

RESEARCH POSTER: RETROFITTING AIREY HOUSES FOR MODERN STANDARDS

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Title: Retrofitting Airey Houses for Modern Standards

Airey houses, a type of prefabricated housing developed in the post-war period, were designed for rapid and affordable accommodation. However, their aging infrastructure, minimal insulation, and outdated materials result in poor energy efficiency, safety concerns, and low comfort. This research investigates sustainable retrofitting strategies to enhance their thermal performance, structural integrity, and compliance with modern standards.

What are the most effective and sustainable retrofitting strategies for upgrading Airey houses to meet modern structural, energy efficiency, and environmental standards?

Research Design and Methodology:

- Mixed Methods Approach: Combining qualitative (interviews, surveys) and quantitative (thermal imaging, energy modeling) methods.



Data Collection:

- Case Studies: Comprehensive analysis of existing retrofitted Airey houses, assessing their long-term performance.
- Thermal Imaging and Blower Door Tests: Detailed assessment of thermal performance, identifying areas of heat loss.
- Surveys and Interviews: Gathering qualitative insights from homeowners, retrofit professionals, and policymakers.
- Material Testing: Laboratory analysis of insulation materials, cladding solutions, and reinforcement methods to evaluate durability, thermal resistance, and sustainability.
- Energy Performance Modeling: Simulating the impact of different retrofit strategies using energy modeling software (e.g., EnergyPlus, DesignBuilder).
- Comparative Analysis: Direct comparison of multiple retrofit strategies based on energy savings, cost-effectiveness, and environmental impact.

Aims and Objectives:

- To conduct a comprehensive thermal analysis of Airey houses using thermal imaging and blower door tests, identifying specific areas of heat loss and energy inefficiency.
- To explore and evaluate a range of cost-effective retrofitting techniques, including insulation (external, internal, cavity), cladding, and structural reinforcement methods, assessing their impact on energy efficiency, safety, and durability.
- To perform a Life Cycle Assessment (LCA) of retrofitting materials and solutions, quantifying their environmental impact, including embodied carbon and sustainability.



Literature Review:

- Structural Challenges: Cracking, spalling, and reduced load-bearing capacity due to aging precast concrete panels.
- Energy Efficiency: Poor insulation, thermal bridging, and air leakage lead to high energy consumption.
- Environmental Sustainability: Emphasis on low-carbon materials and circular economy principles.
- Gaps in Research: Limited comparative analysis, long-term performance data, and occupant experience.



Data Analysis:

- Quantitative Analysis:
 - Statistical Analysis: Descriptive (mean, median, standard deviation) and inferential (t-tests, ANOVA) statistics to evaluate energy performance improvements.
 - Energy Performance Metrics: Calculation of energy savings (kWh), reduction in heat loss, and improvements in U-values.
 - Cost-Benefit Analysis: Net Present Value (NPV), Return on Investment (ROI), and payback period calculations for each retrofit strategy.
 - Environmental Impact Assessment: Life Cycle Assessment (LCA) of materials, quantifying embodied carbon and overall sustainability.
- Qualitative Analysis:
 - Thematic Analysis: Coding and analysis of interview and survey responses to identify common themes (comfort, safety, satisfaction).
 - Comparative Case Studies: Documenting and evaluating the performance of different retrofit approaches across multiple Airey houses.

Timeline:

- Literature Review: 2 months
- Data Collection: 3 months (Thermal analysis, case studies, surveys)
- Data Analysis: 2 months (Energy performance, cost-benefit, LCA)
- Report Writing: 3 months
- Review & Finalisation: 1 month

Expected Outcomes:

- Comprehensive, evidence-based assessment of thermal inefficiencies in Airey houses, highlighting areas of heat loss and energy inefficiency.
- Identification of cost-effective, scalable retrofitting techniques for insulation, cladding, and structural reinforcement, tailored to Airey houses.
- Quantified environmental impact of retrofit solutions, including life cycle emissions, embodied carbon, and sustainability metrics.
- Development of a decision-making framework for selecting retrofit strategies based on cost, energy savings, and environmental performance.
- Policy recommendations for local authorities and policymakers, supporting large-scale, sustainable retrofitting initiatives.
- Practical guidance for homeowners on implementing effective retrofit measures.
- A comprehensive report documenting findings, best practices, and lessons learned for industry professionals.



Conclusion: This research aims to bridge knowledge gaps by providing practical, scalable solutions for retrofitting Airey houses, enhancing sustainability, safety, and comfort while maintaining affordability.

References:

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