A Review on Steel Concrete Composite Structures

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Abstract - *The majority of residential buildings are designed and constructed in reinforced concrete, which largely depends on the existence of the constituent materials as well as the quality of building skills needed, and also the usefulness of the design standards. R.C.C. is no longer economical because of its expanded dead weight, hazardous formwork. Composite construction, however, is a recent development for the construction industry. steel concrete composite structures are currently very popular due to several advantages over conventional concrete and steel structures. Concrete structures are heavy compared to composite building, giving greater seismic weight as well as more deflection, composite structure incorporates their best properties between both steel and concrete to reduced costs, rapid construction, fire protection, etc. Through use of new modern composite structures can find it economically prohibitive the slow construction of every storey while casting RCC columns, allows the erection of high rise structural frameworks to continue at speed. However, the excellent earthquake resistant performance of composite beam columns has long been known in Japan and have been commonly used for construction in that region. It was also necessary to develop seismic design criteria for typically used Indian structural systems to promote the use of such a successful type of composite construction. A study of different aspects of building is clarified by this work.*

Key Words: **Comparative Study, Composite Structure, Steel Structure, RCC, Etabs Software, Seismic, Comparison Aspects. Response Spectrum Analysis, Seismic Responses, Time History Analysis, Pushover Analysis.**

1. INTRODUCTION

The primary objective of any and all types of engineering structures used in the building design category is to effectively transfer structural load. The most common loads that result from the gravity effects are dead load, imposed loads, and snow load. In addition to these vertical loads, horizontal wave, explosion or earthquake loads are also applied to structures. Lateral loads may produce high pressures, sway movement or induce vibration. It is therefore very important enough for system to have enough resistance against vertical loads together with sufficient stiffness in order to resist lateral forces.(Parasiya and Nimodiya 2013)

Different methods are used to satisfy demand in the building industry. Some of them are common because of men, materials & money availability, many of them seem to be famous due to the practicality of their design. Specifically, there have been three main types of construction methods used in the high-rise construction project, which are:

- RCC Structures
- Steel Structures
- Composite or hybrid Construction

The arrangement of different components including such Columns, Beams & Slabs is a R.C.C. Frame structure, each of which plays its own part in maintaining the structure. Columns are vertical component and a beam is a horizontal member of a frame as well as the slab functions as a platform. (Husain, Siddiqui, and Khan 2019)

Depending upon availability of needed materials as well as the workmanship required in the building industry, the majority of building frames are manufactured and made as reinforced concrete structures, consistent with the practicality of the latest design codes. High-rise building construction is needed nowadays to meet the demand of the population increase and RC construction is popular today in India to meet the demand of the construction industry. (Rathod et al. 2017)

In the other side, as the use of steel frames has a much greater impact if the structures are located in strongly seismic regions where the forces on the frameworks are equivalent to the weight of a structures. The steel frames have such a high strength/weight ratios and can undergo large plastic deformations until they collapse. Owing to the use of steel structures for all types of structures, such as high rise buildings, bridges, towers, airport terminals, assembly plants, etc. steel structures have more rigidity, ductility and are often cost effective. In compression, RCC systems are generally stronger, but due to the higher strength/weight ratio of steel structures, they are often subject to more buckling.(Shah and Saranya 2020)

As the building industry has undergone dramatic changes over the last two decades due to growing demographic growth, market situation, and resource supply (men, money & material) etc., resulting in modern construction methods being implemented by inventors in industry that provide conventional construction with an alternative solution. These will be the form of combine or hybrid construction known as a composite construction that uses the component material efficiently and can be more efficient than conventional RC construction. Composite compositions in which various kinds of materials such as steel and concrete have been used to make sections that had to construct beams, columns, slabs, etc. Because of their suitability in building, nowadays composite is popular in foreign countries, it also overcomes the drawbacks of RCC & Steel structure that make the composite or hybrid advantageous for high-rise construction, while the composite absorbs lateral forces more efficiently compared to the RCC & steel.

In composite systems, the benefit of its bonding property of steel and concrete is taken in order to behave as just a single unit under the loading. Both fundamentally different materials are entirely compatible as well as complementary with each other; they have nearly so same thermal expansion; they provide an optimal combination of compression efficient concrete and tensile strength of steel; concrete also provides corrosion protection and thermal shielding to the steel at higher temperature and can also restrict slender steel. In standard composite construction, concrete rests over steel beam and these two elements function independently under loading conditions and a relative slip happens at the interface of concrete slab and steel beam, which could be avoided by having appropriate connections between them. So the beam and slab of steel act as a composite beam and behave the same as the action of the Tee beam.

