Strength and Behavior of Bubbled Reinforced Concrete One Way Slab

By

Humam A. Abdul Hussein

Supervisor by

Prof. Dr. Amer M. Ibrahim

Asst. Prof. Dr. Murtada A. Ismael

ABSTRUCT

Reinforced concrete slab with plastic voids (Bubbled-Deck system) is a new type of slabs which has two-dimensional arrangement of voids within the slab that is developed to decrease the slab self-weight while maintaining approximately the same load carrying capacity as compared with the solid slabs. Plastic voided slabs have the ability to reduce concrete amount by about 30 percent and this reduction is so important in terms of cost saving and enhancement the structural performance.

In this thesis experimental and theoretical investigation is carried out to study the strength and behaviour of bubbled reinforced concrete one-way slabs. The experimental program consists of testing fifteen one-way slabs with dimensions of 1850mm×460mm×110mm. One of the tested slabs is a solid slab (without balls) is used as a reference, the remaining fourteen bubbled slabs (with spherical and elliptical balls) are divided into three groups according to construction type (simple type, filigree type and filigree type with longitudinal joint). The parameters of the experimental work include: shape of the balls (spherical or elliptical), clear spacing between balls in the cross section (25mm or 70mm), type of concrete (NSCC or HSCC) and the presence of lateral shear reinforcement (steel cage or shear key).

The experimental results showed that the simple bubbled slabs containing spherical and elliptical balls have about 81% to 96% of the ultimate load of

solid slab and an increase in the deflection at ultimate load by 7.8% to 21%, at the same time the first crack load decreases by about 6.7% to 16% as compared to solid slab. Also, the results showed that the presence of steel cage in filigree bubbled slabs results in increase the ultimate load by 69% and 50% as compared with that without steel cage. Furthermore, the results reveals that the use of lateral reinforcement (shear key) in filigree bubbled slabs with longitudinal joint increases the ultimate load by about 61% and 37%, at the same time the ultimate deflection increases by about 77% and 63%.

On the other hand, the results showed that the calculated amount of input raw materials of the bubbled slab show a reduction in the input raw materials up to 16% so that the cost reduced by about 8% from the total cost of solid slab. Also, Sustainability analysis proves that the (CO_2 emission and energy consumption) can be reduced by about (5% and 10%) by using the bubbled slabs, so the use of bubbled slab has important contribution to construct the environmentally friendly buildings.