TYPES AND CHARACTERISTICS OF CERAMIC AND CERAMIC MATERIALS

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Abstract : *In today's construction, ceramic materials and products are used for building walls and covering building roofs, covering floors, walls and facades, filling furnaces and smoke pipes, building sewage and drainage pipes, and other purposes. The material from which ceramic products are made is the construction of ceramic products in the technology of ceramic production . according to*

Key words: *ceramic materials, brick, ceramic stones, brick blocks and panels, brick, tiles, pipes, expanded clay, agloporite, granite, syenite, gneiss, granite, ceramic bricks and stones, facade tiles, ceramic as a carpet, glazed tiles.*

And burning are called " *ceramic materials" .* originated in ancient times. A lot then cherepitsa, coating plates and brick like ceramic construction materials _ prepare sh let 's start

Currently under construction ceramic materials and from items walls to build and building the roofs cover , floor, wall and facades cover , furnace and smoke pipes dial , white o and and drainage pipes _ to build and another goals for is used . Ceramic items The material is ceramic in production technology " *tile* " that is called It's a collision ceramic items of the earthenware structure , constructive descriptions , surface status and h . according to is different .

On constructive characteristics and use Ceramic materials and products are divided into the following groups: for walls (bricks, ceramic stones, brick blocks and panels); roofs for (inside hollow stones, beams made of ceramic stones, roof and cladding panels); for covering the facade of buildings (ceramic bricks and stones, facade tiles, ceramic tiles as a carpet, etc.); for covering inside buildings (glazed tiles and fashion details, floor tiles); for the roof designed (stamped wedge and strip clay tile, flat and wavy strip, etc.); sewage and drainage pipes, sanitary ware (bowl, bathtub, toilet bowl, sink, etc.); acid resistant products (bricks, tiles, pipes); road materials (brick and stones); from the heat protector _ materials (porous inside empty bricks

and stones , clay with perlite and others); light concretes for fill with fine particles (ceramsite , agloporite) ; fireproof items (brick and shapely items).

Sopolak's to the structure according to ceramics are porous and dense can be divided into different types . Porous _ of materials made tile when broken dim looks like water easy soaked takes more than 5% porosity . Porous _ ceramic items including brick , inside hole stones , tiles and others enters _ White or uniformly colored dense materials, when fractured, appear shiny shell-like, have a porosity of no more than 5%, and are impermeable to liquids and gases. Among dense ceramic products, we can say floor tiles, acid-resistant bricks, etc.

Ceramics can be glazed or unglazed. Glaze (paint) is a vitreous coating thoroughly impregnated by firing. It makes things resistant to external influences, waterproof and beautiful.

Composition and properties of clay. Clay, which is very common in nature, is the main raw material for the production of ceramic materials and products. When clay is mixed with water, it becomes an easily moldable plastic clay. Then it is molded and burned (baked) at a high temperature, and various building materials and architectural parts are made.

In order to improve the technological properties of clay, as well as to give certain physical and mechanical properties to the prepared products, degreasing, burning and plasticizing additives are added to its composition.

Clay is a product of mechanical erosion and chemical decomposition of some igneous and metamorphic rocks containing feldspar (granite, syenite, gneiss, etc.). Kaolinite mineral $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$ was formed as a result of the decomposition of feldspar . But rocks contain other minerals (quartz, mica, etc.) besides feldspar, so when they are eroded, a complex mixture of particles of clay, quartz, mica and other undissolved minerals is formed.

Clay can contain feldspar, unbroken grains of limestone, as well as iron, organic and other substances. Large grains of limestone in clay are harmful impurities, because during the firing process they turn into lime, and then the lime dries up in the air and expands and absorbs the pottery.

The most important properties of clay that are taken into account in the production of ceramic materials are its plasticity, shrinkage in air and fire, fire resistance, color of clay pottery, etc.

