

## CONSTRUCTION QUALITY FRAMEWORK FOR SCHOOL BUILDINGS IN SRI LANKA

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The built environment of schools plays a crucial role in shaping the educational experience, yet Sri Lanka has faced ongoing concerns regarding the quality of school construction, despite significant government investment in education. To address this issue, a comprehensive study was conducted with the primary objective of developing a construction quality framework specifically tailored for school buildings in Sri Lanka. This framework aimed to establish clear standards and guidelines for the design, construction, and maintenance of school buildings, ensuring that they meet the necessary safety, functionality, and sustainability criteria. An extensive literature review was undertaken to systematically break down the processes involved in school building construction and to conduct background research on contemporary quality standards. The breakdown included the following key phases: project initialization, design and construction, operations and maintenance, and rectification and building condition. Data collection was carried out through multiple methods, including case study reports from the National Building Research Organization (NBRO), which covered 58 buildings across 22 schools. Surveys of school stakeholders and expert interviews were also conducted. The NBRO reports included visual observations and both destructive and non-destructive testing techniques. The survey aimed to assess the efficiency of operations and maintenance processes, while expert interviews provided insights into the procurement procedures of school buildings. The collected data were analysed using statistical methods to categorize and prioritize the defects identified in the construction process. This analytical approach facilitated the identification of the most common and critical defects, along with their correlation to the overall condition of the buildings. The defects were categorized based on their location and severity, offering a clear understanding of recurring issues in school construction. The analysis revealed significant issues in design, construction, and maintenance practices, with gaps in maintenance protocols and challenges such as financial constraints and bureaucratic delays. The importance of addressing these defects proactively, particularly in critical structural elements such as slabs, columns, and beams, was emphasized to ensure the durability and safety of school buildings. The proposed framework was validated through its application to a school building construction project in the Northwestern Province, which encompassed two phases—one completed and the other ongoing. This validation demonstrated the framework's effectiveness in improving construction quality and addressing prevalent issues. The outcomes of this methodological approach provided valuable insights into the construction quality of school buildings in Sri Lanka. By identifying and prioritizing defects throughout the entire construction process, the study established a basis for minimizing or eliminating these issues in future construction projects. The insights gained from this research contribute to the formulation of targeted construction guidelines for school buildings in Sri Lanka, aligning with the evolving needs of the Sri Lankan education system.

**Keywords:** Building condition, Construction quality, Defects, Framework, School building

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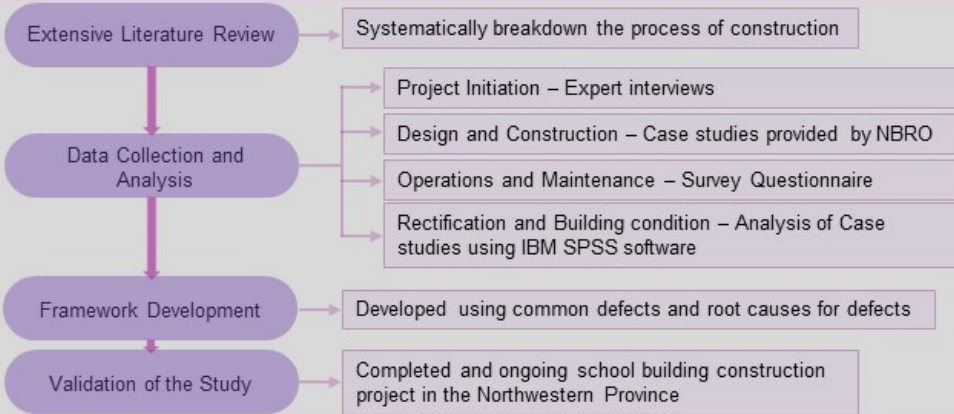
## Background

- Education is crucial for human capital development, but inadequate quality in school building construction in Sri Lanka undermines learning
- This study creates a framework to ensure school buildings are safe, functional, and sustainable, thereby improving educational outcomes and student well-being

## Objectives

- Assess the current construction quality standards for school buildings
- Develop a customized construction quality framework for Sri Lankan school buildings
- Assess the effectiveness and suitability of the developed framework

## Research Methodology



## Summary of the Developed Quality Control Framework for School Buildings in Sri Lanka

### Pre-Construction Stage

#### Drawbacks

- Inadequate Budget Allocation
- Lack of labour competence assessment method
- Poor quality standards maintenance and supervision
- Outdated design standards requiring updates
- Phased construction of buildings due to partial budget allocation
- Inappropriate subcontractor selection

#### Recommendations

- Utilize E-procurement for efficiency and transparency
- Ensure proper funding with a cushion
- Strengthen government policy documents
- Enhance stakeholder communication
- Develop maintenance manuals and monitoring mechanisms
- Introduce labourer licensing
- Develop master plans for school infrastructure

### Design and Construction Stage

- Adequate site investigations (Avoiding ground settlement)
- Adequate grading and sloping of the site
- Proper compaction of the underlying soil
- Construction of proper drainage system
- Protection of structural elements against excessive moisture (Proper water proofing) and termite attacks (Proper termite treatment)

#### Single Storey Buildings

- Proper design of structural elements including sill and lintel beams and walls and columns on which high concentrated loads are applied from the roof

#### Multi-Storey Buildings

- Avoid improper construction techniques such as lack of required concrete cover and stage-by-stage construction
- Proper construction of sunshades with the required concrete cover and drainage mechanisms

### Operations and Maintenance Process

- Remove mosses and vegetation grown on buildings and extensive root systems around the building
- Prevent water infiltration to the building (through roof, walls and upper floor balcony)
- Conduct systematic regular maintenance of the building
- Ensure proper funding for maintenance

### Recommendations

- Adhere strictly to building regulations and industry standards
- Allocate sufficient funding and experienced professionals
- Enhance efficiency through meticulous planning and documentation
- Consider replacing concrete sunshades with metal framed Zn-Al sunshades
- Address defects promptly to prevent potential hazards

### Building Condition Assessment

Building Element	Chi-Square Test		Spearman's rank correlation coefficient test	
	Fisher-Freeman-Halton Exact Test	Significance of the Relationship	Spearman's Rank Correlation Coefficient	Correlation
Slab	0.007	Significant (Only the structural elements)	0.450	Moderate Positive Correlation
Beam	0.016		0.363	
Column	0.024		0.324	

✓ Ground stability and foundation integrity are crucial for structural stability and safety