In steel concrete composite sections, both steel and concrete resist external loads together and tend to limit the building frame's sway. It should be mentioned that the unique combination of concrete cores, steel framework and composite floor structure has become the traditional design type for multistory commercial buildings in many countries. The primary reason for this selection is that the sections and members are best suited to withstand repetitive earthquake loads that need a high degree of resistance and ductility. (Rathod et al. 2017)

A composite member is constructed such that it functions as a single unit by combining a concrete component and a steel member. As we know, concrete is good in compression and poor to tension, and steel being good in tension but poor in compression. The compressive strength of the concrete is complemented by the tensile strength of steel, which itself lead to an efficient section. This composite member's concept combines steel and concrete with a very well manner. The key structural components used in composite construction contain the following components.

A. Composite Slab

B. Composite Beam

C. Composite Column

D. Shear Connector

Composite Slab

Composite slab sheets are connected to the concrete bar in support of the shear connectors, steel sheets originally go through as continuous shuttering and also serve as lower part reinforcement to steel deck slab and thus are soon followed with hardened concrete. It is a composite structure component that interfaces and forms a unit with the beam and column. A trapezoidal deck is positioned over the beam with profiled sheets, reinforcement bars are settled and concreting is performed over that. Since profiled sheets are laid before concreting, it gives a smooth working process. Essentially, there are 2 types of decks available, such as trapezoidal and re-entrant steel decks.

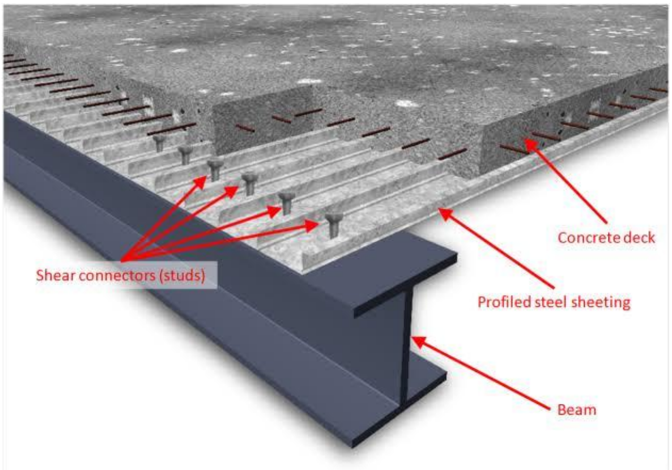

Fig -1: Composite Slab

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Composite Beam

A composite beam is a steel beam and perhaps probably partially concealed beam that is largely exposed to bending and further actively supports the composite deck slab. A composite beam is often a component that binds the slab with the column well together to create a unified single structure. The loading mostly from slab will equally be distributed well to beam. A composite beam could be formed by integrating the steel element into the beam mould and strengthening it with some concrete grades. The main part of a composite beam that acts as shear reinforcement is shear connectors. Inside the beam mould, the steel section can be held or the steel section are being filled with filling material.

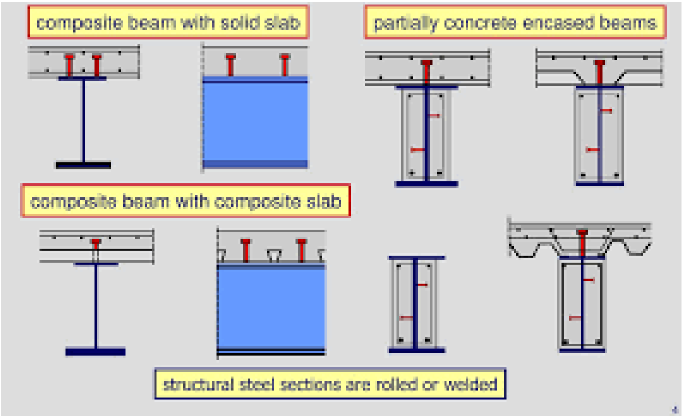

Fig -2: Composite Beam

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Shear Connectors

These are used to have ample strength as well as stiffness for composite members as the link both for concrete and structural steel. By shear transition, it is a crucial component responsible for strengthening the composite action just between the concrete slab as well as the steel beam. Moreover, withstanding with a huge amount of flexural stresses and transferring lateral loads to the resistant lateral load system it is effective for composite system. The cause for the installation of shear connectors is the removal of concrete slab and steel beam divisions and the transition of horizontal shear existing throughout the concrete & steel setup. Based on the requirement, various types of shear connectors can be used.

