International Journal of Research in Engineering, Science and Management
Volume-3, Issue-1, January-2020
www.ijresm.com | ISSN (Online): 2581-5792

Comparative Study on G+4 Multi-Store Building with AAC Block and Conventional Bricks Under Similar Loading Conditions by ETABS Software – A Review

Nitin
Student, Department of Structural Engineering, Millennium Group of Institutions, Bhopal, India

***Abstract*: With the help of this project, it has been prepared keeping in mind the strength of the building. In which the strength of the building is increased by reducing the unnecessary load on the building. The AAC block is very useful for building lightweight structures. The impact of earthquake is proportional to the weight of the building constructed. Buildings constructed from AAC blocks are more reliable and safer. Construction work has taken place rapidly as AAC blocks are available in every size and it is also easy to lift AAC block in high rise building. The use of bricks has directly and indirectly caused problems to the environment and health problems. This project illustrates the analysis and comparison between two identical multi story buildings with different materials in terms of bricks.**

***Keywords*: Design Auto-CAD, RCC Structure, ETABS, Shear force, Analysis, Moments and Comparative results.**

1. Introduction

A. General –

In this chapter the analytical design using with the details of different types of materials. Are using AAC blocks on the wall to design the building as well as using red bricks on the wall in the same size building.

B. Autoclaved aerated concerete (AAC) block

The AAC block was invented in 1924 by Johan Axel Eriksson, a Sweden Architect. It is the most used construction material in Europe and is growing rapidly in many countries around the world. AAC blocks are produced as per the requirement of the construction work, AAC blocks are manufactured from a mixture of pulverized fly Ash, lime, cement, aluminum powder, gypsum, sand, water and hardened by steam curing in autoclaves. It offers a unique combination of strength, weight load, thermal insulation, sound absorption, unsurpassed fire resistance and unprecedented buildability. AAC block is a natural and non-toxic building material that saves energy and is environmentally friendly. Now good and efficient construction material like AAC block is being preferred.

C. Red bricks

Bricks have been used since very old times, it is used in the construction work of walls in building work. It is very useful construction material for construction work, it is generally produced in the village. The production of bricks uses alumina 20%, silica 50% - 60%, lime 4% and iron oxide 4% - 6% production materials. The standard size of red bricks is 190 X 90 X 90 mm but they are produced in the size of 200 X 20 X 20 mm as per usage. The production and use of red bricks has been in place since a very old time, but a large amount of wood is used in its production, which is causing great harm to our environment.

Fig. 1. Burning of red brick

Unskilled labors works in the production of bricks due to which sometimes the size of the bricks is neither correct nor the quality is suitable, due to which the construction of the wall has to face many problems and the quality is also poor. The bricks are used in walls as partition walls with 4 " inch walls and the 8 " wall is used with bricks in the exterior walls of the building. Red bricks have very good load capacity but their density 18.85 kn/m3 is 3 times higher than that of the AAC block, due to which the building weight increases and the amount of RCC and steel is more use in the building and the cost of building also increases.

2. Methodology

A. General

All columns in the design of the building are given in

rectangular shape. The building has designed modeling and analysis for Zone-II in the Hoshangabad District. Multi storey buildings are subject to horizontal air pressure as their height also increases. Along with this, earthquakes cause vibration at the base of the building and hence earthquake analysis is also necessary for the design of high buildings.

B. Equivalent static analysis

The structure needs to be able to resist the effects caused by seismic forces in either direction but not simultaneously in both directions. Equivalent static analysis is used in regular structure with finite structure. This method also requires computer efforts which work according to the provision of the IS code. The first step is to calculate the design base shear according to IS code 1893 Part 1.

C. Nonlinear static analysis

Nonlinear static analysis is a technique used to evaluate the actual strength and seismic performance of a structure. The static nonlinear analysis is performed with the lateral load gradually increasing with the existing vertical load. Structure loading magnitudes are increased according to a certain predefined pattern and therefore obtain order of flow, yield, plastic hinge structures, and fat modes of structure. As a result, each event experiences a reduction in structure defects. According to nonlinear static analysis, the structure allows it to load until failure. Thus this analysis is known as the process of estimation of collapsing capacity and ductility.

D. Response spectrum method

Response spectroscope is a very useful tool for engineers to determine and analyze the demands of motion of earthquake lands on the ability of buildings to resist earthquakes. Thus, if we can find the natural frequency of the ground, then by reading the values from the ground response to the appropriate frequency, we can also estimate the response of the top of the building. The value of the code used to design the buildings of seismic zones is the basis of the calculation of those forces, because that is prepared through the records and information of the old earthquake.

E. Time history method

it is also called time series, data of earthquake and vibration in the ground is recorded through seismograph instrument. It is in the form of time versus acceleration. This instrument is placed inside the ground, this data is in a digital form. Which we run through a software. This data is very important because with the help of this data we can check the effects of using the building on the records of the earthquake of old times.

