

REVIEWER'S REPORT

Manuscript No.: IJAR-59511

Title: Risk-Based Retrofitting and Structural Refurbishment of Ageing Infrastructure in Saudi Arabia: An SBC-Compliant Framework for Long-Term Resilience

Recommendation:

Accept

Rating	Excel.	Good	Fair	Poor
Originality	Yes			
Techn. Quality	Yes			
Clarity	Yes			
Significance		Yes		

Reviewer's ID: JPR- 015

Detailed Reviewer's Report

Reviewer's Comment for Publication.

Acceptance Comment are mentioned below suitable for the paper titled "**Risk-Based Retrofitting and Structural Refurbishment of Ageing Infrastructure in Saudi Arabia: An SBC-Compliant Framework for Long-Term Resilience**"

Reviewer Comments: Accept

Reviewer Comments –

1. Introduction

The manuscript addresses the critical challenge of retrofitting and refurbishing ageing infrastructure in Saudi Arabia under evolving structural, environmental, and operational demands. It highlights the need to integrate material deterioration, structural vulnerability, occupancy changes, and uncertainty in construction records into refurbishment decisions. The emphasis on compliance with the Saudi Building Code (SBC) strengthens the study's regulatory and practical relevance. The manuscript appropriately distinguishes routine repair from structural strengthening and broader resilience objectives. Overall, the introduction establishes a clear research motivation and highlights the importance of risk-informed infrastructure management.

2. Literature Review

The manuscript synthesises 30 DOI-traceable studies published between 2020 and 2025, alongside the published scope of the Saudi Building Code. The review addresses relevant themes, including structural deterioration, seismic and environmental hazards, retrofit technologies, durability, and long-term asset performance. Its distinction between structural condition and vulnerability provides a useful conceptual foundation for prioritising interventions. The discussion also recognises the importance of life safety, functional recovery, and life-cycle considerations in refurbishment planning. Overall, the literature

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review establishes a relevant evidence base and identifies important gaps in the Saudi infrastructure context.

3. Solution Approach / Methodology

The manuscript develops a staged, risk-based decision framework for existing buildings and associated civil infrastructure. Its proposed six-gate pathway covers asset classification, diagnosis, hazard-sensitive assessment, intervention selection, approval, and longitudinal monitoring. The methodology integrates evidence quality, consequence-based prioritisation, retrofit mechanisms, and verified in-service performance. It also considers deformation compatibility, foundation conditions, constructability, environmental durability, and nonstructural functionality when evaluating interventions. This structured approach provides a practical basis for supporting consistent, transparent, and code-informed refurbishment decisions.

4. Results and Discussion

The synthesis demonstrates that retrofit selection cannot be based solely on nominal increases in structural strength. Instead, successful interventions depend on compatibility with existing structural systems, foundation performance, environmental exposure, and continued functional requirements. The proposed framework provides a systematic means of connecting structural risk assessment with intervention selection, regulatory approval, and long-term monitoring. The identification of research needs concerning Saudi deterioration datasets, uncertainty calibration, and auditable assessment-to-maintenance interfaces adds value to the discussion. These findings offer useful guidance for improving infrastructure resilience and supporting evidence-based refurbishment planning.

5. Conclusion

The manuscript presents a relevant and structured framework for risk-based retrofitting and structural refurbishment of ageing infrastructure in Saudi Arabia. Its integration of technical assessment, regulatory considerations, intervention planning, and longitudinal monitoring provides a comprehensive perspective on infrastructure resilience. The six-gate pathway offers practical decision support while appropriately recognising the need for project-specific engineering calculations and statutory approval. The identified research gaps also establish useful directions for future studies and implementation. Overall, the manuscript makes a valuable contribution to infrastructure asset management and resilience planning and is suitable for publication.