

# INTERGOVERNMENTAL STANDARD

## GOST 3916.1-96

Plywood with outer layers of deciduous veneer for general use.

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### SPECIFICATIONS

Introduction date: 01-01-1998

#### 1. DESCRIPTION - GENERAL USE PLYWOOD

This standard covers general use plywood with hardwood face veneer.

This standard is not applicable to specialty or decorative plywood.

Minimal requirements relating to the formaldehyde emission of plywood are covered in 4.3 and 6.8.

#### 3. CLASSIFICATION AND DIMENSIONS

3.1. Plywood is subdivided into grades based on the following: appearance of face veneers, glue bond, the degree of moisture resistance of the bond, and if sanded or not.

3.1.1. The plywood is subdivided into 5 grades, based on the appearance of the face veneers: E (elite), I, II, III and IV. Descriptions of the face grades of the plywood are specified in Supplement A

3.1.2. The degree of moisture resistance of the plywood bond is specified by the following marks:

- FSF - water proof plywood (WBP)
- FK - water resistant plywood (MR)

3.1.3. The sanding of the plywood is specified as follows:

- Not sanded (NS)
- Sanded one side (S1)
- Sanded two sides (S2)

### 3.2. Dimensions.

3.2.1. The dimensions and the number of plies in the plywood sheets must correspond to tables 1 and 2.

*Table 1. Dimensions (millimeters)*

<b>Length(width) of the plywood sheets</b>	<b>Min(Max)Tolerance in mm</b>
1200,1220,1250	+/- 3,0
1500,1525,1800,1830	+/- 4,0
2100,2135,2440,2500	+/- 4,0
2700,2745,3050,3600,3660	+/- 5,0

*Note:* Production of plywood is allowed in other dimensions corresponding with the terms of a contract.

*Table 2. Thickness (millimeters)*

<b>Nominal thickness of plywood</b>	<b>Number of plies</b>	<b>Sanded Plywood Tolerance Min/Max(mm)</b>	<b>Sanded Plywood Thickness Variance(mm)</b>	<b>Unsanded Plywood Tolerance Min/Max (mm)</b>	<b>Unsanded Plywood Thickness Variance(mm)</b>
3,0 mm	3-ply	+ 0,3/-0,4		+ 0,4/-0,3	0,6
4,0 mm	3-ply	+ 0,3/-0,5		+ 0,8/-0,4	
6,5 mm	5-ply	+ 0,4/-0,5		+ 0,9/-0,4	1,0
9,0 mm	7-ply	+ 0,4/-0,6		+ 1,0/-0,5	
12,0 mm	9-ply	+ 0,5/-0,7	0,6	+ 1,1/-0,6	
15,0 mm	11-ply	+ 0,6/-0,8		+ 1,2/-0,7	
18,0 mm	13-ply	+ 0,7/-0,9		+ 1,3/-0,8	
21,0 mm	15-ply	+ 0,8/-1,0		+ 1,4/-0,9	1,5
24,0 mm	17-ply	+ 0,9/-1,1		+ 1,5/-1,0	
27,0 mm	19-ply	+ 1,0/-1,2	1,0	+ 1,6/-1,1	2,0
30,0 mm	21-ply	+ 1,1/-1,3		+ 1,7/-1,2	

*Note:* Production of plywood is allowed in other thickness and construction (number of plies) corresponding with the terms of a contract. The minimum and maximum variances may be determined by the following formula.

Sanded Plywood - maximum/minimum tolerance:

1. Maximum: Thick \* 0.03 mm + 0.2 mm

e.g. (12 mm\*0.03 mm + 0.2 mm) = 12 mm + 0.5 mm

2. Minimum: Thick \* 0.03 mm + 0.4 mm

e.g. (12 mm\*0.03 mm + 0.4 mm) = 12 mm - 0.7 mm

Unsanded Plywood - maximum/minimum tolerance:

1. Maximum: Thick \* 0.03 mm + 0.8 mm

e.g. (12 mm\*0.03 mm + 0.8 mm) = 12 mm + 1.1 mm

2. Minimum: Thick \* 0.03 mm + 0.4 mm

e.g. (12 mm\*0.03 mm + 0.3 mm) = 12 mm - 0.6 mm

3.2.2. Plywood panels must be cut at a right angle. Deviation must not exceed 2 mm per 1 lineal meter.

3.2.3. Deviation from square edges can not exceed 2mm per 1 lineal meter.

3.3. Marking if plywood must include:

- Name of product
- Wood species of the face and core veneers
- Glue Bond marks
- Veneer grades of the face layers
- Formaldehyde emission classification
- Type of surface treatment
- Dimensions
- Applicable GOST standard

Below is an example of marking of birch plywood with core plies of birch veneer, water resistant, with a combination of face veneers I/III, with an emission class of E1, sanded both sides, 2440 mm long, 1220 mm wide and 9 mm thick:

**Plywood birch /birch, FK (MR), I/III, E1, S2, 2440\*1220\*9 GOST 3916.1-96**

## **4. TECHNICAL REQUIREMENTS**

### 4.1. Characteristics

4.1.1. The following species can be used for the face veneer: birch, alder, maple, elm, beech,

aspen, poplar, lime. For core veneers, in addition to the ones just mentioned, the following can be used: pine, spruce, fir, larch and cedar.

The timber used for face veneers of plywood determines the species of the plywood.

The plywood can be made of one or more than one species of wood, therefore it is either "homogeneous" or "combined".

If the number of veneer plies is even, the direction of fibers (grain) of the two middle plies must be parallel.

Veneers, located symmetrically within the thickness of plywood, must be of the same species and thickness.

The thickness of the face veneers must not exceed 3,5 mm and the thickness of core veneers must not exceed 4 mm.

4.1.2. Wood and manufacturing defects exceeding limits stated in Table 3 are not allowed in face veneers.

4.1.3. Wood and manufacturing defects, exceeding the limits stated in Table 3, are allowed in core veneers, as long as they do not influence its integrity and dimensions. The requirements for quality and dimensions are specified in this standard.

4.1.4. The maximum amount of wood and manufacturing defects allowed in face veneers is indicated in Table 4.

4.1.5. The combination of face veneer grades is indicated in GOST 30427.

4.1.6. The face veneer of grade E can consist of 2 veneer strips with one joint in the middle of the sheet. This applies only to widths less than 1525 mm.

If the width is 1525 mm, the face veneer of grade E can consist of 3 strips of equal width.

The face veneer of grades I and II can be made from an unlimited number of veneer strips.

For grades E, I, II veneer joints must be parallel to plywood edges and veneer strips must match in color.

4.1.7. Plugs must fit the surface, be firmly bonded, must match the color of the face veneer and its grain direction. For grades I and II the plugs must match the color of the wood.

Putty fillers or repairs must match the color of the wood species of the given grade. In addition, they must provide easy gluing of the facing materials, must not crumble out or crack during plywood processing or bending.

4.2. Strength and mechanical indices are stated in Table 5.

4.3. Plywood formaldehyde content, depending on emission class, must meet the limits stated in Table 6.

4.4. The plywood is measured in either square meters or cubic meters. The volume of one panel is determined with a precision of up to 0.00001 m<sup>3</sup>. The volume of a plywood lot is determined with a precision of up to 0.01 m<sup>3</sup>. The surface area of a panel is measured with the precision of up to 0.01 m<sup>2</sup>. The surface area of a plywood lot is measured with a precision of up to 0.5 m<sup>2</sup>.

4.5. The marking is stamped with indelible paint on the back side of every panel stating plywood grade and inspector's number.

Marks of bundles or crates of plywood contain:

- Name of the plywood-producer country
- Name of mill-producer and/or its trade mark
- Conventional plywood marking
- Number of panels in the bundle
- National mark of conformity for certified production
- Transportation marking is in accordance with GOST 14192.

#### 4.6. Packaging.

4.6.1. Plywood must be packed in bundles weighting no more than 1500 kgs. It has to be separated according to species, glue bond, grades, glue emission classes, types of surface treatments and dimensions.

If parties mutually agree and in accordance with a sales contract, plywood can be packed in bundles of other weight.

4.6.2. If plywood is to be shipped to regions in the Extreme North or other difficult-to-reach regions, it has to be packed according to 4.6.1. and GOST 15848.

