

## Japanese Agricultural Standard for Plywood

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**Note :** This is an unofficial translation, for your reference only.

### (Scope of Application)

**Article 1** This standard shall apply to the products those having at least 3 layers of veneers (including the small square lumber for core layers) sliced using a rotary lathe or a slicer and bonded together placing the grain direction almost perpendicular to each other (hereinafter, referred to as “plywood”).

### (Definitions)

**Article 2** In this standard, the definition of the terms listed in the left column of the following table shall be those shown in the respective right column of the same table.

Term	Definition
<b>Plywood for General Use</b>	Among plywood products, plywood except for Concrete Forming Plywood, Structural Plywood, Natural Wood Decorative Plywood and Specially Processed Decorative Plywood.
<b>Concrete Forming Plywood</b>	Among plywood products, plywood used for the frame to form concrete to a specific shape (including those with paint or overlay applied on the surface or the surface and back (hereinafter, referred to as ‘surface processed concrete forming plywood’)).
<b>Structural Plywood</b>	Among plywood products, plywood to be used for the principal structural members of buildings (including those with tongue-and-groove finish).
<b>Natural Wood Decorative Plywood</b>	Among plywood products, plywood with the veneers bonded on the surface or the surface and back mainly for the purpose of aesthetic appearance of natural wood material.
<b>Specially Processed Decorative Plywood</b>	Among plywood products, plywood except for Concrete Forming Plywood and Natural Wood Decorative Plywood, having the special processing such as overlay, print and paint is applied on the surface or the surface and back.
<b>Type Special</b>	Type of plywood to be used outdoor or in the sections where constantly exposed to wet sections (environment) and which meets the requirement of Bonding Quality in Item 1 of the next Article.
<b>Type I</b>	Concrete Forming Plywood and type of plywood to be used in the sections where intermittently exposed to wet conditions (environment) and which meets the requirement of Bonding Quality in Item 2 of the next Article.
<b>Type II</b>	Type of plywood to be used in the sections where occasionally exposed to wet conditions (environment) and which meets the requirement of Bonding Quality in Item 3 of the next Article.
<b>F Type</b>	Specially Processed Decorative Plywood mainly used for table top, counter, etc.
<b>FW Type</b>	Specially Processed Decorative Plywood mainly used for bearing wall of building, as well as for furniture.
<b>W Type</b>	Specially Processed Decorative Plywood mainly used for general wall of building.
<b>SW Type</b>	Specially Processed Decorative Plywood mainly used for special wall of building.

**(Bonding Quality)**

**Article 3** Criteria for the bonding quality of plywood shall be as follows:

1. For **Type Special**, the plywood product shall meet the requirement of either (1), (2) or (3) (limited to those consist of softwood veneers only) of all of the followings:
  - (1) As the results of **Continuous Boiling Test** specified in 3(2) of the Appendix, the average wood failure ratio and shear strength shall be not less than the values provided in Table (1). In this case, for layers with its fiber direction mostly parallel to that of the adjacent veneers (hereinafter, referred to as 'parallel layer'), the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 2/3 of the length of each side.
  - (2) As the results of **Cyclic Steaming Test** specified in 3(2) of the Appendix, the average wood failure ratio and shear strength shall be not less than the values provided in Table (1). In this case, for the parallel layers, the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 2/3 of the length of each side.
  - (3) As the results of **Vacuum Pressure Test** as specified in 3(2) of the Appendix, the specimens shall meet the following conditions from a. to c. In this case, for the parallel layers, the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 2/3 of the length of each side.
    - a. The average wood failure ratio of all test specimens shall be not less than 80%.
    - b. The number of test specimens with the wood failure ratio of 60% or greater shall be not less than 90%.
    - c. The number of test specimens with the wood failure ratio of 30% or greater shall be not less than 95%.
2. For **Type I**, the plywood product shall meet the requirement of either (1), (2) or (3) (limited to Concrete forming plywood consists of softwood veneers only) of all of the followings. However, for Surface processed concrete forming plywood, Natural wood decorative plywood, Specially processed decorative plywood and Special core plywood (referring to the plywood with other than 'veneer core', hereinafter the same), as the results of **Type I Immersion Delamination Test** specified in 3(3) of the Appendix, the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 50mm at each side.
  - (1) As the results of **Cyclic Boiling Test** specified in 3(2) of the Appendix, the average wood failure ratio and shear strength shall be not less than the values provided in Table (1). In this case, for the parallel layers, the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 2/3 of the length of each side.
  - (2) As the results of **Steaming Treatment Test** specified in 3(2) of the Appendix, the average wood failure ratio and shear strength shall be not less than the values provided in Table (1). In this case, for the parallel layers, the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 2/3 of the length of each side.
  - (3) As the results of **Vacuum Pressure Test** as specified in 3(2) of the Appendix, the average wood failure ratio and shear strength shall be not less than the values provided in Table (1). In this case, for the parallel layers, the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 2/3 of the length of each side.
3. For Type II of Plywood for General Use (except for the special core plywood), as the results of **Hot and Cold Water Immersion Test** specified in 3(2) of the Appendix, the average wood failure ratio and shear strength shall be not less than the values provided in Table (1). In this case, for the parallel layers, the

length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 2/3 of the length of each side.

For Type II of Natural wood decorative plywood, Specially processed decorative plywood and Special core plywood, as the results of Type II Immersion Delamination Test specified in 3(3) of the Appendix, the length of non-delaminated portion on the same bonding layer of the specimen shall be not less than 50mm at each side.

**Table (1)**

Species of veneer used for the test specimen		Average Wood Failure Ratio (%)	Shear Strength (MPa or N/mm <sup>2</sup> )
Hardwood	Kaba (Birch)		1.0
	Buna (Beech), Nara (Oak), Itaya kaede (Maple), Akadamo (Elm), Shioji (Shioji), Yachidamo (Ash)		0.9
	Sen (Sen), Hoo (Hoo), Katsura (Katsura Tree), Tabu (Tabu)		0.8
	Lawan (Lauan), Shina (Japanese Linden) and other hardwood		0.7
Softwood			0.7
		50	0.6
		65	0.5
		80	0.4

(Notes) Concerning specimens including several different species veneers, the lowest shear strength value among those of included species shall be applied.

**(Standard for Plywood for General Use)**

**Article 4** The standard for Plywood for General Use shall be as follows:

Classification		Criteria															
Quality	Bonding quality	Product shall meet the requirement of Type I or Type II Bonding Quality.															
	Moisture content	As the results of <b>Moisture Content Test</b> specified in 3(4) of the Appendix, the average moisture content of test specimens taken from the same sample plywood shall be 14% or less.															
	Formaldehyde emission amount	<p>As the results of <b>Formaldehyde Emission Amount Test</b> specified in 3(5) of the Appendix, the average and the maximum values of the formaldehyde emission amount from the sample plywood taken according to the 1 of the Appendix shall be not more than the values in the following table, corresponding to the performance class.</p> <p>However, this shall not apply to cases where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product uses the 'Formaldehyde-free' adhesive.</p> <table><tr><th>Performance class</th><th>Average value (mg/L)</th><th>Maximum value (mg/L)</th></tr><tr><td>F☆☆☆☆</td><td>0.3</td><td>0.4</td></tr><tr><td>F☆☆☆</td><td>0.5</td><td>0.7</td></tr><tr><td>F☆☆</td><td>1.5</td><td>2.1</td></tr><tr><td>F☆</td><td>5.0</td><td>7.0</td></tr></table>	Performance class	Average value (mg/L)	Maximum value (mg/L)	F☆☆☆☆	0.3	0.4	F☆☆☆	0.5	0.7	F☆☆	1.5	2.1	F☆	5.0	7.0
	Performance class	Average value (mg/L)	Maximum value (mg/L)														
	F☆☆☆☆	0.3	0.4														
F☆☆☆	0.5	0.7															
F☆☆	1.5	2.1															
F☆	5.0	7.0															
Insect-control treatment (limited to those marked as 'Treated for Insect-control')	<p>For products to be treated with Boron compound, the insect-control treatment shall be made by a veneer treatment method, and for those to be treated with Fenitrothion, Bifenthrin or Cyphenothrin, the treatment shall be by an adhesive mixing method.</p> <p>Also, as the results of <b>Insect-control Treatment Test</b> specified in 3(6) of the Appendix, the absorbed amount of chemicals shall meet the following requirements:</p> <ol style="list-style-type: none"><li>For those treated with Boron compound, the absorbed amount of boric acid shall be 1.2k/m<sup>3</sup> or greater.</li><li>For those treated with Fenitrothion, the absorbed amount of fenitrothion shall be between 0.1kg/m<sup>3</sup> and 0.5kg/m<sup>3</sup>.</li><li>For those treated with Bifenthrin, the absorbed amount of bifenthrin shall be between 0.01kg/m<sup>3</sup> and 0.05kg/m<sup>3</sup>.</li><li>For those treated with Cyphenothrin, the absorbed amount of cyphenothrin shall be between 0.01kg/m<sup>3</sup> and 0.05kg/m<sup>3</sup></li></ol>																
Moisture absorption (limited to those marked as 'Treated for Incombustibility')	As the results of <b>Moisture Absorption Test</b> specified in 3(7) of the Appendix, the average mass increase of the test specimens taken from the same sample plywood shall be not more than 0.4g after the test.																
Incombustibility (limited to those marked as 'Treated for Incombustibility')	<p>As the results of <b>Incombustibility Test</b> specified in 3(8) of the Appendix, each test specimen shall meet the following requirements:</p> <ol style="list-style-type: none"><li>There shall be no meltdown throughout the thickness of the test specimen, no crack on the back face of the test specimen (limited to those with the width of crack on the back face is not less than 1/10 the total thickness of the specimen.) and no other significant deformation damaging fire prevention.</li><li>There shall be no afterflame for longer than 30 seconds after the termination of heating.</li><li>The exhaust gas temperature curve obtained from the test results shall not exceed the standard temperature curve within 3 minutes after the</li></ol>																

		<p>test is started.</p> <p>4. The area of the section surrounded by the exhaust gas temperature curve and the standard temperature curve, where the exhaust gas temperature curve exceeds the standard temperature curve, shall be not more than 350 (unit:°C x min.).</p> <p>5. The smoke generation coefficient per unit area shall be 120 or less.</p>																																								
Gas toxic property (limited to those marked as 'Treated for Incombustibility')	As the results of <b>Gas Toxic Property Test</b> specified in 3(9) of the Appendix, the average time of behavioral incapacitation of mice using the test specimens shall be greater than that of mice using the standard materials.																																									
Nonflammable property (limited to those marked as 'Treated for Flameproof')	<p>As the results of <b>Nonflammable Treatment Test</b> specified in 3(10) of the Appendix, the test specimens shall meet the following requirements:</p> <p>1. After flaming-time (referred to the time from putting off the burner until the specimen stops burning up with flame after flaming of the specimen for 2 minutes, hereinafter the same) shall be not more than 10 seconds.</p> <p>2. After glow-time (referred to the time from putting off the burner until the specimen stops burning up without flame after flaming of the specimen for 2 minutes, hereinafter the same) shall be not more than 30 seconds.</p> <p>3. A carbonized area (referred to the area of the specimen where carbonized by the time of after flaming-time and after glow-time has passed.) shall be not more than 50cm<sup>2</sup>.</p>																																									
Face quality	<p>1. Concerning the plywood using the surface veneer of hardwood species as listed in Appended Table 1, the quality of the surface shall meet the criteria of 'Surface' specified in next Clause, and the quality of the back face shall meet the criteria of 'Back face' specified in Clause No.4.</p> <p>2. Concerning the plywood using the surface veneer of hardwood species other than those listed in Appended Table 1, the quality of the surface shall meet the criteria of 'Surface' specified in Clause 3, and the quality of the back face shall meet the criteria of 'Back face' specified in Clause No.4.</p> <p>3. Concerning the plywood using the surface veneer of softwood species, the quality of surface and back face veneers shall meet the criteria specified in Clause 5, corresponding to the symbols shown in the following Table respectively.</p> <table><tr><th rowspan="2">Symbol</th><th colspan="2">Criteria of Face Quality</th><th rowspan="2">Symbol</th><th colspan="2">Criteria of Face Quality</th></tr><tr><th>Surface</th><th>Back face</th><th>Surface</th><th>Back face</th></tr><tr><td>A-A</td><td>A</td><td>A</td><td>B-C</td><td>B</td><td>C</td></tr><tr><td>A-B</td><td>A</td><td>B</td><td>B-D</td><td>B</td><td>D</td></tr><tr><td>A-C</td><td>A</td><td>C</td><td>C-C</td><td>C</td><td>C</td></tr><tr><td>A-D</td><td>A</td><td>D</td><td>C-D</td><td>C</td><td>D</td></tr><tr><td>B-B</td><td>B</td><td>B</td><td>D-D</td><td>D</td><td>D</td></tr></table>		Symbol	Criteria of Face Quality		Symbol	Criteria of Face Quality		Surface	Back face	Surface	Back face	A-A	A	A	B-C	B	C	A-B	A	B	B-D	B	D	A-C	A	C	C-C	C	C	A-D	A	D	C-D	C	D	B-B	B	B	D-D	D	D
Symbol	Criteria of Face Quality			Symbol	Criteria of Face Quality																																					
	Surface	Back face	Surface		Back face																																					
A-A	A	A	B-C	B	C																																					
A-B	A	B	B-D	B	D																																					
A-C	A	C	C-C	C	C																																					
A-D	A	D	C-D	C	D																																					
B-B	B	B	D-D	D	D																																					
Core overlap	<p>1. Concerning the plywood using the surface veneer of hardwood species and with the surface quality of Grade 1, number of core overlaps shall be not more than 2 and the length of up to 150mm. For those with surface quality of Grade 2, the number of core overlaps shall be not more than 3.</p> <p>2. Concerning the plywood using the surface veneer of softwood species and with surface quality A, number of core overlaps shall be not more</p>																																									

		than 2 and the length of up to 150mm. For those with surface quality B, C or D, the number of core overlaps shall be not more than 3.																							
	Core void (limited to those using the surface veneer of hardwood species as listed in Appended Table 1)	Concerning the plywood with surface quality of Grade 1, number of core voids shall be not more than 2 and the width of up to 3mm. For those with the surface quality of Grade 2, the number of core voids shall be not more than 4.																							
	Uneven thickness of core or crossband (limited to those using the surface veneer of hardwood species as listed in Appended Table 1)	Shall not exceed 6% of the average veneer thickness at the time of production.																							
	Quality of Sides and ends finish	There shall be no scuffing.																							
	Warp or Twist	1. Concave curve shall be not more than 50mm (or not more than 30mm for those with the marked thickness (hereinafter, referred to as ‘marked thickness’) of 7.5mm or greater), or when pressing by hand, the plywood surface shall touch the horizontal plane. 2. When applying 10kg weight (15kg for those with the marked thickness of 7.5mm or greater), the plywood surface shall touch the horizontal plane.																							
	Crook of edges	The largest concave curve of the crook shall be not more than 1mm.																							
	Dimensions	1. The differences between the marked dimensions and the actual measurement (dimensions shall be measured using the equipment measurable up to 0.05mm for thickness, and up to 1mm for other dimensions) shall comply with the criteria in the right column of the following table, corresponding to each classification. <table><tr><th colspan="3">Classification</th><th>Differences between the actual and marked dimensions</th></tr><tr><td rowspan="6">Thickness</td><td rowspan="4">Hardwood</td><td>Marked thickness: &lt;4mm</td><td>±0.2mm</td></tr><tr><td>Ditto, ≥ 4mm, &lt;7mm</td><td>±0.3mm</td></tr><tr><td>Ditto, ≥ 7mm, &lt;20mm</td><td>±0.4mm</td></tr><tr><td>Ditto, ≥ 20mm</td><td>±0.5mm</td></tr><tr><td rowspan="2">Softwood</td><td>Ditto, ≤ 7.5mm</td><td>+0.5mm, -0.3mm</td></tr><tr><td>Ditto, &gt;7.5mm</td><td>+0.8mm, -0.5mm</td></tr><tr><td colspan="3">Width and Length</td><td>+10mm, -0mm</td></tr></table> 2. The difference between the lengths of diagonal lines shall be not more than 2mm.	Classification			Differences between the actual and marked dimensions	Thickness	Hardwood	Marked thickness: <4mm	±0.2mm	Ditto, ≥ 4mm, <7mm	±0.3mm	Ditto, ≥ 7mm, <20mm	±0.4mm	Ditto, ≥ 20mm	±0.5mm	Softwood	Ditto, ≤ 7.5mm	+0.5mm, -0.3mm	Ditto, >7.5mm	+0.8mm, -0.5mm	Width and Length			+10mm, -0mm
Classification			Differences between the actual and marked dimensions																						
Thickness	Hardwood	Marked thickness: <4mm	±0.2mm																						
		Ditto, ≥ 4mm, <7mm	±0.3mm																						
		Ditto, ≥ 7mm, <20mm	±0.4mm																						
		Ditto, ≥ 20mm	±0.5mm																						
	Softwood	Ditto, ≤ 7.5mm	+0.5mm, -0.3mm																						
		Ditto, >7.5mm	+0.8mm, -0.5mm																						
Width and Length			+10mm, -0mm																						
Marking	Items to be marked	1. The following items shall be marked in block. (1) Product name (2) Dimensions (3) Bonding quality (4) Face quality (5) Formaldehyde emission amount (except for cases where marking is																							

		<p>applied in accordance with 4. below).</p> <p>(6) Name of manufacturer or supplier (or importer for the imported products).</p> <p>2. Concerning the plywood marked as 'Treated for Insect-control', type of the chemicals used shall be marked in block, in addition to the items in 1. Above.</p> <p>3. In case of marking the name of species used for veneers (or 'species group', hereinafter the same), name of the species used shall be marked in block, in addition to the items in 1. and 2. above.</p> <p>4. In case where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product uses the 'Formaldehyde-free' adhesive, the product may be marked with 'Non-formaldehyde adhesive is used', in addition to the items in 1., 2. and 3. above.</p>
	Marking method	<p>1. The items specified in (1) to (5) of 1. and 2. to 4. shall be marked by the following methods:</p> <p>(1) Product name          "Plywood for General Use" shall be marked. For those to indicate 'Insect-control treatment', "treated for insect-control", for those to indicate 'Incombustibility treatment', "treated for Incombustibility", and for those to indicate 'Flameproof treatment', "treated for flameproof" shall be marked right after the product name "Plywood for General Use".</p> <p>(2) Dimensions          Thickness, width and length shall be marked clearly in mm, cm or m.</p> <p>(3) Bonding quality          "Type I", or "Type II" shall be marked.</p> <p>(4) Face quality          Concerning the plywood using the surface veneer of hardwood species, "Grade 1" or "Grade 2" shall be marked. Concerning the plywood using the surface veneer of softwood species, the symbols specified in 3. of 'Face quality' under the Classification above shall be marked.</p> <p>(5) Formaldehyde emission amount          For plywood with the Performance class of F☆☆☆☆, "F☆☆☆☆", for plywood of F☆☆☆, "F☆☆☆", for plywood of F☆☆, "F☆☆" and for plywood F☆, "F☆" shall be marked.</p> <p>(6) Insecticide          For plywood treated with Boron compound, "Boron compound" or "B" shall be marked. For plywood treated with Fenitrothion, "Fenitrothion" or "FE" shall be marked. For plywood treated with Bifenthrin, "Bifenthrin" or "BF" shall be marked. For plywood treated with Cyphenothrin, "Cyphenothrin" or "CF" shall be marked.</p> <p>(7) Name of the species used for veneers</p> <p>a. For cases of marking the specie name of surface veneer          The common name of the specie shall be marked. In this case, it shall be marked clearly to indicate that it is the specie of the surface veneer.</p> <p>b. For cases of marking the specie name of veneers other than surface veneer          The common name of the specie shall be marked. In this case, it shall be marked clearly to indicate that it is the specie of the veneers other than surface veneer.</p>

		<p>Also, in case of using more than one species, the names of those species shall be listed in order of more volume used.</p> <p>2. In case of marking that non-formaldehyde adhesive is used in accordance with the item 4. of 'Items to be marked' above, "non-formaldehyde adhesive is used." shall be marked.</p> <p>3. Marking of the items to be marked specified above shall be clearly made on the panel surface of each plywood sheet where they can easily be noticed, in accordance with the Appended Format. However, concerning the product used as base plywood and having a difficulty of marking on each sheet, the marking shall be made on each bale at easily noticeable location.</p>
	Items prohibited from marking	<p>Following items shall not be included in the marking.</p> <p>1. Terms inconsistent with the items specified under the Clause of 'Items to be marked'.</p> <p>2. Other terms and markings which may lead to the misunderstanding of the quality.</p>

Notes

1. 'Veneer treatment method' refers to the treating method by sprinkling or spraying insecticide chemicals onto the green veneers and piling them up to spread and penetrate insecticide chemicals into the material.
2. 'Adhesive mixing method' refers to the treating method by applying the adhesive which is mixed with the insecticide chemicals onto veneers (limited to those with the thickness of not more than 2.0mm for surface veneers or back face veneers, and those with the thickness of not more than 4.0mm for those to be used as the core board or crossband) to penetrate the treatment chemical while pressing and bonding veneers together.

2. Criteria of the surface quality of the plywood using the hardwood species as listed in Appended Table 1 for its surface, as specified in the Clause above, shall be as follows:

Criteria	Grade 1	Grade 2
Total number of sound knots, dead knots, holes, bark pockets and pitch pockets with the longer diameter of exceeding 5mm.	Permitted up to 4 times the value of square meters of the panel area (in case of having fractions after the decimal point, the value after adding '1' to the integer value shall be used, hereinafter the same)	Permitted up to 6 times the value of square meters of the panel area.
Sound knots or dead knots	Permitted up to the longer diameter of 20mm.	Permitted up to the longer diameter of 30mm.
Hollow knots or holes	Permitted up to the longer diameter of the fallen off part or the hole of 5mm, and the fallen off part shall be repaired with fillers so that there will be no possibility of falling-off or collapsing.	Permitted up to the longer diameter of the fallen off part or the hole of 10mm, and the fallen off part shall be repaired with fillers so that there will be no possibility of falling-off or collapsing.
Bark pockets or pitch pockets	Permitted up to the longer diameter 25mm, and the fallen off part shall be repaired with fillers so that there will be no possibility of falling-off or collapsing.	Permitted up to the longer diameter 40mm, and the fallen off part shall be repaired with fillers so that there will be no possibility of falling-off or collapsing.
Decay	Not permitted	Permitted if the area is small, and the degree of softening and weakening of the wood material is



		relatively light.
Open splits or chips	Permitted up to the length of 10% of the panel length, up to the width of 1mm, up to the number of 2, and they shall be repaired with fillers so that there will be no possibility of falling-off or collapsing.	Permitted up to the length of 20% of the panel length, up to the width of 1.5mm, up to the number of 3, and they shall be repaired with fillers so that there will be no possibility of falling-off or collapsing.
Cross break	Permitted up to the length of 10% of the panel width.	Permitted up to the length of 20% of the panel width.
Worm holes	Permitted if repaired with fillers so that there will be no possibility of falling-off or collapsing.	
Joints	The length of a gap of open joints is permitted up to 20% of the panel length and up to the width of 0.5mm, if repaired with fillers so that there will be no possibility of falling-off or collapsing and no overlapping.	The length of a gap of open joints is permitted up to 30% of the panel length and up to the width of 1mm, if repaired with fillers so that there will be no possibility of falling-off or collapsing and no overlapping.
Blisters	Not permitted.	
Folds	Not permitted.	
Press mark	Permitted up to the depth of 0.5mm, and up to the number of 2.	
Flaw	Not permitted.	Permitted if repaired.
Patches	Permitted if there is no possibility of falling-off or collapsing.	
Other defects	Permitted if slight.	Permitted if not conspicuous

3. Criteria of the surface quality of the plywood using hardwood but other than those listed in Appended Table 1 for its surface, as specified in the Clause 1. above, shall be as follows:

Criteria	Grade 1	Grade 2
Category		
Total number of sound knots, dead knots, holes, bark pockets and pitch pockets with the longer diameter of exceeding 5mm.	Permitted up to 5 times the value of square meters of the panel area.	Permitted up to 6 times the value of square meters of the panel area.
Sound knots	Permitted up to the longer diameter of 25mm.	Permitted up to the longer diameter of 45mm.
Dead knots	Permitted up to the longer diameter of 15mm.	Permitted up to the longer diameter of 25mm.
Hollow knots or holes	Permitted up to the longer diameter of the fallen off part or the hole of 3mm. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off or collapsing.	Permitted up to the longer diameter of the fallen off part or the hole of 5mm. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off or collapsing.
Bark pockets or pitch pockets	Permitted up to the longer diameter 30mm. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off or collapsing.	Permitted up to the longer diameter 45mm. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off or collapsing.
Decay	Not permitted.	Permitted if the decay area is small, and the degree of softening and weakening of the wood material is relatively light.
Open splits or chips	Permitted up to the length of 20% of	Permitted up to the length of 40% of

	the panel length, up to the width of 1.5mm, up to the number of 2. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off or collapsing.	the panel length, up to the width of 4mm, up to the number of 3, or up to the length of 20% of the panel length, up to the width of 2mm, up to the number of 6. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off or collapsing.
Cross break	Permitted up to the length of 20% of the panel width.	
Worm holes	1. Concerning the round holes, permitted up to the longer diameter of 1.5mm and if the rim is not darkened. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off.  2. Concerning the linear holes, permitted up to the longer diameter of 10mm, if the rim is not darkened and up to the number of 4 times the value of square meters of the panel area. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off.	Permitted if not exist as a group. If repaired with fillers, it shall be repaired so that there will be no possibility of falling-off.
Joints	Permitted if there is no opening at joints.	
Blisters	Not permitted.	
Folds	Not permitted.	
Press mark	Permitted up to the depth of 0.5mm, and up to the number of 2.	Permitted up to the depth of 2mm.
Flaw	Not permitted.	Permitted if repaired.
Patches	Permitted if there is no possibility of falling-off or collapsing.	
Other defects	Permitted if slight.	Permitted if not conspicuous.

Note: Concerning bark pockets and pitch pockets with 'chips' or 'holes', those chips or holes shall be treated as 'holes'. However, those narrow and long ones with the width of up to 4mm shall be treated as 'open splits', hereinafter the same.

4. Criteria of the back face quality of the plywood using hardwood species for its surface, as specified in the Clause 1. above, shall be as follows:

Category	Criteria
Hollow knots and holes	Permitted up to the longer diameter of the fallen off part of 50mm.
Open splits or chips	Permitted up to the length of 50% of the panel length, and up to the width of 10mm, or up to the length of 30% of the panel length, and up to the width of 15mm.
Blisters	Not permitted.
Other defects	Permitted if not interfere with use.

