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Evaluation of Limestone as Self-Curing Aggregate for Concretes in the Southeast of Yucatan Peninsula

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Abstract : In the southeast of Yucatan Peninsula, sedimentary limestone has different degrees of compaction. Due to its recent geological formation (Quaternary) and weathering effects causing an affordable aggregate for local manufacturers of concrete. It is characterized as lightweight aggregates (average density of 2,50), susceptible to abrasion and varying porosities (water content exceeding 7,50 % of its mass, in saturated condition). In this study, local aggregates with two moisture conditions (saturated and dry), have been examined in order to compare them for optimizing the performance of concrete. It is possible that these aggregates favour a phenomenon of mass transport (self-curing by porous aggregate); influencing the water reactions to form crystalline and gel hydration products. Based on the ACI methodology, a concrete mixture of 250 kg/cm2 was designed, with portland blended cement 30R. The bond between the mortar and the coarse aggregate was characterized as physicochemical based on trials which were carefully observed during time span of 28 days. The BET technique was used to analyse the micro porosity and surface areas of contact of the different crystalline phases of the limestone. Its chemical composition and crystal structures were verified with scanning electron microscopy SEM-EDS. On the third day, the samples with saturated aggregate reached 237 kg/cm2 of resistence, nearly the design strength; while samples with dry aggregate, exceeded the design strength, with a capacity of 308 kg/cm2. Aggregates in dry conditions demand a high quantity of water in the initial mixture, causing high resistance at the early stages. In saturated conditions, the development of resistance is progressive but constant.

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