F. Earthquake design philosophy

During an earthquake, ground shaking at a given location may be minor, moderate and strong. In this way, speaking relatively often is minor shaking, Moderate tremors and strong shocks occur very rarely or rarely. For example, in our world, about 800 earthquakes have a magnitude of 5.0- 5.9. Whereas for magnitude 18 to about 18 is 7.0 to 7.9 there are earthquake resistant normal practice structures. During earthquake conditions, structures are impacted and damage can occur, but still the structures will not collapse, thus protecting people and objects is safer and has been achieved at less significant investment than structures such as earthquakes. So we should build buildings to resist the tremors of that rare earthquake that comes once in 500 or 2000 years even if our building is 50 to 100 years old. Earthquake resistant buildings should be specially built with their main elements with flexibility in them. These types of buildings have the ability to speak during earthquakes and also withstand some earthquake impact but without collapse.

G. Seismic zones in India

The main reason for the history of devastating earthquakes in the Indian subcontinent is the main reason for the high frequency and intensity of the National Center for Seismology (NCS). The constantly changing geology at different locations in our India country clearly means that the probability of a big earthquake at different places is different. Thus a seismic zoning map was needed to identify the regions. Zone map divided India into five zones in 1970, based on the intensity levels created during the old earthquake as needed. In 2002, it was changed to 4 regions i.e. Zones II, III, IV & V.

H. Dead load on structure

In this, all the members of the building such as beam, column, slab, wall, floor finishing work, plaster work, parapet wall, water tank, and all other works that are done in the building are added to it. And as well as stair, exterior wall, inside partition wall cantilevers and their plaster, window, door etc. All the weight of each floor is included in it. This load is the structure member's own weight such as beams, columns, slabs, stairs, etc. Dead load is always permanent in the building, which is its own load. When designing a building, this load is used for each building. The unit weight may taken from IS: 875 (part 1st) .

- Outer wall dead load= 5.50 KN / M
- Internal wall dead load= 3.50 KN / M
- Terrace wall take 3 feet Height = 2 KN / M
- Dead load on slab = 2.0 KN/ SQM

I. Live load on slab

According to IS 875 Part II deals with the Live load on roofs, floors, stairs, balconies etc for various occupancies. There is a provision for reduction in the live load for certain situation. Live load is a load that is in the building for some time such as sudden presence of lots of people on the building, storing materials for some time, this load may be in the building. According to IS code, different types of live loads have been given for each type of building, such as commercial buildings, residential buildings, garages, material storage buildings etc.
Slab live load = 3.0 KN / M

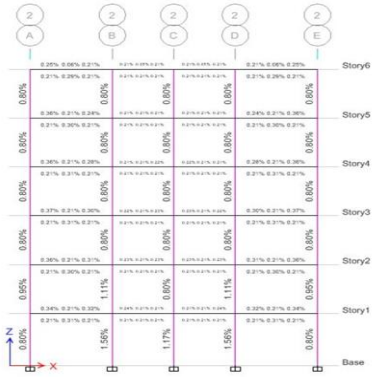

Fig. 2. Elevation Steel in Percentage using Conventional Brick in Dead load

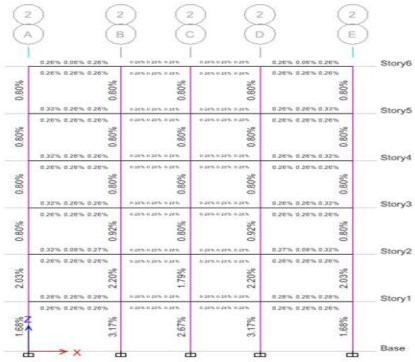

Fig. 3. Elevation Steel in Percentage using Conventional Brick in Dead load

3. Conclusion

This paper presented a review on G+4 multi-store building with AAC block and conventional bricks under similar loading conditions by ETABS software.

References

[1] Ali J. Hamad, "Material, production, properties and application of aerated light weight concrete," International Journal of Materials Science and Engineering, vol. 2, No. 2, December 2014".

[2] Keoleian, G. A., Blanchard, S., and Reppe, P., "Life-Cycle Energy, Costs, and Strategies for Improving a Single-Family House. Journal of Industrial Ecology", 2001.

[3] Mandirola, Martina; Penna, Andrea; Rota, Maria; Magenes, Guido "experimental assessment of the shear response of autoclaved aerated concrete (aac) masonry with flat truss bed-joint reinforcement (15th International Brick and Block Masonry Conference Florianópolis – Brazil – 2012)".

[4] Ortiz, Castells and Sonnemann, "Sustainability in the construction industry Construction and Building Materials, 2009.

[5] Xung, Xu and Jun, "Heritage buildings and historic microclimate without HVAC technology: Malatestiana Library in Cesena, Italy, UNESCO Memory of the World," 2008.