5. Criteria of the surface quality of the plywood using softwood specie for its surface, as specified in the Clause 1. above, shall be as follows:

Criteria Category	A	B	C	D
Total length of diameters in the panel width direction, width or length of sound knots, dead knots, hollow knots, holes, open splits, chips, open joints, cross breaks, linear worm holes and patches	Permitted up to 1/20 the panel width.	Permitted up to 1/15 the panel width.	Permitted up to 1/5 the panel width.	Permitted up to 1/5 the panel width, excluding sound knots.
Sound knots or dead knots	Permitted up to the diameter of 25mm in panel width direction.	Permitted up to the diameter of 40mm in panel width direction.	Permitted up to the diameter of 50mm in panel width direction.	Permitted up to the diameter of 75mm in panel width direction, excluding sound knots.
Hollow knots or holes	Permitted up to the diameter of the fallen off part or the hole of 3mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 5mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 40mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 75mm in the panel width direction.
Patches	Permitted up to the diameter of 50mm in the panel width direction.	Permitted up to the diameter of 100mm in the panel width direction.		
Bark pockets or pitch pockets	Permitted up to the diameter of 30mm.	Permitted up to the diameter of 45mm.	Permitted up to the diameter of 60mm.	
Decay	Not permitted.			
Open splits (including chips or open joints)	Permitted up to the length of 20% of the panel length, up to the width of 1.5mm, up to the number of 2.	Permitted up to the length of 40% of the panel length, up to the width of 6mm, up to the number of 3, or up to the length of 20% of the panel length, up to the width of 3mm, up to the number of 6.	1. Permitted up to the width of 6mm on the panel surface within 25mm from the arrises in the direction of panel length. 2. Concerning the sections other than 1. above, (1) Permitted up to the width of 10mm on the panel surface away from at least 200mm from the arrises in the	1. Permitted up to the width of 6mm on the panel surface within 25mm from the arrises in the direction of panel length. 2. Concerning the sections other than 1. above, (1) Permitted up to the width of 25mm on the panel surface away from at least 200mm from the arrises in the

			direction of panel width, and tapered toward the tip. Or, permitted up to the width of 15mm on the panel surface at least 200mm away from the arrises in the direction of panel width and up to 50% of the length. (2) Permitted up to the width of 50mm on the panel surface at least 200mm away from the arrises in the direction of panel width.	direction of panel width, and tapered toward the tip. (2) Permitted up to the width of 75mm on the panel surface at least 200mm away from the arrises in the direction of panel width.
Cross break	Not permitted.		Permitted up to the length of 10% of the panel width.	
Worm holes	1. Concerning the round holes, permitted up to the longer diameter of 1.5mm. 2. Concerning the linear holes, permitted up to the longer diameter of 10mm and up to the number of 4 times the value of square meters of the panel area.	Permitted if not exist as a group.		
Other defects	Permitted if slight.	Permitted if not conspicuous		

Notes: "Total length of diameters in the panel width direction, width or length of sound knots, dead knots, hollow knots, holes, open splits, chips, open joints, cross breaks, linear worm holes and patches" refers to the total of diameters of each defect in the panel width direction, width or length within the area of the width of 30cm perpendicular to the direction of panel length where having most number of these defects on the panel surface. (hereinafter, the same.)

**(Standard for Concrete Forming Plywood)**

**Article 5** The standard for Concrete Forming Plywood shall be as follows:

Classification		Criteria																				
Quality	Bonding quality	Product shall meet the requirement of Type I Bonding Quality.																				
	Moisture content	Same criteria under the Classification of ‘Moisture content’ in Clause 1. of the previous Article shall be met.																				
	Bending stiffness	<p>As the results of <b>Bending Stiffness Test</b> in the lengthwise direction or Bending stiffness test in the widthwise direction specified in 3(11) of the Appendix, Bending Young’s modulus shall be not less than the values shown in the following table.</p> <table><tr><th rowspan="2">Marked thickness (mm)</th><th colspan="2">Bending Young’s modulus (GPa or 10<sup>3</sup>N/mm<sup>2</sup>)</th></tr><tr><th>Lengthwise</th><th>Widthwise</th></tr><tr><td>12</td><td>7.0</td><td>5.5</td></tr><tr><td>15</td><td>6.5</td><td>5.0</td></tr><tr><td>18</td><td>6.0</td><td>4.5</td></tr><tr><td>21</td><td>5.5</td><td>4.0</td></tr><tr><td>24</td><td>5.0</td><td>3.5</td></tr></table> <p>Note: For those with the marked thickness of other than above listed, the criteria values that are obtained by the proportional calculation (adding or subtracting 0.5/3 (GPa) per 1mm, and rounding off to one decimal place) shall be applied.</p>	Marked thickness (mm)	Bending Young’s modulus (GPa or 10 <sup>3</sup> N/mm <sup>2</sup> )		Lengthwise	Widthwise	12	7.0	5.5	15	6.5	5.0	18	6.0	4.5	21	5.5	4.0	24	5.0	3.5
	Marked thickness (mm)	Bending Young’s modulus (GPa or 10 <sup>3</sup> N/mm <sup>2</sup> )																				
Lengthwise		Widthwise																				
12	7.0	5.5																				
15	6.5	5.0																				
18	6.0	4.5																				
21	5.5	4.0																				
24	5.0	3.5																				
Bonding quality, weather resistance against the temperature change and alkali resistance of the coated or overlaid layer (limited to Surface processed concrete forming plywood)	<p>Product shall meet the requirements of 1. to 3. below:</p> <ol style="list-style-type: none"><li>As the results of <b>Flat Plane Tensile Test</b> specified in 3(12) of the Appendix, the average bonding performance of test specimens taken from the same sample plywood shall be not less than 1.0MPa (or N/mm<sup>2</sup>).</li><li>As the results of <b>Cyclic High and Low Temperature Test C</b> specified in 3(13) of the Appendix, there shall be no splits, blisters or peeling-off on the surface of test specimens (shall read as ‘on the surface and back face of test specimens’ for those coated or with overlaid layer on the back of the panel as well, to be used as the concrete forming plywood).</li><li>As the results of <b>Alkali Resistance Test</b> specified in 3(14) of the Appendix, the following criteria of (1) and (2) shall be met:<ol style="list-style-type: none"><li>After covering for 48 hours, some liquid solution shall remain on the surface.</li><li>After leaving for 24 hours, there shall be no splits, blisters, and peeling off as well as significant discoloration or the change of gloss on the surface of the test specimens (shall read as ‘on the surface and back face of test specimens’ for those coated or with overlaid layer on the back of the panel as well, to be used as the concrete forming plywood). However, in case where no poor concrete forming result or discoloration is verified after the actual use as the concrete forming plywood, there shall be no splits, blisters and peeling off.</li></ol></li></ol>																					
Formaldehyde emission amount (limited to those with the marking of Formaldehyde emission amount)	<p>As the results of <b>Formaldehyde Emission Amount Test</b> specified in 3(5) of the Appendix, the average and the maximum values of the formaldehyde emission amount from the sample plywood taken according to the 1 of the Appendix shall be not more than the values in the following table, corresponding to the performance class.</p> <table><tr><th>Performance class</th><th>Average value (mg/L)</th><th>Maximum value (mg/L)</th></tr><tr><td>F☆☆☆☆</td><td>0.5</td><td>0.7</td></tr><tr><td>F☆☆☆</td><td>1.5</td><td>2.1</td></tr><tr><td>F☆☆</td><td>5.0</td><td>7.0</td></tr></table>		Performance class	Average value (mg/L)	Maximum value (mg/L)	F☆☆☆☆	0.5	0.7	F☆☆☆	1.5	2.1	F☆☆	5.0	7.0								
Performance class	Average value (mg/L)	Maximum value (mg/L)																				
F☆☆☆☆	0.5	0.7																				
F☆☆☆	1.5	2.1																				
F☆☆	5.0	7.0																				

Face quality (excluding Surface processed concrete forming plywood)	<p>The quality of faces shall meet the criteria specified in next Clause corresponding to the symbols shown in the following Table respectively.</p> <table><tr><th rowspan="2">Symbol</th><th colspan="2">Criteria of Face Quality</th><th rowspan="2">Symbol</th><th colspan="2">Criteria of Face Quality</th></tr><tr><th>Surface</th><th>Back face</th><th>Surface</th><th>Back face</th></tr><tr><td>A-A</td><td>A</td><td>A</td><td>B-C</td><td>B</td><td>C</td></tr><tr><td>A-B</td><td>A</td><td>B</td><td>B-D</td><td>B</td><td>D</td></tr><tr><td>A-C</td><td>A</td><td>C</td><td>C-C</td><td>C</td><td>C</td></tr><tr><td>A-D</td><td>A</td><td>D</td><td>C-D</td><td>C</td><td>D</td></tr><tr><td>B-B</td><td>B</td><td>B</td><td></td><td></td><td></td></tr></table>	Symbol	Criteria of Face Quality		Symbol	Criteria of Face Quality		Surface	Back face	Surface	Back face	A-A	A	A	B-C	B	C	A-B	A	B	B-D	B	D	A-C	A	C	C-C	C	C	A-D	A	D	C-D	C	D	B-B	B	B			
Symbol	Criteria of Face Quality		Symbol	Criteria of Face Quality																																					
	Surface	Back face		Surface	Back face																																				
A-A	A	A	B-C	B	C																																				
A-B	A	B	B-D	B	D																																				
A-C	A	C	C-C	C	C																																				
A-D	A	D	C-D	C	D																																				
B-B	B	B																																							
Face quality (limited to Surface processed concrete forming plywood)	There shall be no peeling off, blisters or cracks on the surface (including the back face which is coated or with overlaid layer to be used for concrete forming), and stains, dusts, flaws, press mark and other defects are permitted if very slight. Quality of back face (excluding the back face which is coated or with overlaid layer to be used for concrete forming) shall be A, B, C or D of the criteria of panel faces specified in next Clause.																																								
Core overlap	<ol style="list-style-type: none"><li>Concerning the plywood with the surface quality 'A' or the Surface processed concrete forming plywood, the height of convex portion shall be not more than 1mm, number of core overlaps shall be not more than 2 and the length of up to 150mm.</li><li>For those with surface quality B, C or D, the height of convex portion shall be not more than 1mm.</li></ol>																																								
Core void (limited to those using the surface veneer of domestically harvested hardwood species)	<ol style="list-style-type: none"><li>Concerning the plywood with the surface quality 'A' or the Surface processed concrete forming plywood, the width of the core void shall be up to 3mm and number of core overlaps shall be not more than 2.</li><li>For those with surface quality B, C or D, the width of core void shall be up to 3mm.</li></ol>																																								
Uneven thickness of core or crossband	Shall not exceed 6% of the average veneer thickness at the time of production.																																								
Composition of veneers	<ol style="list-style-type: none"><li>Veneer thickness Not less than 1.0mm and not more than 5.5mm.</li><li>Number of veneers Not less than 4.</li><li>Number of layers Not less than 3. However, for those core and crossband bonding together parallel to the fiber direction of each other, they shall be considered as 1 layer.</li><li>Composition ratio Ratio of the total thickness of veneers having the fiber directions parallel to that of the surface veneer against the thickness of the final plywood product shall be not less than 30% and up to 70%.</li></ol>																																								
Quality of Sides and ends finish	There shall be no scuffing.																																								
Warp or Twist	<ol style="list-style-type: none"><li>Concave curve shall be not more than 30mm, or when pressing by hand, the plywood surface shall touch the horizontal plane.</li><li>When applying 15kg, the plywood surface shall touch the horizontal plane.</li></ol>																																								
Crook of edges	The largest concave curve of the crook shall be not more than 1mm.																																								
Dimensions	<ol style="list-style-type: none"><li>The differences between the marked dimensions and the actual measurement (dimensions shall be measured using the equipment measurable up to 0.05mm for thickness, and up to 0.1mm for other</li></ol>																																								

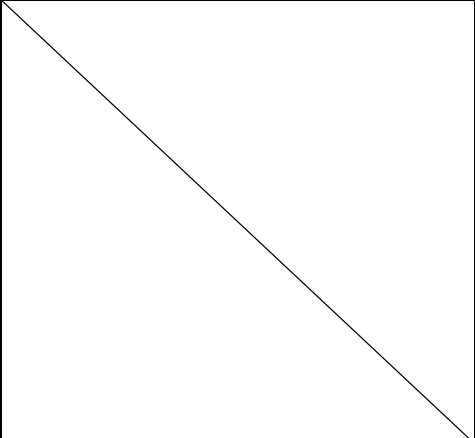
		<p>dimensions) shall comply with the criteria in the right column of the following table, corresponding to each classification.</p> <table border="1"> <tr> <th colspan="2">Classification</th><th>Differences between the actual and marked dimensions</th></tr> <tr> <td rowspan="5">Thickness</td><td>Marked thickness: <math>12.0\text{mm} \leq, &lt;15.0\text{mm}</math></td><td><math>\pm 0.5\text{mm}</math></td></tr> <tr> <td>Ditto, <math>15.0\text{mm} \leq, &lt;18.0\text{mm}</math></td><td><math>\pm 0.6\text{mm}</math></td></tr> <tr> <td>Ditto, <math>18.0\text{mm} \leq, &lt;21.0\text{mm}</math></td><td><math>\pm 0.7\text{mm}</math></td></tr> <tr> <td>Ditto, <math>21.0\text{mm} \leq, &lt;24.0\text{mm}</math></td><td><math>\pm 0.8\text{mm}</math></td></tr> <tr> <td>Ditto, <math>24.0\text{mm} \leq</math></td><td><math>\pm 0.9\text{mm}</math>,</td></tr> <tr> <td colspan="2">Width and Length</td><td>+0mm, -2mm</td></tr> </table> <p>2. The difference between the lengths of diagonal lines shall be not more than 2mm.</p>	Classification		Differences between the actual and marked dimensions	Thickness	Marked thickness: $12.0\text{mm} \leq, <15.0\text{mm}$	$\pm 0.5\text{mm}$	Ditto, $15.0\text{mm} \leq, <18.0\text{mm}$	$\pm 0.6\text{mm}$	Ditto, $18.0\text{mm} \leq, <21.0\text{mm}$	$\pm 0.7\text{mm}$	Ditto, $21.0\text{mm} \leq, <24.0\text{mm}$	$\pm 0.8\text{mm}$	Ditto, $24.0\text{mm} \leq$	$\pm 0.9\text{mm}$ ,	Width and Length		+0mm, -2mm
Classification		Differences between the actual and marked dimensions																	
Thickness	Marked thickness: $12.0\text{mm} \leq, <15.0\text{mm}$	$\pm 0.5\text{mm}$																	
	Ditto, $15.0\text{mm} \leq, <18.0\text{mm}$	$\pm 0.6\text{mm}$																	
	Ditto, $18.0\text{mm} \leq, <21.0\text{mm}$	$\pm 0.7\text{mm}$																	
	Ditto, $21.0\text{mm} \leq, <24.0\text{mm}$	$\pm 0.8\text{mm}$																	
	Ditto, $24.0\text{mm} \leq$	$\pm 0.9\text{mm}$ ,																	
Width and Length		+0mm, -2mm																	
Marking	Items to be marked	<ol style="list-style-type: none"> <li>The following items shall be marked in block. <ol style="list-style-type: none"> <li>Product name</li> <li>Dimensions</li> <li>Face quality</li> <li>Name of manufacturer or supplier (or importer for the imported products).</li> </ol> </li> <li>Concerning those only passed Bending Stiffness Test in widthwise direction, the direction of use shall be marked in block.</li> <li>Concerning those marked with the Formaldehyde emission amount, performance class of formaldehyde emission amount shall be marked in block, in addition to the item under 1. and 2. above.</li> <li>In case of marking the name of species used for veneers, name of the species used shall be marked in block, in addition to the items in 1., 2., and 3. above.</li> <li>Concerning the Surface processed concrete forming plywood, and in case where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product does not use the adhesive containing formaldehyde or paint, etc. which emits formaldehyde (referred to as the material used for coating or overlay, hereinafter the same), the product may be marked with 'Using non-formaldehyde adhesive and the coating material not emitting formaldehyde', in addition to the items in 1. to 4. above.</li> <li>Concerning the product other than Surface processed concrete forming plywood, and in case where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product does not use the adhesive containing formaldehyde, the product may be marked with 'Using non-formaldehyde adhesive', in addition to the items in 1. to 4. above.</li> </ol>																	
	Marking method	<ol style="list-style-type: none"> <li>The items specified in (1) to (3) of 1. and 2. to 6. shall be marked by the following methods: <ol style="list-style-type: none"> <li>Product name "Concrete Forming Plywood" shall be marked. For those to be marked regarding formaldehyde emission amount, "Low formaldehyde emission" shall be marked right after the product name "Concrete Forming Plywood".</li> <li>Dimensions Same method shall be applied as specified in 1(2) of 'Marking</li> </ol> </li> </ol>																	

		<p>method' in Clause 1. of the previous Article.</p> <p>(3) Face quality</p> <p>a. Products other than surface processed concrete forming plywood. Symbols specified in the Clause of Face Quality shall be marked.</p> <p>b. Among surface processed concrete forming plywood, those having coating or overlaying layer applied on both surface and back faces to be used for concrete forming purpose. "Coated on both faces" or "Overlaid layer applied on both faces" shall be marked.</p> <p>c. Among surface processed concrete forming plywood, excluding those having coating or overlaying layer applied on both surface and back faces to be used for concrete forming purpose. "Coated" or "Overlaid" shall be marked, and the symbol 'A', 'B', 'C' or 'D' to indicate the back face quality shall be marked after that. In this case, for those which back face is not intended for the use of concrete forming purpose but coated or overlaid just to avoid the warping or twisting, they shall include the marking to indicate that the back face is not suitable for concrete forming purpose, as well.</p> <p>(4) Direction of use "for the span in widthwise direction" shall be marked.</p> <p>(5) Formaldehyde emission amount For plywood with the Performance class of F☆☆☆, "F☆☆☆", for plywood of F☆☆, "F☆☆" and for plywood F☆, "F☆" shall be marked.</p> <p>(6) Name of the species used for veneers Same method shall be applied as specified in 1(7) of 'Marking method' in Clause 1. of the previous Article.</p> <p>2. In case of marking that using non-formaldehyde adhesive and the coating material not emitting formaldehyde in accordance with the item 5. of 'Items to be marked' above, "Using non-formaldehyde adhesive and the coating material not emitting formaldehyde" shall be marked.</p> <p>3. In case of marking that using non-formaldehyde adhesive in accordance with the item 6. of 'Items to be marked' above, "Using non-formaldehyde adhesive" shall be marked.</p> <p>4. In accordance with the Appended Format, marking of the items to be marked specified above shall be clearly made on the panel surface of each plywood sheet where they can easily be noticed. However, concerning the surface processed concrete forming plywood and those having coating or overlaying layer applied on back face to be used for concrete forming purpose and having a difficulty of marking the panel faces, the marking shall be made on the ends at easily noticeable location.</p>
	Items prohibited from marking	Same criteria shall be applied as specified in 'Items prohibited from marking' in Clause 1. of the previous Article.



2. Criteria of the face quality as specified in the Clause 1. above, shall be as follows:

Criteria Category	A	B	C	D
Total length of diameters in the panel width direction, width or length of sound knots, dead knots, hollow knots, holes, open splits, chips, open joints, cross breaks, linear worm holes and patches	Permitted up to 1/20 the panel width.	Permitted up to 1/15 the panel width.	Permitted up to 1/5 the panel width (up to 1/2 the panel width for those with the surface and back veneer thickness greater than the values in Appended Table 2).	Permitted up to 1/5 the panel width (up to 1/2 the panel width, if the diameters of sound knots, dead knots, hollow knots, holes in the panel width direction is less than 65mm, and the surface and back veneer thickness is greater than the values in Appended Table 2).
Sound knots or dead knots	Permitted up to the diameter of 25mm in panel width direction.	Permitted up to the diameter of 40mm in panel width direction.	Permitted up to the diameter of 50mm in panel width direction.	Permitted up to the diameter of 75mm in panel width direction.
Hollow knots or holes	Permitted up to the diameter of the fallen off part or the hole of 3mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 5mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 40mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 75mm in the panel width direction.
Patches	Permitted up to the diameter of 50mm in the panel width direction.	Permitted up to the diameter of 100mm in the panel width direction.		
Bark pockets or pitch pockets	Permitted up to the longer diameter of 30mm.	Permitted up to the longer diameter of 45mm and the diameter in panel width direction of 30mm, or no possibility of falling-off.		
Decay	Not permitted.			
Open splits (including chips or open joints)	Permitted up to the length of 20% of the panel length, up to the width of 1.5mm, up to the number of 2.	Permitted up to the length of 40% of the panel length, up to the width of 6mm, up to the number of 3, or up to the length of 20% of the panel length, up to the width of 3mm, up to the number of 6.	1. Permitted up to the width of 6mm on the panel surface within 25mm from the arrises in the direction of panel length. 2. Concerning the sections other	1. Permitted up to the width of 6mm on the panel surface within 25mm from the arrises in the direction of panel length. 2. Concerning the sections other

			<p>than 1. above, (1) Permitted up to the width of 10mm on the panel surface away from at least 200mm from the arrises in the direction of panel width, and tapered toward the tip. Or, permitted up to the width of 15mm on the panel surface at least 200mm away from the arrises in the direction of panel width and up to 50% of the length. (2) Permitted up to the width of 50mm on the panel surface at least 200mm away from the arrises in the direction of panel width.</p>	<p>than 1. above, (1) Permitted up to the width of 25mm on the panel surface away from at least 200mm from the arrises in the direction of panel width, and tapered toward the tip. (2) Permitted up to the width of 75mm on the panel surface at least 200mm away from the arrises in the direction of panel width.</p>
Cross break	Not permitted.		Permitted up to the length of 10% of the panel width.	
Worm holes	<p>1. Concerning the round holes, permitted up to the longer diameter of 1.5mm. 2. Concerning the linear holes, permitted up to the longer diameter of 10mm and up to the number of 4 times the</p>	Permitted if not exist as a group.		

	value of square meters of the panel area.		
Press mark	Permitted up to the depth of 0.5mm, and up to the number of 2.	Permitted up to the depth of 2mm..	
Flaw	Permitted if repaired.		
Blisters and Folds	Not permitted.		
Other defects	Permitted if slight.	Permitted if not conspicuous.	

**(Standard for Structural Plywood)**

**Article 6** The standard for Structural Plywood shall be as follows:

Category		Criteria																																																
		Class 1		Class 2																																														
Quality	Bonding quality	Product shall meet the requirement of Type Special of Type I Bonding Quality.																																																
	Moisture content	Same criteria under the Classification of ‘Moisture content’ in Clause 1. of Article 4. shall be met.																																																
	Face quality	The quality of faces shall meet the criteria specified in next Clause corresponding to the symbols shown in the following Table respectively.																																																
		<table><tr><th rowspan="2">Symbol</th><th colspan="2">Criteria of Face Quality</th><th rowspan="2">Symbol</th><th colspan="2">Criteria of Face Quality</th></tr><tr><th>Surface</th><th>Back face</th><th>Surface</th><th>Back face</th></tr><tr><td>A-B</td><td>A</td><td>B</td><td>B-D</td><td>B</td><td>D</td></tr><tr><td>A-C</td><td>A</td><td>C</td><td>C-C</td><td>C</td><td>C</td></tr><tr><td>A-D</td><td>A</td><td>D</td><td>C-D</td><td>C</td><td>D</td></tr><tr><td>B-B</td><td>B</td><td>B</td><td>D-D</td><td>D</td><td>D</td></tr><tr><td>B-C</td><td>B</td><td>C</td><td></td><td></td><td></td></tr></table>				Symbol	Criteria of Face Quality		Symbol	Criteria of Face Quality		Surface	Back face	Surface	Back face	A-B	A	B	B-D	B	D	A-C	A	C	C-C	C	C	A-D	A	D	C-D	C	D	B-B	B	B	D-D	D	D	B-C	B	C								
Symbol	Criteria of Face Quality		Symbol	Criteria of Face Quality																																														
	Surface	Back face		Surface	Back face																																													
A-B	A	B	B-D	B	D																																													
A-C	A	C	C-C	C	C																																													
A-D	A	D	C-D	C	D																																													
B-B	B	B	D-D	D	D																																													
B-C	B	C																																																
Bending property		1. In case of not marking the Bending Young’s modulus and Bending strength by symbols E and F, as the results of <b>Class 1 Bending Test</b> specified in 3(15) of Appendix, the Bending Young’s modulus and Bending strength shall be not less than the values shown in the following table:		As the results of <b>Class 2 Bending Test</b> specified in 3(15) of the Appendix, the Bending Young’s modulus shall be not less than the values shown in the following table.																																														
		<table><tr><th rowspan="2">Marked thickness (mm)</th><th colspan="2">Bending Young’s modulus (GPa or 10<sup>3</sup>N/mm<sup>2</sup>)</th></tr><tr><th>0°</th><th>90°</th></tr><tr><td>&lt;6.0</td><td>8.5</td><td>0.5</td></tr><tr><td>6.0 ≤ &lt;7.5</td><td>8.0</td><td>1.0</td></tr><tr><td>7.5 ≤ &lt;9.0</td><td>7.0</td><td>2.0</td></tr><tr><td>9.0 ≤ &lt;12.0</td><td>6.5</td><td>2.5</td></tr><tr><td>12.0.0 ≤ &lt;15.0</td><td>5.5</td><td>3.5</td></tr><tr><td>15.0 ≤ &lt;18.0</td><td>5.0</td><td>4.0</td></tr><tr><td>18.0 ≤ &lt;21.0</td><td>5.0</td><td>4.0</td></tr><tr><td>21.0 ≤</td><td>55</td><td>3.5</td></tr></table>		Marked thickness (mm)	Bending Young’s modulus (GPa or 10 <sup>3</sup> N/mm <sup>2</sup> )		0°	90°	<6.0	8.5	0.5	6.0 ≤ <7.5	8.0	1.0	7.5 ≤ <9.0	7.0	2.0	9.0 ≤ <12.0	6.5	2.5	12.0.0 ≤ <15.0	5.5	3.5	15.0 ≤ <18.0	5.0	4.0	18.0 ≤ <21.0	5.0	4.0	21.0 ≤	55	3.5	<table><tr><th>Marked thickness (mm)</th><th>Bending Young’s modulus (GPa or 10<sup>3</sup>N/mm<sup>2</sup>)</th></tr><tr><td>&lt;6.0</td><td>6.5</td></tr><tr><td>6.0 ≤ &lt;7.5</td><td>6.0</td></tr><tr><td>7.5 ≤ &lt;9.0</td><td>5.5</td></tr><tr><td>9.0 ≤ &lt;12.0</td><td>5.0</td></tr><tr><td>12.0.0 ≤ &lt;24.0</td><td>4.0</td></tr><tr><td>24.0 ≤ &lt;28.0</td><td>3.5</td></tr><tr><td>28.0 ≤</td><td>3.3</td></tr></table>		Marked thickness (mm)	Bending Young’s modulus (GPa or 10 <sup>3</sup> N/mm <sup>2</sup> )	<6.0	6.5	6.0 ≤ <7.5	6.0	7.5 ≤ <9.0	5.5	9.0 ≤ <12.0	5.0	12.0.0 ≤ <24.0	4.0	24.0 ≤ <28.0	3.5	28.0 ≤	3.3
Marked thickness (mm)	Bending Young’s modulus (GPa or 10 <sup>3</sup> N/mm <sup>2</sup> )																																																	
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12.0.0 ≤ <24.0	4.0																																																	
24.0 ≤ <28.0	3.5																																																	
28.0 ≤	3.3																																																	

Marked thickness (mm)	Bending Strength (0°) (MPa or N/mm <sup>2</sup> )		
	Face Quality Symbols		
	A-B B-B	A-C B-C C-C	A-D B-D C-D D-D
<6.0	42.0	38.0	34.0
6.0 ≤	38.0	36.0	32.0
<7.5			
7.5 ≤	34.0	32.0	28.0
<9.0			
9.0 ≤	32.0	28.0	26.0
<12.0			
12.0 ≤	26.0	24.0	22.0
<15.0			
15.0 ≤	24.0	22.0	20.0
<18.0			
18.0 ≤	24.0	22.0	20.0
<21.0			
21.0 ≤	26.0	24.0	22.0

Marked thickness (mm)	Bending Strength (90°) (MPa or N/mm <sup>2</sup> )
<6.0	8.0
6.0 ≤	14.0
<7.5	
7.5 ≤	12.0
<9.0	
9.0 ≤	16.0
<12.0	
12.0 ≤	20.0
<21.0	
21.0 ≤	18.0

Note: '0°' and '90°' in the tables above indicate the degree of span direction and the main fiber direction of the surface veneer of the test specimen as specified in A of 3(15) of Appendix.

