Co2olBricks

Reliable construction products and articles used to renew historical buildings

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CERAMICS – roasted products from clay or other mineral materials.

The main raw material for ceramic products:

- clay (kaolin),
- pure oxides and carbides,
- additives (attenuating materials) – sand.

Building ceramics is classified into ceramics for walls (common clay bricks, hollow and light bricks, hollow ceramic blocks), roofing ceramics (tiles), facing ceramics (facing bricks, ceramic facing plates, small-dimension tiles, Dutch tiles), flooring and paving ceramics (flooring tiles, clinker). This type of ceramics is usually formed by a plastic and dry method (small-dimension tiles – by casting).

Ceramic bricks – the oldest artificial building material already used in Neolithic age. The oldest brickwork - the Church of the Tithes in Kiev built in 989-996. Till the 19th century the bricks were produced in a primitively and seasonally. In the middle of the 19th century a circular kiln (F. Hofman 1858, Germany) and a moulding belt-press were invented. It was started to automate the production of bricks. In those days the clay preparation machines were also started to be manufactured.

In Lithuania bricks were started to be produced in about the 13th century. The early Lithuanian bricks were 230-310 mm long, 140-200 mm wide and 60-90 mm thick. To make a better adhesion with mortar one side of bricks was provided with 3-6 grooves. Later, for more important buildings the bricks of various shapes and dimensions were produced, for example, for St. Anne‘s Church in Vilnius (the 16th century) 33 kinds of bricks were used. Permanent brickyards used to operate only in large cities. In 1858, Lithuania had 65 brickyards.

Name		Width	Lenght	Height	Quantity in the package
	KS 17,5+D	175	387	188	70
	KS 17,5+D2	175	387	238	70
	KS 20+D	200	285	188	80
	KS 20+D2	200	285	238	80
	KS 20-39+D2	200	387	238	72
	KS 25+D	250	247	188	75
	KS 25+D2	250	247	238	75

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A BRICK is rectangular parallelepiped product of standard dimensions intended for masonry construction. The most widely spread bricks are 250 x 120 x 65 and 250 x 120 x 88 mm in diameter. Commonly, bricks are ceramic (common, facing, special), silicate and from other materials. According to their compressive strength (kg/cm^2) bricks are divided into 7 classes, according to their frost-resistance (freezing-thawing cycles) - into 4 classes.

Ceramic bricks are the oldest artificial construction material. In Lithuania bricks were started to be produced in about the 19th century. The early Lithuanian bricks were 230-310 mm long, 140-200 mm wide and 60-90 mm thick. To ensure a better bonding with mortar one end of the brick was provided with 3-6 grooves.

For example, for the construction of St. Anne‘s Church in Vilnius (the 16th century) 33 bricks of different shape were used.

Until the beginning of the 19th century the bricks were usually produced in seasonal brickyards. Only at the end of the 19th century more brickyards were built.

The brickyards were erected in those places where the suitable clay was found, and its suitability was assessed visually. In this period the bricks of different shape and form were produced.

For the facades of the House of Perkūnas in Kaunas the bricks of several or even several tens of profiles were used. The builders of Gothic churches and Kaunas Forts used to produce ceramic bricks close to the building site. Even today those bricks cause a surprise by their quality, abundance of shapes and structural possibilities. That was a golden age of red bricks.

In 1990, in Lithuania there were 18 ceramic factories. In 2001 a number of ceramic factories, operating in Lithuania, decreased since the work of almost all of them became seasonal.

At present Lithuania has 6 operating enterprises producing building ceramics, those are: *Rokų keramika UAB, Palemono keramika UAB, Tauragės keramika UAB, Švenčionėlių keramika UAB, Jašiūnių keramika UAB, Dvarčionių keramika UAB*. The work of the first five formerly large industrial enterprises is seasonal - products are manufactured during a warm period of the year. The company *Dvarčionių keramika UAB* works all year round. Each ceramic production enterprise produces a certain type of building ceramics.

The companies *Rokų keramika UAB, Tauragės keramika UAB* and *Švenčionėlių keramika UAB* participate in the market being joined into corporation and offering their users ceramic building bricks, wall blocks, partition and floor blocks. The company *Palemono keramika UAB* produces and supplies to the market ceramic tiles and bricks.

