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Comparative Study Seismic Analysis of RCC, Steel & Steel-Concrete Composite Frame: A Review

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Abstract: ***This study examines how composite structures are gaining popularity in developing countries. For medium and high levels in RCC buildings are no longer economical due to increased weight, range limitations and low natural frequencies and dangerous formwork. Steel and concrete composite structures are becoming increasingly popular today and are safe throughout their useful lives. Round Steel and concrete structures are the best solution for modern buildings. In this article we will discuss the various results of building construction for RCC, metal and composite construction taking into account different studies.***
Keyword: RCC Structure, Steel Structure, Composite Structure, Joint Displacement, Base Shear.

I. INTRODUCTION

Conventional concrete is a very common building material in India, especially in low and medium-rise buildings. Steel is also often used in high-rise buildings and composite construction is not that popular, but it is possible. The composite construction material may make more sense for medium and tall structures. Composite reinforced concrete Structures can be built instead of reinforced concrete structures to make the most of steel and concrete and produce efficiently and economically structure. It depends on the type of building and the materials used, and based on these characteristics, the type of material can be selected for best result.
Composite structures are created when two heterogeneous materials are put together effectively so that they work together as part of the structure. Composite construction is a new technique widely used to reduce construction costs and create economic structures.

II. COMPOSITE STRUCTURE

Composite steel and concrete structure used area under construction of bridges and modern buildings to Composite elements are created when steel components such as: like I-beams, attached to concrete elements, like a Plate or bridge deck. Assembled in a T-beam as in the relatively high resistance of Concrete in compression and high strength steel in Voltage used in combination

III. LINEAR STATIC ANALYSIS FOR LATERAL LOAD

IS 1893 establishes procedures to achieve goals. This can be achieved by elastic and restricted structural behavior. The floor is displaced to minimize damage. The inelastic deformation requirement is less than the deformation capacity because gravity loads and decrease in stiffness and resistance due to loads. Displacement is a key performance parameter during an earthquake is not a force or a force. The deformation can be divided into three categories: ceiling displacement, floor displacement and other internal deformations and inelastic deformations of elements and structural members. These movements were created by rigid body displacement and shear deformation. High shear and high base torque can be avoided by:

A. High cutting capacity requirements,
B. Development of ductility of elements and structures under gravity and lateral loads and therefore stresses, and
C. Control of lateral displacement, earth displacement, forces and moments in structures.

IV. LITERATURE REVIEWS

1) *D.R. Panchal et.al, (2011):* In this article, the composite steel and concrete system has become very popular in the civil sector in civil engineering for its advantages over conventional construction. However, according to the results, the steel frame is better than the RCC. The composite options for tall buildings are the most economical of the three options. The permanent load on the steel structure can be reduced by up to 32% with respect to the RCC structure and the compositional structure is 30% with respect to the RCC structure. The axial load on the column can be reduced by 46% in steel construction and 7% less in composite construction compared to RCC construction.