2. In case of marking the Bending Young's modulus and Bending strength by symbols E and F, as the results of **Class 1 Bending Test** specified in 3(15) of Appendix, the Bending Young's modulus and Bending strength shall be not less

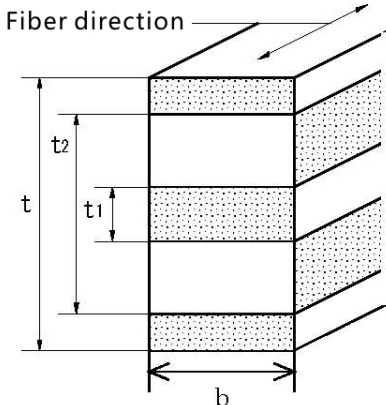
than the values shown in the following table:

Strength grade	Bending Young's modulus (GPa or $10^3\text{N/mm}^2$ )	
	0°	90°
E50-F160	5.0	If no. of veneer is 3: 0.4
E55-F175	5.5	
E60-F190	6.0	If no. of veneer is 4: 1.1
E65-F205	6.5	
E70-F220	7.0	If no. of veneer is 5: 1.8
E75-F245	7.5	
E80-F270	8.0	If no. of veneer is 6 or more: 2.2

Strength grade	Bending strength (MPa or $\text{N/mm}^2$ )	
	0°	90°
E50-F160	16.0	If no. of veneer is 3: 5.0
E55-F175	17.5	
E60-F190	19.0	If no. of veneer is 4: 6.5
E65-F205	20.5	
E70-F220	22.0	If no. of veneer is 5: 9.0
E75-F245	24.5	
E80-F270	27.0	If no. of veneer is 6 or more: 10.0

Note: '0°' and '90°' in the tables above indicate the degree of span direction and the main fiber direction of the surface veneer of the test specimen as specified in A of 3(15) of Appendix.

In-plane Shear Strength	As the results of <b>In-plane Shear Strength Test</b> specified in 3(16), the shear strength shall be not less than 3.2MPa (or N/mm <sup>2</sup> ).																	
Formaldehyde emission amount (limited to those with the marking of Formaldehyde emission amount)	As the results of <b>Formaldehyde Emission Amount Test</b> specified in 3(5) of the Appendix, the average and the maximum values of the formaldehyde emission amount from the sample plywood taken according to the 1 of the Appendix shall be not more than the values in the following table, corresponding to the performance class.																	
	<table><tr><td>Performance class</td><td>Average value (mg/L)</td><td>Maximum value (mg/L)</td></tr><tr><td>F☆☆☆☆</td><td>0.3</td><td>0.4</td></tr><tr><td>F☆☆☆</td><td>0.5</td><td>0.7</td></tr><tr><td>F☆☆</td><td>1.5</td><td>2.1</td></tr><tr><td>F☆</td><td>5.0</td><td>7.0</td></tr></table>	Performance class	Average value (mg/L)	Maximum value (mg/L)	F☆☆☆☆	0.3	0.4	F☆☆☆	0.5	0.7	F☆☆	1.5	2.1	F☆	5.0	7.0		
Performance class	Average value (mg/L)	Maximum value (mg/L)																
F☆☆☆☆	0.3	0.4																
F☆☆☆	0.5	0.7																
F☆☆	1.5	2.1																
F☆	5.0	7.0																
Insect-control treatment (limited to those marked as 'Treated for Insect-control')	Same criteria under the classification of 'Insect-control treatment (limited to those marked as 'Treated for Insect-control')' specified in Clause 1. of Article 4. shall be met.																	
Quality of core or crossband	Criteria under the classification of 'Quality of core or crossband' specified in Clause 3 shall be met.																	
Material	Material with the strength equal to or greater than that of Engelmann spruce shall be used.																	
Composition of veneers	Number of layers, veneer thickness and composition ratio of the plywood corresponding to the marked thickness shall comply with those in the following table. In this case, those core and crossband bonding together parallel to the fiber direction of each other, they shall be considered as 1 layer.																	
	<table><tr><td>Marked thickness (mm)</td><td>No. of layers</td><td>Veneer thickness (mm)</td><td>Composition ratio (%)</td></tr><tr><td>&lt;15.0</td><td>3 or more</td><td rowspan="4">1.0≤ ≤5.5</td><td rowspan="4">Ratio of the total thickness of veneers having the fiber directions parallel to that of the surface veneer against the thickness of the final plywood product shall be not less than 40% and up to 70%.</td></tr><tr><td>15.0≤           &lt;18.0</td><td>4 or more</td></tr><tr><td>18.0≤           &lt;24.0</td><td>5 or more</td></tr><tr><td>24.0≤</td><td>7 or more</td></tr></table>	Marked thickness (mm)	No. of layers	Veneer thickness (mm)	Composition ratio (%)	<15.0	3 or more	1.0≤ ≤5.5	Ratio of the total thickness of veneers having the fiber directions parallel to that of the surface veneer against the thickness of the final plywood product shall be not less than 40% and up to 70%.	15.0≤ <18.0	4 or more	18.0≤ <24.0	5 or more	24.0≤	7 or more			
Marked thickness (mm)	No. of layers	Veneer thickness (mm)	Composition ratio (%)															
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15.0≤ <18.0	4 or more																	
18.0≤ <24.0	5 or more																	
24.0≤	7 or more																	
Quality of Sides and ends finish	There shall be no scuffing.																	
Warp or Twist	1. Concave curve shall be not more than 50mm (or not more than 30mm for those with the marked thickness of 7.5mm or greater), or when pressing by hand, the plywood surface shall touch the horizontal plane. 2. When applying 10kg weight (15kg for those with the marked thickness of 7.5mm or greater), the plywood surface shall touch the horizontal plane.																	
Dimensions	1. The differences between the marked dimensions and the actual measurement shall comply with the criteria in the right column of the following table, corresponding to each classification.																	

		<table><tr><th colspan="2">Classification</th><th>Differences between the actual and marked dimensions</th></tr><tr><td rowspan="2">Thickness</td><td>Marked thickness: <math>\leq 7.5\text{mm}</math></td><td>+0.5mm, -0.3mm</td></tr><tr><td>Ditto, <math>&gt;7.5\text{mm}</math></td><td>+0.8mm, -0.5mm</td></tr><tr><td colspan="2">Width and Length</td><td>+0mm, -3mm</td></tr></table> <p>2. The difference between the lengths of diagonal lines shall be not more than 3mm.</p>	Classification		Differences between the actual and marked dimensions	Thickness	Marked thickness: $\leq 7.5\text{mm}$	+0.5mm, -0.3mm	Ditto, $>7.5\text{mm}$	+0.8mm, -0.5mm	Width and Length		+0mm, -3mm
Classification		Differences between the actual and marked dimensions											
Thickness	Marked thickness: $\leq 7.5\text{mm}$	+0.5mm, -0.3mm											
	Ditto, $>7.5\text{mm}$	+0.8mm, -0.5mm											
Width and Length		+0mm, -3mm											
Ratio of effective section modulus (limited to those marked with Ratio of effective section modulus)		<p>For 5plies plywood, the Ratio of effective section modulus shall be obtained by the following formula:</p> <p>1. Ratio of effective section modulus parallel to (direction of <math>0^\circ</math>) the main fiber direction of the surface veneer (<math>R_0</math>) = <math>Z_0/Z_p</math> <math>Z_0 = b/12 (t^3 - t_2^3 + t_1^3) \cdot 2/t</math> <math>Z_p = bt^2/6</math> <math>Z_0</math> : Section modulus in the direction of <math>0^\circ</math>) <math>Z_p</math> : Section modulus of the plywood</p> <p>2. Ratio of effective section modulus perpendicular to (direction of <math>90^\circ</math>) the main fiber direction of the surface veneer (<math>R_{90}</math>) = <math>Z_{90}/Z_p</math> <math>Z_{90} = b/12 (t_2^3 - t_1^3) \cdot 2/t_2</math> <math>Z_p = bt^2/6</math> <math>Z_{90}</math> : Section modulus in the direction of <math>90^\circ</math>) <math>Z_p</math> : Section modulus of the plywood</p> <p>(Note) Concerning plywood of other than 5 layers, the same procedure shall apply.</p> 											
Marking	Items to be marked	<p>1. The following items shall be marked in block.</p> <p>(1) Product name (2) Dimensions (3) Bonding quality (4) Class</p>											



		<p>(5) Face quality (6) Name of manufacturer or supplier (or importer for the imported products)</p> <p>2. Concerning the plywood marked with the Bending Young's modulus and Bending strength by symbols E and F, 'Bending property' shall be marked in block, in addition to the item in 1. above (limited to Class 1 Structural Plywood).</p> <p>3. Concerning the plywood marked with the Ratio of effective section modulus, the Ratio of effective section modulus shall be marked in block, in addition to the item 1. or 2. above (limited to Class 2 Structural Plywood).</p> <p>4. Concerning those marked with the Formaldehyde emission amount, performance class of formaldehyde emission amount shall be marked in block, in addition to the item under 1. to 3. above.</p> <p>5. Concerning the plywood marked as 'Treated for Insect-control', type of the chemicals used shall be marked in block, in addition to the items in 1. to 4. above.</p> <p>6. In case of marking the name of species used for veneers (or 'species group', hereinafter the same), name of the species used shall be marked in block, in addition to the items in 1. to 5. above.</p> <p>7. In case where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product uses the 'Formaldehyde-free' adhesive, the product may be marked with 'Non-formaldehyde adhesive is used', in addition to the items in 1. to 6. above.</p>
	Marking methods	<p>1. The items specified in (1) to (3) of 1. and 2. to 6. shall be marked by the following methods:</p> <p>(1) Product name "Structural Plywood" shall be marked. For those to be marked regarding formaldehyde emission amount, "Low formaldehyde emission", for those to indicate 'Insect-control treatment', "treated for insect-control" and for those of tongue-and-groove finished, "tongue-and-groove finished" shall be marked right after the product name "Structural Plywood".</p> <p>(2) Dimensions Same method as specified in 1(2) of 'Marking method' in Clause 1. of Article 4 shall be applied. Concerning the width and length of those with tongue-and-groove finish, the effective dimensions (dimensions of the panel (surface) excluding the tongue portion) shall be marked.</p> <p>(3) Bonding quality "Type Special" or "Type I" shall be marked.</p> <p>(4) Class "Class 1" or "Class 2" shall be marked.</p> <p>(5) Face quality Symbols specified under the classification of 'Face quality' above shall be marked.</p> <p>(6) Bending Property Strength grade specified under the classification of 'Bending property' shall be marked.</p> <p>(7) Effective section modulus Effective section modulus in directions of both 0° and 90° shall be marked to the two places of decimals.</p> <p>(8) Formaldehyde emission amount For plywood with the Performance class of F☆☆☆☆, "F☆☆☆☆", for plywood of F☆☆☆, "F☆☆☆", for plywood of F☆☆, "F☆☆" and for plywood F☆, "F☆" shall be marked.</p> <p>(9) Insecticide</p>

		<p>Same method as specified in 1(6) of 'Marking method' in Clause 1. of Article 4 shall be applied.</p> <p>(10) Name of the species used for veneers</p> <p>Same method as specified in 1(7) of 'Marking method' in Clause 1. of Article 4 shall be applied.</p> <p>2. Same method as specified in 2 of 'Marking method' in Clause 1. of Article 4 shall be applied.</p> <p>3. Marking of the items to be marked specified above shall be clearly made on the panel surface of each plywood sheet where they can easily be noticed, in accordance with the Appended Format.</p>
	Items prohibited from marking	Same method as specified in 'Items prohibited from marking' in Clause 1. of Article 4 shall be applied.

2. Criteria of the face quality as specified in the Clause 1. above, shall be as follows:

Criteria Category	A	B	C	D
Total length of diameters in the panel width direction, width or length of sound knots, dead knots, hollow knots, holes, open splits, chips, open joints, cross breaks, linear worm holes and patches	Permitted up to 1/20 the panel width.	Permitted up to 1/15 the panel width.	Permitted up to 1/10 the panel width, up to 1/5 the panel for those using softwood species (up to 1/2 the panel width for those with the surface and back veneer thickness greater than the values in Appended Table 2).	Permitted up to 1/7 the panel width, up to 1/5 the panel for those using softwood species (up to 1/2 the panel width, if the diameters of sound knots, dead knots, hollow knots, holes in the panel width direction is less than 65mm, and the surface and back veneer thickness is greater than the values in Appended Table 2). For Class 1 Structural plywood, the diameter, width and length of sound knots may be excluded from the total length of diameters, width and length.
Sound knots or dead knots	Permitted up to the diameter of 25mm in panel width direction.	Permitted up to the diameter of 40mm in panel width direction.	Permitted up to the diameter of 50mm in panel width direction.	Permitted up to the diameter of 75mm in panel width direction.

Hollow knots or holes	Permitted up to the diameter of the fallen off part or the hole of 3mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 5mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 40mm in the panel width direction.	Permitted up to the diameter of the fallen off part or the hole of 75mm in the panel width direction.
Patches	Permitted up to the diameter of 50mm in the panel width direction.	Permitted up to the diameter of 100mm in the panel width direction.		
Bark pockets or pitch pockets	Permitted up to the longer diameter of 30mm.	Permitted up to the longer diameter of 45mm.	Permitted up to the longer diameter of 60mm.	
Decay	Not permitted.			
Open splits (including chips or open joints)	Permitted up to the length of 20% of the panel length, up to the width of 1.5mm, up to the number of 2.	Permitted up to the length of 40% of the panel length, up to the width of 6mm, up to the number of 3, or up to the length of 20% of the panel length, up to the width of 3mm, up to the number of 6.	<div>1. Permitted up to the width of 6mm on the panel surface within 25mm from the arrises in the direction of panel length.</div> <div>2. Concerning the sections other than 1. above,</div> <div>(1) Permitted up to the width of 10mm on the panel surface away from at least 200mm from the arrises in the direction of panel width, and tapered toward the tip. Or, permitted up to the width of 15mm on the panel surface at least 200mm away from the arrises in the direction of panel width and up to 50% of the length.</div> <div>(2) Permitted up to the width of 50mm on the</div>	<div>1. Permitted up to the width of 6mm on the panel surface within 25mm from the arrises in the direction of panel length.</div> <div>2. Concerning the sections other than 1. above,</div> <div>(1) Permitted up to the width of 25mm on the panel surface away from at least 200mm from the arrises in the direction of panel width, and tapered toward the tip.</div> <div>(2) Permitted up to the width of 75mm on the panel surface at least 200mm away from the arrises in the direction of panel width.</div>

			panel surface at least 200mm away from the arrises in the direction of panel width.	
Cross break	Not permitted.		Permitted up to the length of 10% of the panel width.	
Worm holes	1. Concerning the round holes, permitted up to the longer diameter of 1.5mm. 2. Concerning the linear holes, permitted up to the longer diameter of 10mm and up to the number of 4 times the value of square meters of the panel area.	Permitted if not exist as a group.		
Other defects	Permitted if slight.	Permitted if not conspicuous		

3. Criteria of the core or crossband quality as specified in the Clause 1. above, shall be as follows:

Classification	Criteria
Total number of defects of sound knots, dead knots, hollow knots, holes, patches and decay	Permitted up to the total number of 3 defects calculated by the formula in the Appended Table 3 within the random rectangular area of 300mm in the panel length and 600mm in the panel width direction including White pockets.
Dead knots, hollow knots and holes	Permitted up to the diameter of 75mm in the direction of panel width (up to 90mm for the inner layer veneers located 3 or more layers inside from surface and back face veneers).
Decay	Not permitted. However, White pockets are permitted if not interfere with use.
Open splits (including chips or open joints)	1. Permitted up to the width of 6mm on the panel surface within 25mm from the arrises in the direction of panel length. 2. Concerning the sections other than 1. above, (1) Permitted up to the width of 25mm on the panel surface away from at least 200mm from the arrises in the direction of panel width, and tapered toward the tip. (2) Permitted up to the width of 75mm on the panel surface away from at least 200mm from the arrises in the direction of panel width.
Cross break	Permitted up to the length of 10% of the panel width.
Core overlap	1. For Face quality 'A', permitted up to the number of 2 and the length of 150mm. 2. For Face quality 'B', permitted up to the number of 3.
Other defects	Permitted if not conspicuous.

**(Standard for Natural Wood Decorative Plywood)**

**Article 7** The standard for Natural Wood Decorative Plywood shall be as follows:

Classification		Criteria															
Quality	Bonding quality	Product shall meet the requirement of Type I or Type II Bonding Quality.															
	Moisture content	As the results of <b>Moisture Content Test</b> specified in 3(4) of the Appendix, the average moisture content of test specimens taken from the same sample plywood shall be 12% or less.															
	Weather resistance against the temperature change	As the results of <b>Cyclic High and Low Temperature Test B</b> specified in 3(13) of the Appendix, there shall be no splits, blisters, folds, discoloration and grain depression on the surface of test specimens (shall read as 'on the surface and back face of test specimens for those marked as having a decorative veneer bonded on back face of the panel to be used for the purpose of aesthetic appearance of natural wood material and having the equivalent property to that of the surface of the panel, hereinafter the same in this Article), and the dimensions shall be stable.															
	Formaldehyde emission amount	<p>As the results of <b>Formaldehyde Emission Amount Test</b> specified in 3(5) of the Appendix, the average and the maximum values of the formaldehyde emission amount from the sample plywood taken according to the 1 of the Appendix shall be not more than the values in the following table, corresponding to the performance class.</p> <p>However, this shall not apply to cases where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product uses the 'Formaldehyde-free' adhesive.</p> <table><tr><th>Performance class</th><th>Average value (mg/L)</th><th>Maximum value (mg/L)</th></tr><tr><td>F☆☆☆☆</td><td>0.3</td><td>0.4</td></tr><tr><td>F☆☆☆</td><td>0.5</td><td>0.7</td></tr><tr><td>F☆☆</td><td>1.5</td><td>2.1</td></tr><tr><td>F☆</td><td>5.0</td><td>7.0</td></tr></table>	Performance class	Average value (mg/L)	Maximum value (mg/L)	F☆☆☆☆	0.3	0.4	F☆☆☆	0.5	0.7	F☆☆	1.5	2.1	F☆	5.0	7.0
	Performance class	Average value (mg/L)	Maximum value (mg/L)														
	F☆☆☆☆	0.3	0.4														
	F☆☆☆	0.5	0.7														
	F☆☆	1.5	2.1														
	F☆	5.0	7.0														
Insect-control treatment (limited to those marked as 'Treated for Insect-control')	Same criteria as specified in 'Insect-control treatment (limited to those marked as 'Treated for Insect-control')' in Clause 1. of Article 4 shall be applied.																
Moisture absorption (limited to those marked as 'Treated for Incombustibility')	Same criteria as specified in 'Moisture absorption (limited to those marked as 'Treated for Incombustibility')' in Clause 1. of Article 4 shall be applied.																
Incombustibility (limited to those marked as 'Treated for incombustibility')	Same criteria as specified in 'Incombustibility (limited to those marked as 'Treated for Incombustibility')' in Clause 1. of Article 4 shall be applied.																
Gas toxic property (limited to those marked as 'Treated for Incombustibility')	Same criteria as specified in 'Gas toxic property (limited to those marked as 'Treated for Incombustibility')' in Clause 1. of Article 4 shall be applied.																
Nonflammable property (limited to those marked as 'Treated for Flameproof')	Same criteria as specified in 'Nonflammable property (limited to those marked as 'Treated for Flameproof')' in Clause 1. of Article 4 shall be applied.																
Surface quality	Surface quality of the plywood shall meet the criteria of 'Surface quality' specified in the next Clause.																
Back face quality	Back face quality of the plywood shall meet the criteria of 'Back face quality' specified in Clause 3.																

	Quality of Sides and ends finish	There shall be no scuffing.														
	Warp or Twist	<ol style="list-style-type: none"> <li>1. Concave curve shall be not more than 50mm (or not more than 30mm for those with the marked thickness of 7.5mm or greater), or when pressing by hand, the plywood surface shall touch the horizontal plane.</li> <li>2. When applying 10kg weight (15kg for those with the marked thickness of 7.5mm or greater), the plywood surface shall touch the horizontal plane.</li> </ol>														
	Core void	Permitted up to a width of 3mm of core void on the side of the panel.														
	Crook of edges	The largest concave curve of the crook shall be not more than 1mm.														
	Dimensions	<ol style="list-style-type: none"> <li>1. The differences between the marked dimensions and the actual measurement (dimensions shall be measured using the equipment measurable up to 0.05mm for thickness, and up to 1mm for other dimensions) shall comply with the criteria in the right column of the following table, corresponding to each classification.</li> </ol> <table border="1"> <thead> <tr> <th colspan="2">Classification</th><th>Differences between the actual and marked dimensions</th></tr> </thead> <tbody> <tr> <td rowspan="4">Thickness</td><td>Marked thickness: &lt;4mm</td><td>±0.2mm</td></tr> <tr> <td>Ditto, 4mm ≤, &lt;7mm</td><td>±0.3mm</td></tr> <tr> <td>Ditto, 7mm ≤, &lt;20m</td><td>±0.4mm</td></tr> <tr> <td>Ditto, 20mm ≤</td><td>±0.5mm</td></tr> <tr> <td colspan="2">Width and Length</td><td>+10mm, -0mm</td></tr> </tbody> </table> <ol style="list-style-type: none"> <li>2. The difference between the lengths of diagonal lines shall be not more than 3mm.</li> </ol>	Classification		Differences between the actual and marked dimensions	Thickness	Marked thickness: <4mm	±0.2mm	Ditto, 4mm ≤, <7mm	±0.3mm	Ditto, 7mm ≤, <20m	±0.4mm	Ditto, 20mm ≤	±0.5mm	Width and Length	
Classification		Differences between the actual and marked dimensions														
Thickness	Marked thickness: <4mm	±0.2mm														
	Ditto, 4mm ≤, <7mm	±0.3mm														
	Ditto, 7mm ≤, <20m	±0.4mm														
	Ditto, 20mm ≤	±0.5mm														
Width and Length		+10mm, -0mm														
Marking	Items to be marked	<ol style="list-style-type: none"> <li>1. The following items shall be marked in block. <ol style="list-style-type: none"> <li>(1) Product name</li> <li>(2) Dimensions</li> <li>(3) Bonding quality</li> <li>(4) Formaldehyde emission amount (except for cases where marking is applied in accordance with 4. and 5. below)</li> <li>(5) Name of manufacturer or supplier (or importer for the imported products)</li> </ol> </li> <li>2. Concerning the plywood marked as 'Treated for Insect-control', type of the chemicals used shall be marked in block, in addition to the items in 1. Above.</li> <li>3. In case of marking the name of species used for veneers, name of the species used shall be marked in block, in addition to the items in 1. and 2. above.</li> <li>4. Concerning the coated plywood, and in case where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product does not use the adhesive containing formaldehyde or paint, etc. which emits formaldehyde, the product may be marked with 'Using non-formaldehyde adhesive and the coating material not emitting formaldehyde', in addition to the items in 1. to 3. above.</li> <li>5. Concerning the plywood which is not coated, and in case where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product does not use the adhesive containing formaldehyde, the product may be marked with 'Using non-formaldehyde adhesive', in addition to the items in 1. to 3. above.</li> <li>6. In case of marking on a bale, the number of plywood panels contained in</li> </ol>														

		the bale shall be marked in block, in addition to the items 1. to 5. above.
	Marking method	<p>1. The items specified in (1) to (4) of 1. and 2. to 6. shall be marked by the following methods:</p> <p>(1) Product name  “Natural Wood Decorative Plywood” shall be marked. For those to indicate ‘Insect-control treatment’, “treated for insect-control”, for those to indicate ‘Incombustibility treatment’, “treated for Incombustibility”, and for those to indicate ‘Flameproof treatment’, “treated for flameproof” shall be marked right after the product name “Natural Wood Decorative Plywood”. For those having a decorative veneer bonded on back face of the panel to be used for the purpose of aesthetic appearance of natural wood material and having the equivalent property to that of the surface of the panel, “both faces”, or “Both surface and back faces”, etc. shall clearly marked after the product name “Natural Wood Decorative Plywood”, to indicate clearly that the back face has the equivalent property to that of the panel surface.</p> <p>(2) Dimensions  Same criteria as specified in 1(2) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(3) Bonding quality  Same criteria as specified in 1(3) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(4) Formaldehyde emission amount  Same criteria as specified in 1(5) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(5) Insecticide  Same criteria as specified in 1(6) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(6) Name of the species used for veneers</p> <p>a. For cases of marking the specie name of the veneer used for the decorative layer  The common name of the specie shall be marked. In this case, it shall be marked clearly to indicate that it is the specie of the veneer used for the decorative layer.</p> <p>b. For cases of marking the specie name of veneers other than the veneer used for the decorative layer  The common name of the specie shall be marked. In this case, it shall be marked clearly to indicate that it is the specie of the veneers other than the veneer used for the decorative layer.  Also, in case of using more than one species, the names of those species shall be listed in order of more volume used.</p> <p>2. In case of marking that using non-formaldehyde adhesive and the coating material not emitting formaldehyde in accordance with the item 4. of ‘Items to be marked’ above, “Using non-formaldehyde adhesive and the coating material not emitting formaldehyde” shall be marked.</p> <p>3. In case of marking that using non-formaldehyde adhesive in accordance with the item 5. of ‘Items to be marked’ above, “Using non-formaldehyde adhesive” shall be marked.</p> <p>4. Marking of the items to be marked specified above shall be clearly made on the panel surface of each plywood sheet or on each bale where they can easily be noticed, in accordance with the Appended Format.</p>

	Items prohibited from marking	Same method as specified in 'Items prohibited from marking' in Clause 1. of Article 4 shall be applied.
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2. Criteria of the surface quality as specified in the Clause 1. above, shall be as follows:

Category	Criteria
Worm holes or decay	Not permitted.
Blisters, folds, open joints or press mark	Not permitted.
Other defects	Permitted if very slight.

3. Criteria of the back face quality as specified in the Clause 1. above, shall be as follows:

Category	Criteria
Hollow knots and holes	Permitted up to the longer diameter of 20mm.
Open splits or chips	Permitted up to the width of 5mm and up to the length of 30% of the panel length.
Blisters	Not permitted.
Processing quality and other defects	Permitted if not interfere with use.



