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(57) Abstract :
Lightweight concrete (LWC) has been successfully used since the ancient Roman times and it has gained its popularity due to its lower density and superior thermal insulation properties. Compared with normal weight concrete (NWC), LWC can significantly reduce the dead load of structural elements, which makes it especially attractive in multi-storey buildings. However, most studies on LWC concern "semi-lightweight "concretes, i.e. concrete made with lightweight coarse aggregate and natural sand to manufacture the "totallightweight" concrete, more environmental and economical benefits can be achieved if waste materials can be used to replace the fine lightweight aggregate. With increasing concern over the excessive exploitation of natural aggregates, synthetic lightweight aggregate produced from environmental waste is a viable new source of structural aggregate material. The uses of structural grade lightweight concrete reduced considerably the self-load of a structure and permit larger pre-cast units to be handled. The mechanical properties of a structural grade lightweight aggregate made with fly ash and clay will be presented. It is well know that in general fly ash (FA) and silica fume (SF) increases the compressive strength, splitting tensile strength and flexural strength of concrete. In our study it was found that 10% replacement of fly ash and S.F. will increase the compressive strength, tensile and flexural strength. When FA & SF was increased to 20% the compressive strength, flexural splitting tensile will be decreased. However if the FA addition to the concrete is too high the pacts effect of FA weakens because of positive inference and the secondary hydration reaction is delayed. The SF used in our test has high specific surface, high amorphous siO2 and small particle size only with such chemical and physical characteristics. SF reacts with hydrates of cement and thus become a strong adhesive. It exerts a synergistic effort by promoting cement hydration and improving the uniformity in concrete. SF increases CSH gel hydrates which makes concrete stronger and more durable and adding of SF improves durability and strength of concrete.

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