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REVIEW ON EXPERIMENTAL ANALYSIS OF SHEAR WALL USING GFRP BARS IN HIGH-RISE BUILDING

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ABSTRACT
High-rise buildings are generally constructed with shear walls to withstand high lateral loads such as seismic load and wind pressure. Shear wall provide more stability to structure to withstand heavy horizontal loads & sustain gravity loads. [18] The major problem occurred in the reinforced concrete structure is the corrosion of steel rebars, due to this the failure of structure.[16] To overcome the failure of steel can be replaced by the Glass Fibre Reinforced Polymer(GFRP). GFRP bars have more durability and more tensile strength, thus making its performance superior to that of steel material. Use of the GFRP bars also can be cost effective structure. From the literature study observed that the GFRP bar better than the steel.
Keywords: GFRP bars, High-rise Building, Shear wall, Steel bar, Concrete.

I. Introduction
In structural engineering Shear wall is a vertical member that made to resist the lateral forces acting in plane most often caused by wind & seismic load. Shear wall provides lateral shear strength to structure[1]. For the slender walls where the bending deformation is more, shear wall resist the load due to cantilever action. Shear wall works like a vertical cantilever beam that is supported at the ground carrying vertical load together with columns [5]. Corrosion of reinforcing steel has been the primary cause of deterioration of Reinforced Concrete (RC) structure [8]. To overcome this deterioration of steel the new material has been started using that is Glass Fibre Reinforced Polymer (GFRP) bars. GFRP bars are light weight, corrosion free, having higher tensile strength & higher strength to weight ratio. GFRP bars are non-conductivity in electricity & thermal effect [10]. GFRP reinforcing bars are gradually finding wider acceptance as a replacement for conventional steel reinforcement as it offers many advantages [12]. Due to the increase population need to construct multi storied RC building are need to with stand the lateral load including earthquake & wind load. RC building which are constructed in seismic are collapse due to severe earthquake. To resist loads vertical structure shear wall used [18]. Shear wall in high-rise building are from foundation to terrace. Its thickness may vary from 150mm to 400mm as per the design load. Shear walls are usually provided along both length and width of building [19]. Today's tall buildings are becoming more slender, leading to the possibility of more sway in compression with earlier high-rise building.

II. Literature
Auto CAD
Floor plan is technical illustration showcasing the layout and different measurement of the structure. This type of drawing is generally created in the AutoCAD software. This software give the plan, elevation with different layers and colors for the easy understanding of drawing and good presentation for the users. Due to the autocad the job for the engineer is make easy due to its working and better understanding and also easy to change the plan make faster because of layers and its provide too many options for working.
ETAB
Etabs stands for extended three-dimensional analysis of building system. It is structural engineering software used to analyze and design multi-storey buildings. Etabs offers a single user interface to perform modeling, analysis, design and reporting. It has been utilized in the structural analysis and design of the numerous iconic structure across the globe including the Burj Khalifa deigned by skid more Owings and Merrill LLP(SOM), Taipei lol, and Petronas towers. This is easy and best software

used to design and analyze high-rise buildings and structure with irregular shapes and geometries. It can handle the impact of lateral loads, Torsion and Drift more efficiently and has more build in codes and standards than STAAD Pro [2]. Loads considered are taken in accordance with the IS 875(Part 1& 2), IS -1893(2002) code & combination are according to IS 875(part 5) and IS 456-2000, IS 800-2007 [3]. Extracting the storey drift data of building with and without the shear wall and comparing the data by Etab is easy.

Shear wall

From the literature study conclude that for the worldwide fast growth of multi-storey buildings, no probabilistic assessment procedures have been proposed or developed for seismic risk evaluation of this special building group. RC buildings often have vertical plate like RC walls called Shear walls in addition to slabs, beam & column. Shear walls from footing to terrace as per design of structure. Their thickness can vary from the 150mm to 400mm in multi- storey building. Shear wall mainly provided at core part of structure and it at staircase and lift walls. Shear walls are like vertical oriented wide beams that carry earthquake loads downwards to the foundation. A simplified analytical model is proposed for modeling the nonlinear response of flexural yielding reinforced concrete walls using standard structural analysis software [19]. Shear walls provided on the periphery of the structure is more beneficial to the structure to reduce the collapse & structural Deformation [18]. To withstand against lateral loads shear wall give more stability then the column. Shear wall gives more stiffness & also enhance stability of structure. Shear wall mainly resist two forces Shear force & Uplift force. In IS 456-2000 clause 32 & IS 13920-1993 clause 9 give deign requirement for the shear wall [5].

Glass Fibre Reinforced Polymer (GFRP)

Steel bars can be replaced by the GFRP bars. These bars were light weight, corrosion free, having higher tensile strength and more strength to weight ratio. Due to corrosion property of the steel generally they cannot be used in the bridge structure so there is an alternative material is required which can be replacement of steel with cost and strength related properties such as GFRP can be used because of its higher strength like bridge, rigid pavement, Large infrastructure and other civil engineering structure. There more research is required on the design code with GFRO bars in construction. The factors are to be studied which related to GFRP material are Types of fibre, Volume, Orientation, Types of resin used, Curing, Void content, Temperature , Quality control at the time of manufacturing. GFRP bars are non-conductivity in electricity and thermal effect [10]. GFRP product is composite material consisting of matrix (resin) and reinforcing fibres which are stronger then matrix. GFRP reinforcing bars are manufactured from continuous fibres embedded in matrices. The common fibre reinforcement in pultruded shaped consists of fibre bundles, continuous strand mat, and non-woven surfacing veils. GFRPP material exhibit several properties such as higher tensile strength than steel. The composite materials made of fibres embedded in polymeric resin are becoming an alternative to steel reinforcement for concrete structure [13].

Tests

There are different test can be carried out on the concrete and reinforced concrete and GFRP reinforced concrete. Mainly compressive strength test are carried out on the concrete. For reinforced and GFRP reinforced concrete Tensile strength, Bending and deflection test carried out.

Due to the tests can conclude that the GFRP reinforced and reinforced concrete withstand against load or not. Also from that get to know the GFRP reinforced is normally usable with cost effective.

III. Conclusion

Replacement of the steel bars on tension side of beam has shown better result in flexural load carrying capacity. GFRP bar allow the beam to deflect more and carry higher load compared to the normal RC beam with only steel reinforcement. GFRP reinforcing bar has higher tensile strength & higher corrosion resistance than steel rebar [11].

The performance of GFRP rebar is better than steel rebar, hence it can be good alternative to steel rebar in RC multi storey building [7].
GFRP bars provide more stiffness to the structure [6].
GFRP bar having less weight with more strength compare to steel rebar [10].
The load carrying capacity of GFRP bars structure more than that of steel structure [10].
Shear wall structure have lot less displacement and deflection as compared to without shear wall, also shear wall at core of structure would be suitable to increase the structure stability [5].
Ultimate deflection obtained in the GFRP beam is more than that of steel reinforcement beam [16].
The shear wall and projection of raft proved to be highly advantageous use in the slender high rise building resting on a weak soil [19].

IV. Future scope

To study the behavior of the GFRP bars and steel reinforced structure.
From the literature study concludes that structure with shear wall is more cost effective then the frame structure.
To make the high-rise building more cost effective by using the GFRP bars in the shear wall of structure.
To increase the life of structure by using the GFRP bars because it has non corrosion property.

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