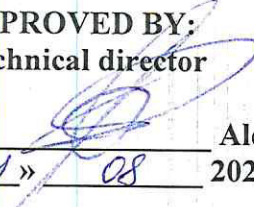


APPROVED BY:


Director General

Konstantin. V. Vikharev2022.**FSF PLYWOOD OF GENERAL PURPOSE
WITH OUTER LAYERS OF BIRCH VENEER****Technical Specifications****TU 16.21.12-006-93222532-2022**

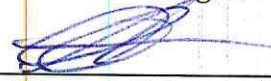
(Supersedes TU 16.21.12-006-93222532-2019)

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1 SCOPE

These Specifications apply to FSF plywood of general purpose with outer layers of birch veneer. These Specifications do not apply to film-faced plywood.

2 REFERENCES

The Specifications refer to the following standards:

GOST 12.1.044-89 (ИСО 4589-84) Occupational safety standards system. Fire and explosion hazard of substances and materials. Nomenclature of indices and methods of their determination

GOST 12.4.011-89 Occupational Safety Standards System. Means of protection. General requirements and classification.

Hygienic standard 2.1.6.3492-17 Maximum allowable concentration (MAC) of pollutants in the atmospheric air of populated areas.

Hygienic standard 2.1.6.2309-07 Safe Reference Levels of Impact (SRLI) of pollutants in the atmospheric air of populated areas. Hygienic standards.

GOST 427-75 Measuring metal rules. Basic parameters and dimensions.

GOST 2140-81 Visible defects of wood. Classification, terms and definitions, methods of measurement.

GOST 3749-77 Checking 90° squares. Specifications

GOST 3916.1-2018 Plywood for general use with outer layers of deciduous veneer.

GOST 6507-90 Micrometers. Specifications

GOST 7016-2013 Wood and wood-based products. Surface roughness parameters

GOST 7076-99 Construction materials and products. Methods of determination of thermal conductivity and thermal resistance under standard thermal conditions

GOST 7502-98 Measuring metal tapes. Specifications

GOST 8925-68 Flat clearance gauges for machine retaining devices. Design

GOST 9620-94 Laminated glued wood. Sampling and general requirements for testing

GOST 9621-72 Laminated glued wood. Methods for determination of physical properties

GOST 9622 - 2016 Laminated glued wood. Methods for determination of bending strength and modulus of elasticity in tension

GOST 9624-2009 Laminated glued wood. Method for determination of shear strength

GOST 9625-2013 Laminated glued wood. Methods for determination of bending strength and modulus of elasticity in static bending

GOST 9626-90 Laminated glued wood. Method for determination of impact strength in bending

GOST 9627.1-75 Laminated glued wood. Hardness determination methods

GOST 11358-89 Dial-type thickness gauges and dial-type wall thickness

gauges graduated in 0,01 and 0,1 mm. Specifications

GOST EN 12086-2011 Thermal insulating products for building applications. Method for determination of water vapor transmission properties

GOST 14192-96 Cargo marking

GOST 15612-2013 Wood and wood-based products. Methods for determination of surface roughness parameters

GOST 15812-87 Laminated glued wood. Terms and definitions

GOST 16297-80 Sound insulation and sound absorption materials. Methods of testing

GOST 18321-73 Statistical quality control. Methods of random sampling of piece products

GOST 25898-2012 Construction materials and products. Method for determination of water vapor transmission resistance

GOST 27296-2012 Buildings and constructions. Methods for measurement of sound insulation of protecting designs

GOST 27678-2014 Wood-based panels and plywood. Perforator method for determination of formaldehyde content

GOST 30244-94 Construction materials. Combustibility test methods

GOST 30255-2014 Furniture, wood-based and polymer materials. Methods for determination of formaldehyde and other harmful volatile chemicals emission in climatic chambers

GOST 30427-96 Plywood for general use. General rules of classification of veneer surfaces by appearance

GOST 32155-2013 Wood-based panels and plywood. Determination of formaldehyde emission by the gas analysis method

GOST 34034-2016 Laminated glued wood. Classification

EN 310:2005 Wood-based panels. Determination of modulus of elasticity in bending and of bending strength.