The whole production manufactured in Lithuania is a porous ceramics from easily fusible clays. The assortment of ceramic products, manufactured in the recent years in Lithuania, is essentially changing: the production of large-dimension blocks, used for walls, partitions, floors, ventilation channels and chimneys, has been increasing. The production of common and solid bricks has been decreasing. Technical development has been mainly directed to the improvement of heat insulation properties of ceramic products.

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Ceramic bricks, produced by the industry of Lithuania, could be used for exterior or interior masonry as they are either solid or hollow. Ceramic bricks are usually produced of the following dimensions: facing bricks of 250 x 120 x 65 mm and thickened bricks of 250 x 120 x 88 mm. Brick density 1.5-2.4 g/cm^3. Compressive strength 2.5-30 MPa, bending strength of solid bricks 0.8-4.4 MPa, of hollow bricks 0.5-2.9 MPa, water absorption 6-21 %, frost resistance > 50 cycles.

Those ceramic bricks should be used in the environment where they are not affected by the aggressive and on-the-average aggressive service conditions.

All the present ceramic factories in Lithuania were using and are still using local easily fusible clays. Their main products are bricks, various blocks, tiles, drainage pipes. Earlier the facing bricks were produced also by the factories in Tauragė and Daugeliai, however, their frost resistance could be higher.

The most widely spread in Lithuania is the easily fusible clay of hydromica group.

Based on the above discussed properties of clay from all main local deposits, it is clear that in Lithuania the clay from the former Panevėžiukas deposit was suitable for the production of clinker bricks. This deposit was intensively used already in the begging of the 20th century, and the amount of raw clay in this deposit was not large, therefore, at present the site has been already exhausted.

In recent years a large attention is paid to the increase in thermal resistance of the partitions of buildings. However, a little attention is given to the enlargement of durability of facades of buildings being constructed or undergoing renovation.

In the last decades the production of ceramic masonry products in Lithuania suffered a noticeable decrease due to a crisis in this branch of industry, where from 1991 to 1997 the decrease of productive capacity made 72 %, and at present almost all ceramic factories in Lithuania have to withstand a strong competitive fight with the foreign manufacturers. The decrease in the amount of production in 1991-1997 was caused by a sudden rise of energy prices and a physical and moral deterioration of the equipment of these industrial enterprises. After the year 1997 the import of various facing products has increased. Since 1995 Lithuania imports more construction materials than exports.

In order to restructure and reconstruct the remaining ceramic factories it is necessary not only to reduce energy input by modernizing the burning and drying facilities but also to start producing ceramic products able to compete with the imported foreign production, also to start using secondary resources of the country.

For the facing of buildings the low-porosity ceramic bricks should be produced which could be used in the strongly and on-the-average destructive environment. The currently valid standards describe the strongly and on-the-average destructive environment as follows: the environment in which the existing building constructions and their parts are affected by a large amount of water and the change in freezing and thawing cycle.

It is very important that this frost resistant production is produced from local raw materials and, if allowed by production technology, using secondary resources of the industrial enterprises of Lithuania.

In Lithuania, same as in Latvia, there are no clay deposits the raw material of which would be fully suitable for the production of low-porosity facing bricks. A ceramic body from such clays is roasted without deformations (without distortions). Its roasting interval is rather large and the ceramic products have a large mechanical strength and are resistant to chemical and other impacts. A ceramic body from local easily fusible clays is roasted in a narrow temperature interval, a compressive strength of products is lower than that of a ceramic body from hard-melting clays. This is a very important problem not only mechanically but also from a durability point of view.

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The current building ceramics, produced in Lithuania, do not meet the requirements to the durability of building facades with accordance to frost resistance. The facing ceramic products under the prevailing destructive climate of Lithuania must be especially resistant to the change in freezing and thawing in humid environment, frequently polluted with exhausted gases or containing the increased amount of salts. This problem could be solved by using for building facades the building ceramics of low porosity.

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For the production of low-porosity building ceramics the usual raw materials of building ceramics industry could be used with certain additives. However, it is necessary for each production composition to attentively select technological parameters for the preparation and forming of raw materials, paying a special attention to the burning processes of products.

Having analyzed and investigated local Lithuanian raw materials and technogenic waste additives it was determined that low-porosity building ceramics can be produced from the clay of Ukmergė and Rokai deposits using the certain technogenic waste additives.

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Based on investigation results when producing low-porosity building ceramics the local raw materials can be used such as clays and technogenic raw materials – accelerants.

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Thank you for your attention!