

ABSTRACT

Strength of concrete is influenced by several factors including: age of concrete, water-cement ratio, density, amount of cement paste, type of cement and aggregate properties. Concrete strength decreases in line with the decrease of the density. The maximum aggregate influenced compressive strength of concrete. Ultrasonic Pulse Velocity (UPV) can be used to describe the homogeneity of concrete with various types of aggregate and maximum aggregate size.

Aggregate used consisted of natural aggregate and crushed aggregate. The natural aggregate is from Bantak and the crushed aggregate is from Celereng, with maximum aggregate sizes of 40 mm, 20 mm and 10 mm and with a variation of the water-cement ratio of 0,4; 0,5; 0,6. This research was conducted by involving UPV in direct and indirect methods. Nine beams of Bantak and Celereng were of $15 \times 15 \times 60 \text{ cm}^3$ dimension. UPV testing was performed at the age of 28 days. Compressive strength test was conducted after applying UPV test by cutting beams into cubes of $15 \times 15 \times 15 \text{ cm}^3$ dimension.

Compressive strength of Bantak cubes with maximum aggregate size of 40 mm, 20 mm and 10 mm, is in line with the decreasing of water-cement ratio. Similarly, for the aggregate of Celereng. Strength to velocity relationship of 40 mm, 20 mm and 10 mm can be formulated respectively in form of exponential equations of Bantaks aggregate $y = 0,187e^{1,291x}$, $y = 0,03e^{1,756x}$, $y = 0,020e^{1,840x}$, with coefficient of correlation of $R^2 = 0,907$, $R^2 = 0,896$, $R^2 = 0,760$. Strength to velocity relationship of 40 mm, 20 mm and 10 mm can be formulated respectively in form of exponential equations of Celerengs aggregate $y = 0,411e^{1,077x}$, $y = 0,091e^{1,460x}$, $y = 0,014e^{1,888x}$, with coefficient of correlation of $R^2 = 0,833$, $R^2 = 0,706$, $R^2 = 0,823$. In comparison to direct method, the indirect result in lower velocity. A correlation factor of 1,020 and 1,019 may be applied for Bantak and Celereng.

Keywords : Concrete, Non Destructive Test, UPV, Agregate Bantak, Agregate Celereng