EN 314-1: 2004 Plywood. Bonding quality. Part 1. Test methods

EN 314-2: 1993 Plywood. Bonding quality. Part 2. Requirements

EN 315:2000 Plywood. Tolerances for dimensions

EN 322:1993 Wood-based panels. Determination of moisture content

EN 323:1993 Wood-based panels. Determination of density

EN 324-1: 1993 Wood-based Panels. Determination of panel dimensions. Part 1. Determination of thickness, width and length

EN 324-2: 1993 Wood-based Panels. Determination of panel dimensions. Part 2. Determination of squareness and edge straightness

EN 326-1: 2005 Wood-based panels. Sampling, cutting and inspection. Part 1: Sampling and cutting of test pieces and expression of test results

EN 636:2012+A1: 2015 Plywood. Specifications

EN 326-2: 2010+A1: 2014 Wood-based panels. Sampling, cutting and inspection. Part 2: Initial type testing and factory production control

EN ISO 12460-3: 2015 Wood-based panels. Determination of formaldehyde emissions. Part 3. The gas analysis method

EN 13986:2004+A1: 2015 Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking

3 TECHNICAL REQUIREMENTS

3.1 Key parameters and characteristics

3.1.1 Plywood is graded by appearance of face layers and classified into sanded and non-sanded by degree of mechanical finishing of surface.

3.1.2 Plywood is graded by appearance depending on the combination of grades of face layers as follows: E, B, S, BB, CP, WG, C (using Latin character notation) and I, II, III, IV (using Roman numeral notation). Both Roman numerals and Latin characters can be used when referring to plywood.

Note: For birch plywood with inner veneers of other hardwood species, two letters from the Latin name of the wood species used shall be added before the variety designation (for example, when using aspen for the inner layers of veneer, As (Aspen) is added before the grade designation)

It is allowed to produce birch plywood SHOP with a conditional transverse (SHOP 1) or longitudinal (SHOP 2) trim on one edge up to 300 mm, the panel volume shall correspond to a full size, but with a reduced merchantable part. In the SHOP (conditional trim) area, all defects are allowed except for the delamination of veneer and out-of-squareness.

3.1.3 Plywood is classified into the following groups by degree of mechanical finishing of surface:

- non-sanded – NS;
- sanded one side – S1;
- sanded both sides – S2.

3.1.4 Length and width of plywood panels shall conform to the values indicated in Table 1.

Thickness of plywood shall correspond to the values specified in Appendix A.

Table 1

Plywood panel length or width, mm	Tolerance, mm
Up to 1250 and including	±2,0
1250-2500 and including	±3,0
Upwards of 2500	±3,5
Note: It is allowed to produce plywood of different sizes as agreed by the manufacturer and the consumer.	

3.1.5 Plywood panels must be cut at right angle.

3.1.6 Maximum tolerance for squareness of panel edges is 1 mm per 1 m of the panel length.

3.2 Designation

The Designation for the plywood designation shall include:

- name of the product;
- species of face veneers;
- brand;
- face veneer grade combination;
- emission class;
- surface finishing type;
- dimensions;
- reference to these Specifications.

Here below there is an example of the Designation for FSF-brand birch plywood with inner layers of aspen veneers and face layers of birch veneers, face veneers grade combination I/II, emission class E1, sanded both sides, length 1250mm, width 2500mm, thickness 12mm:

Plywood, birch FSF, As I/II (B/BB) SHOP 2, E1, S2, 1250x2500x12, TU 16.21.12-006-93222532-2022.

3.3 Requirements to raw and other materials

3.3.1 Plywood is considered to be manufactured from the species of wood from which the outer veneers are made.

3.3.2 Birch veneer is used for manufacturing of outer layers of plywood. For the inner layers, the use of veneer of other hardwood species is allowed.

3.3.3 Plywood made of wood of one or different species is subdivided into single-species and combined plywood.

3.3.4 If the number of veneer plies is even, the grain of the two middle plies must be in the same direction.

3.3.5 The thickness of birch veneer used for face and internal plies is from 1,0 through 6,0 mm. The thickness of hardwood veneer, except birch, used for inner plies is from 2,4 through 6,0 mm.

3.3.6 Face veneers must be free from all wood faults and processing defects in excess of the limits specified in the Appendix B, Table 2.

3.3.7 Internal plies may have wood faults and processing defects if these do not affect the quality and dimensional characteristics of plywood as prescribed in these Specifications.

3.3.8 For the maximum allowable rate of wood faults and process-induced defects in face layers according to grading see Appendix B, Table 2.

3.3.9 Plywood may be manufactured in any combinations of grades depending on the quality of face veneers.

3.3.10 For BB and lower grades, face layers may be composed from two or three jointed veneers of the same color. For CP, WG, C grades, face layers may be composed of any number of jointed veneers regardless of their color.

3.3.11 Veneer patches of varying shapes and sizes are used to plug knots, holes and cracks. These veneer patches must match the surface, hold tightly and have the same direction of the grain

and be of the same species as the face veneers. For S and BB grades, patches must be of the same color as the main wood.

3.3.11 Putty materials must match the color of the wood species and grade and ensure secure bonding of coating materials. These compounds must also remain in place during mechanical finishing and bending of plywood and be resistant to cracking.

3.4 Stress-related characteristics of plywood

For physical and mechanical characteristics of plywood see Tables 3 and 4 below.

