

Rheology of eco-friendly mortars - Effect of industrial wastes additions

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Abstract – Mortar is a mixture of sand, cement, water and eventually additives. With the environmental issues, mortars are increasingly formulated with mineral additions as a substitute for cement in order to produce ecological mortars. It is one of the most widely used cementitious materials in the field of construction and civil engineering after concrete. Mortar placement techniques are evolving day by day, such as pumping, spraying and injection. Therefore, knowing the rheological behavior of mortars becomes more and more crucial to master their implementation techniques. This study presents the development of a vane rheometer to estimate the plastic viscosity yield stress of mortars. The rheological parameters were developed from measurements using a procedure to convert data from moment torque and rotational speed to shear stresses versus shear rate. The procedure used considered the locally sheared material as a Bingham fluid and calculated the characteristic shear rate from the quilt analogy. The device was tested with three experimental programs in which many rheological parameters of the compositions of different mortars were calculated. The results obtained validated the developed rheometer test procedure and confirmed that the test results are reproducible and repeatable. Measurements were made on different compositions of mortar of each mineral addition, altering the amount of blast furnace slag (BFS) and fly ash (FA) in order to evaluate the impact of supplemental cementitious materials and industrial wastes on the rheological characteristics (plastic viscosity and yield stress) of eco-friendly mortar..

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