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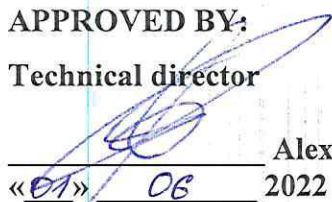
LAMINATED BIRCH PLYWOOD

Technical Specifications
TU 16.21.12-002-93222532-2021
(Supersede TU 5513-002-93222532-2016)

Effective date: June 1, 2022

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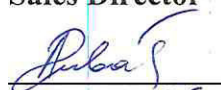
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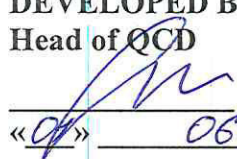

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1 SCOPE

These Technical Specifications apply to highly waterproof birch plywood laminated with thermoset polymer film designed for building construction, transport engineering, furniture manufacturing, packaging, etc.

2 REFERENCES

The Specifications refer to the following standards:

- GOST R 53920-2010 Laminated plywood. Specifications
- GOST 12.1.044-89 (ISO 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.
- GOST 427-75 Measuring metal rules. Basic parameters and dimensions.
- GOST 3749-77 Checking 90° squares. Specifications.
- GOST 6507-90 Micrometer gauges. Specifications.
- GOST 7502-98 Measuring metal tapes. Specifications.
- GOST 8925-68 Flat clearance gauges for machine retaining devices. Design.
- GOST 9620-94 Laminated 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 11358-89 Dial-type thickness gauges and dial-type wall thickness gauges graduated in 0,01 and 0,1 mm. Technical Specifications.
- GOST 14192-96 Cargo marking.
- GOST 18321-73 Statistical Quality Control. Methods of Random Sampling of Batch Products.
- GOST 27678-2014 Particleboards and Plywood. Evaluation of Formaldehyde Content by perforation.
- GOST 27820-88 Elements, products of wood and wooden materials. Method for determining resistance to wear of protective and decorative coatings.
- GOST 30255-2014 Furniture, wood-based and polymer materials. Evaluation of formaldehyde emission and other harmful volatiles content in an environmental chamber
- GOST 30427-96 General purpose plywood. General rules for the classification by appearance.
- GOST 32155-2013 Wood-based panels and plywood. Determination of formaldehyde emission by the gas analysis method.
- EN 310:2005 Wood-based panels. Determination of modulus of elasticity in bending and of bending strength.
- EN 314: part 1 (2005), part 2 (1997) Plywood. Bond quality. Test methods.
- EN 322:1993 Wood-based panels. Determination of moisture content.
- EN 323:1993 Wood-based panels. Determination of density.
- EN 324:2005 Parts 1, 2. Wood-based panels. Determination of panel dimensions.
- EN 326-1:2005 Wood-based panels – sampling, cutting and inspection. Part 1: Sampling and cutting of test pieces and inspection.

EN 326-2:2014 Wood-based panels – sampling, cutting and inspection. Part 2: Initial type tests and factory production control.

EN 636:2012+A1:2015 Plywood – Specifications.

EN ISO 12460-3: 2015 Wood-based Panels – Determination of formaldehyde release. Part 3. Formaldehyde release by the gas analysis method.

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

NF B51-123:1987-12 Wood based panels. Determination of modulus of elasticity in tension and of tensile strength parallel to faces

TU 16.21.12-006-93222532-2019 FSF plywood with outer layers of birch veneer for general use.

RD 2.3-002-2016 Standards for wood flaws and process-related defects limitations of plywood grades.

3 TECHNICAL REQUIREMENTS

3.1 Principal parameters and specifications

3.1.1 Plywood (FOF) is graded by the type of coating and by process-induced defects, if any.

3.1.2 According to the type and method of coating applied, the laminated birch plywood is divided in the following types of surface:

- F – smooth (glossy) surface;
- W – anti-slip mesh surface;
- H (hexa) – anti-slip coating with a pattern (regular hexagon);
- U – surface without film coating (See Note 2)

Notes:

1. Other designations of plywood having a different combination of surfaces may be manufactured at the customer’s request.

