EXPERIMENTAL STUDIES ON RETROFITTED MASONRY BUILDING MODELS FOR RURAL AREAS SUBJECTED TO SHOCK LOADING FOR SEISMIC MITIGATION.

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Introduction:

Unreinforced masonry (URM) buildings are commonly found in semi-urban and rural areas across India. Past earthquakes have shown that these structures are highly vulnerable, often suffering catastrophic failures that result in significant loss of life and property. India's seismic zoning is divided into four zones—II, III, IV, and V—with many aging buildings concentrated in these regions. During seismic events, URM buildings typically bear the greatest impact.

Therefore, enhancing the seismic performance of these existing structures is crucial. This study focuses on evaluating the behavior of URM building models and retrofitted counterparts by subjecting them to simulated earthquake motions using a shock table. Both qualitative and quantitative parameters—such as failure patterns, energy absorption, displacement, and peak accelerations—are recorded to assess and compare their performance.

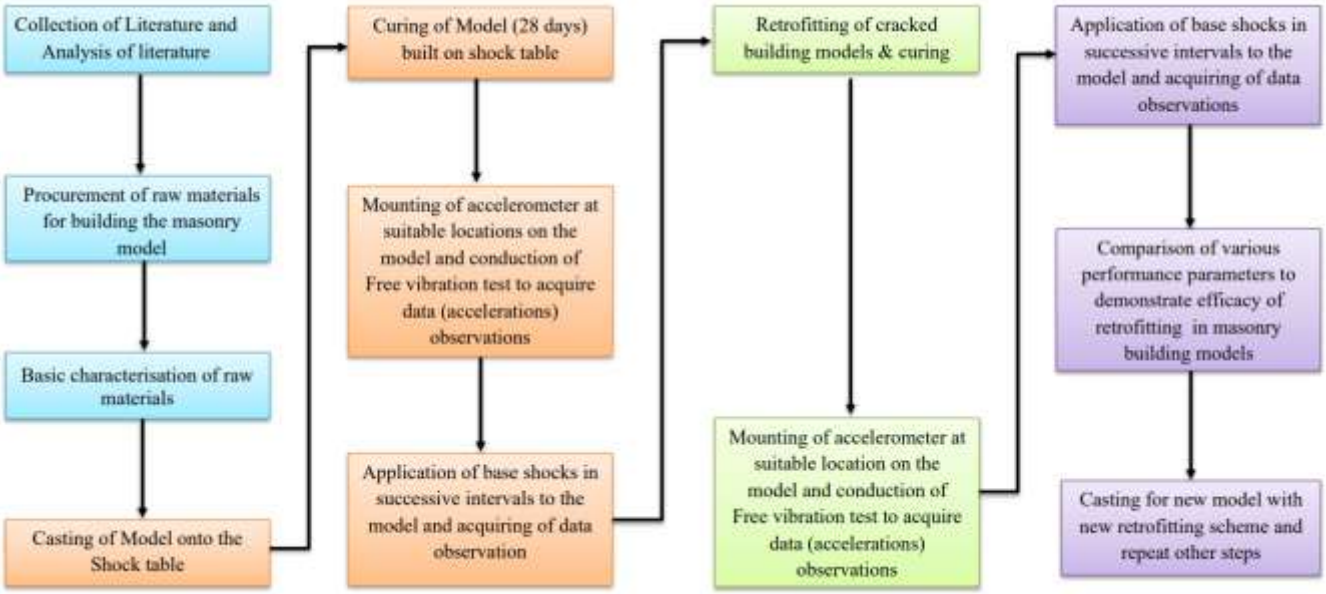
Objectives:

- To study strength properties of masonry walettes /prisms retrofitting with suitable methodology (Grout, Split bandage technique, wrapping etc.).

- To study the performance of masonry building models with and without retrofitting using shock table facility.

To compare the efficiency of suitable retrofitting methodology in masonry specimens / building models under static and dynamic loading.

Methodology:



The methodology for the present study is shown below in Fig.1

Figure 1 Methodology for the present work

Result and Conclusion:

Results on Cement Tests:

Sl No.	Particular	Results	Remarks/ Standard Values
1	Normal Consistency	30%	
2	Specific Gravity	3.0	3.1 - 3.16

3	Initial Setting Time	150 min	30 min

Results on Sand:

Sl No	Particular	Results	Remarks/ Standard Values
1	Specific Gravity	2.66	2.65 - 2.67
	Sieve Analysis	2.91	2.8-3.2

Results on Mortar:

Sl No	Particular	Results	Remarks/ Standard Values
1	Workability Test	110%	100-115%
2	Compressive strength	8.45 MPa	

Results on Concrete blocks

Sl No	Particular	Results	Remarks/ Standard Values
1	Dimensionality Test	402.5x160x199.75	5mm deviation
2	Block Density	2035.64 kg/m³	1800
3	Water Absorption	5%	<=10
4	Initial Rate Absorption	4.92	<=5

5	Compressive strength	5.64	> 4 MPa
6	Flexure Strength	1.76	

Project Outcome & Industry Relevance

The purpose of this project is to find how effectively the models behave to handle dynamic loads, like seismic loads, through investigating the behaviour of the building model with modifications suggested in the objectives. The efficiency of the modifications would be facilitated by the experimental results will be evaluated. Adopting these can be extremely useful in making certain that building structures have the ability of successfully handling dynamic loads. Overall, the research's outcomes may assist organizations that play an essential role in disasters prevention and management.

Working Model vs. Simulation/Study:

This is a working model

Project Outcomes and Learning's:

The results and outcome from the proposed work can lead to better understanding of grouting/ splint bandage type, wrapping in the retrofitted masonry to handle static and dynamic loads such as earthquakes, etc. The data from experimentations can be studied and over a period of time can get converted to simple practices which implemented can be advantageous in buildings built in areas prone to disasters such as earthquake

Future Scope:

The results obtained from the experimentations can be used to validate and refine the computational /analytical models thereby enhancing predictive capabilities for retrofitted structures.

Transitioning from scaled models to full-scale building prototypes can offer more accurate insights into real-world behavior during earthquakes.

Details of the Model cast