CONSTRUCTION MATERIALS

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What are building materials

- CONSTRUCTION MATERIALS — materials used in the construction and repair of buildings and structures. Many of these materials are used not only in construction, but also in the production of various products. Building materials are diverse in their origin or composition of raw materials, for their intended purpose, etc. Here is a brief description of only the main (most commonly used) materials that are used in home repairs or in small individual construction, outbuildings, alterations, etc.

Natural stone materials

- Rocks that have the necessary building properties are used as natural stone materials in construction.
- According to the geological classification , rocks are divided into three types:
- 1. igneous (primary);
- sedimentary (secondary);
- metamorphic (modified);

- 1) Igneous (primary) rocks were formed during the cooling of molten magma that rose from the depths of the earth. The structures and properties of igneous rocks largely depend on the conditions of magma cooling, and therefore these rocks are divided into deep and poured.
- Deep rocks were formed during the slow cooling of magma in the depths of the Earth's crust at high pressures of the overlying layers of the earth, which contributed to the formation of rocks with a dense granular-crystalline structure, high and medium density, high compressive strength. These rocks have low water absorption and high frost resistance. These rocks include granite, syenite, diorite, gabbro, etc.
- The spilled rocks were formed during the magma release to the earth's surface with relatively rapid and uneven cooling. The most common erupted rocks are porphyry, diabase, basalt, volcanic loose rocks.

Diabase

Diorite

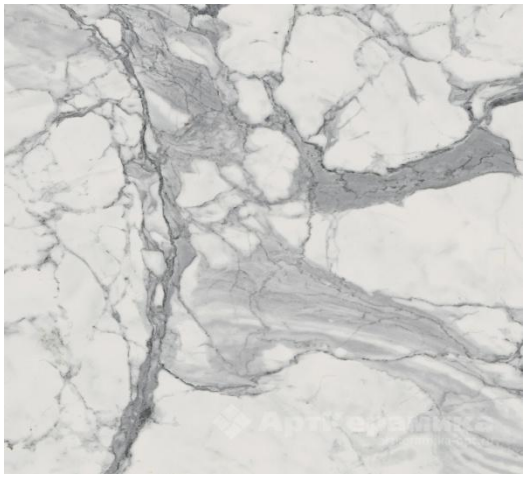
Basalt

- 2) Sedimentary (secondary) rocks were formed from primary (igneous) rocks under the influence of temperature changes, solar radiation, the action of water, atmospheric gases, etc. In this regard, sedimentary rocks are divided into clastic (loose), chemical and organogenic.
- Clastic loose rocks include gravel, crushed stone, sand, clay.
- Chemical sedimentary rocks: limestone, dolomite, gypsum.
- Organogenic rocks: limestone-shell rock, diatomite, chalk.

Crushed stone

Sand

- 3) Metamorphic (modified) rocks were formed from igneous and sedimentary rocks under the influence of high temperatures and pressures during the rise and fall of the earth's crust. These include clay slate, marble, quartzite.



Marble

Quartzite

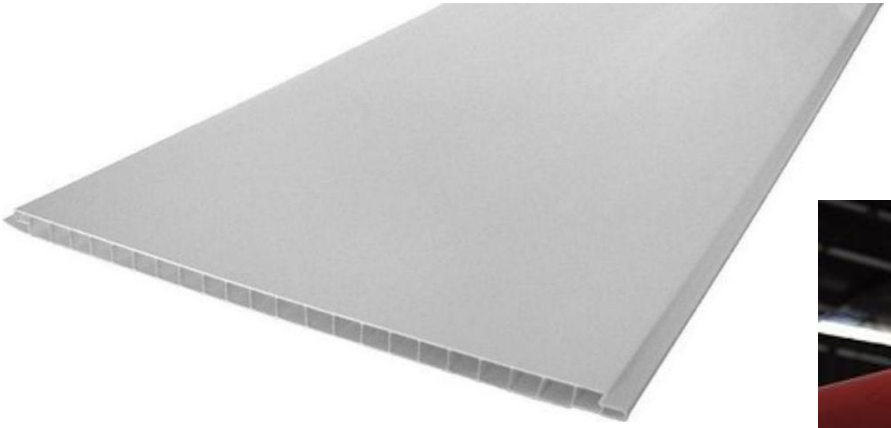
Slate

Artificial firing materials

- Artificial firing materials and products (ceramics) are obtained by firing at 900-1300 ° C of molded and dried clay mass. As a result of firing, the clay mass turns into an artificial stone with good strength, high density of addition, water resistance, water resistance, frost resistance and durability. The raw material for the production of ceramics is clay with thinning additives introduced into it in some cases. These additives reduce the shrinkage of products during drying and firing, increase porosity, reduce the average density and thermal conductivity of the material. Sand, crushed ceramics, slag, ash, coal, sawdust are used as additives. The firing temperature depends on the temperature at which the clay begins to melt. Ceramic building materials are divided into porous and dense. Porous materials have a relative density of up to 95% and a water absorption of more than 5%; their compressive strength does not exceed 35 MPa (bricks, drainage pipes). Dense materials have a relative density of more than 95%, water absorption less than 5%, compressive strength up to 100 MPa; they have wear resistance (floor tiles).