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2) *Renavikar Aniket V et.al, (2013):* The STAAD. Pro software is used for the analysis in this examination. Steel - concrete composite structure system which can provide an efficient and economical structure for most of these problems in medium to tall buildings. The costs can be reduced by the dimensions of the steel girders; the steel structure can be reduced compared to the RCC structure. Axial force, the bending moment and deflection of RCC are higher than those of the steel composite structure, which leads to increased costs. The limbs are lightweight, resulting in a quick completion of the structure taking into account earthquakes and more benefits because of the inherent ductility properties, the reinforced concrete structure will work better compared to the RCC structure.
3) *Shashikala. Koppad et.al, (2013):* In mid-rise and high-rise buildings, RCC structures are no longer economical because dangerous to work with, less rigidity, limited span and increased deadweight composite structure adapted to the economy building. Steel components are subject to local and lateral buckling. RCC members generally have more dimensions and they tend not to bend, but are subject to deformation and shrinkage with respect to stresses. The combination of construction materials is reinforced concrete with wide application in buildings. The economic efficiency of reinforced concrete construction is expected to improve overall achievements in the field of civil engineering.
4) *Zafar Mujawar et.al, (2015):* In steel and concrete composite structures, they have found wide application as a faster connection technology that saves a lot of time in construction, which enables the construction to be realized in the shortest possible time. Availability of interior is more comparable to the RCC structure and also increases the service life of the composite structure. Since test results compared to RCC with the basic shear in the composite structure was reduced by 29% and the composite structure by 29% structure. The axial force on the steel structure is reduced by 48% and the composite structure by 50% compared to the RCC structure. Since conclusions that a reduction in the axial force on the sole leads to a reduction in the sole size, and so does the composite structure ready in no time.
5) *Prakarsh Sangaveet.al, (2015):* In some countries the use of steel structures is very low. In a metropolis like Delhi, Bombay, Bangalore etc. It requires a large number of reinforced concrete composite structures due to the lack of horizontal expansion. The steel industry is one of the booming industries in almost all parts of the world and composite construction is widespread. Time and cost are potentially the most important parameters from a design perspective. Maximum ground displacement increased by 8% in filled steel frame, compared to RCC structure and more earthquake-proof with no failure from steel. The bending moment of the frame construction in the beam and column, as well as the lower axial force compared to the RCC structure.
6) *Sattainathan.A et.al, (2015):* In this study, the steel-concrete composite system has become very popular, compared to the RCC structure. Lots of Engineers are unfamiliar with analysis and design due to its complexity. Steel-concrete composite construction is a system for its advantages over conventional construction. The results show that reinforced concrete systems are very extreme economical structural system with high durability, quick assembly and superior seismic performance characteristics which sets to high performance structures from steel to concrete.
7) *Swapnil B. Cholekaret.al, (2015):* Composite steel is the best way to make efficient and economical constructions of building systems. Concrete construction and has become indispensable in today's construction world. Due to population growth, the average need is for tall buildings to be effective for the community. Steel and concrete structures usually produce efficient and economical products for construction in ordinary structures. The value of the displacement of the joint in the structure is lower in the composite structure than in structure of the RCC. The lower dead weight of the composite structure compared to the reinforced concrete structure results in a better reaction to the basic shear value reduced by 18%.
8) *Varsha Patil et.al, (2015):* Steel structures show elastic behavior up to relatively high stress levels and are generally well defined that is very easy to connect the support elements in a short time. Market service needs, need to shorten construction time and costs through simple and efficient construction methods. The two main advantages of quick build are the reduction in the form of interest and early amortization of the capital used. The construction creates more usable space and less top gasket offset than the RCC due to the higher stiffness of the rod steel structure.
9) *Mohd Amir Khan et.al, (2017):* This article discusses structural steel and concrete composites that are lighter than RCC structure that offers an economical foundation design. The combination of better properties leads to a high strength of the structural frame. Lateral load capacity of the composite structure frame compared to the RCC frame. Lateral shift in the steel-concrete composite the chassis can be minimized and the overturning moment reduced compared to the RCC chassis. Frame made of steel and concrete composite construction high column fallow in which the behavior of the beam is poor because the hinges are formed in the beam and not in the column element due to the lower axial load.