**(Standard for Specially Processed Decorative Plywood)**

**Article 8** The standard for Specially Processed Decorative Plywood shall be as follows:

Classification		Criteria															
Quality	Bonding quality of base panel	Product shall meet the requirement of Type I or Type II Bonding Quality.															
	Bonding quality of overlaid layer	As the results of <b>Flat plane tensile test</b> specified in 3(12) of the Appendix, the average bonding performance of test specimens taken from the same sample plywood shall be not less than 0.4MPa (or N/mm <sup>2</sup> ).															
	Moisture content	As the results of <b>Moisture Content Test</b> specified in 3(4) of the Appendix, the average moisture content of test specimens taken from the same sample plywood shall be 13% or less.															
	Surface property	Surface property shall meet the criteria specified in the next Clause.															
	Formaldehyde emission amount	<p>As the results of <b>Formaldehyde Emission Amount Test</b> specified in 3(5) of the Appendix, the average and the maximum values of the formaldehyde emission amount from the sample plywood taken according to the 1 of the Appendix shall be not more than the values in the following table, corresponding to the performance class.</p> <p>However, this shall not apply to cases where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product uses the 'Formaldehyde-free' adhesive.</p> <table><tr><th>Performance class</th><th>Average value (mg/L)</th><th>Maximum value (mg/L)</th></tr><tr><td>F☆☆☆☆</td><td>0.3</td><td>0.4</td></tr><tr><td>F☆☆☆</td><td>0.5</td><td>0.7</td></tr><tr><td>F☆☆</td><td>1.5</td><td>2.1</td></tr><tr><td>F☆</td><td>5.0</td><td>7.0</td></tr></table>	Performance class	Average value (mg/L)	Maximum value (mg/L)	F☆☆☆☆	0.3	0.4	F☆☆☆	0.5	0.7	F☆☆	1.5	2.1	F☆	5.0	7.0
	Performance class	Average value (mg/L)	Maximum value (mg/L)														
	F☆☆☆☆	0.3	0.4														
	F☆☆☆	0.5	0.7														
	F☆☆	1.5	2.1														
	F☆	5.0	7.0														
	Insect-control treatment (limited to those marked as 'Treated for Insect-control')	Same criteria as specified in 'Insect-control treatment (limited to those marked as 'Treated for Insect-control')' in Clause 1. of Article 4 shall be applied.															
	Moisture absorption (limited to those marked as 'Treated for Incombustibility')	Same criteria as specified in 'Moisture absorption (limited to those marked as 'Treated for Incombustibility')' in Clause 1. of Article 4 shall be applied.															
Incombustibility (limited to those marked as 'Treated for Incombustibility')	Same criteria as specified in 'Incombustibility (limited to those marked as 'Treated for Incombustibility')' in Clause 1. of Article 4 shall be applied.																
Gas toxic property (limited to those marked as 'Treated for Incombustibility')	Same criteria as specified in 'Gas toxic property (limited to those marked as 'Treated for Incombustibility')' in Clause 1. of Article 4 shall be applied.																
Nonflammable property (limited to those marked as 'Treated for Flameproof')	Same criteria as specified in 'Nonflammable property (limited to those marked as 'Treated for Flameproof')' in Clause 1. of Article 4 shall be applied.																
Surface quality	Surface quality of the plywood shall meet the criteria of 'Surface quality' specified in Clause 3.																
Back face quality	Back face quality of the plywood shall meet the criteria specified in Clause 1 of the previous Article.																
Quality of Sides and ends finish	There shall be no scuffing.																
Warp or Twist	1. Concave curve shall be not more than 50mm (or not more than 30mm for those with the marked thickness of 7.5mm or greater), or when pressing																

		by hand, the plywood surface shall touch the horizontal plane. 2. When applying 10kg weight (15kg for those with the marked thickness of 7.5mm or greater), the plywood surface shall touch the horizontal plane.														
	Core void	Permitted up to a width of 3mm of core void on the side of the panel.														
	Crook of edges	The largest concave curve of the crook shall be not more than 1mm.														
	Dimensions	<p>1. The differences between the marked dimensions and the actual measurement (dimensions shall be measured using the equipment measurable up to 0.05mm for thickness, and up to 1mm for other dimensions) shall comply with the criteria in the right column of the following table, corresponding to each classification.</p> <table border="1"> <tr> <th colspan="2">Classification</th><th>Differences between the actual and marked dimensions</th></tr> <tr> <td rowspan="4">Thickness</td><td>Marked thickness: &lt;4mm</td><td>±0.2mm</td></tr> <tr> <td>Ditto, 4mm ≤, &lt;7mm</td><td>±0.3mm</td></tr> <tr> <td>Ditto, 7mm ≤, &lt;20mm</td><td>±0.4mm</td></tr> <tr> <td>Ditto, 20mm ≤</td><td>±0.5mm</td></tr> <tr> <td colspan="2">Width and Length</td><td>+10mm, -0mm</td></tr> </table> <p>2. The difference between the lengths of diagonal lines shall be not more than 3mm.</p>	Classification		Differences between the actual and marked dimensions	Thickness	Marked thickness: <4mm	±0.2mm	Ditto, 4mm ≤, <7mm	±0.3mm	Ditto, 7mm ≤, <20mm	±0.4mm	Ditto, 20mm ≤	±0.5mm	Width and Length	
Classification		Differences between the actual and marked dimensions														
Thickness	Marked thickness: <4mm	±0.2mm														
	Ditto, 4mm ≤, <7mm	±0.3mm														
	Ditto, 7mm ≤, <20mm	±0.4mm														
	Ditto, 20mm ≤	±0.5mm														
Width and Length		+10mm, -0mm														
Marking	Items to be marked	<p>1. The following items shall be marked in block.</p> <p>(1) Product name (2) Dimensions (3) Bonding quality (4) Surface property (5) Formaldehyde emission amount (except for cases where marking is applied in accordance with 4. and 5. below). (6) Name of manufacturer or supplier (or importer for the imported products).</p> <p>2. Concerning the plywood marked as 'Treated for Insect-control', type of the chemicals used shall be marked in block, in addition to the items in 1. Above.</p> <p>3. In case of marking the name of species used for veneers, name of the species used shall be marked in block, in addition to the items in 1. and 2. above.</p> <p>4. In case where a Registered Certifying Body or a Registered Overseas Certifying Body verifies that the product does not use the adhesive containing formaldehyde or materials, etc. which emits formaldehyde (excluding the base plywood, hereinafter the same), the product may be marked with 'Using non-formaldehyde adhesive and materials not emitting formaldehyde', in addition to the items in 1. to 3. above.</p> <p>5. In case of marking on a bale, the number of plywood panels contained in the bale shall be marked in block, in addition to the items 1. to 4. above.</p>														
	Marking method	<p>1. The items specified in (1) to (5) of 1. and 2. to 5. shall be marked by the following methods:</p> <p>(1) Product name "Specially Processed Decorative Plywood" shall be marked. For those to indicate 'Insect-control treatment', "treated for insect-control", for those to indicate 'Incombustibility treatment', "treated for Incombustibility", and for those to indicate 'Flameproof treatment',</p>														

	<p>“treated for flameproof” shall be marked right after the product name “Specially Processed Decorative Plywood”.</p> <p>(2) Dimensions Same criteria as specified in 1(2) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(3) Bonding property Same criteria as specified in 1(3) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(4) Surface property “F” for F Type plywood, “FW” for FW Type plywood, “W” for W Type plywood, “SW” for SW Type plywood shall be marked. In this case, for those having overlaying layer, printing or coating, etc. on the back face, too, and having the equivalent property to that of the surface of the panel, “both sides”, or “Both surface and back face”, etc. shall clearly marked after the product name “Specially Processed Decorative Plywood”, to indicate clearly that the back face has the equivalent property to that of the panel surface.</p> <p>(5) Formaldehyde emission amount Same criteria as specified in 1(5) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(6) Insecticide Same criteria as specified in 1(6) of ‘Marking method’ in Clause 1. of Article 4 shall be applied.</p> <p>(7) Name of the species used for veneers The common name of the specie shall be marked. In case of using more than one species, the names of those species shall be listed in order of more volume used.</p> <p>2. In case of marking that using non-formaldehyde adhesive and the coating material not emitting formaldehyde in accordance with the item 4. of ‘Items to be marked’ above, “Using non-formaldehyde adhesive and materials not emitting formaldehyde” shall be marked.</p> <p>3. Marking of the items to be marked specified above shall be clearly made on the panel surface of each plywood sheet or on each bale where they can easily be noticed, in accordance with the Appended Format.</p>
Items prohibited from marking	Same method as specified in ‘Items prohibited from marking’ in Clause 1. of Article 4 shall be applied.

2. Criteria of Surface Property as specified in the previous clause above, shall be as follows:

Criteria Category	F Type	FW Type	W Type	SW Type
Weather resistance against temperature change	As the results of <b>Cyclic Cold and Hot Test A</b> specified in 3(13) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen (including the back face of panel for	As the results of <b>Cyclic Cold and Hot Test B</b> specified in 3(13) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen.	As the results of <b>Cyclic Cold and Hot Test C</b> specified in 3(13) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen.	As the results of <b>Cyclic Cold and Hot Test D</b> specified in 3(13) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen.

	those marked as having overlaying layer, printing or coating, etc. on the back face and having the equivalent property to that of the surface of the panel, hereinafter the same).			
Water resistance	As the results of <b>Water Resistance Test A</b> specified in 3(17) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen.	As the results of <b>Water Resistance Test B</b> specified in 3(17) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen.	As the results of <b>Water Resistance Test C</b> specified in 3(17) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen.	As the results of <b>Water Resistance Test D</b> specified in 3(17) of Appendix, there shall be no splits, blisters, peeling off and conspicuous discoloration and change of gloss on the surface of the test specimen.
Heat resistance	As the results of <b>Humidity and Heat Test</b> specified in 3(18) of Appendix, there shall be no splits, blisters, peeling off, discoloration and conspicuous change of gloss on the surface of the test specimen.			
Abrasion resistance	As the results of <b>Abrasion Test A</b> specified in 3(19) of Appendix, the abrasion value shall be at least 100, and the abrasion weight loss shall be not more than 0.1g.	As the results of <b>Abrasion Test B</b> specified in 3(19) of Appendix, the abrasion value shall be at least 50, and the abrasion weight loss shall be not more than 0.1g.	As the results of <b>Abrasion Test C</b> specified in 3(19) of Appendix, the abrasion value shall be at least 200.	
Scratch hardness	As the results of <b>Scratch Hardness Test A</b> specified in 3(20) of Appendix, the average depth of the scratched lines on the test specimens shall be not more than 10μm.	As the results of <b>Scratch Hardness Test B</b> specified in 3(20) of Appendix, the average depth of the scratched lines on the test specimens shall be not more than 10μm.		
Impact resistance	As the results of <b>Impact Test A</b> specified in 3(21) of Appendix, there	As the results of <b>Impact Test B</b> specified in 3(21) of Appendix, there		

	shall be no splits and peeling off on the surface of the test specimen.	shall be no splits and peeling off on the surface of the test specimen.	
Color fading	As the results of <b>Color Fading Test</b> specified in 3(22) of Appendix, there shall be no splits, blisters, folds, grain depression, discoloration and change of gloss on the surface of the test specimen.	As the results of <b>Color Fading Test</b> specified in 3(22) of Appendix, there shall be no discoloration and change of gloss on the surface of the test specimen.	
Stain resistance	As the results of <b>Stain Resistance Test A</b> specified in 3(23) of Appendix, there shall be no stain remained on the surface of the test specimen.	As the results of <b>Stain Resistance Test B</b> specified in 3(23) of Appendix, there shall be no stain remained on the surface of the test specimen.	
Chemical resistance	Product shall meet the following criteria 1 to 3: 1. As the results of <b>Alkali Resistance Test</b> specified in 3(14) of Appendix, there shall be no splits, blisters, peeling off, softening, conspicuous discoloration and change of gloss on the surface of the test specimen. 2. As the results of <b>Acid Resistance Test</b> specified in 3(24) of Appendix, there shall be no splits, blisters, peeling off, softening, conspicuous discoloration and change of gloss on the surface of the test specimen. 3. As the results of <b>Thinner Resistance Test</b> specified in 3(25)		

	of Appendix, there shall be no splits, blisters, peeling off, softening, conspicuous discoloration and change of gloss on the surface of the test specimen.	
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3. Criteria of Surface Quality as specified in the Clause 1. above shall be as follows:

Category	Criteria
Conditions of decorative materials	Print, resin, coating film and finishing paint shall be finished evenly.
Peeling off, blisters or splits	Not permitted.
Stain, attachment of dust, scratches or press mark	Not permitted, or permitted if repaired.
Other defects	Permitted if very slight.

**(Standard Dimensions)****Article 9** Standard dimensions shall be as follows:

	Thickness (mm)	Width (mm)	Length (mm)
Plywood for General Use	2.3, 2.5, 2.7, 3.0, 3.5, 4.0, 5.5, 6.0, 9.0, 12.0, 15.0, 18.0, 21.0, 24.0	910	910, 1820, 2130, 2430, 2730, 3030
		610, 760, 1,220	1820
		850, 1,000	2000
		1,220	2430
Concrete Forming Plywood	12.0, 15.0, 18.0, 21.0, 24.0	500	2000
		600	1800, 2400
		900	1800
		1,000	2000
		1,200	2400
Structural Plywood	5.0, 5.5, 6.0, 7.5, 9.0, 12.0, 15.0, 18.0, 21.0, 24.0, 28.0, 30.0, 35.0	900	1800, 1818
		910	1820, 2130, 2440, 2730, 3030
		955	1820
		1,000	2,000
		1,220	2440, 2730
Natural Wood Decorative Plywood	3.2	910	1820
	4.2, 6.0	610, 1,220	2430
		910	1820, 2130
Specially Processed Decorative Plywood	2.3, 2.4, 2.5, 2.7, 3.0, 3.2, 3.5, 3.7, 3.8, 4.0, 4.2, 4.8, 5.0, 5.2, 5.5, 6.0, 8.5, 9.0	606, 610	2420, 2425, 2430, 2440, 2730, 2740
		910, 915, 920	1820, 1825, 1830, 2120, 2130, 2140, 2420, 2430, 2440
		1,000, 1 010	2000, 2010
		1,070	1820
		1,210	2420
		1,220, 1,230	1820, 1825, 1830, 2120, 2135, 2150, 2420, 2430, 2440, 2740
		2,130	2440

**Appendix****1. Number of Sample Plywood to be Taken**

Sample plywood, from which test specimens shall be cut from (hereinafter, referred to as 'sample plywood'), for Continuous Boiling Test, Cyclic Steaming Test, Vacuum Pressure Test, Cyclic Boiling Test, Steaming Treatment Test, Hot and Cold Water Immersion Test, Type I Immersion Delamination Test, Type II Immersion Delamination Test, Moisture Content Test, Formaldehyde Emission Amount Test, Insect Treatment Test, Moisture Absorption Test, Incombustibility Test, Gas Toxic Property Test, Nonflammable Treatment Test, Flat Plane Tensile Test, Cyclic High and Low Temperature Test, Alkali Resistance Test, Class 1 Bending Test, In-plane Shear Strength Test, Water Resistance Test, Humidity and Heat Test, Abrasion Test, Scratch Hardness Test, Impact Test, Color Fading Test, Stain Resistance Test, Acid Resistance Test and Thinner Resistance Test, or testing plywood to be used for Bending Stiffness Test and Class 2 Bending Test (hereinafter, referred to as 'Testing plywood') shall be randomly taken from a lot as specified in the right column of the following table corresponding to the number of plywood contained in the lot as shown in the same table.

(1) Plywood for General Use, Concrete Forming Plywood, Natural Wood Decorative Plywood and Specially Processed Decorative Plywood

Number of Plywood in a lot	Number of Sample Plywood or Testing Plywood to be taken	
≤1,000	2	In case of conducting a re-test for those except for Formaldehyde Emission Amount Test, twice of the number of sample plywood or testing samples shown in the left column shall be taken.
1,001 ~ 2,000	3	
2,001 ~ 3,000	4	
3,001 ~	5	

Notes:

1. Concerning Incombustibility Test and Nonflammable Treatment Test, number of sample plywood to be taken shall be '3' from a lot which only contains plywood of up to 1,000.
2. Concerning Bending Stiffness Test, the number of testing plywood to be taken shall always be '5' regardless the number of plywood in the lot.

## (2) Structural Plywood

### A. Tests other than Insect Treatment Test and Formaldehyde Emission Amount Test

Number of Plywood in a lot	Number of Sample Plywood or Testing Plywood to be taken	
≤1,000	4	In case of conducting a re-test, twice of the number of sample plywood or testing samples shown in the left column shall be taken.
1,001 ~ 2,000	6	
2,001 ~ 3,000	8	
3,001 ~	10	

### B. Insect Treatment Test and Formaldehyde Emission Amount Test

Number of Plywood in a lot	Number of Sample Plywood or Testing Plywood to be taken	
≤1,000	2	In case of conducting a re-test for Insect Treatment Test, twice of the number of sample plywood or testing samples shown in the left column shall be taken.
1,001 ~ 2,000	3	
2,001 ~ 3,000	4	
3,001 ~	5	

## 2. Judgment of Test Results

- (1) If 90% of test specimens cut from sample plywood taken from a lot for Continuous Boiling Test, Cyclic Steaming Test, Vacuum Pressure Test (limited to Type I), Cyclic Boiling Test, Steaming Treatment Test, Hot and Cold Water Immersion Test, Type I Immersion Delamination Test, Type II Immersion Delamination Test, Cyclic High and Low Temperature Test, Alkali Resistance Test, Class 1 Bending Test, In-plane Shear Strength Test, Water Resistance Test, Humidity and Heat Test, Scratch Hardness Test, Impact Test, Color Fading Test, Stain Resistance Test, Acid Resistance Test or Thinner Resistance Test, 90% of sample plywood for Moisture Content Test, Insect Treatment Test, Moisture Absorption Test, Flat Plane Tensile Test or Abrasion Test, and 90% of testing plywood for Bending Stiffness Test or Class 2 Bending Test have met the criteria of the applicable test, the plywood of the lot shall be considered as 'PASS', but if less than 70%, the lot shall be considered as 'FAIL'. If 70% or more but less than 90% have met the criteria, re-test shall be conducted on the required number of sample plywood or testing plywood taken from the same lot for the applicable test. As the results of the re-test, if at least 90% have met the criteria, the lot shall be considered as 'PASS', but if less than 90% has met the criteria, the lot shall be considered as 'FAIL'.
- (2) Concerning Vacuum Pressure Test (limited to Type Special), if the sample plywood taken from a lot have met the criteria, the lot shall be considered as 'PASS'. If 70% or greater and less than 90% of test specimens has resulted with the wood failure ratio of at least 60%, re-test shall be conducted. If the re-tested specimens have passed the criteria, the lot shall be considered as 'PASS', otherwise, 'FAIL'.
- (3) Concerning Incombustibility Test, Gas Toxic Property Test, Nonflammable Treatment Test, if all of the sample plywood taken from a lot have met the criteria, the lot shall be considered as 'PASS', otherwise, 'FAIL'.

## 3. Test Methods

### (1) General conditions

Testing shall be conducted according to the following procedures, unless particularly specified:

- a. Testing equipment shall have the sufficient capability and accuracy to determine the results whether they meet the criteria or not.



- b. Measurement shall be made up to the point readable by the test equipment. Concerning the measurement of deflection, it shall be measured up the unit of 0.01mm.
- c. Calculation of properties such as shear strength shall be made up to the nearest criteria values by rounding off the 1/10 of the smallest place of the criteria values.
- d. Chemicals used (except for those not specified in Japanese Industrial Standards (hereinafter, referred to as 'JIS')) shall be those of Special Class specified in JIS for the applicable chemical (reagent).
- e. 'About' shall mean 'within  $\pm 10\%$ ' of the designated value, and 'accurately measure' shall mean 'measure up to the nearest 0.001g'.
- f. Processing time in each test shall be within -0 minute and +5 minutes of the designated time.
- g. Bending Stiffness Test, Bending Test and In-plane Shear Strength Test shall be conducted in the condition of the temperature of  $20 \pm 2^{\circ}\text{C}$  and relative humidity of  $65 \pm 5\%$  (hereinafter, referred to as 'relative temperature and humidity'), using testing plywood or specimens that are conditioned under the relative temperature and humidity up to a point where the mass of the testing plywood or specimens is stable (which means the difference in the mass of test specimen measured at an interval of 24 hours is not more than 0.1%, hereinafter the same). In case of having a difficulty to conduct these tests in the relative temperature and humidity, tests shall be conducted immediately after testing plywood or specimens are conditioned properly.  
Also, in case of having a difficulty to create a condition of relative temperature and humidity due to the limitation of test equipment or environment, or in case of taking long time to stabilize the mass of testing plywood or specimens in the relative temperature and humidity due to any manufacturing reason(s), these tests may be conducted not in the relative temperature and humidity condition. However, the test results shall properly be evaluated in conjunction with the moisture content of the testing plywood or specimens, etc. so that the bending property or in-plane shear strength value is proved to be equivalent to the results obtained under the relative temperature and humidity condition.

**(2) Continuous Boiling Test, Cyclic Steaming Test, Vacuum Pressure Test, Cyclic Boiling Test, Steaming Treatment Test and Hot and Cold Water Immersion Test**

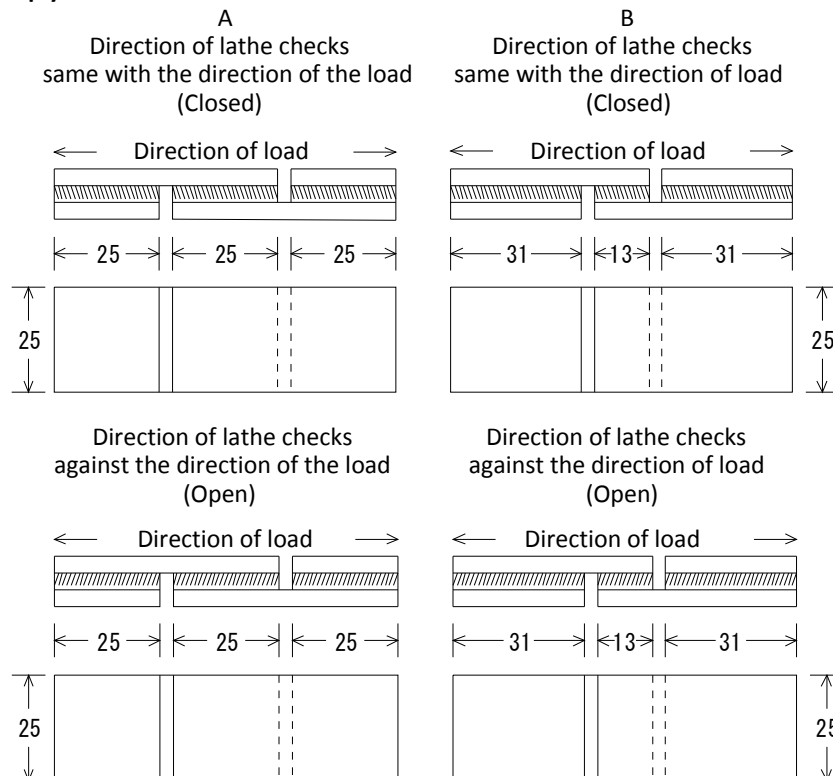
**a. Preparation of test specimens**

Test specimens shall be prepared from each sample plywood by the following methods.

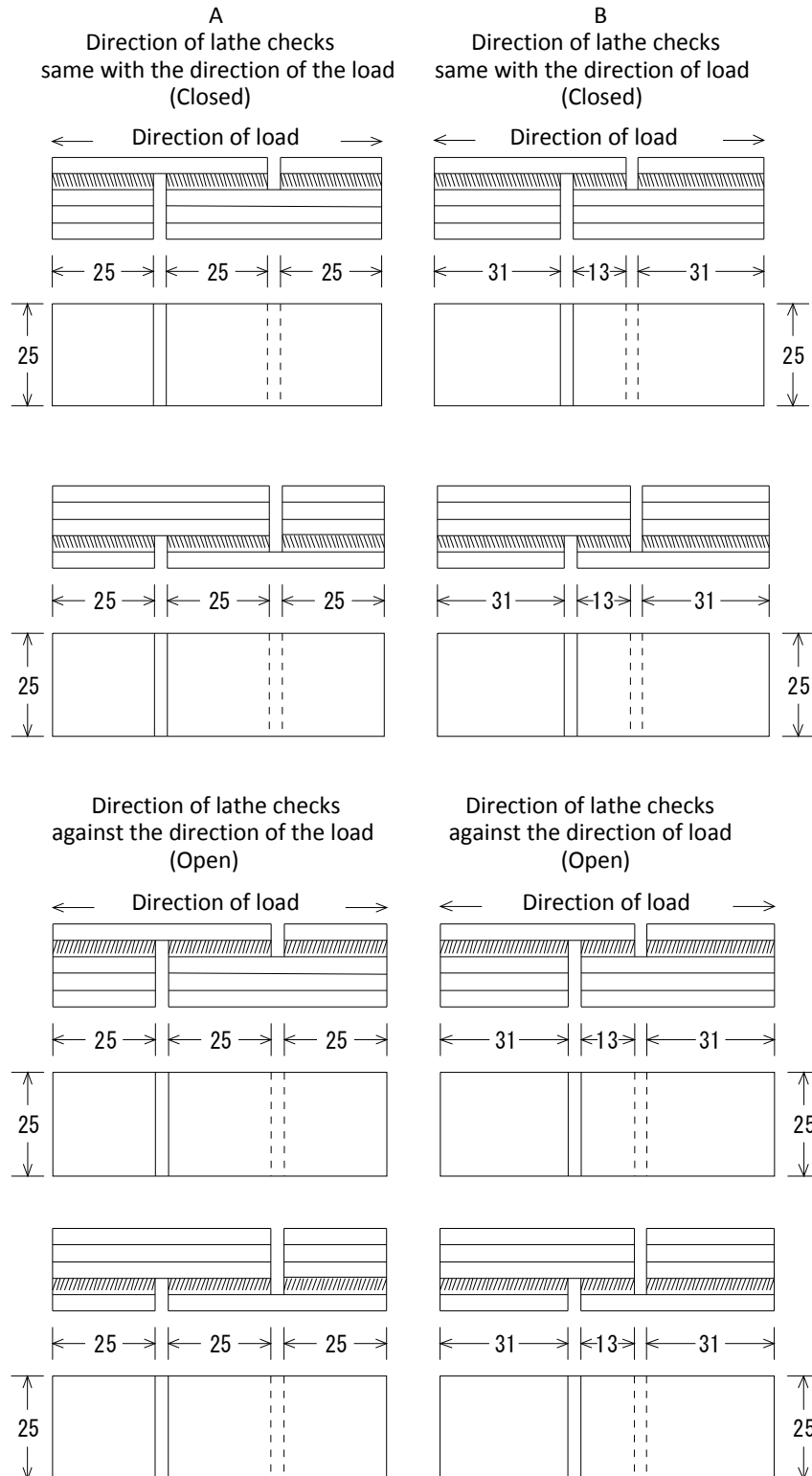
- (a) Concerning 3-ply plywood, 4 test specimens of the shapes as shown in Figure 1, a. A (Shape B shall be prepared when a veneer failure occurs during the test using Shape A) shall be cut from each panel of sample plywood. Test specimens shall be notched as shown in the same Figure in a manner that a half specimens have the direction of lathe checks same with the direction of the load, and the other half specimens have the direction of lathe checks against the direction of load.
- (b) Concerning 5-ply plywood, test specimens of the shapes as shown in Figure 1, b. shall be prepared in accordance with the procedures in (a) above. Notches shall be made to either one of the two glue lines (except for the parallel layers) and test specimens each shall be prepared with the notches to all of each glue lines (except for the parallel layers) in a manner that 2 specimens have the direction of lathe checks same with the direction of the load, and the other 2 specimens have the direction of lathe checks against the direction of load. In this case, any veneers unnecessary for the test may be removed. Concerning plywood with other than 5-ply (except for the one specified in (a) above), the same procedures shall apply. Concerning the plywood having parallel layers, test specimens shall include at least 2 specimens notched to each of those parallel layers.