2. For uncoated surfaces, the name of the outer layer grade shall be indicated (for example: I (BB), II (BB)).

3. The laminated birch plywood in the standard version is available with painted ends. It is possible to manufacture and designate plywood (N) with unpainted ends upon agreement with the consumer.

3.1.3 Laminated plywood surfaces are graded by process-induced defects as follows: I, II, III grades.

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. The panels in the pack should be formed so that the SHOP area is on one side.

It is possible to manufacture laminated birch plywood with various corporate logos.

3.1.4 The length and width of laminated birch plywood shall conform to the values indicated in Table 1.

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

Table 1

Plywood panel length (width), mm	Tolerance, mm
Up to 1250 and including	±2,0
1250-2500 and including	±3,0

Upwards of 2500

±3,5

Notes:

1. Different sizes and tolerances of the laminated birch plywood are permissible if confirmed by the consumer.
2. The length of the part is determined along the direction of wood fibers of outer layers.

3.1.5 Plywood panels shall be cut at a right angle. Maximum tolerance for out-of-the squareness is 1 mm per 1 m of the length of panel edge.

3.1.6 Maximum permissible out-of-the straightness is 1 mm per 1 m of the panel length.

3.2 Designation

Plywood designation includes:

- name of the product;
- brand;
- face veneer grade combination;
- emission class;
- dimensions;
- density of resin-impregnated paper (hereinafter referred to as film);
- reference to these Specifications.

Below there is an example of the designation of FOF-brand plywood coated with dark brown film on both sides, smooth surface on both sides, grade As I/I *SHOP 1*, emission class E1, length 1500 mm, width 3000 mm, thickness 18 mm, film density 120 g/m²:

FOF plywood – As I/I SHOP1 E1 1500x3000x18 FF 120/120 Brown/Brown 400 mm 22 painted ends Brown TU 16.21.12-002-93222532-2021

3.3 Requirements to materials and components

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 The following materials are required to manufacture laminated plywood:

- FSF general-purpose plywood with birch face veneers according to TU 16.21.12-006-93222532-2019, sanded;
- to cover the outer layer of the plywood, a film based on thermoset polymers is used;
- water-based acrylic paint for protection of panel edges during transportation.

3.3.4 The defects exceeding limits laid down in Appendix D are not permitted for the surface of the laminated birch plywood. Terms and definitions of process-related defects are specified in Appendix E.

3.3.5 In the inner plies, wood flaws and processing defects are allowed that do not affect its quality and dimensions, requirements for which are established in these specifications.

3.3.5 The requirements for the outer uncoated plywood surface of the FOF – F/U brand are established in agreement with the consumer.

3.3.6 Any combination of varieties of front and back layers is allowed for all brands of plywood.

3.4 Stress-related parameters of plywood are shown in Tables 2 and 3.

Table 2

Parameter	Thick-ness, mm	Value of stress-related parameter	
		Face and inner layers – birch veneer	Face layers – birch veneer, inner layers – hardwood veneer, except birch
1 Moisture, %	6,0-40	5-12	
2 Density, kg/m ³	6,0-40	650-730	600-730

3 Bending strength at static bending, MPa, min.	6,0-40	Appendix B	Appendix E
4 Bending elasticity modulus, MPa, min.	6,0-40	Appendix B	Appendix E
5 Tensile strength along the grain, MPa, min:	6,0	30,0	
6 Strength of coating adhesion to plywood	6,0-40	Coating shall not peel at the crossing of the 2 cutting lines	
7 Resistance to vapor, points	6,0-40	1 - no swelling, no gloss loss, no bubbles	
8 Resistance to hydrochloric acid solution (HCl)	6,0-40	The color of (HCl) solution must be light yellow or colorless after testing	
9 Resistance to sodium hydroxide (NaOH)	6,0-40	The color of NaOH solution must be light yellow or colorless after testing	
10 Resistance to cement	6,0-40	1- no staining of cement after interaction with plywood	
11 Waviness of surface of laminated birch plywood (Rippling), average deflection length, no more than, mm	6,0-40	20	
12 Surface absorbency by unilateral wetting (Cobb method), g/m ² , max.	6,0-40	250	
13 Determination of abrasion resistance of the film coating (Taber), min., reverse side	6,0-40	300	

Notes:

Test results of uncoated FSF panels are accepted for 1, 2, 3, 4, 5 tests. FOF plywood shall be tested for conformity to 1, 2, 3, 4, 5 if required contractually.

