

Design and Analysis of Multi-Storey Building using ETABS by Replacing Conventional Brick with AAC Block

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Abstract: In today's time, construction work is progressing very fast in our country. The material used in the construction work greatly affects the cost of the entire building. Therefore, the cost of construction work seems to be an expensive work for any type of building. Therefore, there is a need to find a way to overcome these problems, so that the building can be constructed and the cost can also be saved. Cellular light weight concrete blocks can be used to substitute for burnt clay bricks, which are also eco-friendly, to overcome and mitigate such problems. Due to the low density of AAC blocks, tall buildings constructed using AAC blocks have less need for steel and concrete for structural members.

Keywords: RCC Structure, Design Auto-cad, ETABS, Moments, Shear force, Seismic zone, Analysis & comparative results.

1. Introduction

A. Autoclaved aerated concrete (AAC) block

AAC is a load-bearing construction material that is of lower density (6.40 kn/m^3) than other construction materials due to its high porosity. AAC block is one of the environmentally friendly and certified green building materials. AAC block, also known as aircrete, is a lightweight, highly insulated, load-bearing, durable construction product, produced in a wide range of sizes and strengths. The use of AAC blocks provides an incredible opportunity to increase the quality of construction and reduce the cost at the construction site.



Fig. 1. AAC block

B. Red bricks

Brick is one of the most important building materials of our country. Brick production is a traditional industry in India which has generally been confined to rural areas. In recent

years, with the expansion of cities and increasing demand for construction materials, red bricks are also being used rapidly.

2. Methodology

A. General

This thesis deals with the relative study of modeling, designing, and analysis of multi storey building using various different software's. The building plan, section and elevation are created using AutoCAD software and modeling of the building in EATBS software. The entire structure is designed and analyzed in ETAB software for various types of loading.

B. Working stress method

The working stress design method is used for reinforced concrete design. In this method concrete is considered similar to elasticity, steel and concrete and where the linear relationship between loads and stress is. This method is very old method for concrete design work.

C. Limit state method

The stresses are obtained from the design loads and compare to the design strength. In this method, this method follows linear strain relation, but it has no relation to linear stress. The ultimate stresses of the materials it has self-used for allowable stresses. Limit state methods use partial safety factors. This is a new and plastic design method for building design work.

D. Methods of analysis

Structure analysis based on, different types of building materials used, external load on the structure, axial load, seismic record of previous years, type of structure, climate of the building to be constructed and the temperature there, type of structure, type of soil, Selection of materials used in the building, purpose of building to be constructed for example residential, commercial, school, office and factory etc.

1) Equivalent static analysis

The equivalent static lateral force method is a simple technique for design purposes to alter the effect of the dynamic loading of an earthquake expected by a later distributed static force on a structure. The total applied seismic forces V is always evaluated in two horizontal directions parallel to the main axes

of the building. Always the building responds in its fundamental lateral axial mode.

3. Results and analysis

A. Analysis

Analysis work has been done in ETABS Software, and it used M20 grade concrete, steel Fe-415 to prepare the building in structure work. All the analysis work has been done according to the Indian Standard Code. This building has been prepared for zone-II of Hoshangabad district. For Building analysis, the combined action of DL, LL, & EQ forces are considered. The structure model has been modeled using ETABS, total fourteen combinations of different load conditions are generated and applied to design the structure. Analyzed the entire building by using AAC blocks as walls instead of red bricks in the building. The different design codes are used for analysis:

RCC Design – IS 456:2000

Seismic Loads – IS 1893 2005 (Part 1)

Dead Loads – IS 875-1987(Part 1)

Live Load – IS 875-1987(Part 2)

Table 1
Joint coordinates data

S. No.	Label	X Mm	Y Mm	ΔZ Below mm
1	1	15000	0	0
2	2	15000	3000	0
3	3	15000	8000	0
4	4	15000	12000	0
5	5	15000	15000	0
6	6	1000	0	0
7	7	1000	3000	0
8	8	1000	8000	0
9	9	1000	12000	0

4. Conclusion

Considering AAC infill wall effect, the value of axial force, bending moment, Ast is less compared to clay brick infill frame. Because of the infill wall effect, there is a drastic decrease in the value of axial force in column and foundation level. Due to

the good surface on the walls of the AAC block, it does not act as plaster, which saves the cost of plaster on the walls, which affects the total cost of the building and the dead load of plaster is not applied on the building which helps in reducing the axial load of the building.

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