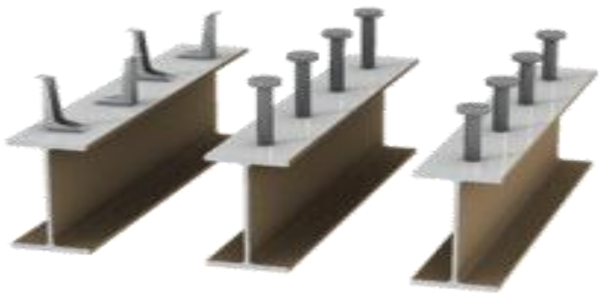

Fig -3: Shear Connectors

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Composite Columns

It is appropriate to consider compression members formed of steel and concrete components as composite columns of steel concrete. There are two types of composite columns.

- Steel embedded in concrete
- Hallow steel section filled with concrete

Well, as in case of composite columns, the parameters under which steel and concrete work together as a solitary unit are friction and bond. The typical construction method for the composite column form construction involves Hollow steel section arrangement, or even I section, which takes primary construction loads, after concrete is cast around I beam or I section filed with concrete. Because of the concrete member, the lateral deflections and also buckling of the steel members are prevented. In comparison to the RCC columns, this composite column has a narrower cross-sectional area and a lighter weight. Since the serviceable floor area increases in the case of composite buildings, the cost of the foundation is also minimized

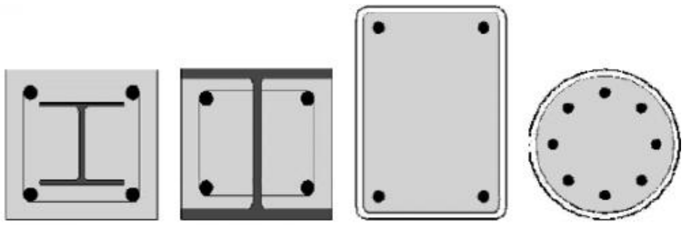

Fig -4: Composite Column Sections

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2. Literature Review

(Patel and Thakkar 2013), the author done study on ten, twenty and thirty storey Concrete Filled Steel Tube (CFT),R.C.C. and Steel building and stated that the permissible displacement limit for 30 storey buildings is 180 mm as per deflection standards and the displacement of the top story of RCC buildings was 179.6 mm very close to the permissible limit. It can also be said that with the adopted geometric frame arrangement, RCC would not be useful above 30 floors. And the time period percentage drop was 26.2 percent and 3.5 percent compared to RC and steel design for a 30storey CFT building, although it was 25.5 and 17.8 percent compared to RCC and steel structure for 20 floors. Comparable to steel and RCC structures, the load carrying capacity for 20storey CFT structures increased by 19.1 percent and 27.3 percent, while for 30storey CFT structures the increase was 22.8 percent and 11.8 percent compared to RC and Steel construction. And the study indicates that the use of concrete filling steel tube columns has been consistently used for the construction of tall buildings as they have substantial economy compared to conventional steel construction. Compared to RCC and Steel construction, performance wise results are also good.

(Patil and Kumbhar 2013) Nonlinear dynamic study of ten storied RCC buildings is conducted and seismic responses of the Modell are analyzed, taking into account different seismic intensities. Using SAP2000-15 program, the building under consideration is modelled. So the seismic responses, notably base shear, storey displacements and storey drifts for both axes, are observed to differ in comparable trends of intensities for all time histories and all models used in the study (V to X). As well as the parameters of seismic responses, base shear, storey displacement and storey drifts alike, are known to be among the enhanced order of seismic intensities differing from V to X for any and all Time Histories, as well as all models. The seismic magnitude of VI, VII, VIII, IX and X has been more than 1.85, 3.56, 7.86, 15.1 and 17.15 times compared to the earthquake magnitude of V for all models (i.e. either with or without soft story) and for all the time history. And for the seismic different intensities of VI, VII, VIII, IX and X, the attributes of base shear, storey displacements and storey drifts (X and Y directions) are measured. Seeing as Time History is a realistic technique used during seismic analysis the reliability of structures evaluated and designed using the process defined by IS code is ideally checked.