The force required to separate the clay particles indicates its *cohesiveness* . Clays with a large amount of clay fractions have a high binding capacity. The binding property of clay is expressed by the fact that clay can bind particles of non-plastic materials (sand, fireclay, etc.) and form a sufficiently strong raw material when it dries.

Shrinkage of clays in air during drying at $110\ ^0$ C is expressed as a percentage of the linear dimensions of the freshly molded sample. High plastic clays in the air linear reduction is more than 10% , on average in plasticity clay 6-10 % and that of low plastic clay is less than 6% will be

Clay mining. Clay for the production of ceramic materials and products is usually mined from open pits located directly near the enterprise with the help of excavators and other machines and mechanisms. The clay body is transported to the plant by dump trucks, railways, dump trucks, belt conveyors, cable cars and other types of transport.

Preparation and molding of raw material mass. The clay extracted from the mine and transported to the enterprise in its natural state is usually unsuitable for molding objects, and it is necessary to change its natural structure by removing harmful impurities, grinding large impurities, mixing additives into the clay, and also moistening it to form a convenient moldable mass.

Drying items. To reduce the moisture content of molded products, it is necessary to dry them, for example, raw bricks are dried to 8-10% moisture content. Due to drying, the strength of raw materials increases, cracks and changes in shape are prevented during cooking. Ceramics are dried in natural and artificial ways.

Natural drying in drying sheds does not require fuel consumption, but takes a long time (10-15 days) and depends on air temperature and humidity. In addition, large rooms are required for natural drying.

Currently, in large factories, raw materials are usually artificially dried in intermittent chamber dryers and continuous tunnel dryers.

The drying method is selected depending on the type of product. Dryers use flue gases from cooking furnaces, as well as gases produced in special furnaces. The drying time for raw materials is from 1 to 3 days, and thin items can be dried in a few hours.

Cooking items. The crucial step in the technological process of the production of ceramic products is the firing of these products. The cooking process can be conventionally divided into three stages: heating the raw materials, cooking and cooling. When heating the raw material, the temperature gradually rises to 100-120 ^{0} C, during which free water is removed from it. After that, the temperature rises to 500-750 ^{0} C, organic compounds in the clay mineral and other compounds of the raw material mixture burn out, and chemically bound water comes out.

Ring-shaped in humdons basically brick and cherepitsa is cooked . Cooking temperature is 900-1100 ^{0} C. _ Whole in Humdon cooking the process lasts 3-4 days is enough

Ceramic materials, such as glazed ceramic tiles, are fired twice. In the first stage of baking, tiles placed in a special mold are baked in tunnel ovens at a temperature of 1240÷1250 ^{0} C. Then, after cooling, it is divided into varieties, glazed, placed in a mold and baked a second time in another tunnel furnace at a temperature of 1140 ^{0} C.

Quick-liquefying clay, quartz sand, feldspar, lead, zinc oxides are used for glaze production. Colored glaze contains oxides or metal salts that produce color. A mixture of raw materials in the form of a finely saturated aqueous suspension of glaze is applied in a thin layer to the surface of the tiles. During cooking, the constituent parts of the glaze liquefy and form a glassy thin layer on the surface of the object. This layer

also ensures waterproofing of the tiles with its excellent decorativeness. Sewerage pipes, facing bricks and tiles covering building facades are also glazed. Such items are glazed after drying and fired once.

The density of the brick in the dry state is 1600-1900 kg/m ^{3}, and the thermal conductivity ·varies around 0.71-0.82 W/(m ^{0} C). These properties of brick depend on the methods of its preparation. The brick made by wet and dry method is very dense, therefore, it conducts a lot of heat.

According to compressive and bending strength, bricks are divided into grades: 75, 100, 125, 150, 175, 200 and 300 (Table 1.1).

