

Abstract

Mostafa Y Yossef

Effective Width of Sandwich Panels with Multiple FRP Shear Connectors Considering Partial Degree of Composite Action

Insulated sandwich panels consist of two wythes separated by a non-structural insulation layer. These two wythes are connected using shear connectors. In recent years, Fiber-Reinforced Polymer (FRP) shear connectors have been increasingly used due to their low thermal conductivity. However, they have lower stiffness compared to other rigid shear connectors, resulting in partial degree of composite action (DCA) for the sandwich panels. Until now, insulated sandwich panels are designed based on the assumption that the longitudinal stress is uniform across the wythe, which is not reasonable since the in-plane shear flexibility of the wythe causes non-uniform distributions of the stress, which is called shear lag effect. This paper presents an analytical solution to study the behavior of insulated sandwich panels with flexible shear connectors. To this end, a solution based on the shear lag model is firstly developed, where the partial DCA of the multiple flexible shear connectors are considered. The effective width, an important parameter to describe the shear lag effect, is defined. The analytical model is then verified through close correlations between finite element and analytical results for an insulated concrete sandwich panel with FRP shear connectors. The results from this study can be used for the design of insulated sandwich panels.