Values of items 6-11 shall be selected upon agreement with the consumer.

Table 3

Average shear strength along the glue line, MPa	Wood failure, %
Upwards of 0,2 through and including of 0,4	Upwards of or equal to 80
Upwards of 0,4 through and including of 0,6	Upwards of or equal to 60
Upwards of 0,6, but below of 1,0	Upwards of or equal to 40
1,0 or more	-

Notes:

1 The components are conditioned for tests using one of the four methods:
 - boiling in water for 1 h;
 - 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).

- 2 The method of conditioning is selected with the customer's approval.
- 3 Wood failure percentage shall be determined by visual inspection
- 4 The shear tests are performed using different glue lines as agreed with the customer

3.5 Formaldehyde content and formaldehyde release as regards plywood of E1 emission class shall conform to the values specified in the Table 4.

Table 4

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
E1	8,0 or under	Upwards of 0,01 through and including 0,124	Upwards of 1,5 through and including 3,5 or under 5,0 within 3 days from the date of manufacture
Note: Test results of uncoated FSF panels are accepted for testing.			

3.6 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;
- coating film, g/m²
- 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.

Each plywood panel shall only be marked if the customer so requests.

3.8 Packaging

3.8.1 Plywood is separated into packages by brands, grades, dimensions.

3.8.2 Packing of plywood packages must ensure that plywood remains safe and intact during transportation. Combined packing types may be used. The packages must be strapped with a packing strap.

4 SAFETY REQUIREMENTS AND ENVIRONMENT PROTECTION

4.1 Environment protection requirements

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

4.1.2 Airborne levels of hazardous substances released during the use of plywood-based products in residential and administrative buildings must be within the limits specified in GN 1.2.3685 -21 “Hygienic standards and requirements for ensuring safety and (or) harmlessness of environmental factors for humans”.

4.1.3 Plywood must be manufactured from materials and components cleared for use by domestic public health authorities.

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

4.2 Fire safety requirements

4.2.1 For the purpose of the applicable law, plywood is considered a general-purpose product.

According to Section 6, par. 8 of the Federal Law dated July 22, 2008 No 123-Φ3 “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 is a highly flammable (Г4) construction material having flue gas temperature of over 450°C.

4.2.3 Materials used for the purpose of birch plywood manufacture are not explosive.

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

4.3 Occupational health and safety requirements

4.3.1 The plywood production generates such hazardous volatile substances as phenol and formaldehyde which are the components of phenol formaldehyde resins used as bonding agents and coating of 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 12.1.005-88.

5 OPERATIONAL GUIDELINES

5.1 Recommendations when using laminated plywood as formwork

5.1.1 Plywood is subject to natural processes of swelling and shrinkage, which is associated with climatic conditions, i.e. with the absorption or release of moisture. Therefore, plywood should be protected from extreme weather conditions, covering with an awning from strong sun exposure or from dampness. This prevents formation of cracks.

5.1.2 In order to protect edges and holes, special types of water-dispersion paint based on acrylate or other sealants are used.

5.1.3 Use lubricants (concrete separating agents).

5.1.4 Immediately after the formwork removal, remove the remnants of concrete from the surfaces, contacting with the concrete. Do not use objects with a sharp end or cutting edge, wire brushes, rotating grinding discs or cup brushes. It is not recommended to use an air compressor to clean the plywood.

5.1.5 The bearing capacity of the plywood must be ensured. Damage, cracks and cuts across the bearing direction can significantly reduce the bearing capacity and therefore require special control. If in doubt, damaged sheets shall be rejected.

5.1.6 Under longstanding use, the moisture content of plywood increases significantly, which reduces its strength characteristics. In this regard, it is necessary to dry the plywood. In order to avoid external deformations, drying of plywood must be carried out in a natural way.

5.1.7 Plywood sawing into parts must be made using belt or circular saws.

In order to obtain a clean cut, sawing must be performed correctly: at first the sawing is to be carried out across the face grain direction, then along. This method allows you to avoid splitting the corners and reduce the size and number of chips on the surfaces.