Table 3

Parameter	Thick-ness, mm	Value of stress-related parameter	
		Face and inner layers – birch veneer	Face and inner layers – birch veneer
1	2	3	4
1 Moisture content, %	4,0 – 40	5-10	
2 Bending strength: - along the grain of face veneers, MPa, min - across the grain of face veneers, MPa, min	6,0 – 40	Appendix C	Appendix D
3 Modulus of elasticity in static bending: - along the grain of face veneers, MPa, min - across the grain of face veneers, MPa, min	6,0 – 40	Appendix C	Appendix D
4 Tensile strength along the grain, MPa, min	4,0 – 6,0	30	
5 Impact strength in bending, kJ/m ²	12,0 – 40	34	
6 Hardness, MPa	6,5 – 40	20	
7 Thermal conductivity ratio, W (mK), for average density, kg/m ³ 300 500 700 1000	4,0 – 40	0,09 0,13 0,17 0,24	
8 Water vapor transmission resistance ratio, wet test, with average density, kg/m ³ 300 500 700 1000 water vapor transmission resistance ratio, dry test, with average density, kg/m ³ 300 500 700 1000	4,0 – 40	50 70 90 110 150 200 220 250	

Parameter	Thick-ness, mm	Value of stress-related parameter	
		Face and inner layers – birch veneer	Face and inner layers – birch veneer
1	2	3	4
9 Sound absorption factor, dB, for frequency range, Hz 250 – 500 1000 – 2000	4,0 – 40		0,10 0,30
10 Sound insulation, dB	6,5 – 40		23,0
11 Biological stability, hazard class	4,0 – 40		2
11.1 Hazard class			
11.2 Natural resistance to: - wood-destroying fungus; - wood-destroying insects; - capricorn beetles (Hylotrupes); - death-watch beetle (Anobium); - termites	4,0 – 40		3 5 Dhy Da St
12 Flammability classification	4,0-40	According to GOST 30244	
Note: Values for items 4-12 are selected with the customer's approval.			

Table 4

Average shear strength along the glue line, MPa	Wood failure, %
Upwards of 0,2 to 0,4 (and including)	Upwards of 80 or equal
Upwards of 0,4 to 0,6 (and including)	Upwards of 60 or equal
Upwards of 0,6, but less than 1,0	Upwards of 40 or equal
1,0 or more	-
<p>Notes</p> <p>1 Plywood is conditioned for tests using one of the four methods: - boiling in water for 1 h (according to GOST 3916.1-2018); - conditioning in water at (20±3) °C for 24 h (according to EN 314-1 cl.5.1.1); - conditioning in boiling water for 4 h, followed by drying in a ventilated drying oven for 16-20 h at (60±3) °C, conditioning in boiling water for 4 h and cooling in water at (20±3) °C for at least 1 h (according to EN 314-1 cl.5.1.3); - conditioning in boiling water for (72±1) h, followed by cooling in water at (20±3) °C for at least 1 h (according to EN 314-1 cl.5.1.4).</p> <p>The method of conditioning is selected with the customer's approval.</p> <p>2 Wood failure percentage shall be determined by visual inspection</p> <p>3 Shear tests are performed in different glue lines as agreed with the customer</p>	

3.5 Formaldehyde content and formaldehyde emission of plywood panels

Formaldehyde content and formaldehyde emission from plywood panels into the room air depending on the emission class must conform to the values specified in the Table 5.

Table 5

Emission class	Formaldehyde content per 100 g of oven dry plywood, mg	Formaldehyde release	
		Chamber test, mg/m ³ of air	Chamber test, mg/m ³ of air
E 0,5	Up to 4.0 and including	Up to 0,01 and including	Up to 1,5 and including

E1	Up to 8.0 and including	Upwards of 0.01 and max 0,124 and including	Upwards of 1,5 to 3,5 and including or under 5,0 within 3 days from the date of manufacturing
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3.6 Plywood accounting

Plywood is counted and registered in cubic meters. The volume of a single panel shall be measured accurately to within 0,00001 m³, the volume of a lot of panels shall be measured accurately to within 0,01 m³. The area of a single panel shall be measured accurately to within 0,01 m², the area of all panels in a lot shall be measured accurately to within 0,5 m².

3.7 Plywood marking

3.7.1 Plywood packages shall be marked with labels

3.7.2 Two labels shall be affixed to the left edge of each longitudinal lining of each plywood package

3.7.3 Labels are marked in Russian and English with the following information:

- country of origin;
- manufacturer's name and/or trademark;
- manufacturer's registered address;
- plywood name and designation;
- formaldehyde emission class;
- format of panels in a package;
- plywood brand;
- plywood grade;
- plywood surface type;
- number of panels in a package, volume;
- date of manufacture;
- barcode with the identification number of the plywood package;
- conformity certification information;
- Keep Dry marking;
- additional marking for export and as requested by the customer;
- reference to these Technical Specification.

