

## The House of Bauxite

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### Abstract

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Under the Removal project a demonstration for the potential of using Bauxite Residue (BR) in building products was conceived in the form of a small informational pavilion. The pavilion is located in the Aspra Spitia settlement, next to MYTILINEOS Alumina and Aluminium plant in Ag.Nikolaos Greece. Using MYTILINEOS BR, BR pavement tiles and BR geopolymerized brick slips were used respectively in the floor and the walls of the pavilion, while vitrified BR was used in used in production of high strength benches and tabletops. The goal of pavilion is to serve as an informational center, showcasing BR reuse technologies and boosting public acceptance for use of BR in commercial applications.

The pavilion is situated at the beach front of the historic modernist settlement by prominent 1960's architect and planner Constantinos A. Doxiadis, himself one of the early figures demonstrating the need and the methods towards a more sustainable turn regarding the science of Ekistics. This presented the project with an important challenge regarding the adaptation of this experimental structure in the overall urban and natural environment of Aspra Spitia. Additionally, the pavilion serves as a continuous testing ground for the functional, aesthetic and technical behaviour of BR materials used, if considering their future commercial development.

**Keywords:** Bauxite Residue, building materials, public acceptance, recycling.

### 1. Introduction

Under the Removal project [1] a demonstration for the potential of using Bauxite Residue (BR) in building products was conceived in the form of a small informational pavilion. The pavilion is located in the Aspra Spitia settlement, next to MYTILINEOS Alumina and Aluminium plant in Ag.Nikolaos Greece. The 'House of Bauxite' was studied and designed by Nikolaos Patsavos and

Alexandros Peteinarelis, architects and researchers affiliated with CRISIS Research Lab of the Department of Architecture at the University of Ioannina and the innovative architectural hub Ctrl\_Space Lab (figure 1). The pavilion is situated at the beach front of the historic modernist settlement by prominent 1960's architect and planner Constantinos A. Doxiadis, himself one of the early figures demonstrating the need and the methods towards a more sustainable turn regarding the science of Ekistics. This presented the project with an important challenge regarding the adaptation of this experimental structure in the overall urban and natural environment of Aspra Spitia.



**Figure 1. Conceptual design and 3D visualization of the pavilion.**

The materials used in the construction of the pavilion were made from bauxite residue. In the past, another bauxite residue brick demonstration house was built in Jamaica, in 1985. In that case bricks were constructed by mixing BR with 6% cement and water and hard pressing the mixture. These 'cement-stabilized red mud bricks' achieved satisfactory compressive strengths but had a high NORM count making them unsuitable for public use [2]. In the Removal project technologies novel technologies were developed to produce safer building materials that comply with all European building and environmental legislation.

#### 4. Acknowledgements

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#### 5. References

1. Removal project, <https://www.removal-project.com/> (accessed on 05/07/23)
2. Dave McLeod et al., Stabilised building material using red mud, *Proc Int Conf Bauxite Tailings*, Kingston Jamaica (1987)
3. Tobias Hertel et al., Proposal for a 100 % Use of Bauxite Residue Towards Inorganic Polymer Mortar. *J. Sustain. Metall.* 2, 394–404 (2016). <https://doi.org/10.1007/s40831-016-0080-6>.
4. Tobias Hertel et al., Correlating the amorphous phase structure of vitrified bauxite residue (red mud) to the initial reactivity in binder systems, *Cement and Concrete Composites*, Volume 127, 2022, 104410, ISSN 0958-9465, <https://doi.org/10.1016/j.cemconcomp.2022.104410>.
5. Michiel Giels et al., High performance mortars from vitrified bauxite residue; the quest for the optimal chemistry and processing conditions, *Cement and Concrete Research*, Volume 155, 2022, 106739, ISSN 0008-8846, <https://doi.org/10.1016/j.cemconres.2022.106739>.
6. Aleksandr Suss et al., Comparison of Lime and Carbon Dioxide Methods of Bauxite Residue Neutralization, *Proceedings of the 38th International ICSOBA Conference, 16 – 18 November 2020*, TRAVAUX 49, BR04, 427-439
7. Removal project, De-alkalization pilot, <https://www.removal-project.com/pilot-plants/> (accessed on 05/07/23)