When sawing with a round saw, high speed and low feed coefficient are recommended. After sawing in order to prevent the moisture absorption by plywood, the edges are to be treated with special types of water-dispersion paint based on acrylate or other sealer.

5.1.8 In order to obtain a hole with smooth edges, it is recommended to use a sufficiently sharp drill, equipped with a front cutter.

It is necessary to begin drilling since the front side. In order to avoid splitting on the reverse side of the panel, it is recommended to use a lining sheet.

In order to avoid splitting of plies when using nails, it is recommended to use threaded nails or special screws. The recommended distance from the panel edge to a nail is 12 through 15 mm.

All the holes done during installation should be filled with water-dispersion paint based on acrylate or other sealer in order to exclude moisture ingress into the plywood, and the panel surface is recommended to be treated with a water-repellent composition.

5.2 Defects in plywood during formwork

5.2.1 Change in thickness, displacement at the joints of plywood panels, recesses in the area with nails or self-tapping screws.

Reason: the plywood is hygroscopic, an increase / decrease in wood moisture leads to an increase / decrease in length, width and thickness (varying degrees of swelling and shrinkage in three directions of the anatomical structure of the wood) when using them at the construction site, the moisture content of the wood usually increases up to 18 - 25%. Approximate parameters of change in size: in thickness about 9%, in length and width about 0.2%.

What to do?

- not to mix new and used plywood sheets;
- use plywood with approximately equal number of cycles of application;
- when assembling, leave nails or self-tapping screws with a small protrusion, in no case should they be buried;
- with special requirements for the concrete surface, fasten the formwork plates with self-tapping screws on the reverse side;
- use a special varnish to protect the edges.

5.2.2 Curved or oblong rough depressions on the plywood surface. In damaged areas, there may be partially or completely no coating. The depth of roughness can reach several millimeters.

Reason: direct contact of the vibratory tip with the formwork plate for a long time

What to do?

- prevent contact of the deep vibrator with the formwork plate;
- use protective rubber caps for the vibratory.

5.2.3 Рипплинг – легкая волнистость на верхнем слое шпона фанеры (волны не выше 0,9 мм, разной длины). Встречается на краях листов и/или по всему листу, рядом с отверстиями от саморезов или гвоздей, либо в местах повреждения поверхности. Волны располагаются вдоль волокон верхнего слоя фанеры. Они появляются только при первых циклах применения до тех пор, пока не будет достигнуто равномерное набухание верхнего слоя фанеры. Rippling is a slight waviness on the upper plywood veneers (waves not higher than 0.9 mm, of different lengths). It occurs on the edges of panels and/or throughout the panel, near holes from self-tapping screws or nails, or at sites of surface damage. The waves are located along the fibers of the top layer of plywood. They appear only during the first cycles of application until a uniform swelling of the top layer of plywood is achieved.

Reason: hair cracks or minor damage to the phenolic film. This leads to moisture saturation of the upper veneers and thereby to volumetric swelling in this area. However, the surface of the plywood around the perimeter is still dry. These differences in the moisture content of the wood lead to the appearance of slight waviness. This phenomenon is especially often observed when using plywood in conditions of direct contact of plywood with water, when used in non-enclosed spaces, a sharp change in climate during the day or conditions of seasonal precipitation (for example, spring-autumn months). The formation of waviness continues until it is completely saturated with moisture (up to approximately 28%) through untreated edges, drilled holes, installed rivets or hair cracks and damage. After full saturation, the waviness from the surface of the plywood panels almost completely disappears. As a rule, this happens after 2 - 3 cycles of plywood with water and with drying between each contact.

What to do?

- store plywood in a dry place until the first cycle of use;
- use a special type of water-dispersion paint based on acrylate or other sealants in order to protect the edges;
- if possible, do not nail plywood with nails, fasten with self-tapping screws or screws at the back;
- countersink and smear with putty places of fastening with self-tapping screws or screws in front;
- prevent damage when using, for example, a deep vibrator, hammer, etc.;
- pre-moisten the plywood with cement milk in certain cases.

Warping disappears when the formwork plate is evenly moistened after the first cycles of application.

5.3 Defects in the concrete surface during formwork

5.3.1 Concrete delamination is a complete or partial exfoliation of concrete on the surface or areas close to the surface.