Marking on each sheet of plywood is applied only at the request of the consumer.

3.8 Packaging

3.8.1 Plywood is separated into packages by brands, grades, dimensions, type of surface finishing.

3.8.2 Packing of plywood packages must ensure that plywood remains safe and intact during transportation. Different types of packaging are allowed. The packages must be strapped with a packing strap.

4 SAFETY REQUIREMENTS AND ENVIRONMENT PROTECTION

4.1 Environment protection requirements

4.1.1 E0,5/E1 emission class plywood has no adverse effect on health and environment during its use, transportation and storage.

4.1.2 The content levels of hazardous chemicals released into the air of residential and public buildings during the use of plywood-based products into the air must comply with the requirements established by the national sanitary and epidemiological surveillance authorities.

4.1.3 Plywood must be manufactured from materials and components cleared for use by the national sanitary and epidemiological surveillance authorities.

4.1.4 Plywood does not contain any materials or components classified as hazardous waste.

4.2 Fire safety requirements

4.2.1 Plywood refers to products for general use.

According to Section 6, par. 8 of the Federal Law dated July 22, 2008 No 123-ФЗ “Technical Regulation concerning fire safety requirements”, general-purpose products do not require a fire safety declaration to certify compliance with fire safety rules.

4.2.2 Plywood refers to a group of construction materials - highly combustible (C4), having flue gas temperature of over 450°C.

4.2.3 Materials used for birch plywood manufacturing are not explosive.

4.2.4 Production facilities used for plywood manufacturing and application have a category B of fire rating.

4.3 Occupational health and safety requirements

4.3.1 Plywood production generates such hazardous volatile substances as phenol and formaldehyde which are the components of phenol formaldehyde resins used as bonding agents for plywood.

4.3.2 Only persons aged 18 and above and having no medical contraindications are allowed to be involved in plywood manufacture. Health checks are to be conducted in accordance with the applicable orders of the Russian Federation Ministry of Public Health.

4.3.3 Persons involved in plywood manufacture must have personal protection devices as prescribed in GOST 12.4.011.

4.3.4 Maximum permissible airborne concentrations of volatile substances at workplaces in plywood manufacturing and storage facilities shall be controlled in accordance with GOST 12.1.005.

5 ACCEPTANCE PROCEDURE

5.1 Plywood is accepted as lots.

5.2 A lot is a quantity of plywood panels of the same brand and emission class manufactured during the same shift.

5.3 The lot is covered by a single quality document which shall include the following information:

- country of origin;
- manufacturer’s name and/or trademark and address;
- plywood designation;
- quantity of panels in a lot;
- conformity certification.

5.4 At least two packages of a lot shall be selected randomly for dimensional and appearance checks.

5.5 The lot is accepted if the number of checked panels with non-conformities to clauses 3.1.4, 3.1.5, 3.1.6, 3.3.6, 3.3.8 of these Specifications is less than or equal to 5% of total panels, provided that the requirements of the clauses 3.4, 3.5. are complied with.

5.6 If the requirements of clause 5.5 are not complied with, the sampling shall be doubled. Test results are applied to the whole lot. If the requirements of clause 5.5 are still not complied with, the whole lot is classified as non-conforming.

5.7 Physical and mechanical characteristics of plywood shall be controlled once per 12 hours. Physical and mechanical properties for each type of plywood depending on thickness and number of plies shall be controlled at least once a month.

5.8 Formaldehyde emission shall be controlled 4 times per 7 days by gas analysis.

6 CONTROL METHODS

6.1 Sampling for physical and mechanical tests is performed in accordance with GOST 9620, EN 326-1. Sampling for formaldehyde emission testing by gas analysis is performed in accordance with GOST 30255, GOST 32155, EN ISO 12460-3. Sampling for determination of formaldehyde content is performed in accordance with GOST 27678.

6.2 Length and width of a plywood panel is measured at two points parallel to the edges at least 100 mm removed from the edges using a metal tape according to GOST 7502, tolerance is 1 mm. The actual length (width) of a panel shall be the arithmetic mean value of the two measured values.

6.3 Thickness shall be measured at a distance of at least 50 mm from the edges and at the center of each panel side, i.e. in the total at 8 points. The measurements are performed using a thickness gauge graduated in 0,1 mm (max) according to GOST 11358. The actual width is the arithmetic mean value of the results of eight measurements with an accuracy of 0.1 mm. Thickness variance for a single plywood panel shall be the difference between the maximum and minimum measured thicknesses of the eight measurements.