### **5. RULES OF ACCEPTANCE**

5.1. Plywood is accepted in lots.

A lot consists of plywood of the same species, the same glue bond, the same grade, the same glue emission class, and the same type of surface treatment and panel dimensions.

There should be one document for each lot, specifying quality and containing:

- Name of the country-producer
- Name of the mill-producer and (or) its trade mark
- Conventional plywood marking
- Volume or square meters of panels in the lot
- Stamp of technical control
- National mark of conformity for a certified production

5.2. Quality and dimensions of panels are subject to random inspection. If specified in a sales contract (agreement), specific lots may be subject to full inspection.

In a random inspection, sheets are selected indiscriminately in accordance with GOST 18324 and confirming the quantities, mentioned in Table 7.

5.3. Shear, tensile and static bending strengths are checked for plywood of every glue bond, thickness and plies construction at least once a month. In accordance with sales contracts (agreements), it is permitted to select 0.1 % of sheets in every lot, but not less than one sheet.

5.4. Formaldehyde emission is checked every 30 days for FSF (WBP) plywood and every 15 days for FK (MR) plywood. In accordance with terms of sales contract, a check may be done every 7 days.

5.5. A lot is considered to meet the requirement of the current standard and is accepted, if in the random inspection the following is confirmed:

- number of plywood sheets which are not meeting the requirements of the current standard due to dimensions, out of square, linear edges, wood and manufacturing defects is LESS or EQUAL to the accepted amount, which is stated in Table 7.
- all sheets of plywood must have no bubbles, no delamination and no trace of bark
- formaldehyde emission corresponds to the norms defined in Table 6

## **6. CONTROL METHODS**

6.1. Selection of samples for strength and mechanical tests is made in accordance with GOST 9620. Selection of samples for formaldehyde emission tests is made in accordance with GOST 27678.

6.2. The length and width is measured at two points in the same panel, which are parallel to the edges and are located at least 100 mm from the edges. The measurements are done with a metal tape, which has an index error of 1 mm or less in accordance with GOST 7502. Measurements have to be taken twice and the actual length (width) of the sheet would be their average.

6.3. Thickness is measured at a distance of at least 25 mm from the edges. Thickness also has to be measured at the middle of each side of the panel with a thickness meter as per GOST 11358, or with a micrometer with a scale division of at least 0.1 mm in accordance with GOST 6507.

Measurements of thickness have to be taken 4 times and the actual thickness would be an average of those 4 measurements.

The difference in thickness in one panel of plywood is determined as a difference between the maximum and minimum thickness from these 4 measurements.

6.4. Moisture content is determined in accordance with GOST 9621.

6.5. Shear strength along the glue line is determined in accordance with GOST 9624.

6.6. Static bending strength is determined in accordance with GOST 9625

6.7. Tensile strength is determined in accordance with GOST 9662

6.8. Formaldehyde emission is determined in accordance with GOST 27678

6.9. Roughness of the surface is determined in accordance with GOST 15612

6.10. Wood and manufacturing defects are measured in accordance with GOST 30427

6.11. Deviation from linear edges of plywood panel is determined by measuring the maximum gap between the panel edge and metal ruler edge with a probe in accordance with GOST 8925 and within an index error of 0,2 mm.

6.12. Measurements for obliquity (out of square) are determined in accordance with GOST 30427.

## 7. TRANSPORTATION AND STORAGE

7.1. Plywood is transported in covered vehicles, in accordance with the transportation consignment rules for the given means of transport.

7.2. Transportation and storage of plywood, which is to be shipped to the Extreme North or difficult-to-access regions, is in accordance with GOST 15846.

7.3. Plywood is stored in horizontally stacked bundles, on pallets or on wooden support sticks, indoors, at a temperature ranging from -40C up to +50C at the humidity not exceeding 80%.

## 8. PRODUCERS GUARANTEE

Producers guarantee that the plywood quality conforms to the current GOST, provided the proper transportation and storage conditions.

FK (MR) plywood has a storage guarantee of 3 years and FSF (WBP) plywood has a storage guarantee of 5 years from the delivery date.

