RESEARCH OF THE TECHNOLOGY FOR PRODUCING LEGO BRICKS OF CONSTRUCTIVE STRENGTH USING THE PRESS METHOD FROM LOCAL WASTE STONES.

Askarov Khasanjon Abdukakharovich
Associate Professor, Department of Construction Engineering, Andijan State Technical Institute
Email: asqar.xasanboy7413@gmail.com

Abstract: In this article, constructive to its strength, has been based on Lego bricks, service equipment, and usage processes. Analysis was carried out independently with special features, and asbestos cement and microsilica waste were used instead of stone.

Keywords: Microsilica, _ stone, asbestos cement, cement, earthquake, wall, construction materials, earth, lego brick, construction, statics, dynamics, loads brick wall, stone wall, wood the wall

Аннотация: В этой статье, конструктивной и прочностной, за основу были взяты кирпичи Lego, сервисное оборудование и процессы использования. Анализ был проведен независимо, с учетом особенностей, и вместо камня были использованы отходы асбестоцемента и микрокремнезема.

Ключевые слова: Микрокремнезем, _ камень, асбестоцемент, цемент, землетрясение, стена, строительные материалы, земля, lego brick, строительство, статика, динамика, нагрузки, кирпичная стена, каменная стена, деревянная стена

Annotatsiya: ushbu maqolada, o'z kuchiga ko'ra konstruktiv, Lego g'ishtlari, xizmat ko'rsatish uskunalari va foydalanish jarayonlariga asoslangan. Tahlil maxsus xususiyatlar bilan mustaqil ravishda amalga oshirildi va tosh o'rniga asbest tsement va mikrosilika chiqindilari ishlatilgan.

Kalit so'zlar: mikrosilika, _ tosh, asbest tsement, tsement, zilzila, devor, qurilish materiallari, tuproq, lego g'isht, qurilish, statika, dinamika, yuklar g'isht devori, tosh devor, yog'och devor

Introduction

In modern housing construction, both in our republic and abroad, the demand for low-rise buildings designed for one or two families is increasing, which requires a new approach to the issue of selecting effective materials for their construction.

Methods

Among the existing technologies for the construction of low-rise buildings, buildings made of wood, brick, blocks, monolithic and lightweight, porous and other concrete panels, as well as ceramic, stand out. Currently, the use of wood as a wall material in the construction structure of Uzbekistan is limited. From the point

ISSN 3030-3907

of view of technical and economic efficiency in the construction of residential buildings, it is difficult to determine the priority of using Portland cement concrete or brick, since each of them has its advantages and disadvantages. For 1 m of the exterior wall of a residential building, almost the same energy is consumed for both materials (30...40 kgf.w./m^2 for bricks and 32...37 kgf.w./m^2 for expanded clay concrete walls). Residential buildings made of lightweight concrete, both monolithic and large wall blocks, are built quickly and require less labor compared to brick, but brick walls have undeniable advantages in terms of aesthetic and sanitary requirements for the dwelling. However, the use of clay soil, the main raw material used in their production, leads to a reduction in the area of fertile land used for growing agricultural crops. Therefore, the production of wall materials based on local raw materials and industrial waste, which are not inferior to ceramic bricks in terms of strength and construction and technical characteristics, is one of the urgent problems that need to be solved today.

New technologies that have entered the production of building materials do not bypass the production of bricks. High requirements for quality, appearance, and affordability have become prerequisites for the creation of a new type of wall material. The famous children's designer inspired Lego construction technologists to create a material with unique properties called Lego bricks. The history of creating such bricks is very long. In the first half of the 20th century, the Danish builder, manager of a team of carpenters, Ole Kirk Kristiansen, put forward the idea of brick with masonry elements without mortar [1,2]. These were small cylindrical protrusions located on the upper surface of the brick.