**Figure 1**

**a. 3-ply wood**



**b. 5-ply plywood**



Note: if the species of the veneer which test specimens are taken from is softwood, notches shall be made to the 2/3 the thickness of the veneer between the two glue lines to be tested.

**b. Test methods**

**(a) Continuous Boiling Test**

After immersing the test specimens in boiling water for 72 hours, immerse them in water of room temperature (10~25°C, hereinafter, the same) until they cool down. While they are wet, **Bonding Strength Test** shall be conducted (by gripping both ends of the specimen, tension load shall be applied in the direction of both ends with the loading speed up to 5.880N/min. until a failure occurs. Hereinafter, the same) and measure the maximum load and wood failure ratio (by the unit of 5%, hereinafter the same) to calculate the Shear Strength and Average Wood Failure Ratio (the average wood failure ratio of all test specimens, and shall be calculated to the nearest 5%, hereinafter the same). However, if the plywood is using only hardwood species, measure only the maximum load and only shear strength shall be obtained (same shall apply from (b) to (f) below.).

**(b) Cyclic Steaming Test**

After immersing the test specimens in water of room temperature for at least 2 hours, put the specimens into steaming at 130±3°C for 2 hours. Then immerse those specimens into the running water of room temperature for 1 hour, put them into another steaming process at 130±3°C for 2 hours and immerse specimens into water of room temperature until they cool down. **Bonding Strength Test** shall be conducted while the specimens are wet and the maximum load and wood failure ratio shall be measured to calculate the Shear Strength and Average Wood Failure Ratio.

**(c) Vacuum Pressure Test**

Immerse the test specimens in water of room temperature, apply the reduced pressure of at least 0.085MPa for 30 minutes and then apply the increased pressure of at least 0.45~0.48MPa for 30 minutes. **Bonding Strength Test** shall be conducted while the specimens are wet and the maximum load and wood failure ratio shall be measured to calculate the Shear Strength and Average Wood Failure Ratio. Concerning the tests for Type Special, measure only the wood failure ratio and obtain the average wood failure ratio and number of test specimens with wood failure ratio of not less than 60% and that of not less than 30%.

**(d) Cyclic Boiling Test**

After immersing the test specimens in boiling water for 4 hours, dry them at 60±3°C for 20 hours (they shall be placed into a thermostat dryer with a care to not bring and keep any moisture in the dryer, hereinafter the same). Then immerse those specimens into boiling water for another 4 hours, and immerse them into water of room temperature until they cool down. **Bonding Strength Test** shall be conducted while the specimens are wet and the maximum load and wood failure ratio shall be measured to calculate the Shear Strength and Average Wood Failure Ratio.

**(e) Steaming Treatment Test**

After immersing the test specimens in water of room temperature for at least 2 hours, put the specimens into steaming at 120±3°C for 3 hours. Then immerse specimens into water of room temperature until they cool down. **Bonding Strength Test** shall be conducted while the specimens are wet and the maximum load and wood failure ratio shall be measured to calculate the Shear Strength and Average Wood Failure Ratio.

**(f) Hot and Cold Water Immersion Test**

After immersing the test specimens in hot water of 60±3°C for 3 hours, immerse specimens into water of room temperature until they cool down. **Bonding Strength Test** shall be conducted while the specimens are wet and the maximum load and wood failure ratio shall be measured to calculate the Shear Strength and Average Wood Failure Ratio.

Note: Shear Strength shall be calculated by the following formula. In this case, for specimens with the ratio of core veneer thickness to that of the surface veneer is not less than 1.50, shear strength shall be the value obtained by multiplying the calculated value by the factor shown in the right column of the following table, corresponding to the thickness ratio shown in the same table.

$$\text{Shear Strength (MPa or N/mm}^2\text{)} = P_s / b \times h$$

Ps : Maximum load (N)  
b: Width of specimen (mm)  
h: Distance between notches (mm)

Thickness Ratio		Factor
1.50 ≤	<2.00	1.1
2.00 ≤	<2.50	1.2
2.50 ≤	<3.00	1.3
3.00 ≤	<3.50	1.4
3.50 ≤	<4.00	1.5
4.00 ≤	<4.50	1.7
4.50 ≤		2.0

### (3) Type I Immersion Delamination Test and Type II Immersion Delamination Test

#### a. Preparation of test specimens

4 test specimens in square shape of 75mm x 75mm shall be cut from each sample plywood.

#### b. Test method

##### (a) Type I Immersion Delamination Test

After immersing the test specimens in boiling water for 4 hours, they shall be dried at 60±3°C for 20 hours. Then specimens shall be immersed in boiling water for another 4 hours and dried at 60±3°C for 3 hours.

##### (b) Type II Immersion Delamination Test

After immersing the test specimens in hot water of 70±3°C for 2 hours, they shall be dried at 60±3°C for 3 hours.

### (4) Moisture Content Test

#### a. Preparation of test specimens

2 test specimens with a proper size (a square shape of 75 x 75mm or a piece with 20g or greater) shall be prepared from each sample plywood.

#### b. Test method

The mass of test specimens shall be measured, and the test specimens shall be dried in the thermostatic dryer at the temperature of 103±2°C and the mass (hereinafter referred to as "oven-dried mass") shall be measured when the test specimens have reached the constant (meaning the time when the difference in mass when measured every six hours is 0.1% or less of the mass of the test specimens). The moisture content shall be calculated up to 0.1% units using the following formula, and the average moisture content of the test specimens prepared from same sample plywood shall be calculated up to 0.5% unit. If there is any other method that definitely allows the judgment of conformance of test specimens to the criteria, however, such a method may be adopted.

$$\text{Moisture Content (\%)} = (W_1 - W_2) / W_2 \times 100$$

Where,

W<sub>1</sub> : Mass of test specimen before drying (g)

W<sub>2</sub> : Oven-dried mass after drying (g)

### (5) Formaldehyde Emission Amount Test

#### a. Preparation of test specimens

10 rectangular test specimens with the length of 150mm and the width of 50mm shall be cut from each sample plywood.

**b. Test method**

**(a) Conditioning of test specimens**

Each group of test specimens cut from the same sample plywood shall be sealed in an air-tight vinyl bag and conditioned in a thermostat room at  $20 \pm 1^\circ\text{C}$  for at least 1 day.

**(b) Preparation of test reagents**

Test reagent shall be prepared according to the following procedures from a to h.

a. Iodine solution (0.05mol/L)

Dissolve 40g of potassium iodide in 25ml of water. After adding 13g of iodine to the solution, transfer the solution to a 1,000mL volumetric flask (as specified in JIS R 3505 (Volumetric glassware), hereinafter the same), add 3 drops of hydrochloric acid and dilute with water up to the constant volume.

b. Sodium thiosulfate solution

Dissolve 26g of sodium thiosulfate pentahydrate and 0.2g of sodium carbonate in 1,000mL of water which not containing dissolved oxygen. After leaving it for 2 days, standardize as specified in 4.5 (Solution for titration) (21.1) 0.1 mol/L sodium thiosulfate solution in JIS K 8001 (General rule for test methods of reagents) using potassium iodate.

c. Sodium hydroxide solution

Dissolve 40g of sodium hydroxide in 200mL of water. Transfer the solution to a 1,000mL volumetric flask, and dilute with water up to the constant volume.

d. Sulfuric acid solution

Dissolve 56g of sulfuric acid in 200mL of water. Transfer the solution to a 1,000mL volumetric flask, and dilute with water up to the constant volume.

e. Starch solution

Mix 1g of starch with 10mL of water, and put it into 200mL of hot water while stirring. Boil it for approximately 1minute, cool it down and filtrate it.

f. Formaldehyde standard stock solution

Put 1mL of formaldehyde solution into a 1,000mL volumetric flask, and dilute with water up to the constant volume.

The concentration of formaldehyde in this solution shall be calculated as follows.

20ml of the Formaldehyde standard stock solution shall be put in a 100mL conical flask with a ground stopper (as specified in JIS R 3503 (Glass apparatus for chemical analysis), hereinafter the same). After adding 25mL of iodine solution in a. and 10mL of sodium hydroxide solution in c. above, leave it in room temperature for 15 minutes shielding in the dark. Then, after adding 15mL of sulfuric acid solution in d. above, the extricated iodine shall immediately titrated with sodium thiosulfate solution in b. above. Wait until the color of the solution becomes pale yellow, then add 1mL of starch solution in e. above as an indicator and further proceed the titration. Separately, a blank test shall be carried out using 20mL of water, and the formaldehyde concentration shall be determined using the following formula.

$$C = 1.5 \times (B - S) \times f \times 1,000/20$$

C: Formaldehyde concentration of the formaldehyde standard stock solution (mg/L)

S: Titer of 0.1mol/L of sodium thiosulfate solution in formaldehyde standard stock solution (mL)

B: Titer of 0.1mol/L of sodium thiosulfate solution in a blank test (mL)

f: Factor of 0.1mol/L of sodium thiosulfate solution

1.5: Formaldehyde amount (mg) equivalent to 1mL of 0.1mol/L of sodium thiosulfate solution

g. Formaldehyde standard solution

Put some of the formaldehyde standard stock solution into a 1,000mL volumetric flask and dilute with water up to the constant volume so that the 3mg of formaldehyde is contained in 1,000mL of water.

h. Acetylacetone ammonium acetate solution

Dissolve 150g of ammonium in 800ml of water. After adding 3mL of glacial acetic acid and 2mL of acetylacetone to the solution, mix well and add water to make up to a volume of 1,000mL.

c. Collection of formaldehyde

As shown in Figure 2, place a crystallizing dish with the diameter of 120mm and the depth of 60mm containing  $300 \pm 1$  mL of distilled water in the center of the bottom of a desiccator with a size of 240mm (capacity of 9~11L) (as specified in JIS R 3503 (Glass apparatus for chemical analysis)). Over the crystallizing dish, place the test specimens secured with a supporting metal frame to avoid contacting the specimens each other, as shown in Figure 3. Leave it under  $20 \pm 1^\circ\text{C}$  for 24hours -0, +5 minutes, let the emitted formaldehyde absorbed to the distilled water to make the sample solution.

Also, for the purpose of measuring the background formaldehyde concentration, the same procedure above, but without having test specimens placed, shall be followed to prepare the background solution.

Figure 2

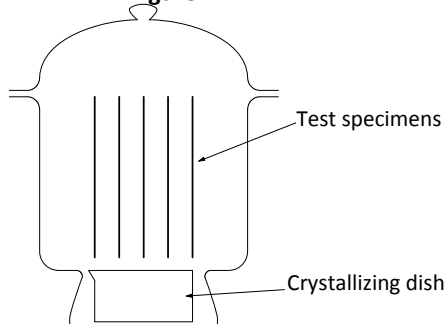
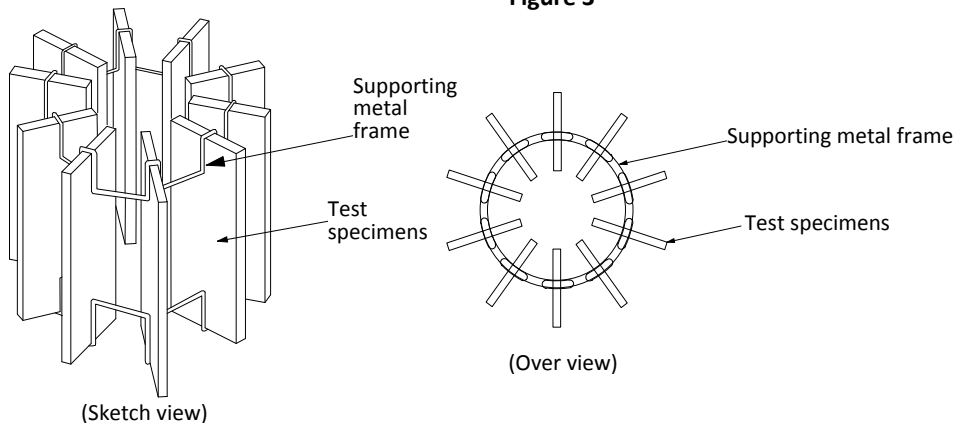


Figure 3



d. Measurement of formaldehyde concentration of the sample solution

Formaldehyde concentration of the sample solution and the background solution shall be measured by the acetylacetone spectrophotometric method.

After putting 25mL of the sample solution of c. above to a container with a ground stopper, add 25mL of acetylacetone ammonium acetate solution, lightly stop the container and mix them. After warming

up the container with a ground stopper under the water at  $65 \pm 2^\circ\text{C}$  for 10 minutes, cool it down to the room temperature by leaving it still and shielded in the dark. Take this solution to an absorption cell and measure the absorbance by a spectrophotometer at the wave length of 412nm using water as a reference.

**e. Preparation of calibration curve**

Using a transfer pipette (as specified in JIS R 3503 (Volumetric glassware)), take 0mL, 5mL, 10mL, 20mL, 50mL and 100mL of the formaldehyde standard solution into a 100mL volumetric flask separately and dilute with water up to the constant volume to make the formaldehyde solution to be used for the preparation of a calibration curve. Take 25mL from each of the formaldehyde solution for the preparation of a calibration curve, follow the procedure in d. above and plot the relation between the formaldehyde amount (0~3mg) and the absorbance. The slope (F) shall be obtained by reading the graph or by a calculation.

**f. Calculation of formaldehyde concentration**

The formaldehyde concentration of the sample solution shall be calculated by the following formula:

$$G = F \times (A_d - A_b)$$

G: Formaldehyde concentration of the test specimens (mg/L)

A<sub>d</sub>: Absorbance of the sample solution

A<sub>b</sub>: Absorbance of the background solution

F: Slope of the calibration curve (mg/L)

**(6) Insect Treatment Test**

**a. Preparation of samples for analysis**

Two test specimens with a proper size shall be cut from each sample plywood. Ground the specimens into fine pieces together with the wood chips shaved off from two specimens prepared from the same sample plywood to prepare the samples for analysis. For the plywood treated with boron compound, the bone-dry samples shall be prepared by drying the fine pieces of samples in a thermostat dryer at 100~105°C.

**b. Calculation of absorbed amount**

The amount of chemicals contained in the samples for analysis shall be determined quantitatively by the method in c. below, and calculate the absorbed amount by the following formula.

$$\begin{aligned} &\text{Absorbed amount of chemicals (kg/m}^3\text{)} \\ &= \text{Amount of chemicals contained (mg)/Volume of bone- dry samples for analysis (cm}^3\text{)} \end{aligned}$$

**c. Quantitation method**

**(a) Treated with boron compound**

**a. Preparation of sample solution for analysis**

Weigh 1g of the sample for analysis accurately and put it into a 200~500mL round bottom flask made of quartz glass or boric acid free glass with a co-ground Kjeldahl trap bulb (hereinafter, referred to as 'round bottom flask'), and add 15mL of hydrogen peroxide solution, 2mL of sulfuric acid and 2mL of phosphoric acid to it. Then gradually heat up the flask on a sand bath to resolve the contents. Add another 5mL of hydrogen peroxide solution when the content turns black. Repeat this process to concentrate the content until the sample for analysis gets completely resolved becoming transparent and the white smoke of sulfuric acid arises. Then cool it down.

Transfer the resolved solution in the round bottom flask into a 200mL volumetric flask and make it to a constant volume to prepare the sample solution for analysis.

**b. Preparation of reagent**



- (a) Carminic acid solution  
Dissolve 25mg of carminic acid in sulfuric acid and make it to a total volume of 100mL.
- (b) Ferrous sulfate solution  
Dissolve 5g of ferrous sulfate in 100mL of 0.5mol/L of sulfuric acid.
- (c) Boric acid standard solution  
Dry 250mg of boric acid in a sulfuric acid dessicator for 5 hours. Transfer it to a 100mL volumetric flask and make it to a constant volume. Take 10mL of this stock solution into a 500mL volumetric flask and make it to a constant volume.

**c. Quatitation of boron compound**

Take 2mL of the sample solution for analysis accurately into a 25mL volumetric flask. After adding 3 drops of hydrochloric acid, 3 drops of ferrous sulfate solution, 10mL of sulfuric acid to it, mix well and place a stopper and cool it down in water. Add 10ml of carminic acid solution and mix well. After cooling it down in water again, dilute with sulfuric acid to make it to a constant volume, and leave it under the room temperature for 45 minutes. Take this solution to an absorption cell and measure the absorbance by a spectrophotometer at the wave length of 600nm using blank test solution as a reference). Determine the boron acid concentration from the calibration curve prepared in advance, and calculate the amount of boron acid in the whole sample solution for analysis by the following formula:

$$\text{Contained amount of boron acid (mg)} = A \times 25 \times 100 / 1000$$

A: Boron acid concentration obtained from calibration curve (µg/mL)

Note: Preparation of a calibration curve

Take 0~2.0mL of boron acid standard solution to a volumetric flask in incremental steps, follow the same quantitation method in c. above and prepare a calibration curve by plotting the relation between the absorbance and the boric acid concentration.

**(b) Treated with Fenitrothion**

**a. Preparation of sample solution for analysis**

Take 1g of the sample specimens for analysis accurately to a 100mL container with a ground stopper, add 5mL of formic acid and leave it until the formic acid penetrates to the sample specimens evenly. After adding 50mL of toluene and shake it well, leave it under the room temperature for 18 hours. Then shake well again, filter and transfer the contents to a 200mL separating funnel. Furthermore, after wash it with water, take only the toluene layer into a 150mL eggplant flask, and evaporate toluene using a rotary evaporator. Add 2mL of acetone and 2mL of torioctyl phosphate standard solution to the dried extract to prepare the sample solution for analysis.

**b. Preparation of fenitrothion standard solution**

Accurately weigh 100mg of reference standard fenitrothion, put it to a 200mL of volumetric flask and dilute with acetone to make it to a constant volume.

**c. Quatitation of fenitrothion**

After putting 2µL of the sample solution for analysis into a gaschromatograph and obtaining a chromatograph, determine the ratio of peek height of fenitrothion and torioctyl phosphate. Obtain the ratio of mass from a calibration curve prepared in advance, and calculate the amount of fenitrothion in the whole amount of sample solution for analysis by the following formula:

$$\text{Contained amount of fenitrothion (mg)} = R \times \text{ISw} / 100$$

R: Ratio of mass obtained by a calibration curve

ISw: Mass of torioctyl phosphate used for the preparation of torioctyl phosphate standard solution (mg)

Note: Preparation of a calibration curve

Take 0~2.0mL of fenitrothion standard solution in incremental steps and add 2mL of torioctyl phosphate standard solution to it. The quantitation method in c. above shall be taken and followed for each 2μL of this solution, and prepare a calibration curve by plotting the relation between the ratio of peak height and ratio of mass of fenitrothion and torioctyl phosphate.

**(c) Treated with Bifenthrin**

**a. Preparation of sample solution for analysis**

Take 1g of the sample specimens for analysis accurately to a 100mL container with a ground stopper, add 5mL of formic acid and leave it until the formic acid penetrates to the sample specimens evenly. After adding 50mL of toluene and shake it well, put it through the extractive process using ultrasound for 30minutes, and leave it under the room temperature for 18 hours. Then shake well again, filter and transfer the contents to a 200mL separating funnel. Furthermore, after wash it with water, take only the toluene layer into a 150mL eggplant flask, and evaporate toluene using a rotary evaporator. Dissolve the dried extract in HPLC mobile phase or 10mL of the equivalent solvent to prepare the sample solution for analysis.

**b. Analytical condition of HPLC**

Measuring wavelength: 220nm

Column: A stainless tube with the inner diameter of 4.6mm and length of 150mm filled with Silica C-18 (ODS), or others that have the equivalent or the greater separation capacity.

Mobile phase: CH<sub>3</sub>CN/H<sub>2</sub>O = 80/20 (V/V)

Flow rate of mobile phase: 1.0mL/min

Column temperature: 40°C

Injected amount: 10 μL

**c. Preparation of bifenthrin standard solution**

Accurately weigh the reference standard bifenthrin and dissolve in HPLC mobile phase or the equivalent solvent to the specified concentration.

**d. Quantitation of bifenthrin**

After putting 10μL of the sample solution for analysis into a HPLC and obtaining a chromatograph, calculate the amount of bifenthrin in the whole amount of sample solution for analysis.

Note: Preparation of a calibration curve

Take appropriate amount of bifenthrin standard solution accurately and dissolve in HPLC mobile phase or the equivalent solvent to the specified concentration. The quantitation method in d. above shall be taken and followed for 10μL of this solution, and prepare a calibration curve by plotting the relation between the ratio of peak height and bifenthrin concentration.

**(d) Treated with Cyphenothrin**

**a. Preparation of sample solution for analysis**

Take 5g of the sample specimens for analysis accurately to a 100mL container with a ground stopper, add 20mL of formic acid and leave it until the formic acid penetrates to the sample specimens evenly. After adding 80mL of toluene and shake it well, put it through the extractive process using ultrasound for 30minutes, and leave it under the room temperature for 18 hours. Then shake well again, filter and transfer the contents to a 200mL separating funnel. Furthermore, after wash it with water, take only the toluene layer into a 200mL eggplant flask, and evaporate toluene using a rotary evaporator. Add 2mL of acetone and approximately 2mL of di-(2-ethylhexyl) phthalate standard solution (prepared by weighing about 50mg of di-(2-ethylhexyl) phthalate accurately to a 200mL volumetric flask, and diluting with acetone to make it to a constant volume) to the dried extract to prepare the sample solution for analysis.

**b. Preparation of cyphenothrin standard solution**

Accurately weigh 100mg of reference standard cyphenothrin, put it to a 200mL of volumetric flask and dilute with acetone to make it to a constant volume.

**c. Quantitation of cyphenothrin**

After putting 2 $\mu$ L of the sample solution for analysis into a gaschromatograph and obtaining a chromatograph, determine the ratio of peak height of cyphenothrin and di-(2-ethylhexyl) phthalate standard solution. Obtain the ratio of mass from a calibration curve prepared in advance, and calculate the amount of cyphenothrin in the whole amount of sample solution for analysis by the following formula:

$$\text{Contained amount of cyphenothrin (mg)} = R \times \text{ISw} / 100$$

R: Ratio of mass obtained by a calibration curve

ISw: Mass of di-(2-ethylhexyl) phthalate used for the preparation of di-(2-ethylhexyl) phthalate standard solution (mg)

Note: Preparation of a calibration curve

Take 0~2.0mL of cyphenothrin standard solution in incremental steps and add 2mL of di-(2-ethylhexyl) phthalate standard solution to it. The quantitation method in c. above shall be taken and followed for each 2 $\mu$ L of this solution, and prepare a calibration curve by plotting the relation between the ratio of peak height and ratio of mass of cyphenothrin and di-(2-ethylhexyl) phthalate standard solution.

**(7) Moisture Absorption Test**

**a. Preparation of test specimens**

2 test specimens in square shape of 50mm x 50mm shall be cut from each sample plywood, and the sides of those specimens shall be sealed by paraffin paper that has the melting point of not less than 60.

**b. Test method**

Test specimens shall be put into a container of saturated aqueous solution of sodium chloride which has been conditioned to the temperature of 40 $\pm$ 3°C. After leaving them for 48 hours, measure the mass of the specimens. Then, put the test specimens in a container of saturated aqueous solution of potassium nitrate which has been conditioned to the temperature of 40 $\pm$ 3°C. After leaving them for 24 hours, measure the mass of the specimens and calculate the average mass increase of each sample plywood.

**(8) Incombustibility Test**

**a. Preparation of test specimens**

1 test specimen in square shape of 220mm x 220mm shall be cut from each sample plywood, and the air-dried specimen shall be dried in a thermostat drier of 35~45°C for at least 24 hours, then place them in a desiccator for at least 24 hours to cure.

**b. Test method**

Test shall be conducted in accordance with the test method for 'Incombustibility Class 3' (Clause 3.2 and 3.3) specified in JIS A 1321 (Testing method for incombustibility of internal finish material and procedure of buildings). The exhaust gas temperature curve (a curve indicated by the autograph thermometer specified in 2.3 (2) of the same standard) and the standard temperature curve (a curve obtained by connecting the points that are plotted by adding 50° to the exhaust gas temperature at a constant interval of time duration elapsed after conditioning of heating kiln specified in 3.2.1 (4) of the same standard), and the smoke generation coefficient (a value specified in 3.4 (5) of the same standard) shall be obtained.

**(9) Gas Toxic Property Test**

**a. Preparation of test specimens and reference material**

The same procedure as specified in 8(a) shall be applied. The reference material shall be a square piece of red Lauan which is finished by planer machine and with the thickness of 10mm, the length of 220mm and the specific gravity of 0.43~0.53 after conditioned.

**b. Test method**

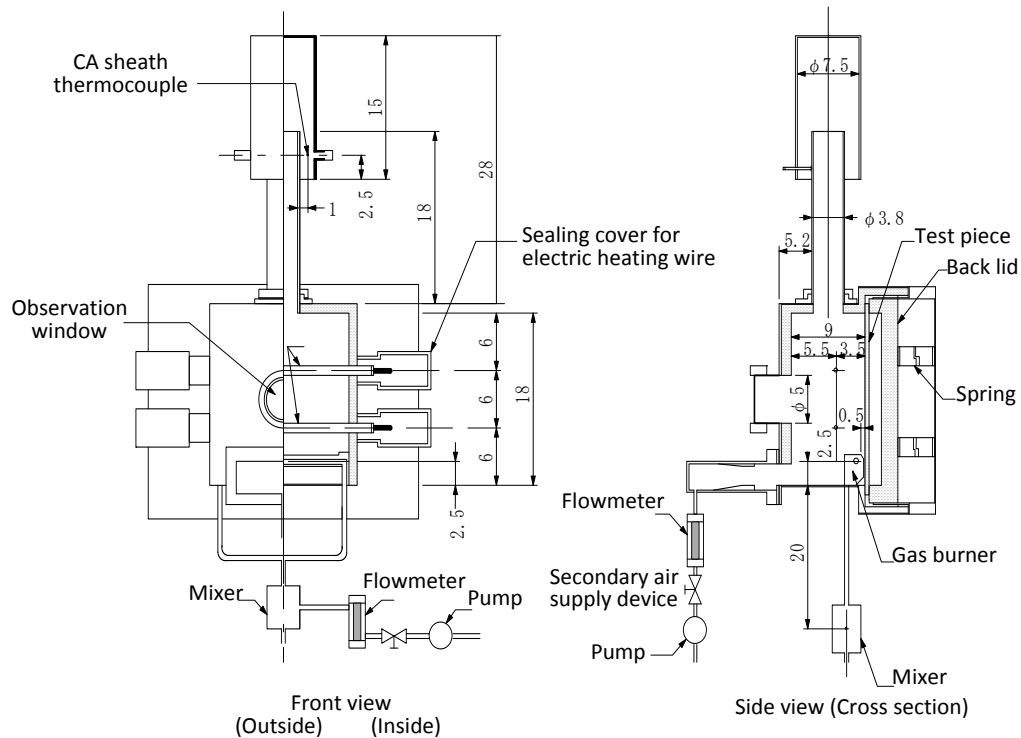
Gas Toxic Property Test shall be conducted using the test apparatus specified in (a) below by the Heat Test specified in (b) below.