TABLE 3. DESCRIPTION AND LIMITATIONS OF PLYWOOD DEFECTS

<b>Description of wood and manufacturing defects acc. to GOST 30427</b>	<b>Grade E plywood face veneers</b>	<b>Grade I plywood face veneers</b>	<b>Grade II plywood face veneers</b>	<b>Grade III plywood face veneers</b>	<b>Grade IV plywood face veneers</b>
1.Pin knots	Not allowed	Max 3 per m2 allowed	Allowed	Allowed	Allowed
2.Sound accrete light and dark knots	Not allowed	Up to 5 per m2 , max. 15mm in diam. with cracks max. 0,5mm wide	Up to 10 per m2 , max. 25mm in diam. with cracks max. 1 mm wide	Allowed with cracks max. 1,5mm wide	Allowed
3.Partly accrete or single knots, loose knots, knot holes, worm holes	Not allowed	Up to 3 per m2, max 6mm in diam.	Up to 6 per m2, max 6mm in diam.	Up to 10 per m2, max 6mm in diam.	No limit, max 40 mm in diam.
4.Closed cracks/splits	Not allowed	Up to 2 per 1 m width of a plywood sheet, max 200mm long	Up to 2 per 1 m width of a plywood sheet, max 200mm long	Allowed	Allowed

5.Open cracks/splits	Not allowed	Not allowed	Max. 2, up to 200 mm long, max. 2 mm wide, on condition they are putty filled	Max. 2, up to 300 mm long, max. 2 mm wide, allowed up to 600 mm long, max. 5 mm wide on condition they are putty filled	Allowed with no limitation in length and in number, max. 10 mm wide
6.Light inbark	Not allowed	Allowed	Allowed	Allowed	Allowed
7.Dark inbark	Not allowed	Not allowed	General number allowed as per item 2 of present table	General number allowed as per item 2 of present table	Allowed
8.Deviation in wood structure	Allowed very insignificant, of incidental nature, except dark eyelets	Allowed	Allowed	Allowed	Allowed
9.Sound stain (color variation)	Not allowed	Allowed, no more than 5% of the sheet surface	Allowed	Allowed	Allowed
10.Unsound stain ( color variation)	Not allowed	Not allowed	Not allowed	Not allowed	Allowed
11.Decay	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
12.Pinholes	Not allowed	General number allowed as per item 3 of present table	General number allowed as per item 3 of present table	General number allowed as per item 3 of present table	General number allowed as per item 3 of present table
13.Veneer overlaps in outer layers	Not allowed	Not allowed	Allowed 1 overlap, max. 100 mm long per 1m of panel width	Allowed up to 2 overlaps, max. 200 mm long per 1m of panel width	Allowed
14.Lack of veneer, defects of panel edges due to sanding or squaring (sawing)	Not allowed	Allowed with a width of no more than 2mm	Allowed with a width of no more than 4mm	Allowed with a width of no more than 4mm	Allowed with a width of no more than 5mm
15.Presense of glue tape	Not allowed	Not allowed	Allowed in non-sanded plywood	Allowed in non-sanded plywood	Allowed in non-sanded plywood



