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Comparative Analysis Of Conventional and Light Weight Building: A Review

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Abstract:

In general lightweight construction is considered to be favorable due to the savings in construction materials. Lightweight construction materials have the potential to improve the sustainability and affordability of homes, depending on the location and climate they are built-in. This is both at an individual home and on a higher density scale. Lightweight materials can also respond rapidly to temperature changes and cool rapidly overnight in warmer climates. Analysis of lightweight and conventional building gives the results that lightweight construction approximately reduces 40% of total weight of the structure and ultimately reduces the cost of construction by 20% less than the conventional building. Although building techniques and materials have evolved over thousands of years, construction is still a long, complex, and expensive process. Construction industry boom can be seen in almost all the developing countries. With the increase in material costs in the construction industry, there is a need to find more cost saving alternatives so as to maintain the cost of constructing houses at prices affordable to people. There is need to develop an alternative system of building component which would impart more benefits . The main aim of the project is to compare the earthquake resistance structure in different seismic zones by adopting parameters like Axial forces, displacement on column and deflection in beam by using STAAD-PRO. The structure is analysis for maximum load cases. The objective of the project is to obtaining the correlation between parameters like Axial forces, displacement on column and deflection in beam and results of different parameters are plotted in the form of graph. The behavior of the structure according to different seismic zone was analyzed. Analysis of G+5 building by referring IS codes i.e IS: 456 : 2000, IS : 1893 (part I) : 2016, IS : 875 (part II) : 1987 and comparison between the normal load cases i.e DL, LL, EQX, EQZ. Live loads are taken from IS codes.

Keywords: AUTO

1. Introduction:

Nowadays the houses building are major work of the social progress of the country. Daily new techniques are being developed for the construction of houses economically, quickly and fulfilling the requirements of the community engineers and architects do the design work, planning and layout, etc., of the buildings. Draughtsman is responsible for doing the drawing works of building as for the direction of engineers and architects. The draughtsman must know his job and should be able to follow the instruction of the engineer and should be able to draw the required drawing of the building, site plans and layout plans etc., as for the requirements.

Comparison of G+5 RC frame building on different seismic zones by adopting earthquake loads and comparing that structure in terms of different parameters such as, Axial load and Displacement on selected columns and Deflection on beam by using software STAAD PRO. Due to different zones, zone factor, Importance factor and Response reduction factor are changes. According to different zones of India, have to design the structure and compare in different parameters so that the structure will be safe and sustain the earthquake load. Selecting columns and beams from the whole RC frame building. employment in emerging markets, according to the report structure. Many of these data show how important SMEs are all across the world. Micro, Small, and Medium Enterprises (MSME) are the names given to small and medium businesses in India (MSMEs). Matching the worldwide trend, the Indian economy views MSMEs as a major economic driver and a factor in achieving a balanced growth of the regional market.

2.Literature Survey

1.Dhanavath Seva et al:-

In order to complete in the ever-growing competent market, it is very important for a structure engineer to save time, as a sequel to this an attempt is made to analyse and design a multi store building by using a software package stadd-pro. For analyzing a multi storied building one has to consider all the possible loading and see that the structure is safe against all possible loading conditions. There are several methods for analysis of different fream like kani's method, cantilever method, portal method, and matrix method. The present project deals with the analysis of multi strayed residential building of G+6 consisting of 5 apartments in each floor.the dead load & live load are applied and design for beam,columns,footing is obtain STAAD-PRO with its new features surpassed its predecessors, and compotators with its data sharing capabilities with other major software like AutoCAD and MS Excel. We conclude that staad pro is a very powerful tool which can save much time and is very accurate in Design. Thus, it is concluded that Staad pro package is suitable for the design of a multistoried building.

2.Dr.Savita Maru ct al,:-

A building can be defined as an enclosed structures intended for human occupancy, Construction work can be seen in almost all the developing countries. With the increases in material cost in the construction work, these is a need to find more cost saving alternative so as to maintain the cost of construction houses, multistory etc., which can be affordable to people. In the manufacturing of burnt clay bricks, smoke evolved at a great extent and also some toxic gases which can harm an environment. So as to overcome with all these problems, Cellular lightweight concrete block are used which is more economical and eco-friendly .this project present analysis and comparison for G+12 residential building by using Celluar lightweight concrete blocks at the replacement of burnt clay bricks. Analysis is made by using burnt clay bricks and cellular lightweight concrete blocks for different densities overall modeling and analysis is done by using STAAD-PRO software. By using cellular lightweight blocks, the overall cost of construction is reduced and it will be safe and economical in earthquake forces also.