Polymer materials

- Polymer materials are natural or synthetic high-molecular organic compounds consisting of a huge number of atoms. The structure of polymer molecules can be linear or volumetric. Polymers whose molecules have a linear structure have thermoplasticity - softening when heated, they harden again when cooled. Softening and hardening can be carried out repeatedly. Repeated heating followed by cooling does not significantly change the properties of the material (polyethylene, polystyrene). Polymers with a bulk structure of molecules have thermosetting properties — they cannot melt and harden reversibly many times. At the first heating, they become plastic and take a given shape, passing into a non-melting and insoluble state (phenoplasts).
- According to elastic properties , polymers are divided into:
- plastics (rigid);
- elastics (elastic).
- Polymer materials contain three groups of substances:
- binders;
- plasticizers;
- fillers.
- Synthetic resins serve as binders. Glycerin, camphor and other substances are introduced as plasticizers, which increase the elasticity and plasticity of polymers, facilitating their processing. Fillers (powder, fibrous) give polymer products greater mechanical strength, prevent shrinkage. In addition, pigments, stabilizers, hardening accelerators, and other substances are introduced into the composition.
- In the manufacture of polymer building materials, products and structures, polyethylene (films, pipes), polystyrene (plates, varnishes), PVC (linoleum), polymethylmethacrylate (organic glass) are most used.
- Due to its good mechanical properties, elasticity, electrical insulating qualities, and the ability to take any shape during processing, polymer materials have found wide application in all areas of construction and in our daily life.



Plastic Panels - PVC panels

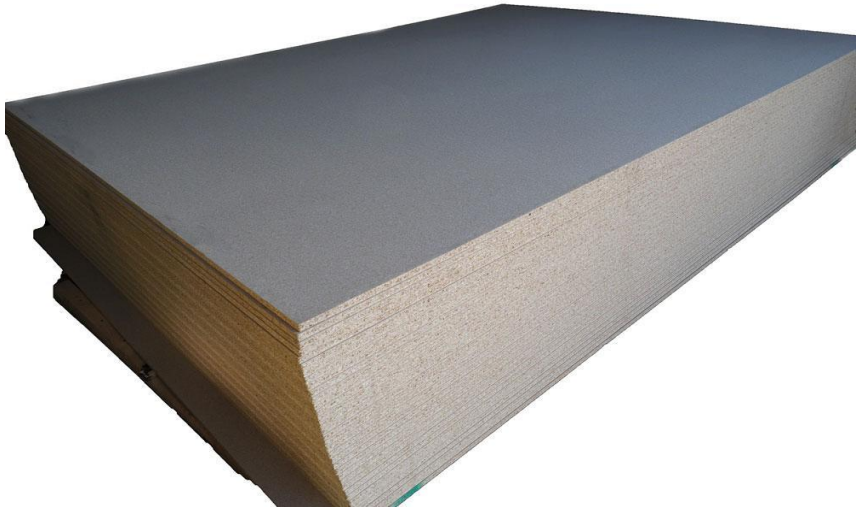
Polymer pipes

Polymer mastics and concretes

Wood construction materials and products

- Due to its good construction properties, wood has long been widely used in construction. It has a small average density, sufficient strength, low thermal conductivity, great durability (with proper operation and storage), is easily processed with tools, chemically resistant. However, along with great advantages, wood also has disadvantages: heterogeneity of structure; the ability to absorb and give off moisture, while changing its size, shape and strength; quickly collapses from rotting, easily ignites. The structure of the trunk: core, core, sapwood, cambium, inner bark (bast), outer bark.
- By breed, trees are divided into coniferous and deciduous. The quality of wood largely depends on the presence of defects in it, which include svilevatost, oblique, knotty, cracks, insect damage, rot. Coniferous — larch, pine, spruce, cedar, fir. Deciduous - oak, birch, linden, aspen.
- The construction properties of wood vary widely, depending on its age, growth conditions, wood species, humidity. In a freshly cut tree, moisture is 35-60%, and its content depends on the time of cutting and the type of wood. The lowest moisture content in the tree in winter, the highest in spring. The highest humidity is characteristic of coniferous species (50-60%), the lowest - hard deciduous species (35-40%). Drying from the wettest state to the saturation point of the fibers (up to 35% humidity), the wood does not change its size, with further drying, its linear dimensions decrease. On average, shrinkage along the fibers is 0.1%, and across - 3-6%. As a result of volumetric shrinkage, cracks form at the junctions of wooden elements, the wood cracks. For wooden structures, wood of the humidity at which it will work in the structure should be used.