16.Glue penetration	Not allowed	Not allowed	Allowed no more than 2% of panel surface	Allowed no more than 5% of panel surface	Allowed
17.Scratches	Not allowed	Not allowed	Allowed	Allowed	Allowed
18.Indentations, imprints, comb	Not allowed	Not allowed	Allowed if depth/height is in range of thickness tolerance	Allowed if depth/height is in range of thickness tolerance	Allowed
19.Torn grain	Not allowed	Not allowed	Allowed no more than 5% of panel surface	Allowed no more than 15% of panel surface	Allowed
20.Sanding through	Not allowed	Not allowed	Not allowed	Not allowed	Allowed
21.Warping	Does not apply to thickness under 6,5mm. For 6,5 and thicker then allowed with a sag of max. 15mm over 1m of panel's diagonal length	Does not apply to thickness under 6,5mm. For 6,5 and thicker then allowed with a sag of max. 15mm over 1m of panel's diagonal length	Does not apply to thickness under 6,5mm. For 6,5 and thicker then allowed with a sag of max. 15mm over 1m of panel's diagonal length	Does not apply to thickness under 6,5mm. For 6,5 and thicker then allowed with a sag of max. 15mm over 1m of panel's diagonal length	Does not apply to thickness under 6,5mm. For 6,5 and thicker then allowed with a sag of max. 15mm over 1m of panel's diagonal length
22.Metal inclusions	Not allowed	Not allowed	Not allowed	Color metal staples are allowed	Color metal staples are allowed
23.Gap in veneer joint	Not allowed	Not allowed	Allowed max. 1 gap no more than 1mm wide per 1 m of panel width	Allowed max. 1 gap no more than 1mm wide per 1 m of panel width	Allowed
24.Delamination, bubbles, bark	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
25.Waviness (for sanded plywood), fluffiness, ripple	Not allowed	Not allowed	Not allowed	Allowed	Allowed
26.Surface roughness	Roughness parameter(Rm) is per GOST 7016, max.: 100 for sanded plywood and 200 for non-sanded	Roughness parameter(Rm) is per GOST 7016, max.: 100 for sanded plywood and 200 for non-sanded	Roughness parameter(Rm) is per GOST 7016, max.: 100 for sanded plywood and 200 for non-sanded	Roughness parameter(Rm) is per GOST 7016, max.: 100 for sanded plywood and 200 for non-sanded	Roughness parameter(Rm) is per GOST 7016, max.: 100 for sanded plywood and 200 for non-sanded

27. Wooden plugs	Not allowed	Not allowed	Allowed in repair up to 8 pieces for 1m <sup>2</sup> of panel	Allowed with no limits	Allowed with no limits
28. Overlapped double plugs	Not allowed	Not allowed	Allowed no more than 2 pieces per 1m <sup>2</sup> of panel	Allowed	Allowed

*Note:*

- 1. Norm of manufacturing defects "lack of veneer" refers both to outer and core layers.
- 2. Wood and manufacturing defects not mentioned in Table 3 are not allowed.

*TABLE 4*

<b>Grade of Face Veneer</b>	<b>Maximum number of permitted wood and manufacturing defects</b>
E	No visible defects
I	3
II	6
III	9
IV	Number of wood and manufacturing defects is unlimited. Limitation on dimensions is in accordance with items 3, 5, 11, 12, 14, 24 of Table 3

*APPENDIX A*

MARKING OF PLYWOOD FACE VENEERS IN THIS GOST, IN GOST 10.55-71 AND GOST 3916.1-89

GRADES

<b>GOST 3916.1-96</b>	<b>GOST 10.55-71</b>	<b>GOST 3916.1-89</b>
E	-	A
I	B	AB
II	BB	B
III	CP	BB
IV	C	C

TABLE 5

VALUES OF PHYSICAL AND MECHANICAL INDICES FOR PLYWOOD WITH CORE VENEERS OF THE FOLLOWING SPECIES:

Index	Thickness(mm)	Glue bond	Birch	Alder, beech, maple, elm	Pine, larch, spruce, fir, cedar	Lime, aspen, poplar
Moisure content, %	3-30	FSF FK	5-10	5-10	5-10	5-10
Shear strenght (MPa) not less than						
after boiling in water for 1 hour	3-30	FSF	1,5	1,2	1,0	0,6
after soaking in water for 24 hours		FK	1,5	1,0	1,0	0,6
Static bending strength along fibres (MPa) not less than	9-30	FSF	60	50	40	30
		FK	55,0	45,0	35,0	25,0
Tensile strength along fibers, MPa, no less than	3-6,5	FSF	40,0	40,0	40,0	40,0
		FK	30,0	30,0	30,0	30,0

Note: Shear strength along glue line of 1.2. Mpa is permitted for birch plywood in accordance with terms of a sales contract.

TABLE 6

Emission Class	Formaldehyde content in 100 grams of absolutely dry plywood mass, in mg.
E1	Up to 10, inclusive
E2	From 10 to 30, inclusive

TABLE 7

Volume of the lot	Control indices according to points (in panels)			
	3.2.1.; 3.2.3; 3.2.3;		4.1.2; 4.1.6; 4.1.7; 4.3	
	Selection Volume	Number for Acceptance	Selection Volume	Number for Acceptance
Up to 500	8	1	13	1
501 to 1200	13	1	20	2
1201 to 3200	13	1	32	3
3201 to 10000	20	2	32	3