

COST ECONOMICS OF PRECAST WALLING SYSTEMS FOR MULTI-STOREY BUILDINGS – A CASE STUDY-BASED APPROACH

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Traditional monolithic building construction is labour and time- intensive and usually found in inadequate quality. Rapid urbanization and steadily expanding metropolitan populations need fast and time-saving construction technology, which can be aided using precast construction techniques. Precast construction offers numerous benefits including reduced construction time, minimal labour requirement, less resource wastage and higher quality. Despite the advantages of precast construction technology, Sri Lankan multi-storey building construction still predominantly relies on conventional on-site construction techniques due to a lack of fresh knowledge and less awareness about the benefits. Hence, this study aims to assess the cost- effectiveness and environmental impact of adopting precast concrete walling systems in multi- storey building construction in the Sri Lankan context through a life cycle thinking approach.

This paper compares a precast concrete walling system with a conventional Cement Sand Block (CSB) walling system in terms of Life Cycle Cost (LCC) and Life Cycle Assessment (LCA). It evaluates the total impact using Eco-Efficiency Analysis. A case study-based approach was adopted and the LCC was compared using the Net Present Value (NPV) method. The results show that the CSB walling system is more cost-effective than the precast concrete walling system in the long run in the Sri Lankan context. But the Eco-efficiency Index of both walling materials is in the same range according to the percentages they got. Moreover, precast walling system shows considerable time and labour saving with improved quality of construction. Therefore, the findings of this study help to select a walling material for multi-storey building construction from a broader perspective.

Key Words: Precast construction technology; Precast concrete walling systems; Life Cycle Cost (LCC); Life Cycle Assessment (LCA); Net Present Value (NPV)

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MAIN AIM:

To assess the cost effectiveness of precast concrete walling systems in multi-storey building construction in Sri Lankan context



Literature Review:
Main parameters that influence LCC



Data collection:

- Expert interviews
- Auto CAD Drawings
- BSR 2021



Building Information Modelling of Case study building (BIM)



Building Energy Modelling for case study building



Life cycle cost calculation

- NPV method



Life cycle impact assessment

OUTCOME 1:
Comparison between precast walling system and conventional cement sand block walling system

OUTCOME 2 :
Life cycle cost model of precast walling system

CONCLUSIONS:

- LCC of precast concrete walling system is higher than that of CSB walling system
- Eco efficiency ratios are in similar range for both systems

	Precast walling system	CSB walling system
LCC in NPV (LKR)	577.893	536.038
Normalized LCC	1	0.928
Net emissions in kgCO ₂ e	34,442,625.0	32,210,320
Normalized LCA	1	0.935
Eco Efficiency Index (LCC/LCA)	1	0.992

RESULTS AND ANALYSIS