(Parasiya and Nimodiya 2013)For simulation and study of the brace frame RC structure and conventional lateral load resisting frame structures, performance correlation and different parameters are contrasted with some of the previous research wok. In terms of seismic dynamic response, whatever work has been done, covers brace frame effects, shear wall effect, bracing system types such as lateral load resisting system, bracing system material, stiffness of various bracing types, bracing properties, etc. If the bracing system is incorporated to resist a lateral load, it serves better than conventional lateral load resisting system when the structure is under dynamic loads. The bracing mechanism also increases the structure's stiffness and ductility as the seismic force is applied. The bracing system is a good method of retrofitting the high-rise RCC structure to improve the seismic excitation system. It can also be said that the bracing system is a safe practice for high-rise RCC structure implementation to control and reduce the damage to the RCC structure during dynamic loading by increasing the structure's lateral load resistance capability due to strengthening characteristics.

(Tedia and Savita Maru 2014)For the comparative analysis of six storey commercial building in which the height of each storey is considered as 3.658 meters, located in seismic zone III and the intensity of wind is taken as 50 m/s, the frame type in this is steel concrete composite frame with R.C.C. options are considered. The plan dimensions are 56.3 m x 31.94 m. for the modeling of the composite and RCC frame Structures Staad-pro software has been used and the findings are compared. The cost analysis shows that the composite design structure of Steel Concrete is costlier, it will make the composite construction of steel concrete commercially feasible and minimize the direct expense of the steel composite structure arising from accelerated erection. Furthermore, owing to the intrinsic ductility properties, under earthquake considerations, the Steel Concrete structure can work better than a typical R.C.C. structure.

(Panchal 2014) In the Indian context, composite steel concrete section is a relatively recent design concept and no suitable updated codes are available for the design of the same A simpler approach discussed in the current work not only avoids costly experimentation needed for design purposes, but also facilitates the design of several options for steel sections and shear connectors with shear connectors VB.NET is fully object oriented and offers execution of controlled code that runs under Common Language Runtime (CLR), resulting in applications that are robust, stable and secure. It also makes it possible to conveniently connect to the Microsoft Access database that has been found to be very helpful in providing quick access to the properties needed for design of different steel sections. As part of the pre- and postprocessor, a number of forms designed to allow the design of various types of composite slabs, beams and columns not only make the software quite user friendly and flexible, but also make the implementation of the software very appealing. For composite columns with a number of steel sections embedded in concrete and numerous concrete filled sections, the proposed computational approach is found to provide detailed performance.

(Fahad and Bhalchandra 2015) the authors taken a 6,11, and 16 storeys buildings for the study of continuous RCC and composite frame structures the authors has also selected a simply supported composite frames structure and the results are concluded as On the application of seismic force, the deflection in continuous composite frames seems more than RCC frames, but within limit values, but the deflection in simply supported composite frames is much more than all frames and reaches the appropriate limits of deflection. In high-rise buildings, Continuous Composite frames are more affordable than R.C.C. frames and are better than simply supported composite frames. The self-weight of RCC frames becomes greater than those of continuous composite frames and simply supported composite frames. For low-rise structures, the cost distinction between composite structures and RCC building is not noticeable, but composite structures are best suited to high-rise buildings.

(Shariff and Devi 2015)This paper is based on modern building extensive study is basically done on steel section embedded in concrete composite columns have been carried out by ETABS software using non-linear analysis is used for stimulation of steel concrete composite with RCC structure of varying number of storeys such as fifteen, twenty and twenty-five are taken under consideration for a comparative study. And structural parameters considered are axial force, base shear and bending moment is done and concluded that the composite structures are stronger for seismic analysis than RCC and finally composite structures shows better performance for these structural parameters.

(Zaveri et al. 2016) Low-rise building comparisons are analyzed in this study work, in which the same seismic parameters are applied to all structures and the results of the analysis were compared to verify the suitability under seismic conditions of RCC, steel and composite low-rise buildings. Compared to RCC or SS (Steel Structures), the authors have concluded that the CS is stiffer and thus seismically resistant.