- Materials and wood products
- Roundwood: logs — long sections of the trunk of a tree, cleared of branches; roundwood (podtovarnik) — logs 3-9 m long; ridges - short sections of the trunk of a tree (1.3—2.6 m long); logs for piles of hydraulic structures and bridges - sections of the trunk of a tree 6.5—8.5 m long. The humidity of the roundwood used for load-bearing structures should be no more than 25%.
- Building materials made of wood are divided into lumber and slab materials.
- Lumber is obtained by sawing roundwood.
- The plates are longitudinally sawn into two symmetrical parts of the log.
- Timber — has a thickness and width of more than 100 mm (two-channel, three-rolled and four-rolled).
- A bar is a sawn timber up to 100 mm thick and no more than double the width.
- A humpback is a sawn-off outer part of a log, one side of which is not processed.
- Board - lumber up to 100 mm thick and more than double the width of the thickness. It is considered the main type of lumber.
- A high-tech type of lumber is wall and window glued beams, as well as bent-glued load-bearing structures and floor beams. They are made by gluing boards, bars, plywood with waterproof adhesives (waterproof glue FBA, FOK).
- Joinery is made from lumber. Planed long products are mouldings (lining, floorboard, baseboard, rail), platbands (window and door openings), handrails for railings, stairs, window sills, windows and doors. Joinery is made in specialized factories or workshops from coniferous and hardwood. The service life and cost of the finished product depend on the type of wood.
- Among the slab building materials made of wood are: plywood, wood-fiber boards, chipboard, cement chipboard, oriented chipboard.
- Plywood is made of veneer (thin shavings) of birch, pine, oak, linden and other species by gluing its sheets together. Veneer is obtained by continuous removal of chips along the entire length of a log steamed in boiling water (1.5 m long) on a special machine.



Chipboard

Board

Plywood

Balk

Metals and metal products

- Various materials in the form of rolled metal and metal products are widely used in water management construction. Rolled metal is used in the construction of pumping stations, industrial buildings, the manufacture of metal gates of various types. Metals used in construction are divided into two groups: ferrous (iron and alloys) and non-ferrous. Depending on the carbon content, ferrous metals are divided into cast iron and steel.
- Cast iron is an iron-carbon alloy with a carbon content from 2% to 6.67%. Depending on the nature of the metal base, it is divided into four groups: gray, white, high-strength and malleable.
- Grey cast iron - contains 2.4-3.8% carbon. It lends itself well to processing, has increased fragility. It is used for casting products that are not exposed to shock.
- White cast iron - contains 2.8-3.6% carbon, has a high hardness, but it is brittle, not amenable to processing, has limited use.
- High-strength cast iron is obtained by adding 0.03-0.04% magnesium to liquid cast iron. It has the same chemical composition as gray cast iron. It has the highest strength properties. It is used for casting pump housings, valves.
- Ductile iron is produced by prolonged heating at high temperatures of castings made of white cast iron. It contains 2.5-3.0% carbon. It is used for the manufacture of thin-walled parts (nuts, staples, etc.). Cast-iron plates are used in water management construction — for lining the surfaces of hydraulic structures that are subject to abrasion by deposits, cast-iron water valves, pipes.
- Steel - is obtained as a result of processing of white cast iron in open-hearth furnaces. With an increase in the carbon content of steels, their hardness and brittleness increase, while at the same time their ductility and toughness decrease.
- The mechanical and physical properties of steels are significantly improved when alloying elements (nickel, chromium, tungsten) are added to them. Depending on the content of alloying components, steels are divided into four groups: carbon (there are no alloying elements), low—alloyed (up to 2.5% of alloying components), medium-alloyed (2.5-10% of alloying components), high-alloyed (more than 10% of alloying components).
- Carbon steels, depending on the carbon content, are divided into low—carbon (carbons up to 0.15%), medium—carbon (0.25-0.6%) and high-carbon (0.6-2.0%).
- Non-ferrous metals and alloys include aluminum, copper and their alloys (with zinc, tin, lead, magnesium), zinc, lead.
- In construction, light alloys are used - based on aluminum or magnesium, and heavy alloys - based on copper, tin, zinc, lead.

Cast iron

Zinc

Conclusion

- The main purpose of the presentation was the study of basic building materials, consideration of their basic properties. Materials such as wood, steel, natural stone and so on were considered. As a conclusion, we can say that the main purpose of the presentation was achieved and fully reasonably presented.