Comparative study and analysis of GFRG and conventional multistoried building using E-TABS

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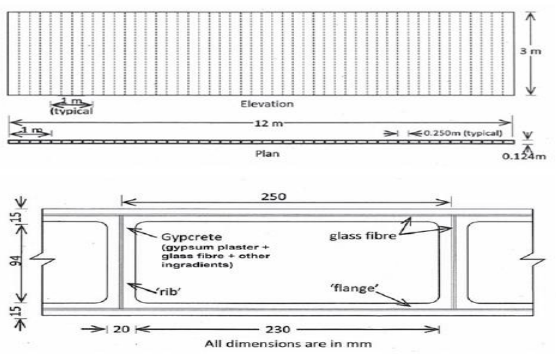
Abstract - *In this project a comparison of GFRG (GLASS FIBRE REINFORCED GYPSUM) building with conventional G+10 multi-story building is studied for earth quake load using ETABS. GFRG wall panel is made essentially of gypsum plaster reinforced with glass fibers. The panels are hollow and can be used as load bearing walls. The hollow cores inside the walls can be filled with in-situ plain or reinforced concrete.GFRG walls are used in residential, commercial and industrial buildings. The gypsum is industrial by product waste. The product is not only eco friendly, but also resistant to water and fire. In India fertilizer industries are facing problem in disposal of industrial waste gypsum (2000 tons per day). To meet this challenge, India requires innovative, energy efficient, strong and durable in fast method of construction at economical cost.*

Key Words: Maximum Storey displacement, storey shear, story drift, response spectrum analysis, base reaction, seismic ZONE V, ETABS

1.INTRODUCTION

The main aim of this project is to present the dynamic analysis and comparative study of G+10 multistoried building constructed using GFRG panels as structural as well as non structural components, and conventional building with corresponding dimensions using "Response Spectrum Analysis" in Etabs software. Engineering models are created for the analysis and the parameter **Maximum Story Displacement, Storey Drift, Storey Shear** and **Base Reactions** are observed and compared in Etabs.

1.1 Typical Cross Section of GFRG panel



1.2 Modelling Details

For analysis and study purpose two models are created with corresponding dimensions and anlaysed for ZONE V in ETABS software.

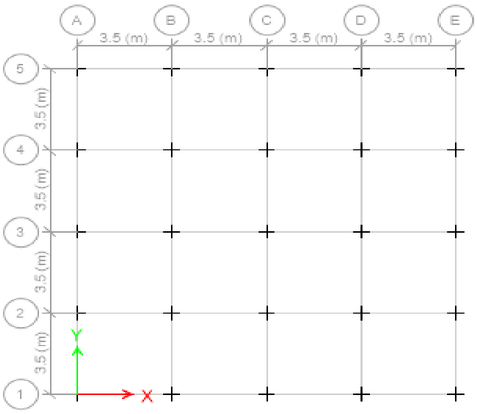
Table -1.1: GFRG G+10 building Model details

Serial number	Properties	Dimensions
1	Building Plan	14m x 14m
2	Column C1	350 x 350 mm
3	Plinth beam B1	350 x 250 mm
4	Roof beam B2	200 x 94 mm
5	Plinth height	1.8 m
6	Storey height	3.5 m
7	Unit weight of GFRG panel	0.40 N/m^3
8	Wall thickness	124 mm

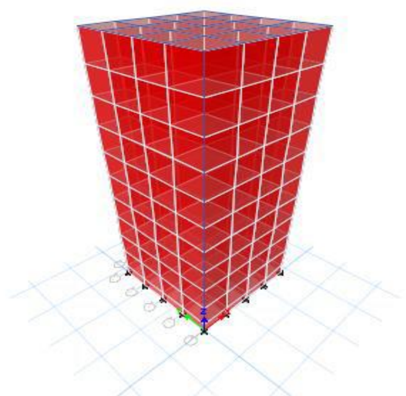
Table -1.2 : Conventional G+10 building model details

Serial number	Properties	Dimensions
1	Building Plan	14m x 14m
2	Column C1	350 x 350 mm
3	Plinth beam B1	350 x 250 mm
4	Roof beam B2	350 x 250 mm
5	Plinth height	1.8 m
6	Storey height	3.5 m
7	Wall thickness	230 mm