Figure 1.1. Lego bricks

The new invention was highly appreciated by Danish engineers and architects. In 1949, this type of brick was first used in building construction in Denmark. In the project documentation, the new bricklaying technique is described as "automatic bricklaying." And in 1951, the word "automatic bricklaying" was changed and finally received the name "Lego brick." Various technologies and materials are used for its production, but what unites them all is the shape of the

ISSN 3030-3907

brick obtained from the children's construction complex of the same name, based on the method of joining the bricks.

Subsequently, from the 70s, pressed brick became widespread, first in Africa, then in Canada, the Middle East, and India [3,4]. However, currently in the CIS countries, this technology and materials based on it are not used for mass construction, since the production of these materials on an industrial scale has not been established.

The equipment for the Lego brick production technology does not differ from the equipment for the technology of ordinary fine-grained heavy concrete products - a crushing and sorting device, a line for preparing the pressed mixture, hydraulic presses, and loaders.

The production process is based on the method of hyperpressure. The hydraulic press creates a compressive force in the molded mixture at a pressure of at least 30 tons. In this case, adhesion of the filler with a small amount of cement and water (cold welding) occurs [5].

The composition of the raw material is very simple: cement, water, coloring pigment, rock filler (turned into powder).

Widely used materials such as soil, sand, dolomite, travertine, and various industrial waste are used as fillers for the production of Lego bricks. As a result of experiments, finely ground limestone rocks were recognized as the best material; the finer they are, the higher the mechanical properties of the brick. In addition to the listed ingredients, various dyes are added to the mixture to improve the structural appearance of the finished product [6].

The initial operation of brick production consists of preparing and creating a high-quality mixture. Depending on the capacity of the production line, from the front loader, conveyor, or pneumatic feeder to manual loading, all necessary components are measured in a dispenser, fed into a mixer, mixed until a uniform fine structure is formed, and fed into a molding device (matrix). These processes allow obtaining bricks that meet the standard requirements for mass, size, and density. Hydraulic presses, which allow for high compression, are mainly used in pressing [7].

Results

As mentioned above, the technology of lego brick production does not differ from the technology of small-sized concrete products (passage beams, curb stones, etc.). Therefore, the results of research conducted on concrete technologies were used to determine the optimal parameters of lego-brick production.

Maximizing the potential strength and binding properties of concrete components is one of the important tasks of modern building materials science. The issue of improving the physical and mechanical properties of concrete has been the

ISSN 3030-3907

subject of research by many domestic and foreign scientists. One of the most promising directions for increasing the strength properties of concrete is its compaction by pressing.

Analysis

In the works of Professor A.M. Sheikin [8-10], it is emphasized that the strength of concrete is determined by the strength of cement stone. The strength properties of cement stone depend on the strength of bonds in crystal hydrate complexes and the density of their arrangement in the occupied volume, the strength of contact between structural components, the number and size of pores (defects), as well as the nature and volume of the capillary-porous space. When concrete is compacted by pressing, during the formation of the coagulation structure, a portion of the unbound water is expelled, and the solid particles of the cement combine, which, in turn, contributes to an increase in density and strength [11, 12]. In addition to solving the main technological problem, the compaction of the concrete mixture contributes to a significant change in the nature of the hydration process and structure formation, which leads to an improvement in the mechanical properties of concrete.

Influence of pressing on concrete strength Ananenko A. A., Akhverdov I. N. [13], Babkov V. V. [14], Butenko S. A., Lokhovisky G. Z. [15], Murashkin G. V., Nedoseko I. V., Rakhimov R. Z., Salalkin A. V. [16] Seskin I. E [17-19], Usachev S. M. [20], Chuikin A. E. [21], Elbakidze M. G. [22].

Compaction of concrete before the start of the adhesion process contributes to the formation of its structure and properties. The results of studies conducted by A.V. Satalkin showed that earlier compaction of concrete leads to a more intensive increase in its strength.

The magnitude of the pressing pressure significantly affects the strength of the pressed concrete. Satalkin A.V., Lokhovisky G.Z., and Elbakidze M.G. note the presence of optimal pressing pressure, and at higher pressures, the strength of concrete decreases. First of all, this is due to two reasons: the separation of the coarse aggregate, which occurs as a result of the breakdown of the aggregate grains, and the appearance of elastic deformation, which occurs when the pressing pressure is reduced.