3. Prof. M. R. Nalamwar et al –

Although building techniques and materials have evolved over thousands of years, construction is still a long, complex, and expensive process. Construction industry boom can be seen in almost all the developing countries. With the increase in material costs in the construction industry, there is a need to find more cost saving alternatives so as to maintain the cost of constructing houses at prices affordable to people. There is need to develop an alternative system of building component which would impart more benefits and are multifunctional with optimum use of labor and material. This project presents brief analysis of building for G+4 & G+7 by using Red brick, CLC block and AAC block with and without considering earthquake forces are considered. Cost analysis is made by using Red brick, CLC & AAC block and overall modeling and analysis is done by using STAAD-Pro software to known the various bending moment and shear force acting on a building. By using AAC block and CLC block the overall cost of construction is reduce and it will be safe and economical in earthquake forces also.

4. LaxmikantVairagade et al –

This research work on comparison of seismic analysis and design of G+15 building using ALC (Aerated light weight concrete block) and conventional bricks. The performance of the building is analyzed for different position of shear wall, aerated light weight concrete block and conventional brick. The study includes understanding the main consideration factor that leads the structure to perform badly during

earthquake in order to achieve their approx. behavior under future earthquakes. The analyzed structure is symmetrical, G+15, Ordinary RC momentresting frame (OMRF). Modelling of the structure is done as per STAAD Pro. V8i software. Time period of the structure in both the direction is retrieve from the software and as per IS 1893 (part 1): 2002 seismic analysis has undergone. The lateral seismic force of RC frame is carried out using equivalent static method as per IS 1893 (part 1): 2002 for earthquake. The scope of present work is to understand that the structure need to have suitable earthquake resisting features to safety resist large lateral force that are imposed on them during earthquakes. The results of the performance and the analysis of the models are then graphically represented and also in tabular form and is compared for determining the performance of building against lateral stiffness by arrangement of different material property of bricks in the structure and different position of shear wall. The analytical results of the high-rise building will be compared and analyzed obtained are storey drift, equivalent diagonal strut, axial force, shear force and moment in beam and column when subjected to static earthquake loadings. And the structre properties are optimized are optimized for most economical dimensions.

5. T.Berset, L.Abacherli&G.Schwrgler, H.Stempfle, R.Herter:

The office building housing the Agrisano health insurance company in Windisch was fuly renovated and also raised by one storey in the summer of 2011 thus the buildings seismic resistance was also increased. The review of the structures earthquake resistance was carried out on the basis of Seismic Review of Existing Buildings. Various strengthening operations were considered for increasing the seismic resistance of the office building and its masonry wall panels. The final strengthening system adopted was StressHead AG which involves the installation and post tensioning of Sika CarboDur CFRP Plates. In total 16 post tensioned plates tensioned with 220KN force were used. The anchorage of the tensioning force was achieved with a combined CFRP StrssHead and steel reaction frame to transfer the load directly into the floor slab. Including all of the pre treatment and post treatment works only 15 working days were needed for complete installation of all 16 systems. The seismic resistance to 80% of the potential impact were obtained.

6. R.Riddell& J.C. De La Llera:

A Smmary of available methods of analysis and design and a review of the state of practice in earthquake resistant design is presented. A change in format of seismic design code is proposed aimed to gurantee structural quality with a predominant earthquake performanceobjectives. The concept of validation ground motion is introduced as opposed to design ground motion, and an integrated design validation procedure was

proposed. IN order to achieve the goals of the proposed procedure they state to implement following requisites in future codes. It provides specific definition of validation earthquake. It gives freedom to the designer and privilege good engineering. It establish explicit performance objectives associated to various levels of protection. It also standardize acceptable models for no linear response validation. Also in turn the designer should privilege high performance structures and state explicity to the owner the quality of the design (level of protection) and provide the owner a cost protection relationship.