6.4 Squareness check is performed using a precision square according to GOST 3749. At a distance of (1000 ± 1) mm from the corner of the sheet, the deviation between the edge of the sheet and the side of the precision square is measured with a ruler according to GOST 427 with an accuracy of 1mm, as described in GOST 30427, EN 324: part 2. Measurement is carried out for each corner of the plywood sheet. The result is the maximum measured value of the deviation of the precision square side and the sheet edge. Out-of-squareness is expressed in mm per 1 m of the sheet edge length (mm/m) with an accuracy of 0.5 mm/m.

6.5 The warp of plywood sheets is determined by the maximum bending deflection of a sheet relative to a flat horizontal surface, with an accuracy of no more than 0.1 mm.

6.6 The straightness deviation of plywood sheet edges is determined by measuring the maximum gap between the edge of the sheet and the edge of the metal ruler by a clearance gauge according to GOST 8925, with an accuracy of 0,1 mm - according to EN 324: part 2.

6.7 The appearance check is performed by visual inspection.

6.8 Moisture determination - according to GOST 9621, EN 322.

6.9 Density determination - according to GOST 9621, EN 323.

6.10 Shear strength along the glue line is determined according to GOST 9624, EN 314 part 1, 2.

6.11 Bending strength and modulus of elasticity are determined according to GOST 9625, EN 310.

6.12 Tensile strength is determined according to GOST 9622.

6.13 Formaldehyde release is determined according to GOST 32155, EN ISO 12460-3.

6.14 Formaldehyde content is determined according to GOST 27678.

6.15 Roughness is determined according to GOST 15612.

6.16 Wood faults and process-induced defects are evaluated according to GOST 30427 and GOST 2140.

6.17 Sound absorption factor is determined according to GOST 16297.

6.18 Impact bending strength is determined according to GOST 9626.

6.19 Sound insulation is determined according to GOST 27296.

6.20 Hardness is determined according to GOST 9627.1

6.21 Biological stability is determined according to GOST 34034, EN 1099.

6.22 flammability classification is determined according to GOST 30244 and GOST 12.1.044.

6.23 Thermal conductivity ratio is determined according to GOST 7076.

6.24 Water vapor transmission resistance ratio is determined according to GOST 25898, ISO 12572:2001.

7 TRANSPORTATION AND STORAGE

8.1 The plywood is transported in closed vehicles in accordance with rules of carriage applicable to a specific mode of transport.

8.2 The plywood is stored as horizontally stacked packages on pallet or wooden blocks indoors at the temperature ranging from -40°C to 50°C and ambient humidity of 80% RH max. For plywood thicknesses less than or equaling 2500 mm at least three wooden blocks are to be used, for plywood thicknesses over 2500 mm at least four wooden blocks are used.

8.3 Increased humidity and temperature variations may cause swelling in thickness, surface damage, as well as internal stresses and eventual delamination of plywood.

8 MANUFACTURER'S WARRANTY

9.1 The manufacturer's guarantees that plywood conforms to these Technical Specifications as long as the consumer observes the rules of transportation and storage as prescribed herein.

9.2 The warranty period is five years from the date of receipt by the customer.

Appendix A
(compulsory)

Table A.1

Nominal thickness of plywood, mm	Number of plies when veneer thickness is from 1,0 through 2,7 mm; pcs		Sanded plywood		Unsanded plywood		
	Inner layers – birch veneer	Inner layers – hardwood veneer, except birch	Max. tolerance, mm	Thickness variation, mm	Max. tolerance, mm	Thickness variation, mm	
4	3	3	+0,3 -0,5	0,6	+0,8 -0,4	1,0	
6; 6,5	3-8	4	+0,4 -0,5		+0,9 -0,4		
8	4-10	5	+0,4 -0,5		+0,9 -0,4		
9	4-11	5	+0,4 -0,6		+1,0 -0,5		
10	5-12	6	+0,4 -0,6		+1,0 -0,5		
12	6-14	6-7	+0,5 -0,7		+1,1 -0,6		
15	7-17	7-8	+0,6 -0,8		+1,2 -0,7		1,5
16	7-18	8-9	+0,6 -0,8		+1,2 -0,7		
18	8-21	9-10	+0,7 -0,9		+1,3 -0,8		
21	9-24	10-11	+0,8 -1,0		+1,4 -0,9		
24	10-27	11-13	+0,9 -1,1	+1,5 -1,0			
27	11-30	13-14	+1,0 -1,2	+1,6 -1,1	2,0		
30	13-33	14-15	+1,1 -1,3	+1,7 -1,2			
35	15-39	16-17	+1,1 -1,5	+1,9 -1,2			
40	17-45	18-20	+1,2 -1,6	+2,0 -1,5			

Notes:

«*» - not apply for size 7x13 ft

It is allowed to manufacture components of other thicknesses, number of plies and max. deviations upon agreement with the consumer. In this case, the limit deviations are calculated by the formulas:

- for sanded plywood: $+ (0,2 + 0,03 S_{pl})$, $- (0,4 + 0,03 S_{pl})$;

- for unsanded plywood: $+ (0,8 + 0,03 S_{pl})$, $- (0,3 + 0,03 S_{pl})$,

where S_{pl} is a nominal thickness of plywood.