The consumption of used cement also affects the strength of pressed concrete. Akhverdov I. N. used 350 and 580 cements per 1 m^3 of concrete, conducted experimental studies on the strength of concrete samples compacted by pressing [13]. The research results showed that a slight increase in the strength of the samples with a cement consumption of 350 kg/m^3 and a pressing intensity of more than 12 MPa led to a sharp decrease in strength. Due to the low cement content, the pressing pressure is suppressed by the aggregate grains and prevents proper compaction of the cement gel without crushing them.

ISSN 3030-3907

According to Akhverdov I.N., short-term pressing leads to an increase in the volume of the sample as a result of elastic deformation and a decrease in its strength [13]. It was also observed that pressing greatly contributes to the formation of the structure (Fig. 1.1).

First of all, the change in the properties of concrete is associated with the peculiarities of the formation of the structure of cement stone. In the works of Babkov V.V. and Seskin I.E., it was established that porosity has a significant influence on the strength of cement stone [14, 24-26].

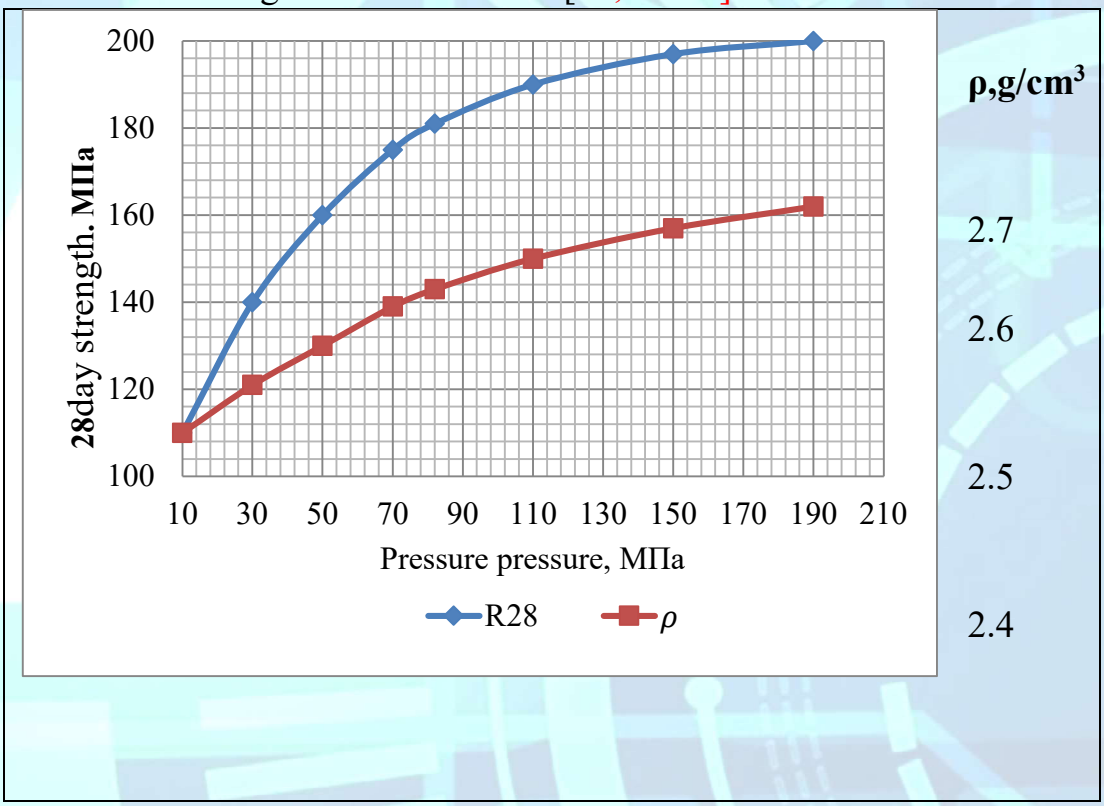


Figure 1.1. Dependence of cement stone strength (P_{28}) and density (ρ) on pressing pressure [13].