(Mandlik, Sharma, and Mohammad 2016) The aim of this paper is to explain improvements in the different structural parameters of all these different types of building techniques on symmetrical multi-storey structures 11, 16 and 21 storey buildings respectively, under the influence of seismic and wind forces. R.C.C. and Steel are deemed to withstand lateral forces resisting the system in these buildings. This research explores 11, 16 and 21 storied buildings with using STAAD.ProV8ii the comparison of results shows that: In such loading situations, the node displacement in steel systems is smaller than that in the RCC structure wind load and seismic load. In the case of seismic loading, the column forces in the R.C.C. structure are greater than those of the steel structure. Column forces in 16 storey and 21 storey RCC and steel systems are almost the same under the impact of wind load due to the ductile behavior of the steel that withstands the wind force more than that in concrete, but 11 storey RCC construction has less column forces than that in steel. The moment in the RCC structure in both seismic and wind load is very high relative to Steel. For steel buildings, there are very low bending moments.

(Sutar and Kulkarni 2016) the research cited here has done to understanding the nonlinear composite frame behavior using ETAB 9.7 after examining the author reported that, composite steel concrete has more lateral load capability compared to RCC frame and the lateral displacement of composite steel concrete frame is reduced compared to RCC frame as composite steel concrete has light weight. The composite steel concrete frame follows strong column weak beam behavior as hinges are formed rather than column components in the beam element. From inelastic study for both RCC & composite frames, no unexpected plastic hinges were found. But the composite yield mechanism is superior to RCC since, compared to RCC, in high seismicity, the composite moment resisting frame has better performance.

(Vaseem and Patagundi 2016) The author has studied the seismic effect on 10 storied RC and Steel Structure located in seismic zone-4 the modeling and analyzing is done through ETABS 2015 and has used MS Excel for cost estimation and stated that the seismic results are more as compared to RCC and steel is most costlier than RCC frame. The results are compared on graphical comparison of joint displacement, story forces, story stiffness, story drift, natural time period and base shear.

(Abhishek Sanjay Mahajan and Kalurkar 2016) The author has done this study on the behavior of Fully Encased Composite structure (FEC) the author has modeled a twenty-one storey special moment frame and has considered two different type of structures for the comparison under seismic analysis. The “Pushover analysis” are done for twenty-one storey structure. The analysis and design is done by using ETABS software and as the result base shear in RCC structure will be more because of heavy self-weight as compared to Composite structure, as composite structure has more lateral stiffness which results less time period as compared to RCC frame.

(Rathod et al. 2017) this is held on a 12 storey multi-story building ETABS is used for Pushover Analysis using and the study says that ETAB is used to do inelastic/pushover analysis on both RCC & Composite frames. The result of the study is defined with different parameters and systematic analysis is carried out with the RCC frame. The conclusion of the study shows that Steel, EIS-SB, CIS-SB & CFT SB parts provide minimum dead load as opposed to RCC in the case of dead load and Base Shear. As compared to RCC, the CFTRC output point is optimum. Therefore, they may indeed claim that composite sections are better suitable than RCC for high-rise construction.

(Bani-hani and Malkawi 2017) Comparing the method of time history and the method of response spectrum and illustrating the response spectrum is adopted for nonlinear dynamic analysis. Both previous earthquake history, spectrum records, he considered. Research of two multistory buildings built to handle earthquakes in two different areas of Kabul. By generating an artificial field with seismic forces, analysis and comparison is done. Both approaches are compared by models of construction and study under different loading conditions by the development of artificial accelerographs.

(Mathew 2017) This research was conducted to compare seismic assessment of R.C.C column and composite column G+15 storey building with and without GFRG infill located in seismic zone V Analytical study was conducted to consider the action of R.C.C and concrete enclosed columns in a building. In order to do the analysis, ETABS software is used. A distinction has been made between conventional and composite designs. In contrast to the structure of RC columns, the author claimed that the base shear is around 10 to 15 percent variation in the structure of both composite columns. In terms of base shear and storey drifts, conventional construction can also be considered equivalent to composite building, which is 40 percent higher in the case of composite building. And, as per the IS code, drift is within the limits for all building. Compared to composite structures of entirely and partially concrete enclosed steel column sections, the column with completely concrete enclosed steel sections has better performance.

