

ABSTRACT

The purpose of this research is to design and analyze the characteristics of fast-track porous (pervious) concrete as a solution to mitigate surface runoff. This was achieved by utilizing local materials in the form of river stone coarse aggregates (batu sungai) and modifying the cement paste matrix using a 5% silica fume additive and 0.9% superplasticizer (Conso N11 LN) to achieve high early strength. Referencing the ACI 522R-10 standard, this study tested cylindrical specimens (15x30 cm) with three variations of river stone coarse aggregate gradation compositions (1.5 cm : 2.5 cm), namely: B1 (25% : 75%), B2 (50% : 50%), and B3 (75% : 25%). Compressive strength testing focused on the ages of 3 and 7 days to review the fast-track characteristics, with 28 days serving as the control.

The test results showed that the river stone aggregate characteristics included a bulk specific gravity of 2.25, an average bulk density of 650.6 kg/m³, and a very high water absorption rate of 28.78%. The mechanical compressive strength of the porous concrete increased linearly with the increase in the percentage of the smaller aggregate fraction (1.5 cm) and the concrete age. At the early age of 3 days, the average compressive strengths achieved were 5.43 MPa (B1), 5.7 MPa (B2), and the highest was B3 at 6.6 MPa. At 7 days, the compressive strength increased to 5.94 MPa (B1), 6.21 MPa (B2), and 7.07 MPa (B3). The peak mechanical strength was reached at 28 days, where the B1 variation produced a compressive strength of 8.00 MPa, followed by B2 at 8.33 MPa, and B3 at 9.60 MPa. Consequently, the B3 river stone variation is concluded to be the optimum mix composition because the dominance of smaller aggregate sizes expands the bonding surface of the cement paste and optimizes the interlocking effect between rock particles, thereby generating a high mechanical load-bearing capacity at both early and mature ages.

Keywords: Porous concrete, fast-track, river stone, silica fume, compressive strength.