Table A.2

Nominal thickness of plywood, mm	Number of plies when veneer thickness is from 4 through 6 mm; pcs	Sanded plywood		Unsanded plywood	
		Max. tolerance, mm	Thickness variation, mm	Max. tolerance, mm	Thickness variation, mm
4	3	+0,3 -0,5	0,6	+0,8 -0,4	1,0
6; 6,5	3-5	+0,4 -0,5		+0,9 -0,4	
8	3-6	+0,4 -0,5		+0,9 -0,4	
9	3-7	+0,4 -0,6		+1,0 -0,5	
10	3-8	+0,4 -0,6		+1,0 -0,5	
12	3-9	+0,5 -0,7		+1,1 -0,6	
15	3-11	+0,6 -0,8		+1,2 -0,7	1,5
16	3-12	+0,6 -0,8		+1,2 -0,7	
18	4-13	+0,7 -0,9		+1,3 -0,8	
21	4-15	+0,8 -1,0		+1,4 -0,9	
24	5-17	+0,9 -1,1		+1,5 -1,0	
27	5-19	+1,0 -1,2	1,0	+1,6 -1,1	2,0
30	6-21	+1,1 -1,3		+1,7 -1,2	
35	6-25	+1,1 -1,5		+1,9 -1,2	
40	7-28	+1,2		+2,0	
		-1,6		-1,5	

Примечание:

«*» - not apply for size 7x13 ft

It is allowed to manufacture components of other thicknesses, number of plies and max. deviations upon agreement with the consumer. In this case, the limit deviations are calculated by the formulas

- for sanded plywood : $+(0,2 + 0,03 S_{pl})$, $-(0,4 + 0,03 S_{pl})$;
 - for unsanded plywood : $+(0,8 + 0,03 S_{pl})$, $-(0,3 + 0,03 S_{pl})$,
- where S_{pl} is a nominal thickness of plywood.

Appendix B
(compulsory)

Maximum allowable rate of wood faults and process-related defects of outer layers

Table B.1

No.	Veneer defects	Veneer grade							
		grade I (E)	grade I (B)	grade I (S)	grade II (BB)	grade III (CP)	grade III (WG)	grade IV (C)	
1	2	3	4	5	6	7	8	9	
1	Pin knot - a sound intergrown knot of not more than 3 mm in diameter	Permitted							
2	Sound knot – knot free from rot. Intergrown knot - a knot, the annual growth layers of which have grown together with the surrounding wood for a length of not less than 3/4 of the cut knot perimeter. Light knot – sound knot having light-colored wood similar to the color of the surrounding wood. Dark knot – sound knot having dark, frequently irregularly colored wood which is considerably darker than the surrounding veneer	Permitted with a diameter up to 15 mm, max 2 knots per 1 sq.m	Light knots with a diameter up to 10 mm are not taken into account. Permitted with a diameter up to 20 mm with cracks of up to 0,5 mm width, max 3 knots per 1 sq.m.		Permitted with a diameter up to 25 mm, max 10 knots per 1 sq.m. with cracks of up to 1 mm width	Permitted: knots with cracks of max 1,5 mm width	Permitted	Permitted	
3	Partially intergrown knot – a knot, the annual growth layers of which have grown together with the surrounding wood for a length of 1/4 to 3/4 of the cut knot perimeter	Permitted: max 2 knots per 1 sq.m. of up to 6 mm in diameter	Permitted: max 3 knots per 1 sq.m. of up to 6 mm in diameter	Permitted: max 10 sound knots per 1 sq.m. of up to 15 mm in diameter			Permitted: max 10 knots per 1 sq.m. of up to 6 mm in diameter	Permitted: max 10 knots per 1 sq.m. of up to 15 mm in diameter	Permitted: unlimited quantity of up to 40 mm in diameter with bark inclusion
4	Dead knot – knot having fibres intergrown with those of the surrounding veneer to the extent of less than 1/4 of its cross-sectional perimeter or non-adhering knot. Loose knot – knot non-adhering to the surrounding veneer and hanging loosely. Knot holes. Worm holes - holes or channels made by inserts or their larvae.			Permitted: max 6 knots per 1 sq.m. of up to 6 mm in diameter	Permitted: max 10 knots per 1 sq.m. of up to 6 mm in diameter	Permitted: max 10 knots per 1 sq.m. of up to 15 mm in diameter			
5	Checks (closed) – separation of the fibers max 0,2 mm wide	Permitted: max 2 checks per 1 m of panel width, max 200 mm long		Permitted: max 2 checks per 1 m of panel width, max 300 mm long	Permitted				