Reason: use of too dry plywood and, as a result, dehydration during hydration.

What to do?

- pre-wetting of plywood with cement milk and water. When wetted with cement milk, the hydrolysis sugar that may be contained in the wood is neutralized. Wetting with water prevents excessive absorption of water by the formwork.

- use a proper lubrication.

5.3.2 Shades of gray on the surface of concrete can appear within the boundaries of the plywood and / or between adjacent panels. If the plywood does not absorb or weakly absorbs moisture, then the surface of concrete has a light color. If the plywood absorbs moisture, the surface of the concrete gets a darker color. The use of lubricant, wax for formwork, changes in the absorbency of plywood depending on moisture saturation, etc. can affect these color effects.

Reason: the absorption capacity of plywood is affected by the following factors:

- a number of cycles of application, operating loads, etc.
- weather conditions: plywood exposed to severe weather influences, for example, with a very dry surface and a large number of cracks, can vary greatly in absorbency. This can lead to the appearance of stains on the concrete, and to the exfoliation of the concrete surface in extreme cases. When stored in a stack, the upper panel due to drying out in the sun may show a different absorbency, than panels in the lower part of the stack.

What to do?

- with high requirements for face concrete, use only plywood with the same storage conditions, method and duration of use;
- before the first use, do not allow long-term storage in adverse weather conditions;
- if possible, protect plywood from weather influences between concreting cycles;
- cover plywood stacks with an awning to prevent drying of individual sheets;
- apply lubricant to the plywood.

5.3.3 Spot and blurry spots, heterogeneity of the structure, increased dusting, stains after formwork removal, excess lubrication on plywood with weak absorbency, as well as weather effects can lead to increase in layers of dirt and dust particles.

Reason: wet or contaminated plywood surface, different absorbency of plywood panels.

What to do?

- use only plywood with the same storage conditions, method and duration of use;
- at the end of formwork k, the plywood surface shall be cleaned of the concrete mixture residues.

5.3.4 Appearance of brown color shades - concentrated spots of intense brown color on concrete in the areas between anchor fasteners and / or near the wall, spots of ring-shaped or horseshoe shape, often with brown or yellow stains directed upwards.

Reasons: intense exposure to sunlight or ultraviolet radiation causes damage to the film. In the summer months, such a defect may occur after a few days. The appearance of stains is caused by a combination of the following factors: after removing the anchors during decking, the plywood remains in direct contact with the surface of the concrete. Due to the release of heat during hydration, condensation forms between the plywood and the concrete. When in contact with a film having a defect, this condensate blurs the colored products from the damaged layer, which settle on the surface of the concrete after the condensate dries. Low-quality or less resistant to ultraviolet radiation concrete separators (lubricant) can increase the appearance of shades of brown.

What to do?

- защищать поверхность опалубочных плит от интенсивного солнечного излучения;
- использовать надлежащую смазку;
- сразу после снятия анкеров отделить опалубку от бетона.
- protect the surface of formwork plates from intense solar radiation;
- use proper lubrication;
- separate the formwork from the concrete immediately after removing the anchors.

5.4 Reuse of plywood for the formwork

It depends on a variety of external factors affecting the plywood. Under optimal operating conditions and proper handling, the reuse reaches 50 cycles (indicative) for plywood with a double-sided film phenolic coating with a density of 120 g/m².

5.5 Flooring recommendations

5.5.1 The parts made of plywood should be fastened using galvanized screws or stainless steel with round heads. It is recommended to perform pre-drilling of holes. Gaps and notches for fastening must be filled with the elastic mastic or paint. The recommended distance between the screws is the following: along the edge of the part from 200 through 300 mm; in the center of the part from 300 through 500mm; the distance from a screw head to the edge of the part must be at least 10 mm.

5.5.2 Parts of the plywood are to be fixed on all four sides.

5.5.3 If the parts have been subjected to machining (trimming, milling), the untreated surfaces of the edges must be covered with waterproof paint of at least two layers. It is necessary to leave a gap of 2-3 mm between the parts for moisture migration.

5.5.4 Unpacking of packages must be performed manually so as not to damage the edges surfaces and corners of the parts.

5.5.5 Minor damage of the overlaying film can be restored first by grinding, and then apply waterproof paint to the damaged surface.