(May et al. 2017) This study is carried on Dynamic analysis of 13 storey RCC multi storey framed structure the Bhuj and Koyna earthquakes are considered in the study through time history and response spectrum analysis, with the aid of SAP2000 software, responses of such building are analyzed comparatively. By using time history analysis, the seismic response such as base shear for Bhuj earthquake is found to be more than 45.44 percent for Koyna earthquake. By response spectrum method, the base shear of the Koyna and Bhuj earthquake is found to be 37.01 percent and 41.30 percent higher than the time history method. The top storey displacement by response spectrum method of the Koyna and Bhuj earthquakes were found to be 33.15 percent and 34.26 percent higher than the time history method. For all the effects, the values of the storey drifts for all the stories are found to be within the allowable limits defined as per IS: 18932002 (Part I). The research recommends that time history analysis be conducted as it more reliably determines the structural response than the analysis of the response spectrum, It is concluded that the building used for pushover analysis is seismically stable since the base shear of the performance point is greater for both koyna and Bhuj earthquakes than the base shear designed.

(Nethravathi and Thouseef 2017) This paper provides performance analyses for RCC and Composite column of the regular and irregular structure under seismic effect. Structure simulation and analysis is conducted using ETABS software. The study says that in comparison to the same structure with rectangular RCC column, displacement in the regular structure with rectangular composite column is reduced to 40 percent to 50 percent. Compared to the same structure for a circular RCC column, circular composite column displacement is reduced to 40 percent to 50 percent in an irregular structure. In comparison to the same structure with the rectangular RCC column, shear is increased to 60 percent to 70 percent in regular structure with rectangular composite column. Compared to the same structure for a circular RCC column, circular composite column shear is increased to 60 percent to 70 percent in an irregular structure. In comparison to the same structure with rectangular RCC column, drift is increased to 35 percent to 40 percent in the regular structure with rectangular composite column. In an irregular structure with a circular composite column drift, relative to the same structure with a circular RCC column, the drift increased to 35 to 40 percent.

(Namratha, Ganesh, and Spandana 2018) It is a critical study of the whole reaction of 20storey structure of various steel concrete composite frame systems and RCC structures. The two analytical techniques used for this work are the equivalent static approach and the response spectrum approach. Various parameters such as bending moment, shear force, time period, storey displacement, storey drift ratio, base shear have been derived for different models both for zones II and V and are therefore evaluated to determine the better performing structure, stating that the percentage improvement in the displacement and drift ratio is exactly the same for both zones II and V. Compared to other composite models, the RCC model time period is shorter, meaning that the RCC model is stiffer than other composite models. And, as comparable static analysis reveals relatively higher values than the response spectrum method of analysis and graphs plotted with the response spectrum method of analysis data, the structure's behavior is more predictive than static analysis.

(Achari and Kiran 2018) A simplified 30story composite structure approach is modelled and evaluated in this study, where columns and slabs are of composite form and steel section beam. Equivalent static analysis and dynamic time history analysis was carried out using ETABS Ver.15 software in conformity with IS 1893 (Part 1): 2016 requirements. It can be concluded from modal analysis that, due to larger time periods, composite structures are more stable in design and the presence of vertical irregularities raises the time period. The composite structure is subject to greater deformation and drifts compared to all other structural systems, with vertical irregularities at two positions, i.e. at the foundation and at mid height. Composite structure drifts and displacements with vertical irregularities are found to be within the allowable limits as defined by the code (H/300 = 300 mm and h/250 = 12 mm). These designs can also be suggested in the high seismic zone, up to 30 stories. Vertical irregularities lower the composite structure's overall stability, so it is possible to adopt such external bracing structures at these places. It can be concluded from the dynamic time history study that the vertical irregular steel structure does not induce additional acceleration, although it does see a slight increase in displacement.

(Husain, Siddiqui, and Khan 2019) This study addresses a Comparison Review of R.C.C. Frame structure in seismic zone 5 with different slabs and different cross sectional shapes of columns. ETABS 2016 is the software used for this study. It was concluded that the conventional slab has very decent performance as the different criteria from which they have concluded are Maximum and Minimum Displacement, Maximum and Minimum Storey Drift, Maximum and Minimum Storey Shear, Maximum and Minimum Storey Stiffness. While, as in the case of using shapes such as Circle, Rectangular, Square, they have concluded that in contrast to the other forms, Rectangular one has better results. Thus, he inferred through research that the best performing combination of slab and column is conventional slab with rectangular column.