Bricks _ strength

Table 1.1

Bricks _ _ brand	Bricks _ to squeeze млиги мустахка , MPa	Durability limit , MPa		
		plastic method _ mold - gan full brick -s	semi-dry molded solid and hollow bricks	take it lashti - rila bricks _
300	30	4.4	3.4	2.9
250	25	3.9	2.9	2.5
200	20	3.4	2.5	2.3
175	17.5	3.1	2.3	2.1
150	15	2.8	2.1	1.8
125	12.5	2.5	1.9	1.6
100	10	2.2	1.6	1.4
75	7.5	1.8	1.4	1.2

The water absorption of the brick dried to constant mass should be at least 8%. If the water absorption is less than this, the brick will conduct heat a lot, which is not desirable. Brick saturated with water should not have visible defects in frost resistance (cracking, crushing, etc.), it should be able to withstand repeated 15-stage freezing at a temperature of -15 ^{0} C and below, and then thawing in water at 15 ±5 ^{0} C.

Ceramic bricks are used for interior and exterior walls, domes and other parts of buildings. In addition, brick panels are made from it.

The wall will consist of effective earthen materials - hollow bricks and stones (Fig. 1.2). They have the appearance of a parallelepiped with flat right-angled edges. Cavities in bricks and stones can be perpendicular or parallel to the surface, and both sides or one side of the cavity can be open.

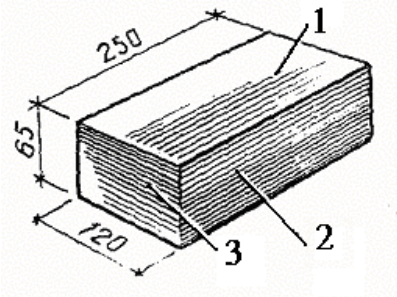
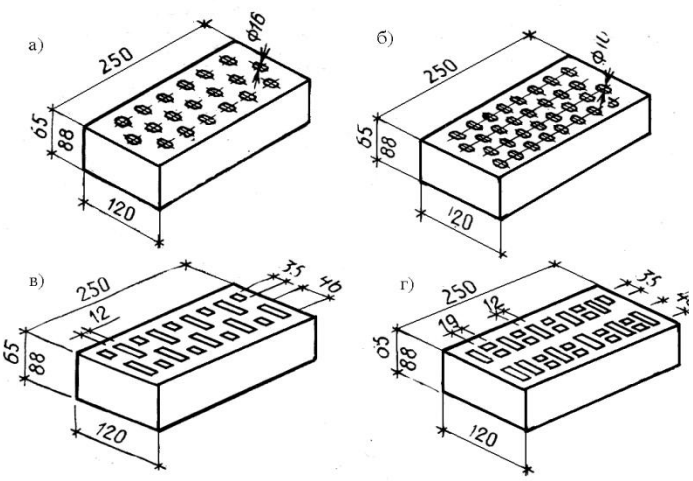


Figure 1.1 . _ Overall ceramic brick . 1st seat; 2-lojok (longitudinal side surface); 3rd cross (transverse side surface)



1.2 - picture . a (19) , b (32) , v (13) and g (28) ceramic with pits bricks . _

The diameter of open cylindrical holes should be 16 ммup to , and the width of slotted holes 12 ммshould be up to . The thickness of external walls made of bricks and stones should be at least 250 mm, and the water absorption of porous ceramics should be at least 6%. According to frost resistance, bricks are divided into F 15, 25, 35 and 50 brands.

Brick wall panels are industrial products of a certain size, which are individually cemented together with brick or ceramic stone and cement-sand mixture. Depending on the task, there will be panels adapted for external and internal walls, as well as special panels (footboard, ventilator-tsiyabop, etc.).

The brick panels of the external walls are made in one, two and three layers, with a thickness of 140-280 mm. One-layer panels made of large stones with large holes and slots are promising, the panels of the internal walls of the building are made of single-layer bricks and reinforced with metal pins. The total thickness of the panels 140 мм, including the thickness of the brick (120 мм) and the mixture layer on both sides (10 ммfrom).

One layer of two-layer panels is made of 1/2 brick (thickness 120mm) and the second layer is made of heat-retaining material (thickness up to 120mm).