5.6 Storage conditions for components on construction and production sites

5.6.1 The storage area should be well ventilated and protected from sunlight and rain. In all possible circumstances, cover the plywood in order to protect against exposure to weather conditions. Slight deviation in thickness of the panels under the influence of humid air during transportation along the edge at a distance of up to 50 mm from the edge is permitted. If possible, the

plywood should be covered with a tarpaulin. It is not recommended to use impermeable plastic packaging material for external protection at the place of operation.

5.6.2. The packs shall be stored on a flat work area, on bars at both ends and in the middle of the package. The bars shall be of the same height in order to avoid warping. If the width of components is up to 2500 mm, the number of bars should be at least 3. If the width of panels exceeds 2500 mm - at least 4. All panels having a longitudinal warping or bending points within the limits exceeding the requirements specified in point 19 of Annex B shall not be used.

5.6.3. The packs shall be kept dry and clean, prevent contact with the ground (minimum 70 mm), exclude mechanical damage.

5.6.4. The packs shall be stored horizontally, storage of packs at the ends is prohibited.

5.6.5. Individual panels shall be moved by lifting and transferring them manually or automatically using a vacuum lift. It is not permitted to move panels on the ground or on the floor. Do not move panels without packaging around the production site using mechanical equipment, as they are extremely slippery.

6 ACCEPTANCE PROCEDURE

6.1 Plywood is accepted as lots.

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

6.3 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.

6.4 At least one package of a lot shall be selected randomly for dimensional and appearance checks.

6.5 The lot is accepted if the number of panels with non-conformities to clauses 3.1.4, 3.1.5, 3.1.6, 3.3.5 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.

6.6 If the requirements of clause 6.5 are not complied with, the sampling shall be doubled. Test results are applied to the whole lot. If the requirements of clause 6.5 are still not complied with, the whole lot is classified as non-conforming.

6.7 The stress-related characteristics of plywood shall be controlled once every 12 hours. The stress-related characteristics for each type of plywood depending on thickness and number of plies shall be controlled at least once a month.

The stress-related characteristics listed in cl. 6 through cl. 13 shall be controlled once a month.

6.8 Formaldehyde release shall be controlled 4 times per 7 days by gas analysis.

7 CONTROL METHODS

7.1 Sampling for the stress-related tests is performed in accordance with GOST 9620, EN 326-1. Sampling for formaldehyde release testing by gas analysis is performed in accordance with GOST 30255, GOST 32155, EN ISO 12460-3. Sampling for formaldehyde levels is performed in accordance with GOST 27678.

7.2 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 being 1 mm. The actual length (width) of a panel shall be the arithmetic mean of two measured values.

7.3 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 total at 8 points. The measurements are performed using a thickness gauge graduated in 0,1 mm (max) according to GOST 11358. The actual thickness is the arithmetic mean of eight measured values. Thickness variance for a single panel shall be the difference between the maximum and minimum measured thicknesses.

7.4 Squareness check is performed using a precision square according to GOST 3749. The squareness is determined by measuring the maximum deviation of the panel edges from the square surface with a metal straightedge according to GOST 427, tolerance being 1 mm, as described in GOST 30427, EN 324: part 2.

7.5 The plywood appearance is evaluated by visual inspection.

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

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

7.8 Tensile strength is determined according to GOST 9622, NF B51-123.

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

7.10 Formaldehyde content is determined according to GOST 27678.

7.11 Warping of the plywood is determined based on maximum deflection of the panel relative to a flat level surface, tolerance being 0,1 mm.

7.12 Out-of-straightness is determined by measuring the maximum clearance between the component edge and the edge of a metal straight edge using a clearance gauge according to GOST 8925, tolerance being 0,1 mm, as described in EN 324: part 2.

7.13 Moisture content is measured according to GOST 9621, EN 322.

7.14 Density is determined according to EN 323.

7.15 Process-related defects are evaluated according to GOST 30427.

7.16 Strength of coating adhesion to a component is determined according to GOST 14614 by cutting the components samples along the coating in two directions crossing at an angle of 45 degrees. Then the sample is visually inspected.