**a. Test apparatus**

The heating kiln, stirring box and testing box shall be prepared as shown in Figure 4, Figure 5 and Figure 6.

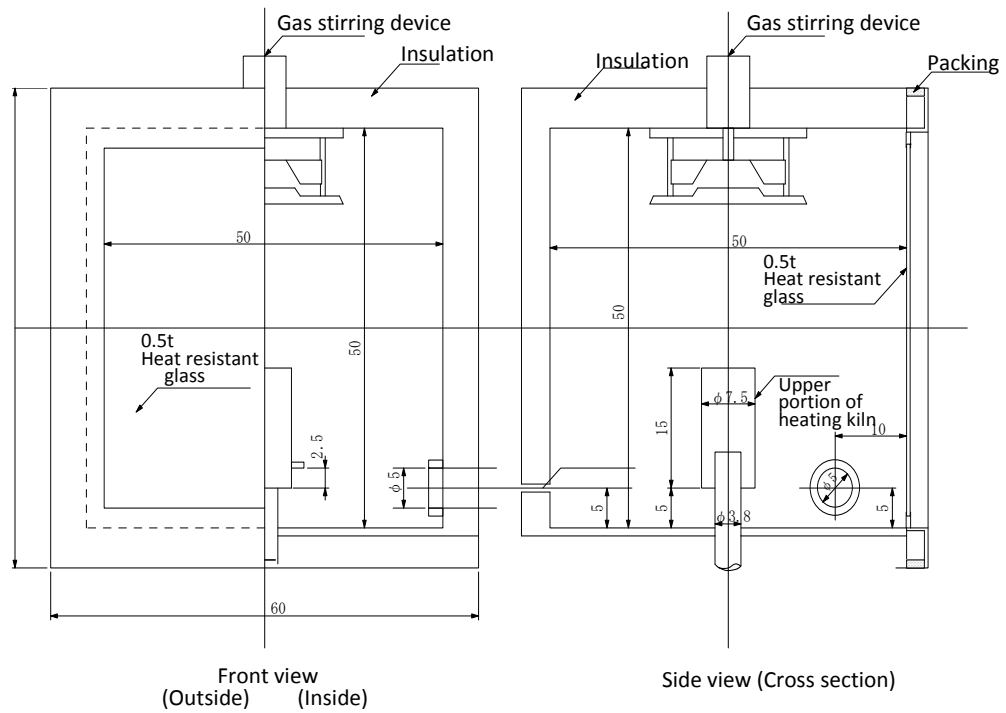
**Figure 4 Heating Kiln**

(Unit: cm)

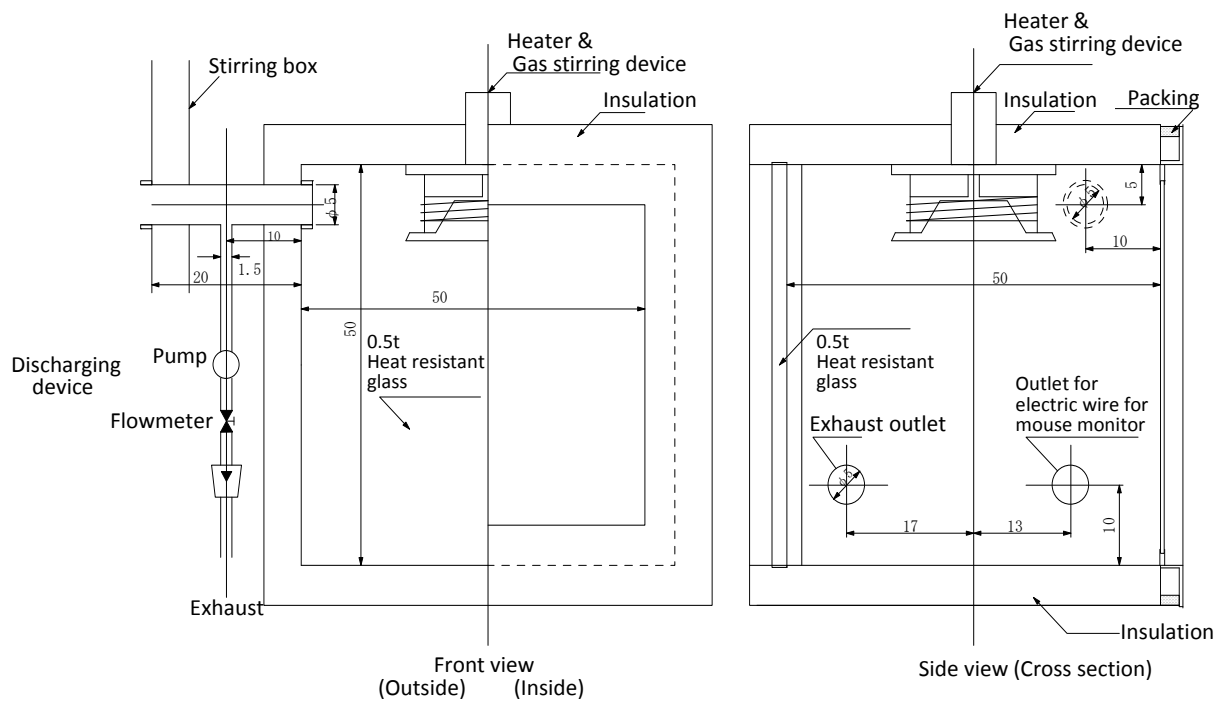


**Figure 5 Stirring Box**

(Unit: cm)



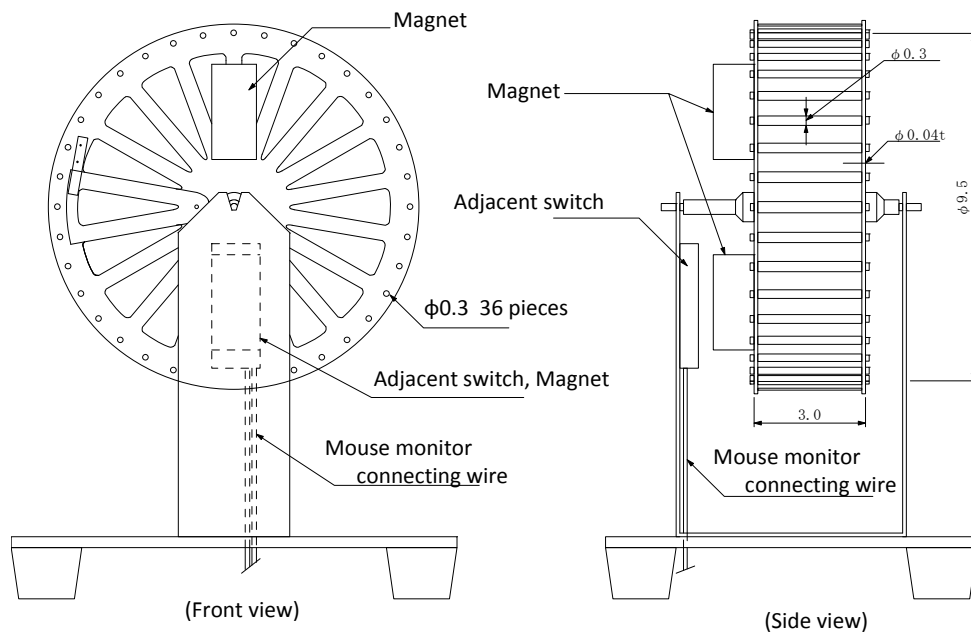
**Figure 6 Testing Box**



**b. Heating Test**

- a. The size of heat receiving face of the test specimen shall be 180mm both in horizontally and vertically. After heating for 3 minutes by the sub-heating source, add the main heating source and heat another 3 minutes. Heat specimens for the total of 6 minutes.
- b. The air supply shall be limited only during the heating process, and the amount of air shall be 25.0L/min. using the primary air supply device of the heating kiln.
- c. The discharge of gas by the discharging device of the testing box shall be limited only during the heating process, and the amount of discharge shall be 10.0L/min.
- d. Exhaust gas temperature shall be measured using the sheathed thermocouple with the outer diameter of 1.6mm and the solid line recording type of an electronic-tube self-balancing thermometer.
- e. Prior to the heating test, the reference panel shall be pre-heated by the method a. to c. above. Heating test shall be started after removing the back lid and the reading of the thermocouple which measures the exhaust gas temperature comes down to approximately 50°C. If the heating tests are conducted continuously, the pre-heating using the reference panel shall not be required.
- f. When starting the test, raise the inside temperature of the testing box up to approximately 30°C, and 8 rotating cages (as specified in Figure 7, the rotating part shall basically be made of aluminum, and the weight of the cage shall be up to 75g) with a mouse (dd-strain or ICR-strain of female, week-age of 5, weight 18~22g) in each cage shall be placed in the testing box.
- g. The time duration from when heating started until the mouse stops moving (hereinafter, referred to as 'time duration until stopping movements) shall be measured on each mouse for 15minutes after heating started, using the automatic recording device.

**Figure 7 Rotating Cage**



**c. Average Time Duration until Stopping Movements**

The average time duration until stopping movements shall be calculated by the following formula.

$$\bar{x}_s = \bar{x} - \sigma$$

$\bar{x}$ : Average of time duration until stopping movements of 8 mouse (15min. if any mouse did not reach the point where it stops movement) (min.)

$\sigma$ : Standard deviation of time duration until stopping movements of 8 mouse (15min. if any mouse did not reach the point where it stops movement) (min.)

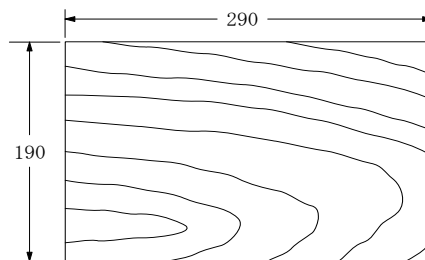
**(10) Nonflammable Treatment Test**

**a. Preparation of test specimens**

One rectangular test specimen as shown in Figure 8 with the length of 290mm approximately parallel to the main grain direction of the surface or back veneer x 190mm approximately perpendicular to the main grain direction of the surface or back veneer shall be taken from each sample plywood (concerning the sample plywood having overlaying, printing and coating on the surface layer, two specimens shall be taken). Prior to the test, the air-dried specimens shall be dried in the drier at  $40 \pm 3^\circ\text{C}$  for 24hours and cured by leaving in a desiccator with silica gel for at least 24hours.

**Figure 8**

Unit: mm



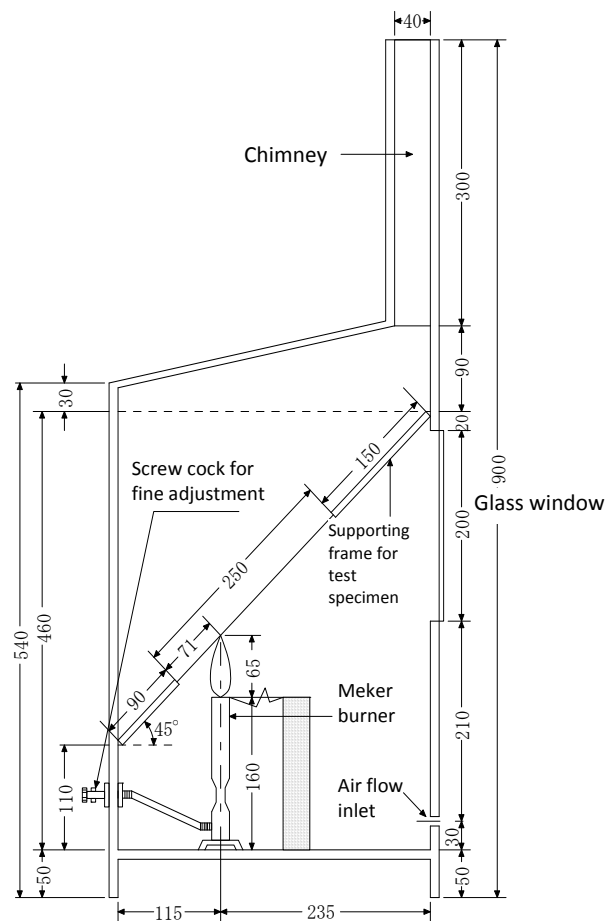
**b. Test method**

Combustion test as specified in (b) below shall be conducted using the combustion test device as specified in (a) below.

- a. The details of combustion testing box, a supporting frame for test specimens, an electric spark generating device and a meker burner shall be as shown in Figure 9 to 12 below, and the fuel for combustion shall be the liquefied petroleum gas No.4 as specified in JIS K 2240 (Liquefied Petroleum Gas (LP Gas)).
- b. Combustion test shall be conducted by securing the test specimen to the supporting frame, setting the flame length of the burner to 65mm, placing the tip of the flame to the centre on the surface veneer (in case of having two specimens prepared in accordance with the a. above, the tip of the flame shall be placed on the centre of back veneer of one of the specimens) and heating the specimen for 2 minutes.

**Figure 9 Combustion Testing Box**

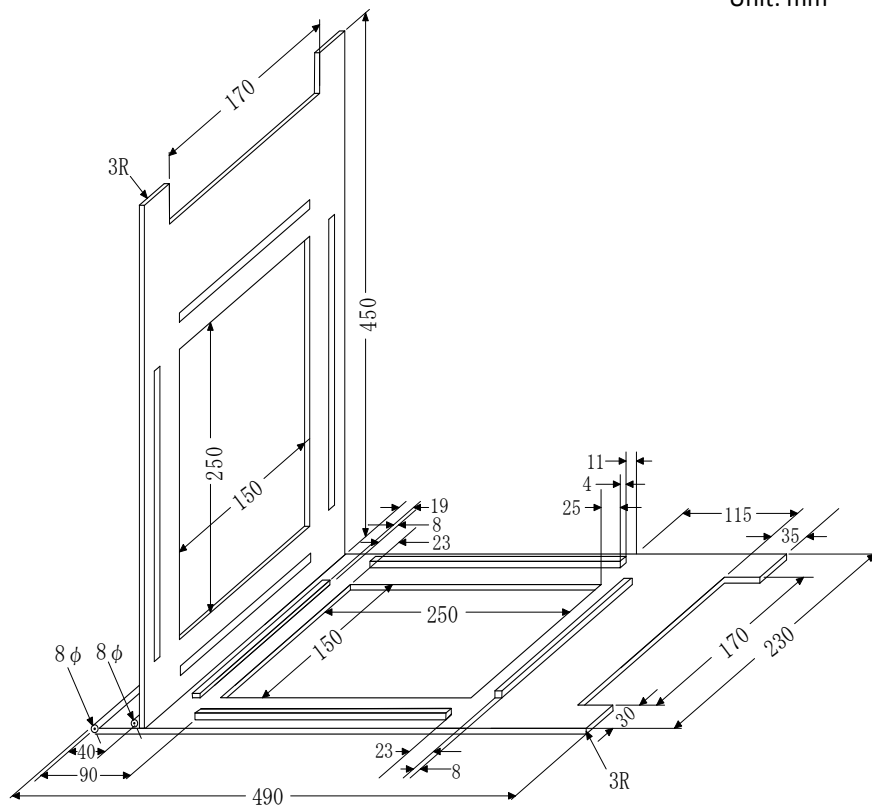
Unit: mm





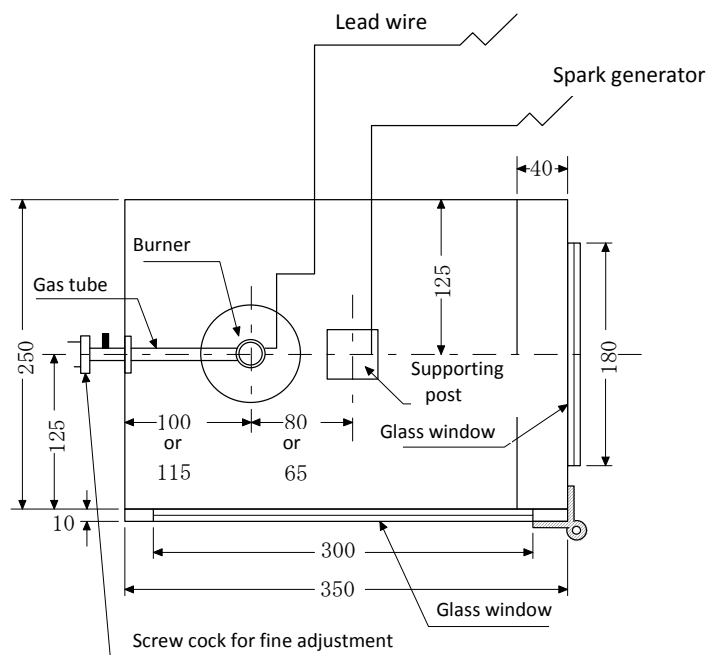
**Figure 10 Supporting Frame for test specimens**

Unit: mm



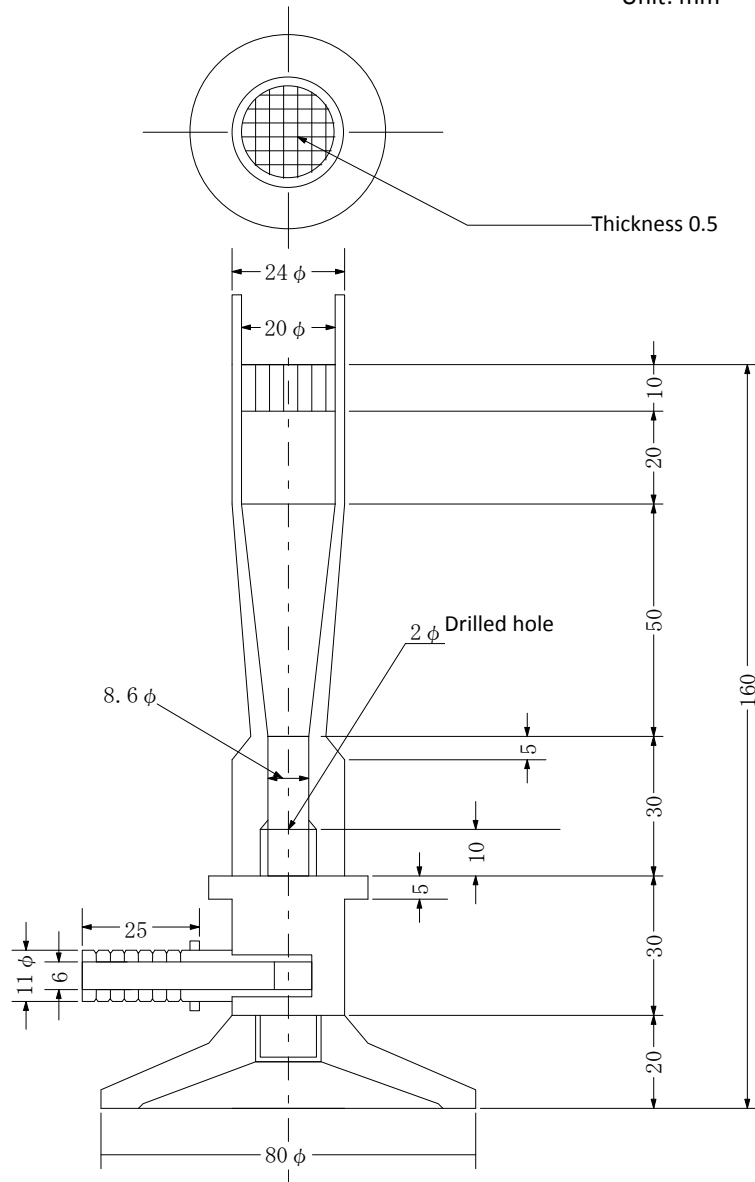
**Figure 11 Electric Spark Generating Device**

Unit: mm



**Figure 12 Meker Burner**

Unit: mm



### (11) Bending Stiffness Test

#### a. Test method

The actual size of testing plywood shall be placed with the surface veneer side up, as shown in Figure 13. After putting a weight on the effective length (length or width of the plywood) of the loading rod placed at the center of the span perpendicular to the span, the deflection shall be measured and Bending Young's modulus shall be calculated by the following formula.

$$\text{Bending Young's Modulus (MPa or N/mm}^2\text{)} = \Delta P \ell^3 / 4bh^3 \Delta y$$

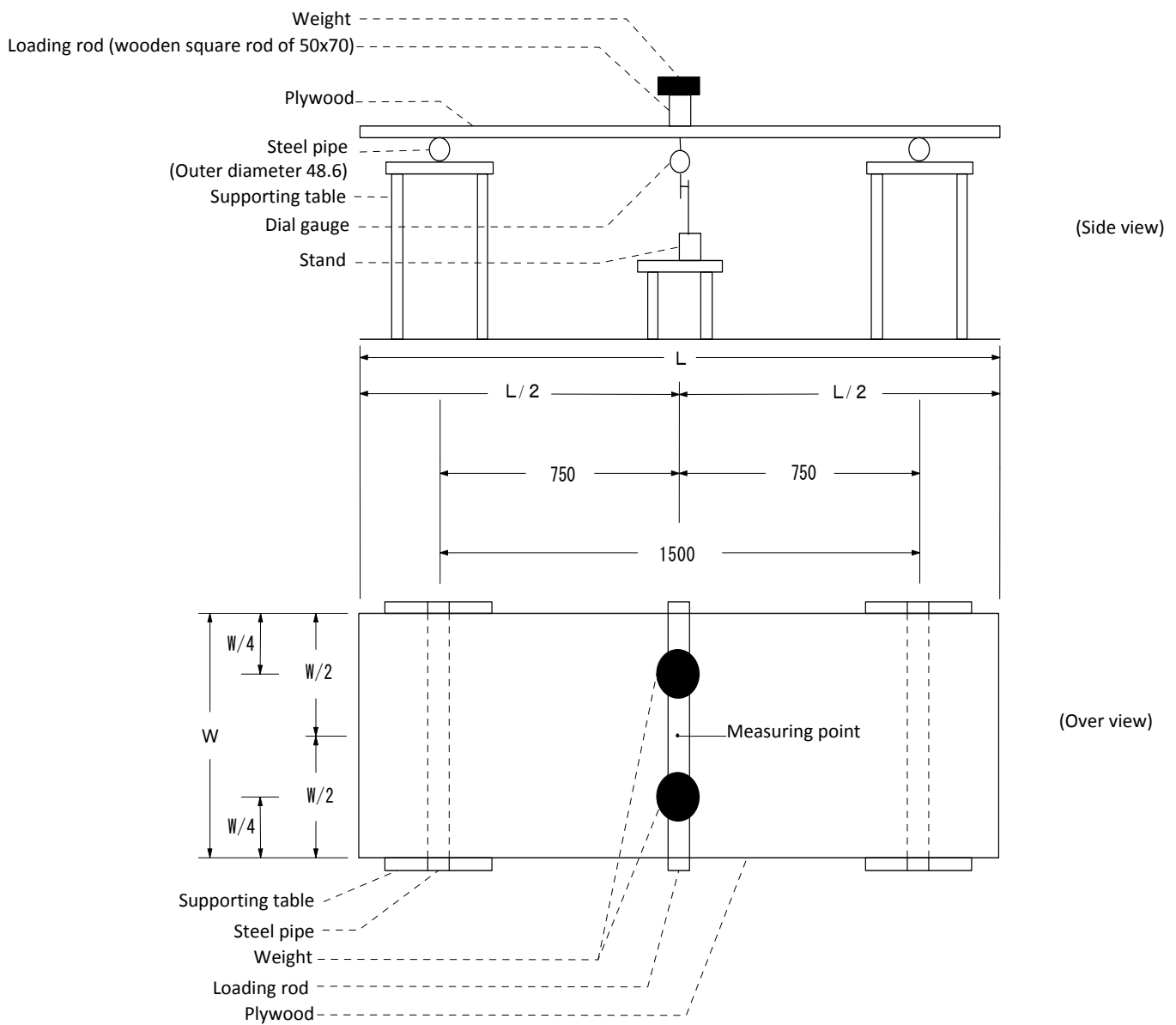
$\ell$  : Span (mm)

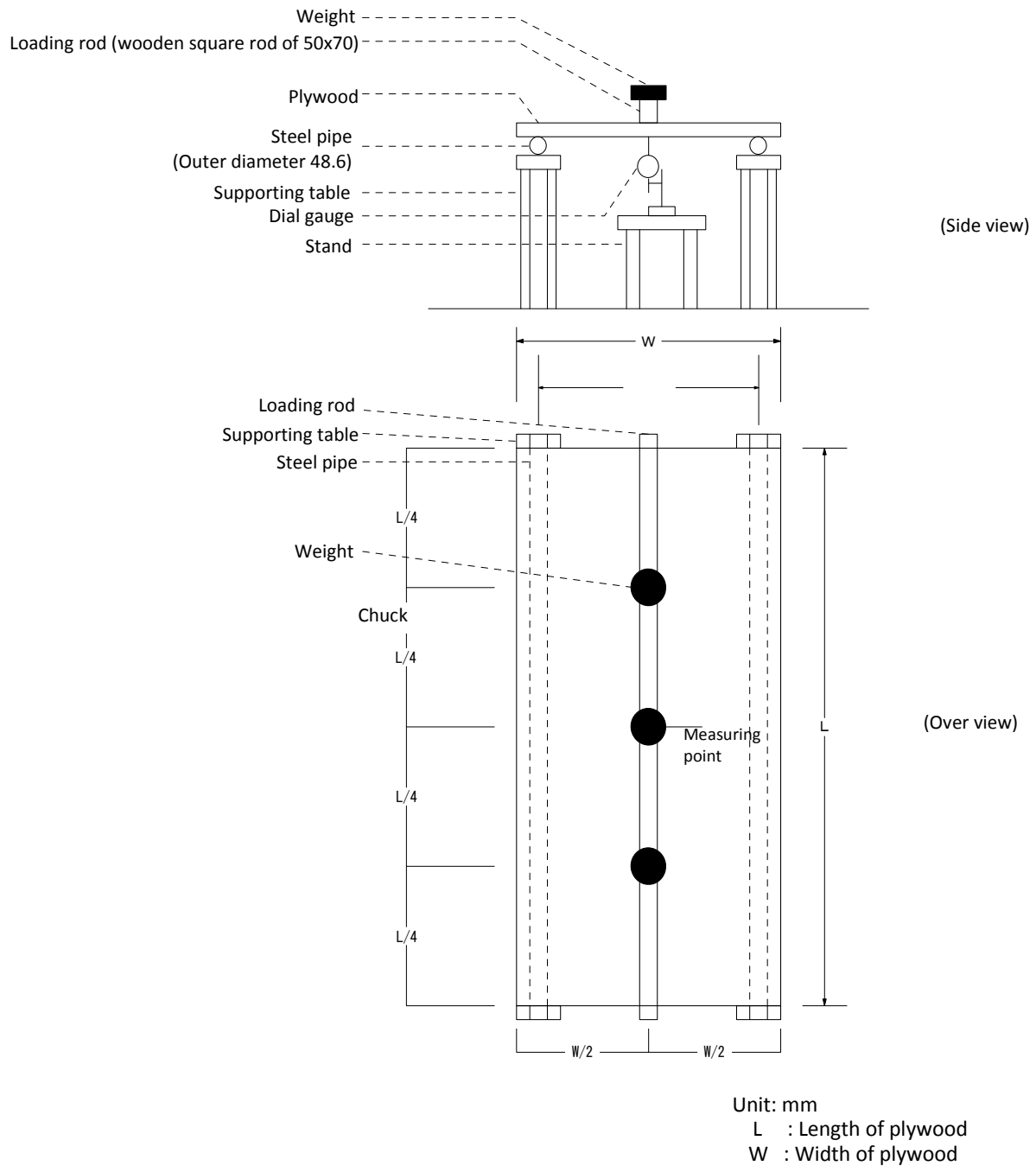
$b$  : Width of testing plywood (mm)

(or length of testing plywood, in case of conducting bending stiffness test in width direction)

$h$  : Marked thickness of testing specimen (mm)  
 $\Delta P$  : Difference of upper and lower limit load within the proportional range (N)  
 $\Delta y$  : Deflection at the centre of span corresponding to  $\Delta P$  (mm)

**Figure 13**





## (12) Flat Plane Tensile Test

### a. Preparation of test specimens

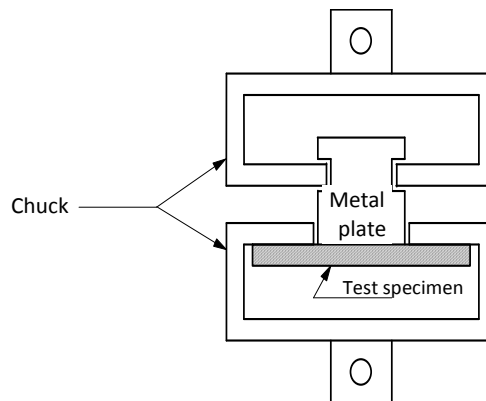
4 test specimens in square shape of 50mm x 50mm shall be cut from each sample plywood (in case of testing Surface processed concreted forming plywood which has coating or overlaying layer on the back of the panel as well, to be used as the concrete forming plywood (hereinafter, referred to as 'Both faces processed concreted forming plywood') or testing Specially Processed Decorative Plywood which has a overlaying layer, printing or coating, etc. on the back face, too, and having the equivalent property to that of the surface of the panel (hereinafter, referred to as 'Both faces specially processed decorative plywood'), 8 specimens shall be taken from each sample plywood).