Reducing porosity leads to an increase in the strength of cement stone. Moreover, its density is closely related to porosity. It turned out that pressing increases the density of the cement stone and, accordingly, its strength. A linear relationship was found between the strength of the compacted cement stone and its total porosity [26].

In addition, at pressing intensity from 5 to 10 MPa for 15 seconds, the strength of the concrete increased by 1.3 - 1.65 times [25].

M.Sh. Salamanova's research [27] Figure 1.2 shows that pressing pressure above 30 MPa does not significantly affect the strength properties of concrete (Figure 1.2) [27]. This is primarily explained by the development of elastic deformation in high-intensity compacted concrete.

ISSN 3030-3907

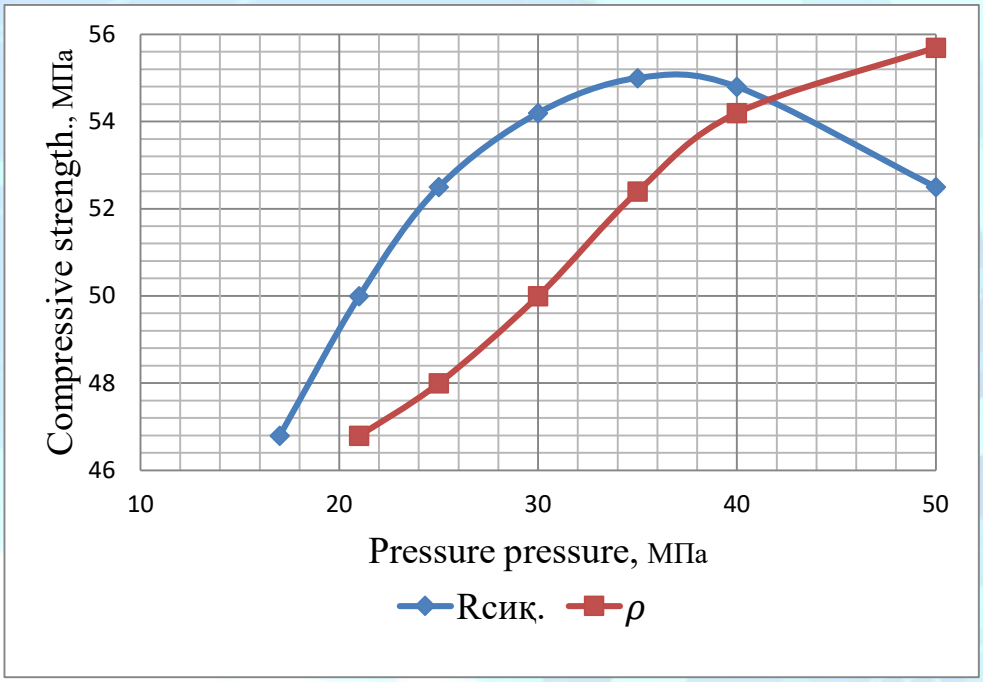


Figure 1.2. Dependence of concrete strength (P_{28}) and density (ρ) on pressing pressure [27].

Discussion

Thus, the conducted literature analysis showed that, despite the obvious advantages of pressing technology, there are also shortcomings that prevent its widespread use in product manufacturing.

