Proceedings of the 8th International Conference On Civil Structural and Transportation Engineering (ICCSTE'23)
Ottawa, Canada – June 04-06, 2023
Paper No. 149
DOI: 10.11159/iccste23.149

Compressed Recycled Asphalt Blocks as an Alternative to Capillary Moisture

Hernán Darío Cañola [1]
Grupo de Investigación Ambiente, Hábitat y Sostenibilidad,
Institución Universitaria Colegio Mayor de Antioquia, Medellín, Colombia
hernan.canola@colmayor.edu.co
Andres Fernando Urrego [2]
Grupo de Investigación Ambiente, Hábitat y Sostenibilidad,
Institución Universitaria Colegio Mayor de Antioquia, Medellín, Colombia
andres.urrego@colmayor.edu.co

Extended Abstract

Currently, the use of materials has become an imminent need that seeks to generate constructive alternatives to climate change [1]–[3], however these constructive alternatives from the environmental point of view must point to the solution of other problems from the technical component; It is for this reason that the development of new materials from the use of waste with a view to generating durability alternatives, becomes an efficient proposal to minimize the negative impacts generated by the Architecture and Construction industry worldwide. The durability of buildings today has also become a topic of interest as a result of the processes of premature deterioration that civil works present regardless of their use, either at the architectural or structural level [4]–[7]; Many researchers have studied these problems [8]–[10], however, no constructive alternatives have been developed that link sustainability issues with durability issues aimed at solving construction problems such as capillary moisture; It is for this reason that in this research from aspects of sustainability and durability was developed an overlay system consisting of blocks of recycled asphalt compressed by mixing 90% asphalt waste and bituminous compounds such as cold asphalt emulsions, corresponding to 10% of the total mixture, is subjected to a pressure process of 2000 psi by means of a hydraulic equipment known as Cinva Ram [11]. As processes of characterization of the blocks were determined the following physical characteristics according to the standard UNE 83.982 [12]: Coefficient of capillary absorption less than 0.001 Kg / ($s^{1/2}$ m^2), Resistance to water penetration 133.33 (106 s / m^2) and effective porosity of 0.0%, which allowed to establish its waterproof based on the coefficient of capillary absorption according to [13]. Subsequently, the blocks were implemented in study patients with recurrence of pathological lesions due to capillary moisture, where the functionality and effectiveness of the block system as impermeable barriers was demonstrated due to the non-ascension of the humidity of the ground and phreatic levels. It is concluded that the use of environmental alternatives from the use of materials can be a viable option to contribute to the environment and improve the durability of buildings against capillary moisture.

References

[1] M. Mah and T. Fujiwara, "Environmental Impacts of Construction and Demolition Waste Management Alternatives," no. May, 2018, doi: 10.3303/CET1863058. H. D. Cañola, K. Venegas, G. F. B. Sandoval, and Á. F. do Couto, "Demolition Waste as an Alternative Aggregate for Plaster Mortars," in Proceedings of the 7th World Congress on Civil, Structural, and Environmental Engineering, Apr. 2022. doi: 10.11159/icsect22.178.

[2] Mansour, H. Mansour, and S. A. Ali, “Energy for Sustainable Development Reusing waste plastic bottles as an alternative sustainable building material,” Energy for Sustainable Development, vol. 24, pp. 79–85, 2015, doi: 10.1016/j.esd.2014.11.001.
[3] Broto, Charles; Mostaedi, Enciclopedia Broto.patologias de la construcción. Barcelona, 2006.
[4] J. Bai, Durability of sustainable construction materials, Second Edi. Elsevier Ltd., 2016. doi: 10.1016/B978-0-08- 100370-1.00016-0. XXX-2.
[5] V. Cangrejo, H. Cañola, A. Builes, and J. Pérez, “Analysis of pathological injuries from visual inspection of the quality schools in the city of medellin (colombia), built between 2004 and 2007,” in Rehabend 2020 Construction Pathology, Rehabilitation Technology and Heritage Management, 2020.
[6] H. Cañola, F. Granda-Ramírez, and J. Arroyave-Rojas, “Emulsión asfáltica como alternativa de reducción de la presencia de eflorescencias en morteros de pega,” Revista UIS Ingenierías, vol. 20, no. 1, pp. 103–114, 2020, doi: 10.18273/revuin.v20n1-2021009.
[7] H. D. Cañola and C. Echavarria, “Bloques de concreto con aditivos bituminosos para sobrecimiento Concrete blocks with bitumen emulsion for foundation walls,” Ingenieria y desarrollo, vol. 3461, no. 63, 2017.
[8] H. Cañola, A. Builes, C. Medina, and G. González, “Bloques de Tierra Comprimida (BTC) con aditivos bituminosos,” TecnoLógicas, vol. 21, no. 43, pp. 135–145, 2018.
[9] H. Cañola and C. Echavarría, “Concrete blocks with paraffin wax,” Lámpsakos, no. 17, pp. 14–19, 2017.
[10] H. Cañola, “NC2017/0006873 Bloque impermeable de asfalto reciclado comprimido,” 2015.
[11] H. Cañola, F. Granda, K. Vengas, J. Arroyave, and A. Urrego, “Análisis de recurrencia de lesiones patológicas en edificaciones residenciales de baja altura en la ciudad de Medellín,” in Rehabend 2022, Sep. 2022, pp. 1–9.
[12] Zürcher and T. Frank, Physique du bâtiment: construction et énergie., 1st ed. Zürich: vdf Hochschulvlg AG an der ETH Zürich, 2014.