**b. Test method**

Prior to the test, a metal plate having a square shape of bonding surface of 20x20mm in its centre shall be bonded on the surface of the specimens (and on the back face of the other 4 specimens when preparing 8 specimens according to the procedures a. above) using cyanoacrylate adhesive. After notching around the metal plate up to the depth reaching the base plywood, the test specimen and the metal plate shall be secured to chucks as shown in Figure 14. Tensile force shall be applied to the specimen with the loading speed of not more than 5.880N per minute in the direction perpendicular to the bonding surface, and the maximum load at the time of a delamination or a failure occurs shall be measured. Bonding strength the test specimen shall be calculated to the 1<sup>st</sup> decimal point by the following formula, and the average bonding strength of specimens taken from the same sample plywood shall be obtained.

$$\text{Bonding Strength (MPa or N/mm}^2\text{)} = \text{Maximum Load (N)} / 20 \times 20$$

**Figure 14**



**(13) Cyclic High and Low Temperature Test**

**(Cyclic High and Low Temperature Test A, Cyclic High and Low Temperature Test B, Cyclic High and Low Temperature Test C and Cyclic High and Low Temperature Test D)**

**a. Preparation of test specimens**

2 test specimens in square shape of 150mm x 150mm shall be cut from each sample plywood. Concerning the test specimens for Cyclic High and Low Temperature Test A, a hole with the diameter of 3mm shall be made in the centre of the specimen.

**b. Test method**

**a. Cyclic High and Low Temperature Test A and Cyclic High and Low Temperature Test B**

Test specimen shall be secured to the metal frame as shown in Figure 15. After placing it in a thermostat at 80±3°C for 2 hours, leave the specimen in the thermostat at -20±3°C for 2hours. Repeat this cycle and cool it down to reach the room temperature.

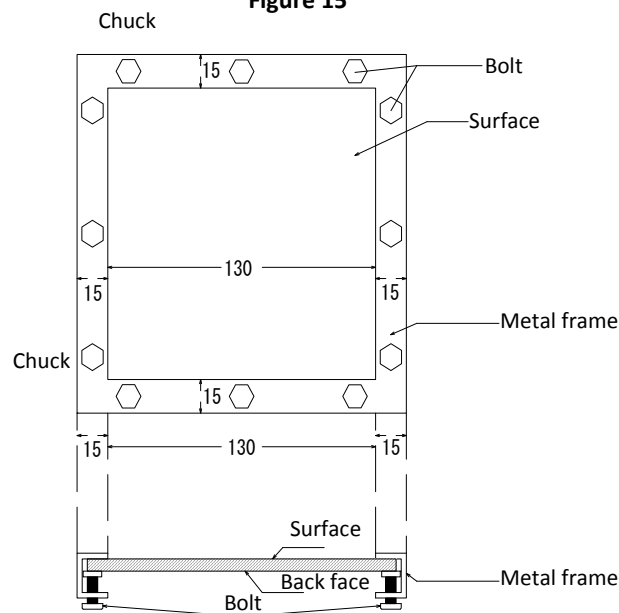
**b. Cyclic High and Low Temperature Test C**

Test specimen shall be secured to the metal frame as shown in Figure 15 (in case of testing Surface processed concrete forming plywood, use the test specimen as it is). After placing it in a thermostat at 60±3°C for 2 hours, leave the specimen in the thermostat at -20±3°C for 2hours. Repeat this cycle and cool it down to reach the room temperature.

**c. Cyclic High and Low Temperature Test D**

Test specimen shall be secured to the metal frame as shown in Figure 15. After placing it in a thermostat at 40±3°C for 2 hours, leave the specimen in the thermostat at -20±3°C for 2hours. Repeat this cycle and cool it down to reach the room temperature.

**Figure 15**



#### **(14) Alkali Resistance Test**

##### **a. Preparation of test specimens**

2 test specimens in square shape of 75mm x 75mm shall be cut from each sample plywood (in case of testing Both sides processed concrete forming plywood or Both sides specially processed decorative plywood, 4 specimens shall be taken from each sample plywood).

##### **b. Test method**

When testing Surface processed concrete forming plywood, place the specimens horizontally and drop approximately 5ml of 1% solution of sodium hydroxide on the surface of the specimens (and on the back of other 2 specimens, if 4 specimens are prepared in accordance with the procedure a. above). After keeping the specimens on the watch glass covered for 48 hours, rinse them with water immediately, and leave them in a room for 24 hours.

When testing Specially processed decorative plywood, place the specimens horizontally and drop 1% solution of sodium carbonate on the surface of the specimens (and on the back of other 2 specimens, if 4 specimens are prepared in accordance with the procedure a. above).

After keeping the specimens on the watch glass covered for 6 hours, rinse them with water immediately, and leave them in a room for 24 hours.

#### **(15) Bending Test**

##### **a. Class 1 Bending Test**

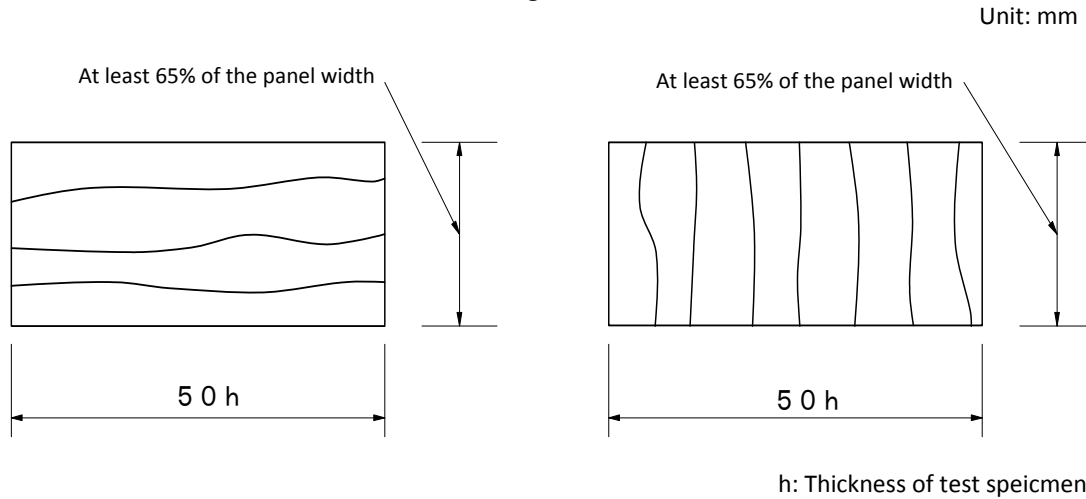
##### **a. Preparation of test specimens**

One rectangular test specimen as shown in Figure 16, with the length of at least 65% of the panel width perpendicular to the main grain direction of the surface x 50 times the marked thickness parallel to the main grain direction of the surface veneer, and another specimen with the length of at least 65% of the panel width parallel to the main grain direction of the surface x 50 times the marked thickness perpendicular to the main grain direction of the surface veneer the shall be taken from each sample plywood. In case where the dimension of the plywood to be tested is not large enough to prepare the required specimens as shown in Figure 16, specimens of the largest possible size shall be taken.

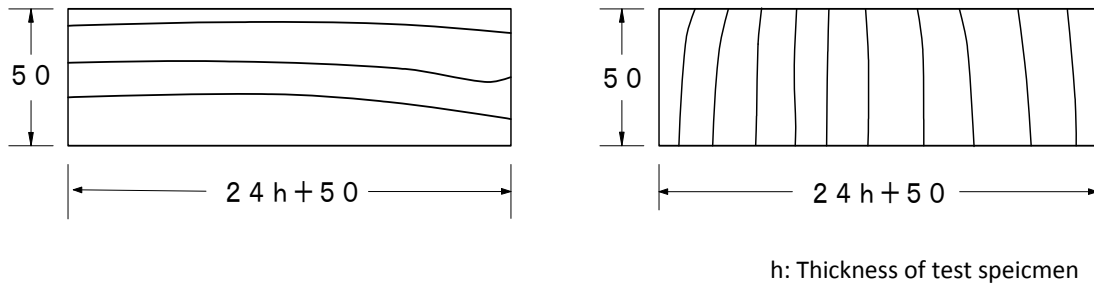
Concerning the plywood which is composed of with veneers of only tropical hardwood species (usually, Lauan), the test specimens may be those as shown in Figure 17, that are one rectangular specimen

with the length of 50mm perpendicular to the main grain direction of the surface x 24 times the marked thickness plus 50mm parallel to the main grain direction of the surface veneer, and another specimen with the length of 50mm parallel to the main grain direction of the surface x 24 times the marked thickness plus 50mm perpendicular to the main grain direction of the surface veneer (hereinafter, referred to as 'small test specimens'). In that case, 2 specimens of each shall be prepared.

**Figure 16**



**Figure 17**



**b. Test method**

According to the procedure as shown in Figure 18 (if the length of the test specimen is less than 50h, the distance between the fulcrum and the loading point and the distance between the loading points (15h) may be reduced to the maximum possible length), measure the upper limit and lower limit of load within the proportional range, the deflection and the maximum values corresponding to them on both specimens that have the direction of test span parallel to the main grain direction of the surface veneer of the specimen and that have the direction of test span perpendicular to the main grain direction of the surface veneer of the specimen. Then Bending strength and Bending Young's modulus shall be calculated using the following formula. In this case, the average loading speed shall be not more than 14.7MPa per minute, and the load shall be applied to the surface veneer so that the back face veneer is on the tension side. In case of using the small test specimen, the test shall be conducted by the method as shown in Figure 19. When it is impossible to test the specimens with the width of at least 65% of the plywood width due to the limitation of the capacity or the size of test equipment, the test specimens may be cut and divided to several pieces to reduce the width of the test specimens. In this case, the width of each divided test specimen shall be the same, and the average value of Bending strength and Bending Young's modulus of each divided specimen shall be considered as those of the plywood.

$$\text{Bending Strength (MPa or N/mm}^2\text{)} = P_b l / b h^2$$

$$\text{Bending Young's Modulus (MPa or N/mm}^2\text{)} = 23 \Delta P l^3 / 108 b h^3 \Delta y$$

(in case of using small test specimen)

$$\text{Bending Strength (MPa or N/mm}^2\text{)} = 3P_b\ell/2bh^2$$

$$\text{Bending Young's Modulus (MPa or N/mm}^2\text{)} = \Delta P\ell^3/4bh^3\Delta y$$

$P_b$ : Maximum load (N)

$\ell$  : Span (mm)

$b$  : Width of test specimen (mm)

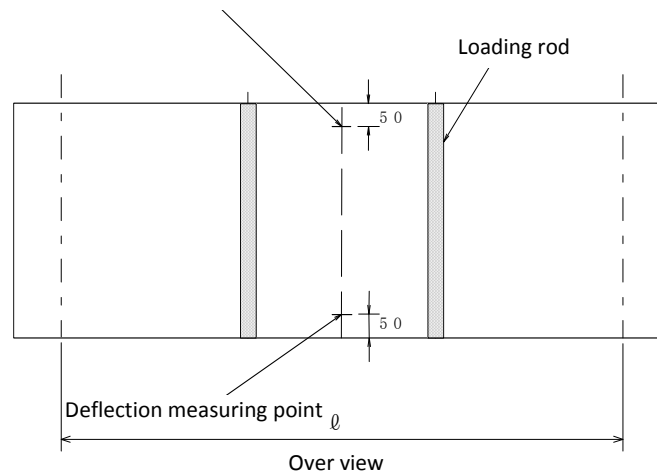
$h$  : Thickness of test specimen (mm)

$\Delta P$ : Difference between upper limit and lower limit of load within the proportional range

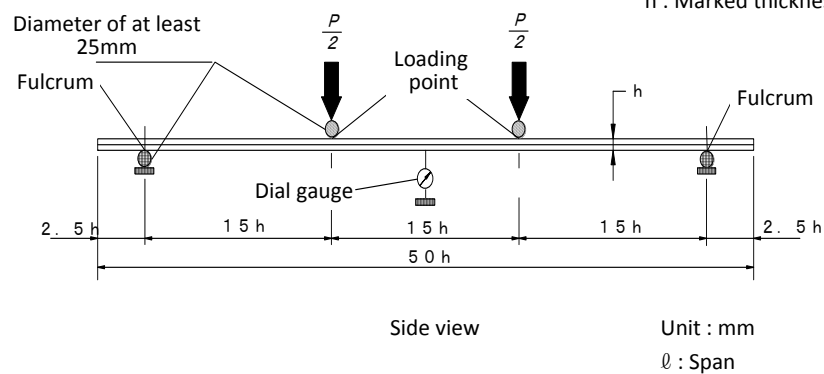
$\Delta y$ : Deflection in the center of test span corresponding to  $\Delta P$

**Figure 18**

Deflection measuring point

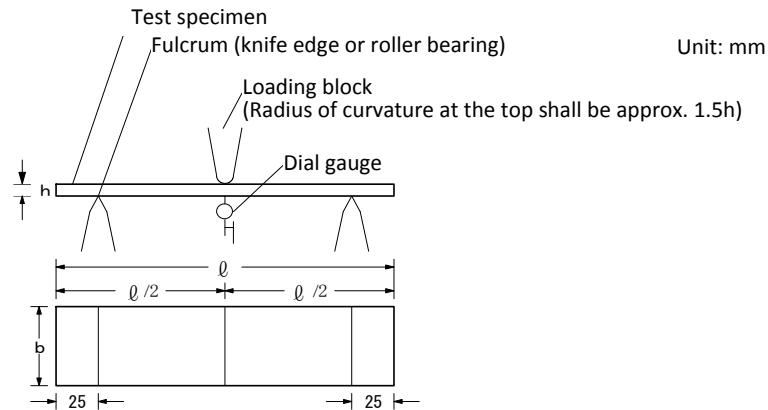


$h$  : Marked thickness of the sample plywood



**Figure 19**





**c. Other test methods**

Except for these methods specified above, the other methods may be used if the evaluation results can clearly be proved to be equivalent to or not more than those obtained by the methods specified above, or it can clearly be proved that the results by those methods could be converted to the results equivalent to those by the method specified above.

**b. Class 2 Bending Test**

**a. Test method**

According to the procedure as shown in Figure 20, place the actual size of the testing plywood with the surface veneer side up. Deflections shall be measured when applying load on the effective length (width of the plywood) of the loading rod which is placed in center and perpendicular to the span, corresponding to the thickness, width and length of the testing plywood. Bending Young's modulus shall be calculated using the following formula.

$$\text{Bending Young's Modulus (MPa or N/mm}^2\text{)} = \Delta P l^3 / 4bh^3 \Delta y$$

$l$  : Span (mm)

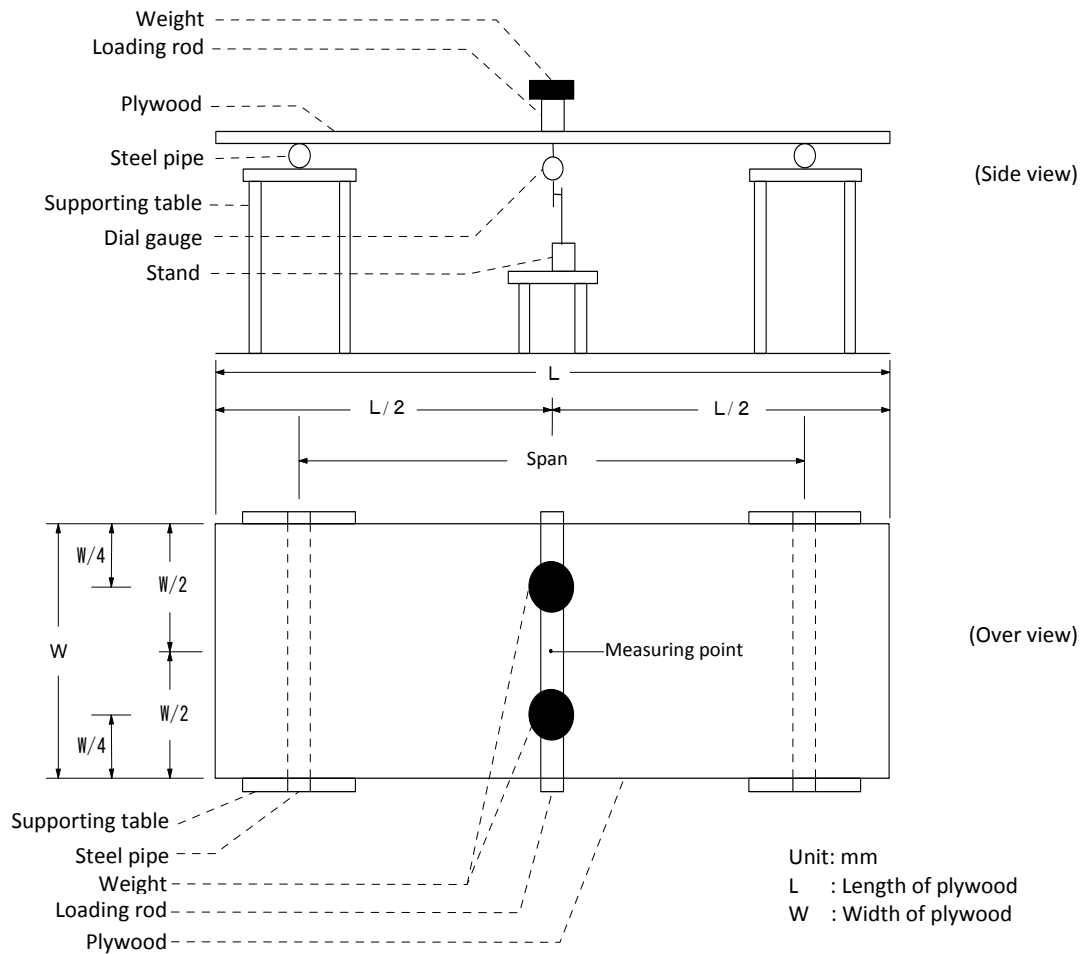
$b$  : Width of test specimen (mm)

$h$  : Thickness of test specimen (mm)

$\Delta P$ : Difference between upper limit and lower limit of load within the proportional range

$\Delta y$ : Deflection in the center of test span corresponding to  $\Delta P$

**Figure 20**



#### (16) In-plane Shear Strength Test

##### a. Preparation of test specimens

2 rectangular test specimens as shown in Figure 21 with the length of 85mm perpendicular to the main grain direction of the surface veneer x 255mm parallel to the main grain direction of the surface veneer shall be taken from each sample plywood.

##### b. Test method

According to the procedure as shown in Figure 21, test shall be conducted to measure the maximum load, and the In-plane Shear Strength shall be calculated using the following formula. The average loading speed shall be not more than 2.0MPa per minute.

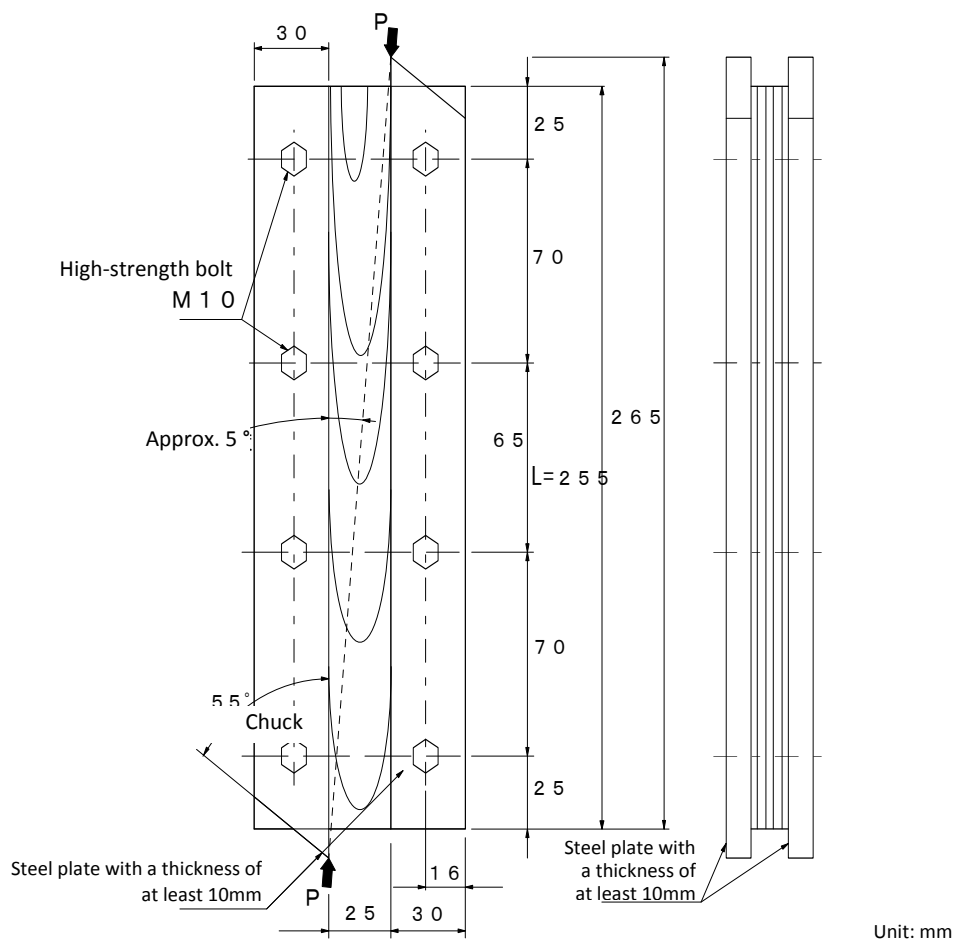
$$\text{In-plane Shear Strength (MPa or N/mm}^2\text{)} = P_s/h\ell$$

$P_s$ : Maximum load (N)

$h$  : Marked thickness of the sample plywood (mm)

$\ell$  : Length of test specimen (mm)

**Figure 21**



Notes: The face of steel plate contacting the plywood may be sanded to avoid slipping. High-strength bolts shall be fastened tightly so that the test specimen and the steel plate do not slip from each other. If still slippery after these procedures, thicker bolts can be used. In that case, the width of the steel plate can be wider than 30mm.

#### c. Other test methods

Except for these methods specified above, the other methods may be used if the evaluation results can clearly be proved to be equivalent to or not more than those obtained by the methods specified above, or it can clearly be proved that the results by those methods could be converted to the results equivalent to those by the method specified above.

### (17) Water Resistance Test (Water Resistance Test A, Water Resistance Test B, Water Resistance Test C and Water Resistance Test D)

#### a. Preparation of test specimens

2 test specimens in square shape of 150mm x 150mm shall be cut from each sample plywood (in case of testing Both faces specially processed decorative plywood, 4 specimens shall be taken from each sample plywood).

#### b. Test method

##### a. Water Resistance Test A

The 2 test specimens cut from the same sample plywood shall be bonded back to back together using the phenol resin adhesives for room temperature curing (in case of preparing 4 test

specimens taken from a sample plywood, according to the procedure in a. above, the rest of 2 specimens shall be bonding surface to surface together), and all the sides shall be sealed (hereinafter, referred to as 'test piece'). Test pieces shall be immersed to the warm water of  $80\pm 3^{\circ}\text{C}$  for 1 hour, and dried at  $60\pm 3^{\circ}\text{C}$  for 2 hours. This process shall be repeated twice, and then the test pieces shall be left until they reach the room temperature.

b. **Water Resistance Test B**

Test pieces shall be immersed to the warm water of  $60\pm 3^{\circ}\text{C}$  for 1 hour, and dried at  $60\pm 3^{\circ}\text{C}$  for 2 hours. This process shall be repeated twice, then the test pieces shall be left until they reach the room temperature.

c. **Water Resistance Test C**

Test pieces shall be immersed to the warm water of  $60\pm 3^{\circ}\text{C}$  for 1 hour, and dried at  $60\pm 3^{\circ}\text{C}$  for 2 hours.

d. **Water Resistance Test D**

Test pieces shall be immersed to the warm water of  $40\pm 3^{\circ}\text{C}$  for 1 hour, and dried at  $60\pm 3^{\circ}\text{C}$  for 2 hours.

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**(18) Humidity and Heat Test**

a. **Preparation of test specimens**

2 test specimens in square shape of 200mm x 200mm shall be cut from each sample plywood (in case of testing Both faces specially processed decorative plywood, 4 specimens shall be taken from each sample plywood).

b. **Test method**

After fixing the test specimens horizontally, some boiling water shall be dropped to the surface of the specimen (in case of preparing 4 test specimens taken from a sample plywood, according to the procedure in a. above, boiling water shall be dropped to the back faces of the rest of 2 specimens). Then place an aluminum container of a capacity of 1L containing 0.5L of boiling water on the test specimen and leave for 20 minutes. Rub the specimen using a dry cloth, and leave as it is for another 24 hours.

Note: the aluminum container shall be the flat-bottomed round shape with a bottom surface diameter of 160mm and with a lid.