LIST OF USED LITERATURE

1. Asqarov, X. A., Asqarova, M. B. Q., & Axmadaliyev, USO (2021). Bino va inshoatlarni qurishda g‘ishtlarning tahlili. Ilmiy taraqqiyot , 1 (6), 1112-1116.
2. Asqarov, X. A., Egamberdiyeva, S. A., Maxmudov, S. M. (2022 yil, noyabr). “LEGO” G 'ISHT ISHLAB CHIQARISH TEXNOLOGIYASI. 21-asrda innovatsion ta’limning o‘rni va ahamiyatiga bag‘ishlangan xalqaro konferensiyada (1-jild, №7, 102-106-betlar).
3. Asqarov, X. va Mamajonov, M. (2023). Inshoot va binolarga zilzila ta'siri yuklar tahlili. Oltin miya , 1 (6), 12-14.
4. Askarov, X. (2023). SILIKAT MATERIALLARDAN TAYORLANGAN G ‘ISHTLARDAN BINO INSHOOTLARINI QURISH TAHLILI. GOLDEN BRAIN, 1(8), 162-164.
5. Askarov, X., & Qodirova, G. (2023). ALABASTR VA GIPS QURILISHDA QO ‘LLASH XUSUSIYATLARI TAHLILI. GOLDEN BRAIN, 1(5), 55-58.
6. Mirzayev, B. O., & Askarov, X. (2023). METHODS FOR CALCULATING BRICK CONSUMPTION WHEN BUILDING WALLS FROM SILICATE AND

ISSN 3030-3907

CERAMIC BRICKS. Ethiopian International Journal of Multidisciplinary Research, 10(08), 1-14.
7. Asqarov, X., & Zokirjonov, A. (2023). MAHALLIY CHIQINDI TOSHLARDAN LEGO G'ISHT ISHLAB CHIQARISH TEXNOLOGIYASINI. BARQARORLIK VA YETAKCHI TADQIQOTLAR ONLAYN ILMIY JURNALI , 3 (10), 40-43..
8. Raximov, R. A., Asqarov, X., & Zokirjonov, A. (2023). MAHALLIY CHIQINDI TOSHLARDAN PRESS USULIDA KONSTRUKTIV MUSTAXKAMLIKKA EGA BO'LGAN G'ISHT ISHLAB CHIQARISH TEXNOLOGIYASI. ARXITEKTURA, MUHANDISLIK VA ZAMONAVIY TEXNOLOGIYALAR JURNALI , 2 (9), 11-15.
9. Asqarov, X. A., Egamberdiyeva, S. A., Maxmudov, S. M. (2022 yil, noyabr). “LEGO” G 'ISHT ISHLAB CHIQARISH TEXNOLOGIYASI. 21-asrda innovatsion ta’limning o‘rni va ahamiyatiga bag‘ishlangan xalqaro konferensiyada (1-jild, №7, 102-106-betlar).
10. Asqarov, X. va Qodirova, G. (2023). ALABASTR VA GIPS QURILISHDA QO 'LLASH XUSUSIYATLARI TAHLILI. OLTIN MIYA , 1 (5), 55-58.
11. Askarov, X. A., & Maxmudov, S. M. (2022, November). QURILISH SANOATIDA KERAMZIT BETON TO ‘SQICHLAR TAYYORLASH INNOVATSION TEXNOLOGIYASI. In INTERNATIONAL CONFERENCES (Vol. 1, No. 10, pp. 99-102).
12. X, F., Sh, R., Tashtanova, M., Yalgashev, O., & Adkhamova, G. (2019). Fosfogipsning qurilish xususiyatlari, to'g'onlarni o'rab turgan loy qoldiqlari uchun material sifatida. Fan, muhandislik va texnologiya sohasida ilg'or tadqiqotlar xalqaro jurnali , 6 (7), 10270-10277.
13. Tojiboyev, B. T., & qizi Askarova, M. B. (2023). ARCHITECTURE AND LANDSCAPE OF FERGANA CITY. GOLDEN BRAIN, 1(13), 403-408.
14. Tojimatovich, K. I., Abdukahorovich, A. H., & Behruz, K. (2024). VINEGAR ACID REGENERATION MAKING COLUMN APPARATUS PLATES MODERNIZATION. American Journal of Technology and Applied Sciences, 21, 53-55.
15. Abduqaxorovich, A. X., Tojimatovich, K. I., & Islomiddin, I. (2024). CONSTRUCTIVE ANALYSIS OF PLATE COLUMNS. American Journal of Technology and Applied Sciences, 21, 49-52.

ISSN 3030-3907