(Jagadale et al. 2019) The paper provides a comparative analysis of the seismic performance of eight Storey frames for Steel, R.C.C. and Composite RCC, Steel and Composite

Building Frame situated in Earthquake Zone V. The ETAB 2015 software is being used and the observations are evaluated and recorded. For seismic analysis, the equivalent dynamic method is used. Composite structures are ideally suited to high rise buildings and help in rapid construction. Lateral displacement of the Composite frame top story is 17 percent less than the steel frame and 15 percent more than the RCC frame in X Direction the Composite frame base shear is 84 percent less than the RCC frame and16 percent more than the steel frame. For RCC frames, axial forces in columns are greater than composite frames and steel frames, which equate to 24 percent and 81 percent respectively. The composite frame weight is 15% higher than the steel frame and 34% lower than the RCC frame for the (G+7) building frame.

(Shah and Saranya 2020) For both the modelling and evaluation of RCC and steel structure ETABs software is used and a comparative study of 9 storey hospital RCC and steel construction was carried out during this article. The researchers indicated here that weight of the steel framework is lower than that of the Rcc frame, which helps to reduce the expense of the core, similarly, the base shear of RCC systems is much more related to the weight of the RCC frame than that of the steel frames, so higher the weight of the structure, higher the stiffness higher the base shear, the research also notes that the displacement In steel structure is much lees as the displacement developed in RCC structure but in the case of RCC that is also in limits. the time period of the resistance of seismic action of steel frame is found to be slightly high.

(Agrawal, Sharma, and Pandey 2020) The paper provides a comparative analysis of the seismic performance of (G+7) Storey frames for Steel, R.C.C. and Composite RCC, Steel and Composite Building Frame situated in Earthquake Zone V. The ETAB 2015 software is used and the results are compared and reported. For seismic analysis, the equivalent dynamic method is used. Composite structures are ideally suited to high rise buildings and help in rapid construction. Lateral displacement of the Composite frame top story is 17 percent less than the steel frame and 15 percent more than the RCC frame in X direction The Composite frame base shear is 84 percent less than the RCC frame and16 percent more than the steel frame. For RCC frames, axial forces in columns are greater than composite frames and steel frames, which equate to 24 percent and 81 percent respectively. The composite frame weight is 15% higher than the steel frame and 34% lower than the RCC frame for the (G+7) building frame.

3. CONCLUSIONS

The foregoing conclusions are drawn from the aforementioned literature.

- In terms of the construction time factor, due to faster erection and placement, composite structure rather than RCC models can be suggested. However, for better structural behavior, appropriate workmanship needs to be followed.
- The composite structure is light weight thus the base shear and base moments are very lees as compared to conventional RCC frame structure beside this shear force in RCC structure is also considerably more than the composite structure due to heavy weight.
- When comparing the two composite structures, it was found that the structure's response parameters with concrete filled steel tubular columns and with concrete enclosed I section columns did not change significantly.
- For RCC, the time period is lower than for composite structures. Besides being more ductile, composites resist lateral load better than RCC structures.
- In the RCC structure, the displacements and storey drift are greater than the composite structure, but are within allowable limits. In contrast to the RCC structure, this is due to the flexibility of the composite structure. The composite structure gives lateral stability and more ductility.
- For steel and RCC building contrasts, cost is a significant consideration. Customers are still already opting for the cheaper option to ignore the time consuming and costly systems. The cost of columns and as well as steel beams is lower than that of the RCC structural members because they do not need any forming. Ultimately, in steel columns, reaction and axial forces on the column are smaller, reducing the expense of column supports and whole steel structures. Buildings need less building time due to the quick installation of the steel frame and simplicity of shuttering for concrete. The inclusion of the building cycle as a feature of the total expense into the cost equation would certainly contribute to a stronger economy for the composite structure.
- The research recommends that time history analysis be conducted as it more reliably determines the structural response than the analysis of the response spectrum.
- Equivalent static analysis shows relatively higher values than the response spectrum method of analysis and the response spectrum method of analysis findings display the structure's behavior more reliably than static analysis,
- The choice of steel frames is better than RCC, but the choice of composite frames for high-rise construction is best.
- The ultimate behavior of the composite structure is higher than the structure of RCC and Steel.

FUTURE WORK

Study can be held on comparison of RCC structure with sear walls in deferent locations and Composite structure at deferent earthquake zones.

The researchers can use deferent softwares and then compare results and state that which software is more effective.

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