

Correlation Between Physical and Mechanical Performances of Concrete Based On Local Materials

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Abstract

This study examines the correlation between the physical and mechanical performance of concretes base on local materials, such as natural aggregates and local cementitious additives. Physical properties, including density, porosity, and shrinkage, were first evaluated to assess the material's compactness and deformability. Mechanical prperties was then analyzed using mechanical resistance results at different curing ages (7, 28, 90 and 180 days).

The experimental results show a good correlations between physical and mechanical parameters. Concretes presented lower open porosity and free shrinkage exhibited higher mechanical resistance, confirming the significant influence of microstructural compactness on load-bearing capacity.

The use of local materials slightly improved the pore structure, but optimization of the formulation, particularly the aggregate grading, resulted in mechanical performances comparable to, or even superior to, those of normal concrete. Statistical analysis revealed a strong strong relations between total porosity and compressive strength ($R^2 > 0.90$), highlighting the importance of reducing void content to improve durability and mechanical strength.

Key words: Correlations; local materials; compressive strength, porosity, and shrinkage.