7. Kiyoshi Muto:

This paper describes the method of analysis of single storey and multi storied reinforced concrete buildings. In these buildings, the various vertical framing members are framed into and connected to reinforced concrete floor slab structures. The basic principle of the stress analysis in this paper is to distribute the lateral shear at any one storey to the resting elements of the story. This distribution was made in proportion to the D values, distribution coefficients of these elements. The principles such as direction of earthquake forces, action of earthquake force, displacement of the floor slabs, plastic deformation, D-values, the shearing force, distribution coefficients and conditions of the foundations were applied for the analysis of a building for seismic forces. The method of seismic analysis adopted as evaluation of he D-value, distribution of the storey shear to the framing elements, torsional correction of the distributed shear, calculation of stresses and recheck of the analysis.

8. T.Subramani, R.Ganapathy, V. Manoharan, M.Balamurugan, R. Murugasen.:

In this paper, the computer aided analysis was done by using E-TABS to find out the effective lateral load system during dynamic loading in lightweight concrete building. The performance of the building was evaluated in terms of Lateral Displacement and Storey Drifts. The study found that Response Spectrum analysis reduced lateral displacement and storey drift due to dynamic loads compare to static analysis for all analysed modes. In addition to that light weight concrete reduces the dead load of wet concrete allows longer span to be poured unpropped. In their project the Earthquake resistant Commercial Building was planned using Autocad and analysis and designed with limit state method using E-TABS. They show the result using dynamic loads in a lightweight building and conclude that light weight concrete is more effective compared to conventional concrete.

9. Md.Arifujjaman& Yoshiaki Nakano.

This paper focuses on the seismic capacity of the light weight RC structures and the effect of the lightweight components on the seismic behavior of RC structures. Housing and Building Research institute (HBRI) is a national research institute of Banglades. HBRI is working to develop lightweight building component to reduce the cost and seismic risk of structure. Therefore, HBRI has constructed a 5 Storied residential building using lightweight thermal block walls and Ferrocement floor channels. Non linear pushover analysis was done to know the performance of the structure. The model building analysis was divided into three cases. Non linear pushover analysis is carried out on the model structure for the three cases and their performance was compared. It was found that seismic performance of the light weight structure is found better than the conventional structure. It is also possible to construct a comparatively safe structure against earthquake forces by using lightweight component at low cost.

10. Swamy NadhVandanapu&Muthumani Krishnamurthy:

This paper attempts to predict the seismic response of a six storied reinforced concrete frame with the use of lightweight concrete. A well designed six storid building was taken for study. The structure was modeled with standard software, and analysis was carried out with normal weight and lightweight concrete. Bending moment and shear force was considered for both NWC and LWC and it was observed that bending moment and shear force were reduced to 15 and 20% respectively, in LWC. The density difference observed was 28% lower when compared NWC to LWC. The study was extended with dynamic analysis carried out using the response spectrum method. The safety of the structure as observed fro drift at each storey level was good. With new research it s possible to get higher young's modulus for same strength parameter by suitable modification of concrete mix design. As the no. of storey increases the benefit on economy is likely to be more.

Carsten Block, Fritz-Otto Henkel: This paper focuses on Earthquake induced forces as mass proportional forces. Within a European research project an earthquake resistant lightweight house was developed and a two storiesmock up was tested on a 3D shaking table. Two variants for the structural system at three different stages f construction were tested at different excitation levels with a maximum peak ground acceleration of upto1g. The main purpose of the test was to determine the load carrying capacity of the building that is made of a combination of lightweight steel construction and drywall elements is suitable forvresidential buildings in seismic prone areas. The relatively low mass of such constructions leads to a reduction of inertia loads and by this to reduction of requires cross secti

Conclusion

This comparative study presenting an assessment of seismic load effect on multi-storey building using conventional bricks and light weight infill blocks. By observing the overall analysis result, images and bar chart

Of conventional and light weight building structure and comparing parameters, Following conclusion can be made-

- The weight of light weight building structure is found to be 30% to 40% less than conventional building.
- The parameter of light weight Wight building like maximum moment, maximum axial force is found 20% to 25% lesser then conventional building.
- According to the project use of light weight building in construction in seismic zone reduce the percentage od damages as well as economy of construction.

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