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10) *Gorakh Vinit et.al, (2018):* Analysis and design of high-rise buildings in the popular STAAD.pro software in this article. right here, ISMB profiles are used in beams. This provides a thick strip that can effectively bear the load of the panel. A wide flange profile is used in column construction, as it offers excellent cross-sectional behavior during load conversion with high bending and buckling strengths. Due to the lower weight of the steel, the axial load on the steel structure is less than on the RCC structure. Last quick watch The construction will result in a faster return on investors' capital and more profits.
11) *Jyothi D N, (2018):* This article concludes that steel frames are stronger than RCC frames. The steel structure has less dead weight, even the bending moment and transverse working force are lower compared to the RCC structure. Construction element made of steel they have a high resistance per unit mass. Even in high-rise buildings, the size of the steel frame elements is small, which saves interior space design and aesthetic enhancement of the landscape. Another important advantage of the steel structure is the rapid construction technology as well production in the workshop is possible because standard steel parts are available on the market and can also be easily transported the place.
12) *Pallavi Harish Wagh et.al, (2019):* Because the studied steel is a universal building material in many high-rise commercial buildings and both in the factory and on the bridge. Steel and concrete allow fast construction and good adhesive properties. Both of them are of different materials are completely compatible and complementary. Mixed reinforced concrete structures are the only. They have almost the same thermal expansion under load. This process is cheaper than steel and reinforced concrete jobs. The weight of the steel and concrete structure is reduced compared to the RCC structure because the steel structure is small part. This leads to minimization of initial costs. The floor drift ratio for RCC and composite structures ranges from 22% to 32%. Due to the increased axial loads in RCC structures, they have higher values for bending moments and shear forces.
13) *Samadhan jagadale et.al, (2019):* Composite structures are the latest concept for high-rise buildings and in this study which leads to rapid development. Steel trusses have had a good response compared to RCC, but composite trusses are suitable for high-rise buildings. According to these results, the lateral displacement of the upper deck of the composite framework is 15% higher than that of the RCC framework, 17% less than that of steel Frame. With the 7-tier G + beam, the maximum transverse force on the composite frame is almost 40.45% higher than with the RCC frame and 112.29% lower than with the steel frame and maximum bending moment for composite frames 23.42% higher than RCC frames and 178.83% lower than steel Frame. The axial load on the foundation is higher with the RCC frame than with the composite frame and steel frame and is 24% and 81% respectively. After all, the cost of a 7-story G + building for composite trusses is almost half that of steel trusses and 15% higher than RCC trusses.
14) *Madhav Rana et.al, (2019):* In this study, the steel structure offers better resistance to a combination of lateral loads and various loads. Steel is a recyclable material that can be used based on property requirements. Brazing systems are known to increase weight the stiffness of all types of buildings is generally provided at the corners to support the load. Maximum angle offset support is made for bracing type 'A Arc' Av Arc ', single elliptical and double elliptical connections. Strengthening of "Arco Av" it has the lowest maximum displacement and is the most efficient bracing system. The point is that the amount of steel material is less 'A Arc' brace and more on the dual elliptical brace system.
15) *Kentan Patel et.al, (2019):* In this study, a comparative study of the CFT of concrete-filled steel pipes, reinforced concrete structures and steel structures was carried out completed. Composite columns made of steel and concrete are widely used today in modern construction for the best results. The use of CFT columns has consistently established itself in the design of high-rise buildings, as it is an economical structure in compared to RCC and steel structure. In the CFT frame construction of 20- and 30-story buildings, the load-bearing capacity is increased by elevated 19.10% and 11.80% compared to the steel structure also 27.30% and 22.80% based on the CR structure. Modern materials and the availability of construction techniques lead to the rapid completion of structures from a seismic point of view due to ductility properties of steel.
16) *Anil S.Savadi et.al, (2019):* This role meets the requirements and needs of high-rise commercial buildings. Composite structures are best suited for the growing infrastructure and economic structures other than RCC and steel structures. Cost comparison for (G + 2) commercial construction was carried out, resulting in composite beams being 1.7% smaller than steel structures and 13.7% smaller than steel structures. For reinforced concrete structures, the main advantage of composite frame structures is that the beams can be bent and no formwork is required. Main parameters in composite structure it is cheaper than RCC and steel structure. During assembly work such as beams, columns, etc. the requirements for composite structures are very low compared to RCC structures. In the case of mixed structures, the deflection criteria are less comparable in steel construction and more in RC structures.

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V. CONCLUSION

A. After studying magazine articles, many researchers have found that steel is the most universal and versatile material for engineering and construction purposes.

B. As a good engineer, conserving natural resources is a very important task. The main ingredient in cement is very expensive as well as on the edge of the extension. Therefore, it is very important to find alternative materials regarding related properties such as strength, Cost and time. In addition, the engineers accepted the mixed steel and concrete construction out of ignorance about analysis and design.

C. Availability of easy steel building materials on the market, Ex. B. I profile, C profile, Z shape, L angle, profile bar, sheet metal or dishes, etc ...

D. Steel provides a lightweight structure in a composite steel and concrete frame. The dead weight of the structure can be approx. reduced. The use of lightweight materials such as walls, panels, etc. in precast aerated concrete. Easy to modify and expand if necessary.

