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Choosing the Material for Façade Systems Using Optimal Energy and Sound Reduction Criteria

Case Study: An Elementary School in Sanandaj City

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Abstract

Many researchers have been conducted regarding to how select facade systems based on economic and environmental sustainability. For a sustainable system, both economic and environmental factors must be taken into account. Choosing facade materials solely based on environmental factors is not lead to the sustainable system. The research paper explores the environmental, acoustic, and economic impacts of facade materials, and finally presents appropriate facade materials for a building. The goal of this research is to investigate sustainability criteria for identifying the most sustainable facade material systems, among five options including Double Brickwork, Aluminum Composite Panel, Ceramic coating, Autoclaved Aerated Concrete (AAC), and concrete blocks. The two main factors are optimal energy calculated by combining two factors (thermal resistance, thermal conductivity coefficient) and sound reduction for Sanandaj city. Factors were tested in Design Builder's simulator environment, and finally, the results were analyzed through the AHP technique to measure the relative importance of different factors and rank the different facade materials. Based on the results, Autoclaved Aerated Concrete facades have the best energy mode in a simulator environment and sound reduction criteria based on the three factors mentioned.

Keywords: Optimal facade materials, Environmental, Economic, Sound criteria, Optimal energy.

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