1	2	3	4	5	6	7	8	9
6	Splints - separation of the fibers of 1 mm wide and more	Not permitted		Permitted: max 2 splints per 1 m of panel width, max 200 mm long, max 1 mm wide	Permitted: max 2 splints per 1 m of panel width, max 200 mm long, max 2 mm wide, provided that the splints are patched	Permitted: max 2 splints per 1 m of panel width, max 600 mm long, max 2 mm wide	Permitted: unlimited number of splints, max 600 mm long, max 5 mm wide	
7	Light inbark - (inbark is a dead-tissue trunk surface region grown over with wood with an outgoing radial crack) inbark having the wood of the similar color than the surrounding veneer without bark	Not permitted	Permitted					
8	Dark inbark – inbark having the wood of a much darker color than the surrounding veneer and/or having bark inclusions	Not permitted	Permitted: in the total quantity and with the norms of dead knots	Permitted: in the total quantity and with the norms of sound knots			Permitted: unlimited number of inbark with a diameter up to 40 mm	
9	Grain imperfections: wavy grain – grain deviations across and along the panel. Curly grain – curved or chaotically positioned grain. Burl – local warping of growth layers due to knotting or inbark. Dark eyes – spots left by shrunken buds of max 5 mm in diameter having the wood of a much darker color than the surrounding veneer. Eye clusters	Permitted						
10	Natural discoloration: - False heartwood – discoloration of trunk, comes in various shades, intensity and pattern, without affecting wood hardness. Occurs in a growing tree, is generally dark brown or red. False sapwood – a growth layers around the heart similar in coloring and properties to sapwood.	Not permitted			Permitted: max 25% of the panel surface	Permitted: max 75% of the panel surface		Permitted

1	2	3	4	5	6	7	8	9	
11	<p>Natural discoloration: Discoloration streaks – mottle as thin yellowish-brown strips of soft tissue at the boundaries between annual growth layers. Overgrown traces of damages in the cambial layer of wood by the larvae. Mottle – spotty and streaky hardwood sap discoloration without affecting wood hardness, which occurs in growing trees and which is of the similar color as the heartwood.</p>	Permitted: max 3 streaks or spots per 1 sq.m. of up to 150 mm long, up to 4 mm wide		Permitted: max 15% of the panel surface	Permitted: max 30% of the panel surface	Permitted			
12	<p>Natural discoloration: Streak clusters</p>	Permitted: max 1 streak cluster per 1 sq.m of 60×40 mm size		Permitted: max 15% of the panel surface	Permitted: max 30% of the panel surface	Permitted			
	<p>Natural discoloration: Red stain – surface (up to 5 mm deep) reddish-brown or bluish-brown color, resulting in wood due to oxidation of tanning substance.</p>	Not permitted		Permitted: no more than 200 mm long and in an amount of not more than 4 defects per 1 sq.m.		Permitted			
13	<p>Chemical discoloration: brown stain – abnormally colored brown sapwood regions of varying hues, intensity and distribution. Occurs in felled wood during storage. Blue stain – bluish or greenish grey discoloration of the sapwood. Dark sapwood stains of fungal origin – abnormally colored darker sapwood spots obscuring wood texture without affecting hardness. Light chemical discoloration - chemical discoloration, coloring wood in pale tones without obscuring wood texture. Colored sapwood stains - orange, yellow, pink (up to light violet) and brown discoloration of sapwood.</p>	Not permitted	Permitted: max 10% of the panel surface	Permitted: max 50% of the panel surface		Permitted			
14	<p>Abnormal discoloration: discoloration with partial destruction of the wood: fungal stains (stripes), dark sapwood stains of fungal origin.</p>	Not permitted						Permitted	
15	<p>Decay – abnormally colored wood regions with decreasing hardness as a result of wood-destroying fungal activity.</p>	Not permitted							
16	<p>Scratch – surface damage by a sharp object in the shape of a narrow and long hollowing; may be left by harvesting equipment. Dent – local impression on the surface layer. Ridge – a region of unprocessed surface of wood assortment in the shape of a narrow strip protruding above the processed surface due to a defect in the cutting edge of the tool.</p>	Not permitted			Permitted в пределах значений предельных отклонений по толщине			Permitted	
1	2	3	4	5	6	7	8	9	
17	<p>Breaking out of grain (tearout) – a dent on the plywood surface as a result of local wood removal during processing (rough peeling)</p>	Not permitted			Permitted: max 5% of the panel surface	Permitted: max 15% of the panel surface		Permitted	