7.17 Resistance to vapor is evaluated according to MG 2.2-006 “FOF Plywood Testing”. Damage extent is assessed visually on a scale from 1 to 3, the permissible value is 1 point.

7.18 Resistance to sodium hydroxide (NaOH) is evaluated according to MG 2.2-006 “FOF Plywood Testing”. The result is assessed visually by the change of color of the sodium hydroxide solution. The permissible result is from light yellow to colorless.

7.19 Resistance to hydrochloric acid (HCl) solution is evaluated according to MG 2.2-006 “FOF Plywood Testing”. The test result is evaluated visually by changing the color of the hydrochloric acid solution.

7.20 Resistance to cement is evaluated according to MG 2.2-006 “FOF Plywood Testing”. The result is assessed visually by the change of cement color on a scale from 1 to 3, the permissible value is 1 point.

7.21 Density of the plywood is measured according to GOST 9621-72.

7.22 Waviness of surface of laminated birch plywood (Rippling) is determined in accordance with MG 2.2-006 “FOF Plywood Testing”

7.23 Surface absorbency by unilateral wetting (Cobb method) is determined in accordance with MG 2.2-006 “FOF Plywood Testing”

7.24 Abrasion resistance of the film coating (Taber) is determined in accordance with GOST 27820, MG 2.2-006 “FOF Plywood Testing”.

8 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. A slight deviation in thickness along the edge of a panel is permissible if the moisture of the ambient air is over 80%.

Swelling of the components in the radial direction max. 6.5%, in the plane not more than 0.02% by 1% change in humidity is permitted.

9 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.

9.3 When using plywood for further processing, it is recommended to contact the manufacturer to clarify the properties and characteristics of the plywood.

Appendix A
 (compulsory)

Table A

Nominal thickness of plywood, mm	Number of plies when veneer thickness is from 1,0 through 2,7 mm; pcs		Number of plies when veneer thickness is from 4,0 through 6 mm; pcs	Max. tolerance, mm	Thickness variation, mm
	Face and inner layers – birch veneer	Face layers – birch veneer, inner layers – hardwood veneer, except birch			
6; 6,5	3-8	4	3-5	+0,4 -0,5	0,6
8	4-10	5	3-6	+0,4 -0,5	
9	4-11	5	3-7	+0,4 -0,6	
10	5-12	6	3-8	+0,4 -0,6	
12	6-14	6-7	3-9	+0,5 -0,7	
15	7-17	7-8	3-11	+0,6 -0,8	
16	7-18	8-9	3-12	+0,6 -0,8	
18	8-21	9-10	4-13	+0,7 -0,9	
21	9-24	10-11	4-15	+0,8 -1,0	
24	10-27	11-13	5-17	+0,9 -1,1	
30	11-30	13-14	6-21	+1,1 -1,3	
35	13-33	14-15	6-25	+1,1 -1,5	
40	15-39	16-17	7-28	+1,2 -1,6	

Note:

It is allowed to manufacture components of other thicknesses, number of plies and max. deviations upon agreement with the consumer.

Appendix B
(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)

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 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 – hardwood species except birch)

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	вдоль волокон наружных слоев	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

Appendix D
(compulsory)

