Manufacturing Thermally and Mechanically Enhanced Concrete Bricks Using Glass Waste and Reducing Building Energy Consumption

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Waste accumulation and energy consumption have negative impacts on environment, human and economy. Also, there is a limited natural resources in Palestine such as sand which is expensive. Thus, the local brick industry has replaced it by fine rock particles, which decreased product quality (e.g. strength). Within this context, there is a need for innovative solutions for waste recycling and minimizing energy usage. Responding to the three E's of environment, energy and economy, this project investigated the development and manufacturing of enhanced concrete bricks. The main research question is as follows: Is it technical feasible to enhance the thermal and mechanical characteristics of concrete bricks using additives including waste glass combined with other additives? Experimental method was used. Concrete samples were cast with various addition percentages of waste glass particles, rock-wool and a mineral reactive agent (water glass). The investigated experimental dependent variables included, slump, compressive strength, density and thermal conductivity. Adding glass particles (1 mm) with 15% as a replacement of fine rock particles, increased the slump and the compressive strength, while it decreased the density and consequently the thermal conductivity. Similar effects were observed when rock-wool was added together with glass, and when the reactive agent was also used. The output included designing an applicable production formula for enhanced brick, in addition to a new product targeted to be registered as a patent for enhancing the thermal concrete characteristics based on crystallization. The new product will be named Safex. It improves local industry, and targets a positive economic and environmental change, worldwide.

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