

MECHANICAL PROPERTIES OF FRESH CEMENT
COMPOSITES USING COMPOUND SHELLS APPARATUS



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ABSTRACT

The rheology of concrete in general is important for the construction industry. Flow properties would affect the ease of placement, consolidation, durability, and strength. This study dealt with the development of new methods for determining flow properties of concrete. Tests were conducted on two mixtures using the first version of the probe penetration test. It was concluded that the relationships between the slump, Vebe, Compaction factor and the coefficient of X of the penetration probe were established. The coefficient of X can be used to estimate the slump and Vebe with good accuracy. It could determine the loss in slump with time. However, the rheological parameters could not be determined using the first version of the probe penetration test.

Different probe sizes with smaller diameter were made in the first modification. The apparatus has been modified to the probe and the electromagnetic measurements rings had been omitted due to the unavailability of the readings to be taken. The workability of the fresh concrete with different W/C ratio was evaluated and it was found that for the sample without admixtures, the higher water cement ratio gave higher slump and the sample with additional superplasticizer gave lower slump. The coefficient of X increased with the water cement ratio. However, the sample with superplasticizer showed otherwise. It was also found that the relationship in slump and flow are proportional to the coefficient of X . The second version of Probe

Penetration Apparatus is suitable to determine the workability of fresh concrete only in terms of yield stress.

The results of the tests conducted on seven cement paste mixtures and five fresh mortars using the third version of the probe penetration test have been reported. Fortunately, slump values and the rheological parameters of the fresh cement paste and mortar can be related by using the third version of the probe penetration test.