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REVIEW PAPER ON RELIABILITY ANALYSIS OF HIGH RISE BUILDING

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ABSTRACT

Reliability is the ability of a structure to comply with given requirements under specified conditions during the intended life for which it was designed [ISO2394:2015]. The design and execution of a structure should be done in such a way that it will be reliable and shall remain fit for use by people during its proposed period and sustains all actions and influences likely to occur during execution and use. Study of different materials like Expanded Polystyrene (EPS), Foam Concrete and Autoclaved Aerated Concrete (AAC Blocks) which are used for wall structure is done.

KEYWORDS: Reliability Analysis, EPS, AAC, Foam Concrete

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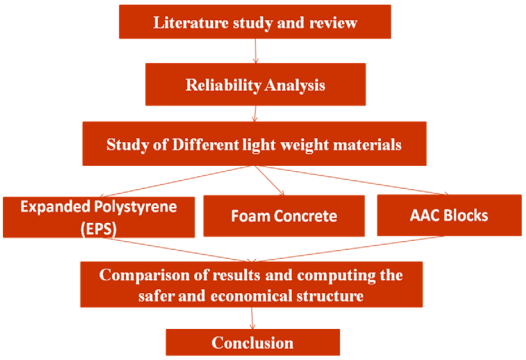
1. INTRODUCTION

The depletion of natural resources due to the huge demand for energy and construction materials for the ever-increasing population and demand in the construction sector has caused changes in the environmental cycle. The impact of human activities and their growing concern towards the decreasing resources has caused researchers and engineers to work on the concept of sustainable development.

In this past years , various methods have been immerged to work towards environmental benefits like use of light weight material due to use of this there are drastic change in the working way and techniques made the construction speedy. These specific characteristics result in lower environmental loads and enhanced seismic resistance.1

2. METHODOLOGY



3. MATERIAL PROPERTIES

3.1 Expanded Polystyrene (EPS)

In this paper, lightweight materials will be used to construct wall panels. EPS is one such material. EPS is a safe and economical system used in buildings which can be used as load bearing as well as non-load bearing elements. The total cost of construction is reduced manifolds by using such materials. Table 1 shows properties of material used.

Density	20 kg\m3
Poisson's Ratio	0.15
Young's Modulus	5 MPa
Thermal conductivity	0.35 mW/cm °C

Table 1: Material properties of EPS [1]

3.2 Foam Concrete

Foam concrete is composed of mixture of raw materials such as fine aggregate, Ordinary Portland Cement and water with pore structure created by air voids, which are entrapped in mortar or cement paste by suitable foaming agent. Material properties of foam concrete are shown in Table 2.

Density	1076 kg\m3
Poisson's Ratio	0.327
Young's Modulus	114 Mpa
Thermal conductivity	0.65 mW/cm °C

Table 2: Material properties of Foam concrete [2]

3.3 Autoclaved Aerated Concrete (AAC Blocks)

Autoclaved Aerated Concrete is defined as the lightweight

Concrete. It is formed by the combination of fine grain siliceous aggregate and an inorganic binder (which may be lime or cement) using a pore-forming agent which results in decrease in the

Research Paper

unit weight and a following steam curing process which gives its mechanical strength which are shown in Table 3

Density	300 kg\m3
Poisson's Ratio	0.18
Young's Modulus	900 Mpa
Thermal conductivity	0.06 mW/cm °C

Table 3: Material properties of AAC [3]

4. LITERATURE REVIEW

Naji et al. 2014 Observed that the sandwich panel has better structural behaviour in terms of resistance against lateral loads. The thermal performance evaluation of the walls and ceilings shows that the Wood Light Frame and Lightweight Steel Frame walls have better insulation values. The cost of construction for lightweight steel panel was more compared to wood frames and 3D sandwich panel frames. 3D sandwich panel is more economical compared to other systems. Also, seismic behaviour of 3D panels was better compared to other systems [4].

Liu and Li 2012 The analysis of demand and capacity is done. The demand is comparatively lower than the capacity. The maximum peak acceleration occurs when the wind direction is parallel to the x axis. Reliability analysis conducted can predict the probability of dissatisfaction with occupant comfort criteria for a variety of probability distributions of the structural eccentricity [5].

Kabir et al. 2008 Dynamic properties of the structure, including natural frequencies and dynamic Responses such as story displacement, story drift, story shear force and energy absorbed by each story under different seismic motion, in linear and nonlinear region are investigated. In addition, the distribution of tensile and compressive stress in concrete and tensile stress in reinforcement of various partition and also quality of generated cracks are estimated. The results of this study would be used in predicting the behavior of the structure under real earthquakes[6].

Lu et al. 2008 This paper built up a global load-carrying limit state function based on limit base shear, put forward a new semi-analytical method to analyze the nonlinear global seismic reliability of structures, which comprises point estimation method, pushover analysis. By applying the proposed approach in R.C. frame structure, the changing rules of the global seismic reliability of the structure with the coefficient of variation of the total seismic action and correlation coefficient of storey-level seismic forces are derived[7].

Liu And Liu 2000 Reliability analysis method of structures under different earthquake intensities in structural serviceability limit state is put forward on the basis of results of seismic risk analysis and that of equivalent ductility damage criteria accounting for low-cycle fatigue characteristics of structures[8].

5. ECONOMICAL STRUCTURE

Economic issues and saving money are among the most important challenges in all aspects of human life. In this respect, it is also important to discuss the construction cost of each structural system.

If we compare RCC Structure with light weight materials then the construction cost is reduced to the great extent, for example if we consider AAC blocks, the cost of raw materials used here is very less as compared to RCC because of use of fly ash which is a waste material. Also there is no need of plastering when the construction is done with the help of AAC blocks. So the cost of plastering is also removed.

If we consider the construction using EPS then the material quantity is reduced in large amount which reduces the overall cost of construction plus it provides better insulation and fire resistance.

In the third material i.e. foam concrete; the wall constructed is light weight as compared to RCC because of the air voids which causes formation of concrete. Here also the overall cost gets reduced[9].

In short, the use of light weight materials not only reduce the construction cost but also provides better properties like fire resistance, insulation etc. The labor cost is also reduced as the construction takes less time compared to RCC construction. So the overall structure becomes economical.

6. CONCLUSION

This study has been carried out in order to evaluate the general performance of three types of lightweight residential system. EPS core Panel system is a modern, efficient, safe and economic construction system for the construction of buildings. In addition, an evaluation of the lifetime operational energy cost shows that the building constructed with demands less energy for cooling of the interior spaces, because of the better thermal insulation performance of the sandwich panels. It is important to emphasize that the values related to energy demand are totally related to the local climate.

AAC blocks are suitable for walls in RCC framed building. Utilization of fly ash leads to the reduction in the cement consumption in the product which results in reduction of green house gases. Density of AAC block is 1/3 that of traditional clay brick and there is no more change in wet condition. It helps in reducing dead load of structure.

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