

APPLICATION OF LOAD BEARING CEMENT HOLLOW BLOCK WALLS FOR MULTI STOREY HOUSING

Y.A.D.K.H. Wijayarathna^{1,*}, M.T.R. Jayasinghe¹

¹ Department of Civil Engineering, University of Moratuwa, Moratuwa

The economic challenges facing Sri Lanka have highlighted the need for affordable housing solutions. This study investigates the viability of load-bearing hollow block walls within a hybrid construction system for multistorey residential buildings, utilizing precast slab panels and concrete hollow blocks as lightweight construction materials. The study aims to redefine traditional construction practices and propose an economically viable approach.

Structural analysis was conducted using the “Manual for the Design of Plain Masonry in Building Structures to Eurocode 6”, to evaluate the load-bearing capacity and structural integrity of the hybrid system across varying building heights (three to eight stories). Two alternative wall configurations were assessed: (1) walls supporting simply supported beams that carry slab panel loads, and (2) walls directly supporting slab panels. The concrete hollow blocks used are standardized at 200 mm x 190 mm x 390 mm with 47% voids, and the height of wall panel is 3 m with a thickness of 200 mm. The block density is 22 kN/mm³, with the mortar strength being 4.0 N/mm².

The study showed that the wall configuration of Alternative 2 requires less block strength while maintaining efficient load-bearing capacity compared to Alternative 1 for buildings up to eight stories. Additionally, the Alternative 2 configuration can be applied to buildings up to six stories without needing additional frame support. For buildings with up to three stories, both wall configurations were found to be feasible under the current allowable block strength of 8 N/mm². Moreover, the block strength requirements for buildings up to eight stories using Alternative 2 were determined to be within the achievable limits of current manufacturing practices.

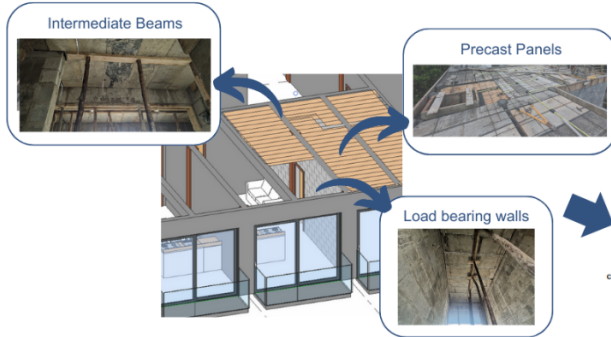
This study contributes to the growing body of knowledge aimed at enhancing sustainable construction practices in the region. It offers a practical pathway for structural engineers to meet the increasing demand for affordable housing in urban areas while promoting sustainability of the construction industry. Furthermore, the findings emphasize the potential of using precast slab panels and hollow blocks to enhance the efficiency and sustainability of housing projects. Further exploration of the application of this hybrid system in seismic conditions is recommended as additional reinforcement measures might be necessary to ensure safety and durability under seismic loads. Also, it is recommended that methods to improve the strength of hollow blocks be explored further, particularly for taller structures. Adopting this innovative approach could significantly contribute to meeting Sri Lanka's urgent demand for affordable housing while promoting sustainable construction practices.

Keywords: Lightweight hybrid construction, Load-bearing walls, Multistorey apartment design, Precast slabs

* Correspondence: kavindyawijayarathna@gmail.com

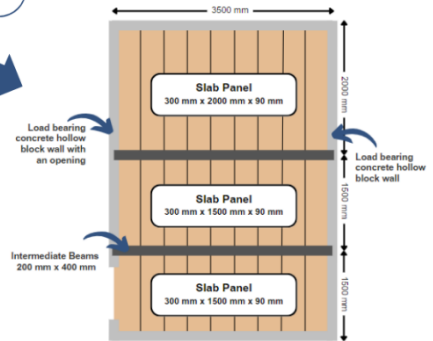
APPLICATION OF LOAD BEARING CEMENT HOLLOW BLOCK WALLS FOR MULTI STOREY HOUSING

A Hybrid System

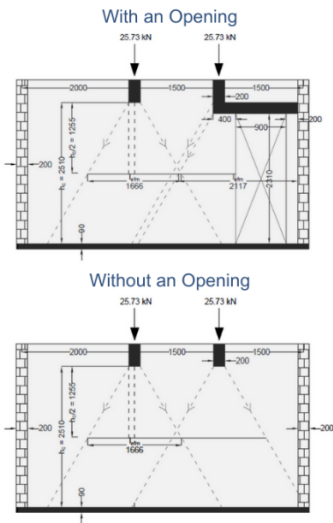


Design Alternatives

Design Alternative 01



Load Distribution



Design Alternative 02