**(19) Abrasion Test**

a. **Preparation of test specimens**

2 test specimens in round shape with a diameter of approximately 120mm or any shape which does not interfere with the test shall be cut from each sample plywood (in case of testing Both faces specially processed decorative plywood, 2 specimens for testing on surface veneer and another 2 specimens for back face veneer, total of 4 specimens shall be taken from each sample plywood). A hole of a diameter of 10mm shall be drilled in center of each specimen.

b. **Test method**

a. **Abrasion Test A and Abrasion Test B**

After measuring the mass of test specimen, fix it horizontally on to the rotating table of the testing device as shown in Figure 22, 23 or 24. Abrasion test shall be carried out after setting two rubber discs (those passed the test specified in JIS K 6902 (Testing method for laminated thermosetting high-pressure decorative sheets)) with sandpapers (those passed the test specified in JIS K 6902 (Testing method for laminated thermosetting high-pressure decorative sheets)) attached around the discs. When reaching the final abrasion point, read the number of rotation, measure the mass of test specimen, and calculate the abrasion value and the abrasion weight loss. In this case, the

total mass to be put on the tested face of specimen shall be 500g including the mass of the rubber discs.

b. **Abrasion Test C**

Fix it horizontally on to the rotating table of the testing device as shown in Figure 22, 23 or 24.

Abrasion test shall be carried out after setting 2 soft abrasion discs. When reaching the final abrasion point, read the number of rotation, measure the mass of test specimen, and calculate the abrasion value and the abrasion weight loss. In this case, the total mass to be put on the tested face of specimen shall be 1,000g including the mass of the soft abrasion discs.

Note1: The abrasion value and abrasion weight loss shall be calculated by the following formula. In case of 4 specimens are prepared according to the procedure in a. above, the abrasion value and abrasion weight loss shall be calculated for the surface and back faces respectively.

**Abrasion value = Total number of rotation of each test specimen / 2**

**Abrasion weight loss (g) = W / C x 100**

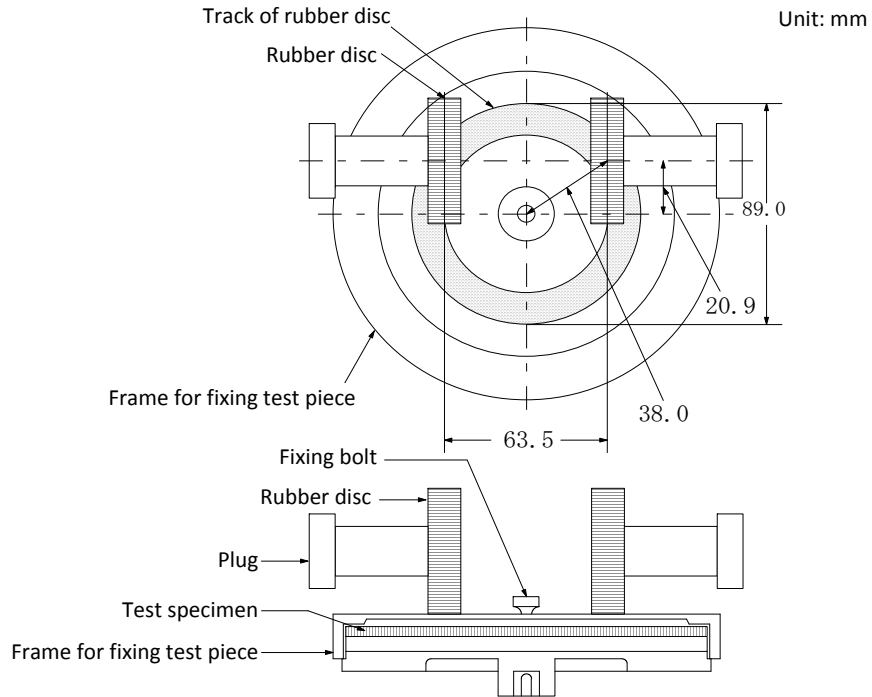
W: Average weight loss of 2 test specimens

C : Abrasion value

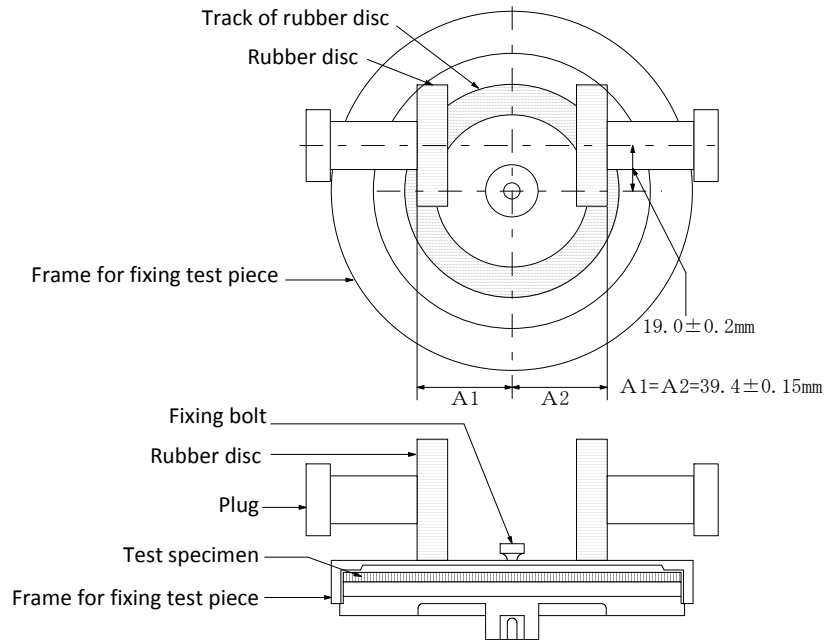
Note2: Definition of 'final abrasion point':

- If the decorative face of the specimen has patterns, it shall be the point when approximately 50% of the pattern is worn out.
- If the decorative face of the specimen has no pattern, it shall be the point when approximately 50% of the base material underneath the decorative layer appears.

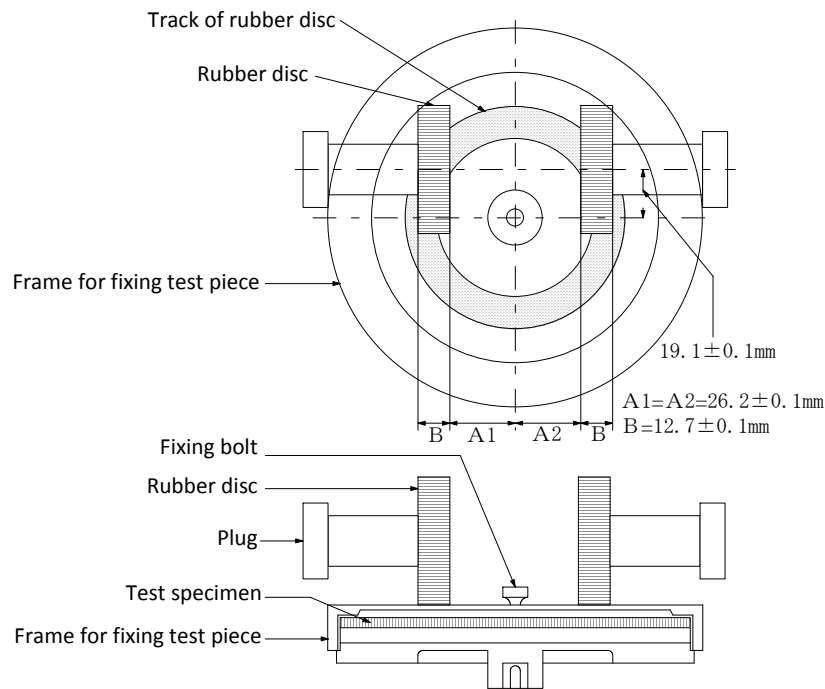
**Figure 22**



**Figure 23**



**Figure 24**



**(20) Scratch Hardness Test (Scratch Hardness Test A and Scratch Hardness Test B)**

**a. Preparation of test specimens**

2 rectangular test specimens with the length of 90mm parallel to the main grain direction of the surface veneer of the base plywood x 170mm perpendicular to the main grain direction of the surface veneer of the base plywood shall be taken from each sample plywood (in case of testing Both faces specially processed decorative plywood, 2 specimens for testing on surface veneer and another 2 specimens for back face veneer, total of 4 specimens shall be taken from each sample plywood).

**b. Test method**

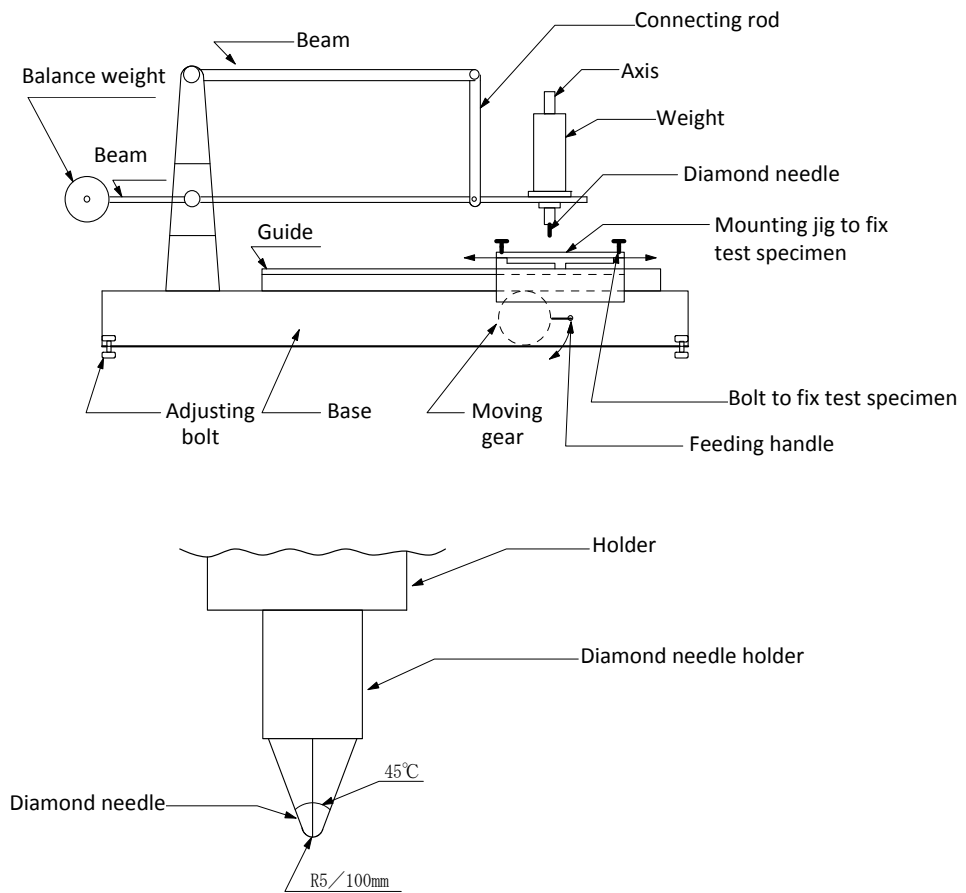
**a. Scratch Hardness Test A**

After fixing the test specimen horizontally to the mounting jig as shown in Figure 25, a load of 200g shall be applied using a diamond needle as shown in the same Figure to make 3 scratch lines with the length of 50mm on the surface of test specimen. The depth of scratches shall be measured and the average value shall be calculated. (In case of preparing 4 test specimens taken from a sample plywood, according to the procedure in a. above, the average depth of scratches on the surface and back faces shall be calculated respectively, hereinafter the same in (20).)

**b. Scratch Hardness Test B**

After fixing the test specimen horizontally to the mounting jig as shown in Figure 25, a load of 100g shall be applied using a diamond needle as shown in the same Figure to make 3 scratch lines with the length of 50mm on the surface of test specimen. The depth of scratches shall be measured and the average value shall be calculated.

**Figure 25**



**(21) Impact Test (Impact Test A and Impact Test B)**

**a. Preparation of test specimens**

2 test specimens in square shape of 100mm x 100mm shall be cut from each sample plywood (in case of testing Both faces specially processed decorative plywood, 4 specimens shall be taken from each sample plywood).

**b. Test method**

**a. Impact Test A**

After fixing the test specimen horizontally to the fixing table as shown in Figure 26, a dropping weight of 150g with a top of curvature radius of 25.4mm shall be dropped on to the centre of test specimen from 30mm height for 50 times.

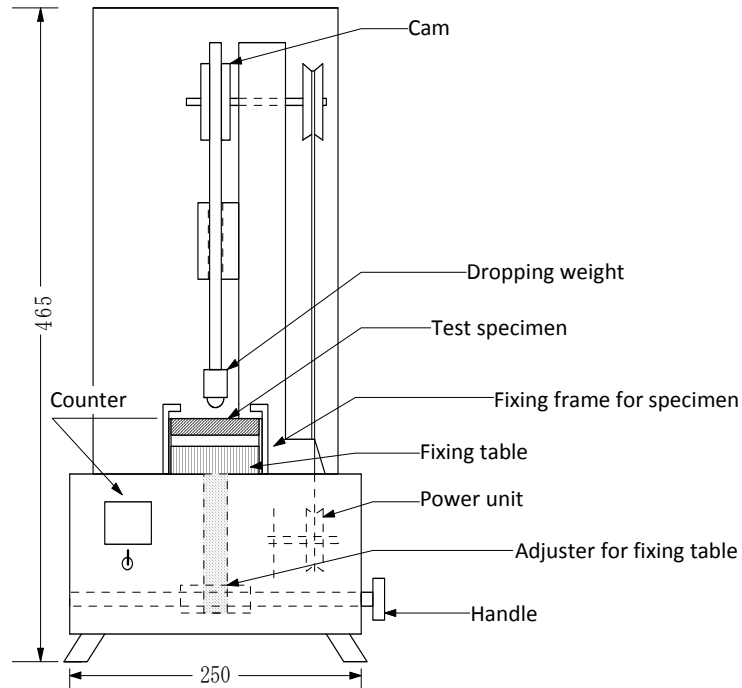
**b. Impact Test B**

After fixing the test specimen horizontally to the fixing table as shown in Figure 26, a dropping weight of 100g with a top of curvature radius of 25.4mm shall be dropped on to the centre of test specimen from 30mm height for 50 times.



**Figure 26**

(Unit: mm)



**(22) Color Fading Test**

**a. Preparation of test specimens**

2 rectangular test specimens with the length of 75mm parallel to the main grain direction of the surface veneer of the base plywood x 150mm perpendicular to the main grain direction of the surface veneer of the base plywood shall be taken from each sample plywood (in case of testing Both faces specially processed decorative plywood, 2 specimens for testing on surface veneer and another 2 specimens for back face veneer, total of 4 specimens shall be taken from each sample plywood).

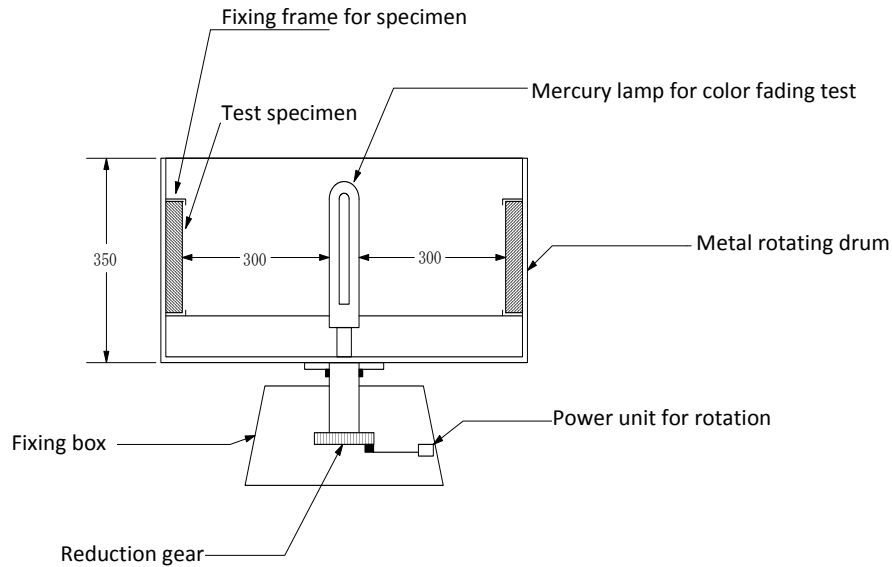
**b. Test method**

After fixing the test specimen vertically to the fixing frame as shown in Figure 27, adjust the horizontal distance between the test specimen and a mercury lamp for color fading test to 300mm. Test specimen shall be exposed to the light of mercury lamp rotating with a speed of 2.5 round per minute for 48 hours, and it shall be kept in a dark room for 72 hours.

Note: The mercury lamp shall be the one of 400w with a long-wavelength of not less than 3,000Å, and the arc tube inside the lamp shall be made of quartz.

**Figure 27**

(Unit: mm)



**(23) Stain Resistance Test (Stain Resistance Test A and Stain Resistance Test B)**

**a. Preparation of test specimens**

2 test specimens in square shape of 75mm x 75mm shall be cut from each sample plywood (in case of testing Both faces specially processed decorative plywood, 4 specimens shall be taken from each sample plywood).

**b. Test method**

**a. Stain Resistance Test A**

Place test specimen horizontally, and mark lines of the 10mm width using the blue ink and black quick drying ink for office use available on the market (as specified in JIS S 6037 Marking Pen) and red crayon (as specified in JIS S 6026 (Crayon and Pastel), hereinafter, the same) on the surface of test specimens (in case of preparing 4 test specimens taken from a sample plywood, according to the procedure in a. above, marking shall be made on the back face of the rest of 2 specimens). After leaving test specimens as they are for 4 hours, wipe the marked faces with a cloth soaked with solvent or detergent.

**b. Stain Resistance Test B**

Place test specimen horizontally, and mark lines of the 10mm width using quick drying ink (as specified in JIS S 6037 Marking Pen) and red crayon on the surface of test specimens. After leaving test specimens as they are for 2 hours, wipe the marked faces with a cloth soaked with solvent or detergent.

**(24) Acid Resistance Test**

**a. Preparation of test specimens**

2 test specimens in square shape of 75mm x 75mm shall be cut from each sample plywood (in case of testing Both faces specially processed decorative plywood, 4 specimens shall be taken from each sample plywood).

**b. Test method**

Place test specimen horizontally, and drop 5% solution of acetic acid on the surface of test specimen (in case of preparing 4 test specimens taken from a sample plywood, according to the procedure in a. above, solution shall be dropped on to the back face of the rest of 2 specimens). After leaving test

specimens in a sealed watch glass for 6 hours, immediately rinse them with water, and keep them in a room for 24 hours.

**(25) Thinner Resistance Test**

**a. Preparation of test specimens**

2 test specimens in square shape of 75mm x 75mm shall be cut from each sample plywood (in case of testing Both faces specially processed decorative plywood, 4 specimens shall be taken from each sample plywood).

**b. Test method**

Place test specimen horizontally, and drop some lacquer thinner (as specified in JIS K 5538 (Lacquer thinner) on the surface of test specimen (in case of preparing 4 test specimens taken from a sample plywood, according to the procedure in a. above, lacquer thinner shall be dropped on to the back face of the rest of 2 specimens). After leaving test specimens in a sealed watch glass for 6 hours, keep them in a room for 24 hours.

**Appended Table 1 (concerning Article 4)**

Yanagi-ka (Salicaceae), Yamamomo-ka (Myricaceae), Kurumi-ka (Juglandaceae), Kabanoki-ka (Betulaceae), Buna-ka (Fagaceae), Nire-ka (Ulmaceae), Kuwa-ka (Moraceae), Katsura-ka (Cercidiphyllaceae), Mokuren-ka (Magnoliaceae), Kusunoki-ka (Lauraceae), Mansaku-ka (Hamamelidaceae), Bara-ka (Rosaceae), Mikan-ka (Rutaceae), Tsuge-ka (Buxaceae), Mochinoki-ka (Aquifoliaceae), Kaede-ka (Aceraceae), Tochinoki-ka (Hippocastanaceae), Mukuroji-ka (Sapindaceae), Shinanoki-ka (Tiliaceae), Tsubaki-ka (Theoiidae), Ukogi-ka (Araliaceae), Mizuki-ka (Cornaceae), Kakinoki-ka (Ebenaceae), Hainoki-ka (Symplocaceae), Egonoki-ka (Styracaceae) and Mokusei-ka (Oleaecae)

**Appended Table 2 (concerning Article 5, Article 6)**

Thickness of plywood	No. of veneers	Thickness of Surface veneer and Back face veneer (unit: mm)			
		3 or 4	5 or 6	7 or 8	9 or more
7.5mm ≤	<9.0mm	2.5	-	-	-
9.0mm ≤	<12.0mm	2.5	-	-	-
12.0mm ≤	<15.0mm	2.5	2.0	-	-
15.0mm ≤	<18.0mm	3.0	2.5	-	-
18.0mm ≤	<21.0mm	-	3.0	-	-
21.0mm ≤	<24.0mm	-	4.0	3.0	-
24.0mm ≤		-	-	3.5	3.0

**Appended Table 3 (concerning Article 6)**

Classification	Calculation formula for the number of defects
White pocket with a severe decay	Width in the direction of panel width (mm) / 150
White pocket with a slight decay	Width in the direction of panel width (mm) / 300
Sound knots, dead knots, hollow knots, holes and patches with a diameter of exceeding 25mm and not more than 40mm in the direction of panel width	Number of defects x ½
Sound knots, dead knots, hollow knots, holes and patches with a diameter of exceeding 40mm and not more than 65mm in the direction of panel width	Number of defects x 1
Sound knots, dead knots, hollow knots, holes and patches with a diameter of exceeding 65mm in the direction of panel width	Number of defects x 3

## Appended Format

### 1. Format of marking for Plywood for General Use

1	Name of product
2	Dimensions
3	Bonding quality
4	Face quality
5	Formaldehyde emission amount
6	Insecticide
7	Name of specie
8	Type of adhesives used
9	Name of manufacturer

Remarks:

- 1 If not marking the Formaldehyde emission amount, 'Formaldehyde emission amount' shall be omitted from the above.
- 2 If not marking the Insect-control treatment, 'Insecticide' shall be omitted from the above.
- 3 If not marking the specie of the veneer, 'Name of specie' shall be omitted from the above.
- 4 If marking the Formaldehyde emission amount, 'Type of adhesives used' shall be omitted from the above.
- 5 If the marking is made by a distributor, 'Name of manufacturer' shall be 'Name of Distributor'.
- 6 For imported products, 'Name of manufacturer' shall be 'Name of Importer' regardless of 5. above.
- 7 This format may be written vertically.

### 2. Format of marking for Concrete Forming Plywood

1	Name of product
2	Dimensions
3	Face quality
4	Formaldehyde emission amount
5	Name of specie
6	Type of adhesives used
7	Name of manufacturer

Remarks:

- 1 If not marking the Formaldehyde emission amount, 'Formaldehyde emission amount' shall be omitted from the above.
- 2 If not marking the specie of the veneer, 'Name of specie' shall be omitted from the above.
- 3 If marking the Formaldehyde emission amount, 'Type of adhesives used' shall be omitted from the above.
- 4 If the marking is made by a distributor, 'Name of manufacturer' shall be 'Name of Distributor'.
- 5 For imported products, 'Name of manufacturer' shall be 'Name of Importer' regardless of 5. above.
- 6 This format may be written vertically.

### 3. Format of marking for Structural Plywood

1	Name of product
2	Dimensions
3	Bonding quality
4	Class
5	Face quality
6	Bending property
7	Effective section modulus
8	Formaldehyde emission amount
9	Insecticide
10	Name of specie
11	Type of adhesives used
12	Name of manufacturer

Remarks:

- 1 If not marking the bending property, 'Bending property' shall be omitted from the above.

- 2 If not marking the Effective section modulus, 'Effective section modulus' shall be omitted from the above.
- 3 If not marking the Formaldehyde emission amount, 'Formaldehyde emission amount' shall be omitted from the above.
- 4 If not marking the Insect-control treatment, 'Insecticide' shall be omitted from the above.
- 5 If not marking the specie of the veneer, 'Name of specie' shall be omitted from the above.
- 6 If marking the Formaldehyde emission amount, 'Type of adhesives used' shall be omitted from the above.
- 7 If the marking is made by a distributor, 'Name of manufacturer' shall be 'Name of Distributor'.
- 8 For imported products, 'Name of manufacturer' shall be 'Name of Importer' regardless of 5. above.
- 9 This format may be written vertically.

#### 4. Format of marking for Natural Wood Decorative Plywood

<b>1</b>	<b>Name of product</b>
<b>2</b>	<b>Dimensions</b>
<b>3</b>	<b>Bonding quality</b>
<b>4</b>	<b>Formaldehyde emission amount</b>
<b>5</b>	<b>Insecticide</b>
<b>6</b>	<b>Name of specie</b>
<b>7</b>	<b>Type of adhesives used</b>
<b>8</b>	<b>Name of manufacturer</b>

Remarks:

- 1 If not marking the Formaldehyde emission amount, 'Formaldehyde emission amount' shall be omitted from the above.
- 2 If not marking the Insect-control treatment, 'Insecticide' shall be omitted from the above.
- 3 If not marking the specie of the veneer, 'Name of specie' shall be omitted from the above.
- 4 If marking the Formaldehyde emission amount, 'Type of adhesives used' shall be omitted from the above.
- 5 If the marking is made by a distributor, 'Name of manufacturer' shall be 'Name of Distributor'.
- 6 For imported products, 'Name of manufacturer' shall be 'Name of Importer' regardless of 5. above.
- 7 This format may be written vertically.

#### 5. Format of marking for Specially Processed Decorative Plywood

<b>1</b>	<b>Name of product</b>
<b>2</b>	<b>Dimensions</b>
<b>3</b>	<b>Bonding quality</b>
<b>4</b>	<b>Surface property</b>
<b>5</b>	<b>Formaldehyde emission amount</b>
<b>6</b>	<b>Insecticide</b>
<b>7</b>	<b>Name of specie</b>
<b>8</b>	<b>Type of adhesives used</b>
<b>9</b>	<b>Name of manufacturer</b>

Remarks:

- 1 If not marking the Formaldehyde emission amount, 'Formaldehyde emission amount' shall be omitted from the above.
- 2 If not marking the Insect-control treatment, 'Insecticide' shall be omitted from the above.
- 3 If not marking the specie of the veneer, 'Name of specie' shall be omitted from the above.
- 4 If marking the Formaldehyde emission amount, 'Type of adhesives used' shall be omitted from the above.
- 5 If the marking is made by a distributor, 'Name of manufacturer' shall be 'Name of Distributor'.
- 6 For imported products, 'Name of manufacturer' shall be 'Name of Importer' regardless of 5. above.
- 7 This format may be written vertically.

**Supplementary provision** (Notification No. 233, February 27, 2003, Ministry of Agriculture, Forestry and Fisheries)  
This notification shall be put into effect on the date 30 days passed from the date of publication.

**Amendment** (Notification No. 1751, December 2, 2008, Ministry of Agriculture, Forestry and Fisheries)  
This notification shall be put into effect on March 2, 2009.

**(Enforcement date of the last amendment)**

Notification No. 1751, December 2, 2008, Ministry of Agriculture, Forestry and Fisheries shall be put into effect on March 2, 2009.