In three-layer panels, the inner and outer layers are made of brick, the thickness of each is 65 mm, the thickness of the middle layer is 110...130 mm, and it is made of heat-preserving material.

In order to increase the strength of the panels and ensure their earthquake resistance, their interior and the perimeter of the window frames are reinforced with steel reinforcing bars. When choosing panels, cement mixtures of the brand no less than 75 are used. Carpet-mosaic tiles are used in most places to finish the surface of the panels.

Brick panels have a number of advantages compared to bricks or ceramic stones, including the saving of material consumption, the preparation of large-sized panels in enterprise conditions, their restoration on the construction site with the help of modern machinery, and also the cost of construction is reduced by 10-15%.

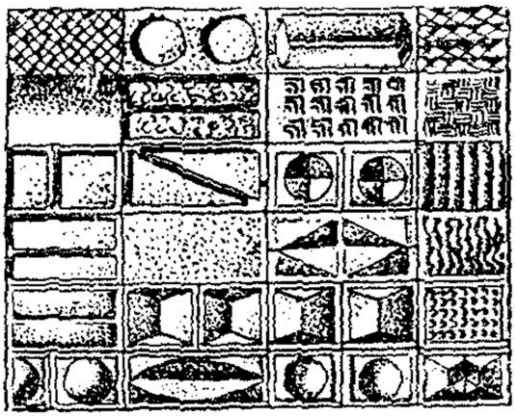
Coating ceramic materials . The front surface of ceramic materials used for covering facade surfaces, interior walls and floors of buildings can be painted in different colors, natural, smooth, embossed, glazed. Surfaces covered with ceramic materials are distinguished by their decorative properties, they are thorough and relatively economical. Their back side is embossed for good adhesion with the mixture.

Decorative bricks and stones, small-sized facade tiles and carpet imitation ceramic materials are mainly used to cover the facades of buildings.

Decorative bricks and stones will be of the correct shape, edge and uniform color. The right side can be smooth, embossed and textured. The color of decorative bricks and stones ranges from dark red to whitish yellow. Such materials are made of high-quality and easy-to-melt flowable clays, which are currently the most widely used. In addition, "angobli" and "glazed" bricks are also used as finishing materials. Bricks and stones are made solid and hollow. The technology of preparation is similar to the preparation of clay bricks in semi-dry or plastic methods.

Decorative bricks and stones are "ordinary" and "profiled" depending on the shape and place of use. brick and split into stones. Normal ones are used in flat parts of walls, and profiled ones are used in eaves, eaves, belts, etc.

Decorative bricks and stones are used for facing the outer surfaces of facades and the interior walls of entrance halls, stairwells, passages and other rooms.



3.3-расм. Меъморий - бадиий фасадбоп сопол плиталар.

Facade ceramic tiles are made by semi-dry densification method. Facade tiles main size 250x1 40x10 , footbed tiles 150x75x7 , _ "kabanchik " types 125x60x7 mm . From this except for "rhomb", " petal ", " diagonal ", " pyramidal ", " wave ", "sphere" types facade architectural - artistic tiles is released (Figure 3.3) .

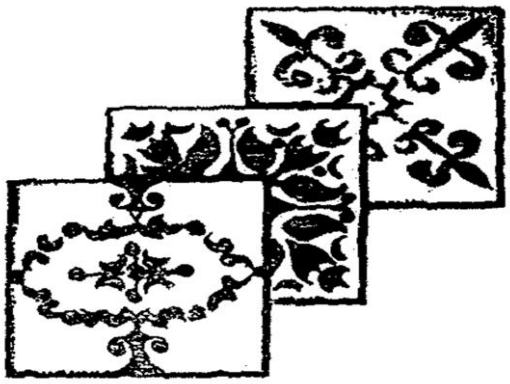
The surface of facade tiles can be smooth, unglazed and glazed, painted in different colors. Indentations are carved on the back side for better adhesion with the cement mixture. Water absorption of facade tiles is 2-8%, frost resistance is at least 8 levels. Facade tiles are used to cover the external and internal surfaces of walls, to finish individual architectural elements, as well as in entrance halls and staircases of residential and public buildings.