18	Bark patch – bark and phloem patch remaining on the veneer surface	Not permitted						
19	Wood inlay patch	Not permitted	Permitted: max 1 patch per 1 sq.m	Permitted: max 8 patches per 1 sq.m	Permitted			
20	Double wood inlay patch	Not permitted		Permitted: max 1 patch per 1 sq.m	Permitted: max 2 patch per 1 sq.m	Permitted		
21	Patch for repairing open cracks	Not permitted		Permitted: max 2 cracks per 1 m of panel width of up to 300 mm long and up to 30 mm wide	Permitted: max 2 cracks per 1 m of panel width of up to 600 mm long and up to 30 mm wide	Permitted		
22	Mechanical damage	Permitted: in the total quantity and with the norms of dead knots						
23	Process-induced spots – water stains, traces of joists, traces left by harvesting equipment	Not permitted	Permitted: max 5% of the panel surface	Permitted: max 10% of the panel surface	Permitted			
24	Trace left by veneer peeling process – a strip with a color tint different from the color of the veneer without changing the surface structure	Not permitted	Permitted: up to 5 mm wide		Permitted			
25	Incision – local damage by a sharp object	Permitted: in the total quantity and with the norms as indicated in clause 3 hereof						
26	Overlap in face veneers	Not permitted		Permitted: max 1 overlap per 1 m of panel width, max 100 mm long, max 2 mm wide	Permitted: max 2 overlaps per 1 m of panel width, max 200 mm long, max 2 mm wide	Permitted: max 2 overlaps per 1 m of panel width, max 300 mm long, max 2 mm wide	Permitted	
27	Glue stain (penetration)	Not permitted	Permitted: max 1% of panel surface	Permitted: max 2% of panel surface	Permitted: max 5% of panel surface		Permitted	
28	Warping	Disregarded for panels up to 6,5 mm thick; max 15 mm per 1 m of panel diagonal length for panels 6.5 mm thick or more						
29	Air bubbles, delamination	Not permitted						
30	Lack of veneer, panel edge defects due to clipping and sanding	Permitted: max 2 mm wide			Permitted: max 5 mm wide			
1	2	3	4	5	6	7	8	9
31	Sanding through	Not permitted				Permitted: max 1% of panel		Permitted
32	Rippling (for sanded plywood), woolly grain, wrinkling	Not permitted		Permitted: if slight	Permitted			

33	Surface roughness	Roughness parameter Rm according to GOST 7016, μm, max: for sanded plywood - 100, for non-sanded plywood - 200		
34	Glued-in veneer patches	Not permitted	Permitted: max 1 per panel, max 150 mm long, max 30 mm wide	Permitted

Notes

Limit for processing defect "Lack of veneer" refers to the inner layers of plywood as well

Table B.2

Face veneers grade	Maximum number of permissible wood faults and process-induced defects, pcs
I	3
II	6
III	9
IV	Wood faults and process-induced defects: no quantity limit. Dimensional restrictions: see cl. 3, 4, 6, 8, 18, 22,25, 28,29,30,33 of Table A.1

Appendix C
(compulsory)

Bending strength and modulus of elasticity at static bending along and across the grain of face layers
(face layers – birch veneer, inner layers – birch veneer)

Table C

Thickness, mm	Bending strength at static bending, MPa, min.		Modulus of elasticity at static bending, MPa, min.	
	along the grain of face layers	along the grain of face layers	along the grain of face layers	along the grain of face layers
6,0; 6,5	64,1	38,9	9606	3894
9	57,3	42,5	8597	4903
12	54,0	43,7	8106	5394
15	52,1	44,1	7818	5682
18	50,9	44,4	7630	5870
21	50,0	44,6	7497	6003
24	49,4	44,7	7399	6101
27	48,9	44,7	7324	6176
30	48,5	44,9	7264	6236
35	47,9	44,9	7175	6325
40	47,4	44,9	7113	6387

Appendix D
(compulsory)

Bending strength and modulus of elasticity at static bending along and across the grain of face layers
(face layers – birch veneer, inner layers – hardwood species except birch)

Table D

Thickness, mm	Bending strength at static bending, MPa, min.		Modulus of elasticity at static bending, MPa, min.	
	along the grain of face layers	along the grain of face layers		along the grain of face layers
6,0; 6,5	61,5	37,3	9222	3738
9	55,0	40,8	8253	4707
12	51,8	42,0	7782	5178
15	50,0	42,3	7505	5455
18	48,9	42,6	7325	5635
21	48,0	42,8	7197	5763
24	47,4	42,9	7103	5857
27	46,9	42,9	7100	5929
30	46,6	43,1	7088	5987
35	46,0	43,1	7052	6072
40	45,5	43,1	7012	6132

