

## **Abstract**

Rubber tires are an important material in our lives, but they cause many environmental problems during disposal. From this arises the aim of this project, which is to use rubber tire waste to produce thermally insulated cement bricks. This provides a sustainable solution to reduce environmental waste while enhancing energy efficiency in buildings and addresses two crucial challenges in the construction industry: enhancing sustainability and improving thermal efficiency.

The objective of this research is to manufacture thermally insulated bricks by incorporating rubber tire powder. This involves partially replacing coarse sand with rubber tire powder in varying weight percentage ratios, specifically 5%, 10%, 15%, and 20%, and comparing these with reference (control) concrete bricks (0%) and bricks from a local factory.

First, concrete bricks are produced as control or reference samples without rubber tire powder, and then with the mentioned proportions of rubber tire powder. After 28 days, tests were conducted for density, water absorption, compressive strength, and thermal conductivity.

The results indicated that density decreased with increasing proportions of rubber tire powder, with a 6% reduction when comparing the reference brick to the brick containing 20% rubber tire powder. All values were less than  $1650 \text{ kg/m}^3$ , indicating compliance with Palestinian quality standards. Water absorption increased with higher rubber tire powder content, increasing by 20% when comparing the reference brick to the brick containing 20% rubber tire powder, with values less than 12%, meeting international standards. Compressive strength decreased with increasing rubber tire powder content, with a 9% reduction when comparing the reference brick to the brick containing 20% rubber tire powder. The values were above  $3.5 \text{ N/mm}^2$ , except for the 20% ratio, which was lower, indicating compliance with Palestinian standards except for the 20%. The results showed that the thermal conductivity values were 0.71, 0.50, 0.42, 0.36, and 0.26 W/m. K at ratios of 0%, 5%, 10%, 15%, and 20%, respectively. These values indicate that as the rubber tire powder content increases, the thermal conductivity decreases. The thermal conductivity decreased by 64.43% when comparing the reference brick to the brick containing 20% rubber tire powder.

The comparison between the reference bricks and the local bricks showed that the reference bricks had higher density and compressive strength than the local bricks, while the water absorption of the reference bricks was slightly lower.