UDC 691.11(575.4)=111

APPLICATION OF WASTE WOOD FOR RECEIVING BUILDING MATERIALS

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Organic building materials include wooden materials and items, polymer-based materials and also organic binders and bitumen-based materials. The properties of wood, its application are described in the article.

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Wooden Materials and Items

In modern building practice wood is extensively used for walls and floors of buildings, carpentry and graded plank items, as well as prefabricated standard wooden cottages. A great quantity of wood is consumed in building and installation work for making piles, poles, various loads-bearing components, casings, scaffolds.

Glued wood components – beams, trusses, arches, frames and roofs of buildings and installations — are very effective in chemically aggressive environment because their life span is 1,5 times greater than that of steel or reinforced concrete.

In building conifer (pine, spruce, larch, fir) and broad-leaved (oak, birch, alder, aspen, beech, lime, maple) wood species are used. Pine is used for building walls of dwelling houses, bridges, poles, window sashes, transoms, floors. Larch is used for the manufacture of poles, girders, and in general hydraulic engineering construction. Broad-leaved species mostly used in building practice for trimming work because it has a pleasant texture and color.

Structure and Properties of Wood

Wood is organic natural, fibred, porous (macrostructure) material, which consists of living and dead cells of various size and shape (microstructure). A living cell provides of trees with growth. After a while these cells die and become hard and strong. Macrostructure of wood is studied by cutting the trunk in three directions: cross-sectional, radial cut and tangential. The cross-section has layers formed during the growing season (spring-autumn). They are called annual rings. Each annual ring consists of light (early) wood resistance and strong. The higher the percentage of the late wood, the stronger the wood is.

Wood as a building material has a great number of valuable properties: high compressive and bending strength, small true and average density, low heat conductivity. Wood has several negative properties: its anisotropy results in different strength, heat conductivity and electrical conduction in length and across fibers; wood is a hydrophilic and combustible material.

Properties of wood are greatly affected by moisture content. Therefore its principal properties (strength, average density, heat conductivity) calculated with the use of standard moist are equal to 12%. Wood may contain water in three forms: capillary (of free), hygroscopic and chemically bonded. Moisture content of wood exposed to prolonged contact with air of constant relative humility and temperature is called the equilibrium moisture content. Because of structural differences wood shrinks during drying or swells irregularly in various directions. Linear shrinkage along the fibers lies between 0,1 and 0,3%, in radial direction between 3 and 6%, in tangential direction between 7 and 12%. Wood is dried from 15 to 20% (air-dry) and is suitable for the open air application; and it can be dried from 8 to 13 % (room-dry) as well and is applied indoors. These measures allow to avoid shrinkage of the material during its exploitation.

The following drying methods are in current use: air (natural), chamber, electric, in hot liquids, the chief methods are air and chamber drying.

The true density of wood is approximately equal to all species and averages 1,54 t/m^3.

Due to anisotropy, the resistance of wood to mechanical action differs the fiber orientation. Compressive strength parallel to fibers of wood at 12% moisture content varies greatly with wood species, the range from 30 to 100 MPa, and compressive strength perpendicular to fibers of wood amounts from H to 25 MPa.

Decay of wood stops as soon it dries, and all the fungi perish. Wood in construction items or in storage may be attacked by fungi and insects. Wood can be protected against decay and its life span in structures increased by preventing its humidification by structural means, such as painting or coating, leaching and impregnating with antiseptics. Antiseptics are substances which are poisonous for wood-attacking fungi. They should be harmless to man and domestic animals. Antiseptics are subdivided into water-soluble, oil and paste varieties.

Water-soluble antiseptics are used for making wood moistureproof. Because of high inflammability and sharp odour, oil antiseptics are used only for impregnating or coating wood placed in the open air, soil or water. Antiseptic pastes are subdivided according to their binders into bitumen, silicate, etc., varieties.

Wood preservation with liquid compositions includes surface preservation, impregnation in hot-cold and high-temperature baths, impregnation under pressure.

Wood is very inflammable, this being one of its major shortcomings. Wood can be protected against fire by plastering, coating with gypsum or asbestos-cement sheets or surface treatment with fire resistant substances. There are two surface treatment techniques, namely, painting and impregnation with fire protection compounds, or antipyrines.

Materials, Items and Structures from Wood

Building logs from conifer and broad-leaved species should not be less than 14 m thick at the top and 4 to 6,5 m long. Logs are used for hydraulic engineering structures, bridge elements, power transmission and communication lines, railway tracks.

Sawn timber is obtained by longitudinal cutting of logs planks, sleepers. By finish, sawn timber falls into clean-cut variety in which both edges have been cut throughout their length and non-trimmed variety in which the edges are not cut or cut less than half their length. Sawn timber for glued items and structures (archs, beams, farms) should have a moisture content not more than 15%, and that for bridge span structures and other load-bearing constructions should carry not more than 25% moisture.

Factory plank used for various building applications include platbands, plinths, finished floor boards, handrails for barriers, treads, window-sill board and exterior sheathing of house.

Floor materials include piece parquet, parquet boards, finish flooring boards, wood chipboards, wood laminates and fiberboards.

Wood chipboards are sheet materials manufactured by hot-moulding of wood chips, impregnated with polymers. In the course of hot-moulding, chips are compacted, and the viscous polymers harden, to cement the filler into a monolithic material. Wood chipboards are made of wood of conifer and broad-leaved species. Resistance of wood chipboards to water biological agents and fire is enhanced by treating chips with antiseptics and antipyrens.

Wood fiberboards are sheet materials composed of organic fibrous fillers (wood, reed, hemp) polymer-bonded together by hot-moulding. Culled wood is first cut into chips, than into fibers. Fibrous pulp is diluted with water and pumped to a reservoir for mixing with a solution of phenol-formaldehyde polymer (4-5% of the dry mass weight), hydrophobic additives, antiseptics and antipyrens. Fibrous pulp is pumped from the reservoir to a long mesh moulding machine for dehydrating and moulding the pulp into a continuous sheet, which is passed to a machine where it is cut into boards. By their average density, wood-fiber boards are available in three kinds: semi-hard (not less than 400 kg/m^3), hard (not less than 850 kg/m^3) and extra-hard (not less than 950 kg/m^3). Soft boards are used for heat-insulating of walls and floors, semi-hard and hard boards are used for facing walls and the extra-hard ones, mostly for floors.

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UDC 697.921.42

ENERGY CONSUMPTION REDUCING IN THE ASPIRATION SYSTEMS AT THE WOODWORKING ENTERPRICES

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The article deals with traditional and modernized aspiration systems at woodworking enterprises. It presents some activities for aspiration systems technology improvement, which help to reduce energy consumption. It researches a volume vertical packaged collector application in the aspiration system; it