

Response of precast foamed concrete sandwich panels to flexural loading

ABSTRACT

This paper presents the results of an experimental and analytical investigation of a total of six precast foamed concrete sandwich panels (PFCSPs) as one-way acting slabs tested under flexural loads. Foamed concrete of 25.73 MPa was used to produce the PFCSP concrete wythes. The results obtained from the tests have been discussed in terms of ultimate flexural strength capacity, moment-vertical deflection profile, load–strain relationship, strain variation across the slab depth, influence of aspect ratio, cracking patterns, and ultimate flexural load at failure. An analytical study of finite element analysis (FEA) as a one-way slab model was then conducted. The increase in aspect ratio (L/d) from 18.33 to 26.67 shows a reduction of 50% and 69.6% on the ultimate flexural strength capacity as obtained experimentally and in FEA models, respectively. Theoretical analyses on the extremes of fully composite and non-composite actions were also determined. The experimental results showed that cracking patterns were observed in one direction only, similar to those reported on a reinforced concrete solid slab, as well as precast concrete sandwich panels, when both concrete wythes act in a single composite manner. The experimental results were compared with FEA model data, and a significant degree of accuracy was obtained. Therefore, the PFCSP slab can serve as an alternative to the normal concrete slab system in buildings.

Keyword: Precast concrete sandwich panel (PCSP); Foamed concrete (FC); Precast foamed concrete sandwich panel (PFCSP); Finite element analysis (FEA); Vertical deflection; Composite actions; Aspect ratio; Crack patterns; Ultimate flexural strength capacity