ADOPTION OF PRECAST HOLLOW CORE PANELS FOR EXTERNAL WALLS OF MULTI-STOREY BUILDINGS

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Precast hollow core wall panels have gained popularity for their efficient use as load-bearing and non-load-bearing wall elements. ICC ACOTEC hollow core wall panels are manufactured locally and intended to be used as internal partition wall panels in multi-storey buildings. Partition walls in general are not load-bearing elements, thus they do not undergo significant deformations. This research study focuses on verifying the usability of such precast panels as external wall panels in multi-story buildings, where their load resistance is investigated under lateral wind loads and vertical deformations due to column shortening effects. In addition, using the shape optimisation technique in-built into ABAQUS/CAE advanced finite element software and parametric optimisation study, a better layout for the precast wall is also proposed and its performance is compared with the current standard layout under similar loading and boundary conditions. The numerical model was validated using experimental test results and the optimised panel has a 16% lower net volume than the original hollow panel. Meanwhile, the optimised panel did not show any reduction in strength properties and does not pose any challenges in manufacturing. Using shape-optimised panel sections, panel assemblies are simulated to investigate the panel assembly response under wind loads. Further, recommendations are given on the maximum number of wall panels that could be installed as a single assembly under different wind load intensities at various heights of multi-story buildings. Considering practical aspects, these recommendations are integrated with proposals on connection mechanisms between panel assemblies. Due to the nature of the scope of this research study, long-term effects such as creep and fatigue were not incorporated, and it is recommended to conduct experimental tests for the proposed panel assemblies before practical usage.

Keywords: Precast hollow core panels, shape optimisation, numerical modelling

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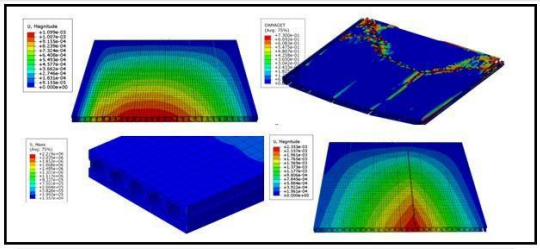

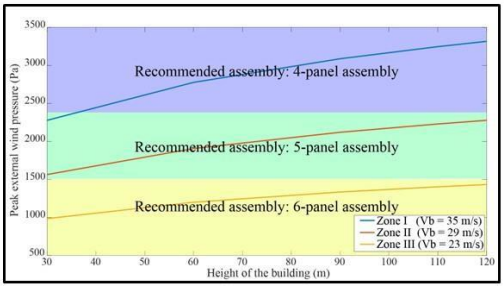

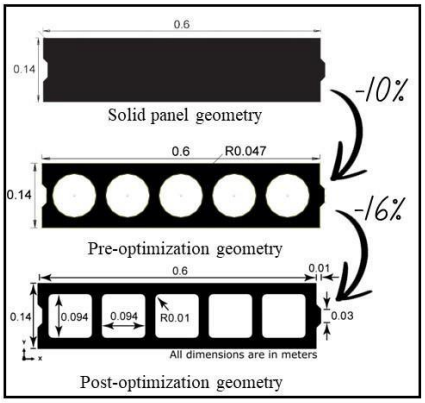

Conclusions:

- The panel geometry is optimized by reducing the volume by 16%
- Recommendations on required number of panels to be used at different heights of multistorey building were proposed