Plan view :-



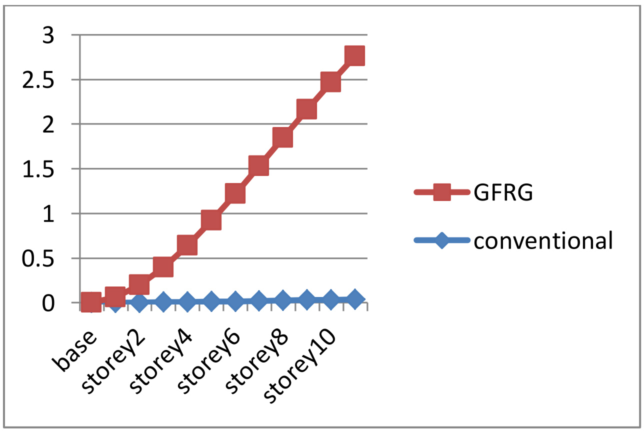
3D View :-



2. ANALYSIS RESULT :-

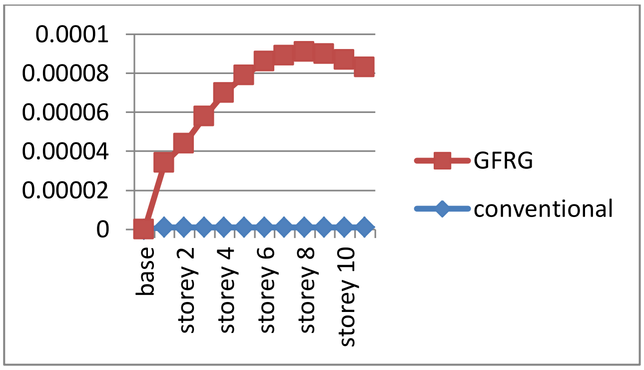
As per the Response Spectrum Analysis done on both the models 1 and 2 in ETABS respectively, comparative results obtained are described below :

2.1. MAXIMUM STOREY DISPLACEMENT :-



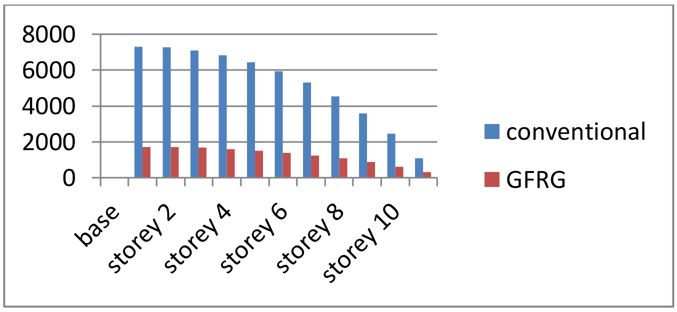
Comparative Maximum Storey Displacement

2.2 MAXIMUM STOREY DRIFT



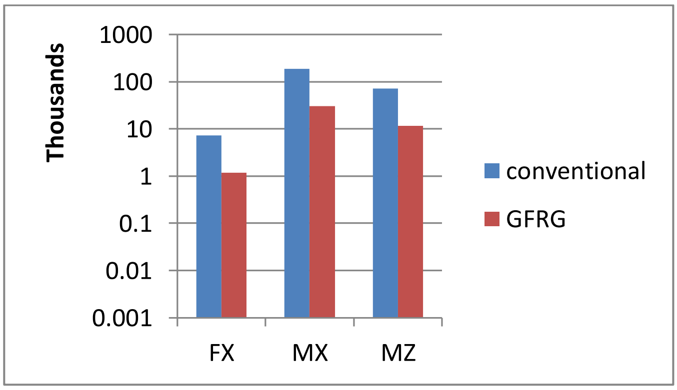
Comparative Maximum Storey Drift

2.3 MAXIMUM STOREY SHEAR :-



Comparative Maximum Storey Shear

2.4 BASE REACTION :-



Comparative Base Reaction

3. CONCLUSIONS :-

On the basis of Response Spectrum Analysis of both the models, following conclusions are drawn :

1. Considering story displacements for zone V, the displacements increases from ground floor to top floor in both the cases i.e., RC building and GFRG building as shown in figure

2. In case of story displacement , GFRG building creates greater displacement as compared to conventional RC building,
3. Values of storey drift for conventional RC building are very low as compared with GFRG building as shown in figure ,
4. While considering storey shear , GFRG building gives very low values as compared with conventional RC building as shown in figure ,
5. Values of storey shear increases from top floor to bottom floor for both GFRG building and conventional RC building ,

6. The shear force and bending moment acting over the base of GFRG building is far lower than at the base of conventional RC building as shown in figure. This is mainly because of the light weight components of GFRG building as compared with conventional RC building.

   As per the analysis and comparative study of both the building it is concluded that GFRG building acts similar to conventional RC building . GFRG buildings are economical on the basis of design and construction point of view. At the same time , story displacement keeps on increasing with the increase in number of storeys in case of GFRG building , it is found suitable for low rise building structures and low cost building construction.

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