Maximum allowable rate of wood faults for plywood grades

Table D

Name of defect	Maximum allowable rate of wood faults for plywood grades		
	I	II	III
1 Film delamination or no film	Permitted on one edge with a max. width 3 mm under condition of painting	Permitted, if max 2% of the panel surface	Permitted
2 Film overlaps	Permitted with max. width 10 mm, max. length 500 mm in max. amount of 1 pcs/m ²	Permitted	
3a Traces of defects and faults of internal plies (off-white spots)	Permitted as spots 25x25 mm, in amount of 5 pcs per a panel with size 1250x2500 mm and 6 pcs per a panel with size 1500x3000 mm	Permitted	
3b Traces of defects and faults of internal plies (off-white spots)	Permitted max. width 5 mm, max. length 300 mm, in max. amount of 1 piece/m ²	Permitted	
3c Sanding defects traces (off-white spots and streaks)	Not permitted	Permitted max. 25% of a panel surface	Permitted
4 Film fragments stuck onto the surface (secondary film)	Permitted with max. size of 30x30 mm in max. amount of 1 pcs/m ² or 10x100 mm in max. amount of 1 pcs/m ²	Permitted	
5 Temperature stains	Permitted if the coating is undamaged	Permitted	
6a Burnt spots – burnt film caused by defects of outer layers: cracks, damages, loose knots	Not permitted	Permitted	
6b Burnt spots – burnt film caused by defects of outer layers: rough peeling	Permitted max. 2 % of a panel surface	Permitted	
7 Microcracks (hair cracks)	Not permitted	Permitted with max. total area 100 sm ² , end microcracks are permitted with max. width 10mm	Not permitted
8 Traces of veneer joints (dark spots)	Permitted if the coating is undamaged	Permitted	
9 Streaks and stains from film	Permitted max. 15 % of a panel surface	Permitted	
10 Local delamination of veneer	Not permitted	Permitted with max. diameter of 100 mm in max. amount of 1 pcs/m ²	Permitted
11 Dents	Permitted by shape: round shape with max. diameter 6 mm in max. amount of 1 piece/m ² ; long dent with the size, mm, 30×3 in amount of 2 pcs on a panel surface	Permitted	
12 Press plates marks	Permitted		

Name of defect	Maximum allowable rate of wood faults for plywood grades		
	I	II	III
13 Scratches	Not permitted		Not permitted
14 Insufficient veneer of internal plies	Not permitted	Permitted along one edge with max. depth 5 mm	Permitted
15 Paint drips on panel	Permitted max. width 5 mm	Permitted	
16 Traces of sound knots, inlays, face veneer wood faults (curly grain, burls, dark eyes, dark inbark, streak clusters)	Permitted		
17 Pressed-in waste	Not permitted	Permitted	
18 Panel delamination (bubbles in internal plies)	Not permitted		
19 Warping	For laminated panels with thickness up to 6,5 mm and including – disregarded, for laminated panels with thickness upwards of 6,5 mm – max 15 mm per 1 m of the length of the panel diagonal		
20a Cutting defects: saw chips	Permitted max. length 3 mm under condition of painting	Permitted max. length 10 mm under condition of painting	Permitted
20b Cutting defects: trimmer chips	Permitted max. 1 mm under condition of painting	Permitted	
Notes:			
1 Other process-related defects not covered by the Appendix D are not allowed.			
2 All maximum permissible values listed in the Appendix D apply to one panel face.			

Appendix E
(compulsory)

Terms and definitions of process-related defects

Table E

Name of process-related defect	Definition
Film delamination or no film	Panel surface areas not coated with film
Film overlaps	Thickening due to film overlapping on the panel surface
Traces of defects and faults of internal plies (off-white spots and streaks)	Spots and streaks on the surface of the film from the defects of internal plies if such defects are more lightly colored, and the film is essentially undamaged
Film fragments stuck onto the surface (secondary film)	Glued-in film fragments stuck onto the surface of the component during coating
Temperature stains	Change of film color (with or without a violation of the coating integrity) due to premature curing of the film without pressure
Rough peeling	Placed closely small depressions on the surface of the component, formed as a result of local removal of wood during peeling.
Changes of surface structure in a form of spots and points, film powdering, film crumbling (burned film)	Failure of the film integrity
Microcracks (hair cracks)	Cracks of microscopic width, formed as a result of premature curing of the film during lamination and deformation of the face veneer under the influence of stresses.
Streaks and stains from film	Abnormally painted areas of the component coating caused by release of volatile substances of the film during pressing
Local blisters of film	Partial detachment of film from the component surface
Dents	Local indentation of the outer layer without damaging the film coating
Scratches	Damage of the component coating with a sharp object in the form of a long and narrow cavity or local indentation of the outer layer with damage of the film coating
Traces of sound knots, patches, face veneer flaws on face layers	Outlines of sound knots, structure of wood fibers, patches on the birch plywood surface
Local delamination of veneer in inner layers of a detail (inside the bubble)	Separation of two adjacent veneer layers by adhesive layer
Paint drips on the component surface	Getting paint on the layer of the component
Insufficient veneer of internal plies	Insufficient veneer in internal plies except end knots and checks
Press plates marks	Stripes and stains on the coated surface of the component due to contamination of the press plates