A copy of the carpet tile different colors , glazed _ and unglazed small sized from tiles consists of One or one how many colorful tiles in the form of a " carpet ". is typed ,

in which the right surface with kraft on paper is attached . No match with good adhesion for of tiles back the side is tense . A copy of the carpet tiler of tiles dimensions 48x48 and 22x22 mm, thickness 4 мм from them _ prepared carpets size and equal to 724x464 and 672x424 mm will be of tiles water pants the level does not exceed 12% , to the cold endurance while at least 25 stages to be need _

Current at the time carpet copy - koshinkor tiles external the wall panels , transport and sports facilities , trade and another enterprise buildings the walls to cover for wide is used .

Internal to the walls covered materials . Stays place , community and industry of buildings some sanitation and hygiene in the rooms artistic landscape giving , as well as devices - wet and flame from the effect to protect for to the walls ceramic tiles is covered (Figure 3.4). To the walls to cover for glazed tiling _ as well as a carpet copyist tiles is used .



1.4-расм. Кўп рангли қилиб сирланган сопол плиткалар

Internal to the walls covered tiles different in the form is issued . Square tiles size 150x150 mm, correct rectangular tiles are 150x100 and 150x75 mm , thickness is equal to 46 мм will be

Carpet copy - mosaic casting 20 types *of tiles* dimensions work are issued : edges 25, 35, 50, 75, 100 and 125 мм square and 25x100 mm _ angular tiles and h . The quality of Q 2,5 мм and front surface different colorful will be (Figure 3.5) .

From tiles prepared composition carpets panels surfaces to cover and view places finishing for is used .

Polbop ceramic tiles . Such tiles are made from a clay mass with or without additives and coloring compounds, compacted and then baked until solidified.

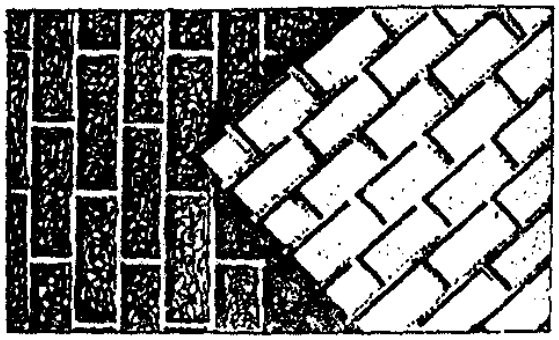


Figure 1.5 . _ Carpet copier down - ma ceramic tiles

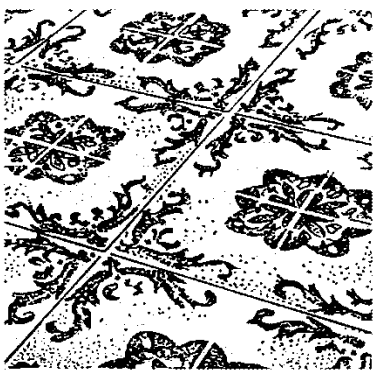


Figure 1.6 . _ Floors for intended _ _ big sized ceramic tiles

Ceramic from tiles make it floors water does not pass , to friction resistant , acid and to the effect of alkali steady will be Ceramic from tiles make it of floors

disadvantage : heat to himself a lot takes , beats low resistance and much is hard working . Ceramic tiles public of buildings access in the halls of enterprises work release in their rooms and another in places is used .

Last in years ceramic of tiles a new type is a picture seriographic method hand plan _ big sized tiles (200x200x11 mm) public floor material in buildings as wide is being used

Sides 23 and 48 мм is a square and right of angular mosaic tiles thickness 6 and 8 мм will be The color of the tiles is white , yellow , red , gray and another in appearance to be can , water pants sensitivity 4% up to At the enterprise mosaic tiles in the water soluble glues with kraft square li of paper i known as surfaces to the picture according to distributed is attached .

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