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Development of Interaction Diagram for Eccentrically Loaded Reinforced Concrete Sandwich Walls with Different Design Parameters

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Abstract : Sandwich sections have a very complex nature due to variability of behavior of different materials within the section. Cracking, crushing and yielding capacity of constituent materials enforces high complexity of the section. Furthermore, slippage between the different layers adds to the section complex behavior. Conventional methods implemented in current industrial guidelines do not account for the above complexities. Thus, a throughout study is needed to understand the true behavior of the sandwich panels thus, increase the ability to use them effectively and efficiently. The purpose of this paper is to conduct numerical investigation using ANSYS software for the structural behavior of sandwich wall section under eccentric loading. Sandwich walls studied herein are composed of two RC faces, a foam core and linking shear connectors. Faces are modeled using solid elements and reinforcement together with connectors are modeled using link elements. The analysis conducted herein is nonlinear static analysis incorporating material nonlinearity, crashing and crushing of concrete and yielding of steel. The model is validated by comparing it to test results in literature. After validation, the model is used to establish extensive parametric analysis to investigate the effect of three key parameters on the axial force bending moment interaction diagram of the walls. These parameters are the concrete compressive strength, face thickness and number of shear connectors. Furthermore, the results of the parametric study are used to predict a coefficient that links the interaction diagram of a solid wall to that of a sandwich wall. The equation is predicted using the parametric study data and regression analysis. The predicted α was used to construct the interaction diagram of the investigated wall and the results were compared with ANSYS results and showed good agreement.

Keywords : sandwich walls, interaction diagrams, numerical modeling, eccentricity, reinforced concrete
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