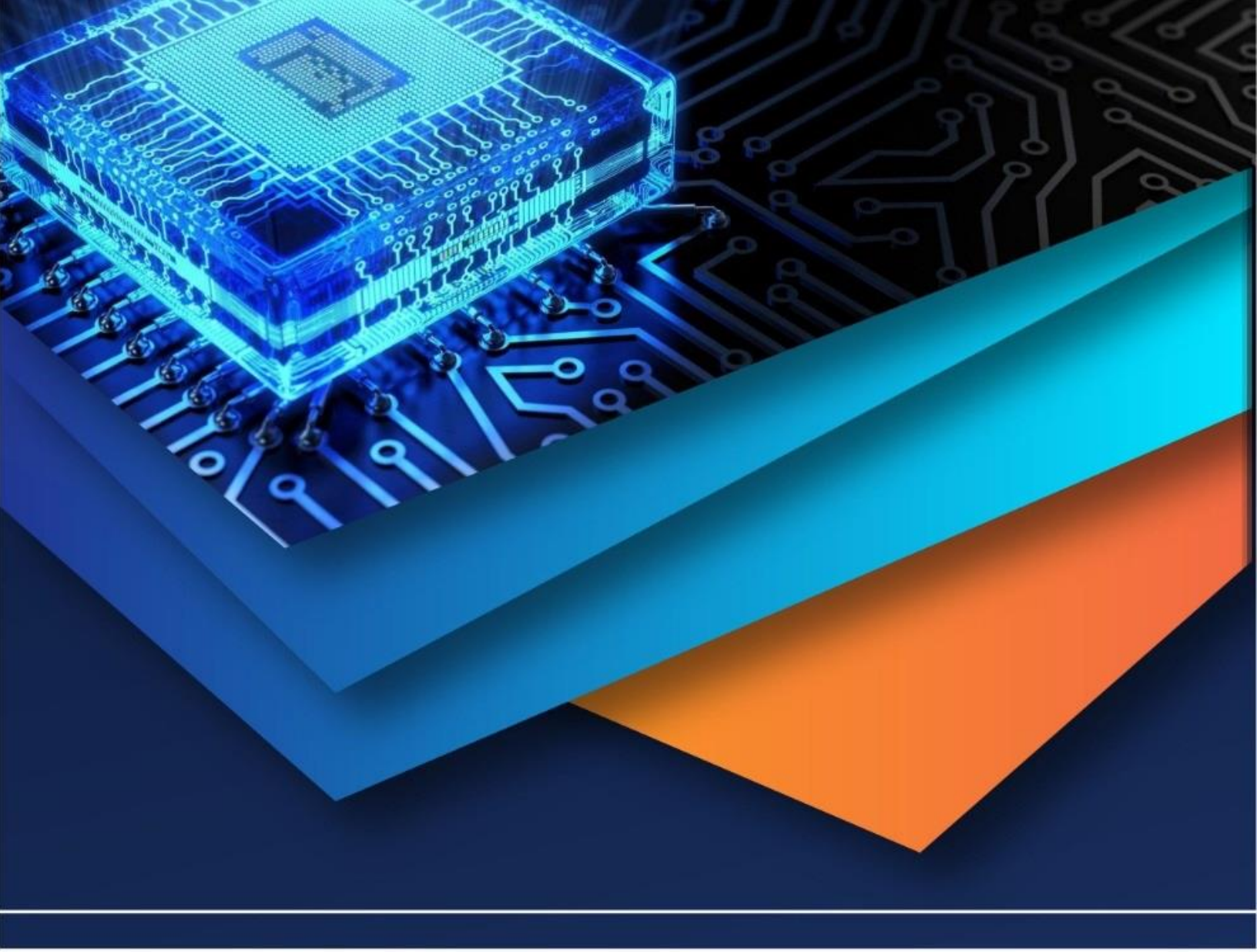
E. The steel construction offers fast construction and is extremely durable, gains strength without wasting time, is biodegradable and recyclable.

F. 6. This means less health risks, less waste, less energy consumption, less emissions, and better environmental work in low-rise buildings.

REFERENCES

[1] D.R. Panchal and P.M. Marathe. December, 2011. “Comparative Study of RCC, steel and composite (G+30 storey) Building”, ICCTT.
[2] Renavikar Aniket V, Suryawanshi Yogesh. July, 2013. “Comparative study on analysis and cost of RCC and steel composite structure”. ISSN: 2319-7064, Volume 5, Issue 7, IJSR.
[3] Shashikala. Koppad, Dr. S.V.Itti. November, 2013. “Comparative Study of RCC and Composite Multistoreyed Buildings”. ISSN: 2277-3754, Volume 3, Issue 5, IJEIT.
[4] Zafar Mujawar, Prakarsh Sangave, January, 2015. “Comparative Evaluation of Reinforced Concrete, Steel and Composite Structure under the Effect of Static and Dynamic Loading”. ISSN: 2248-9622, Volume 5, Issue 1, IJERA, Pg.no:41-44.
[5] Prakarsh Sangave, Nikhil Madur, Sagar Waghmare, Rakesh Shete, Vinayak Mankondi, Vinayak Gundla. February, 2015. “Comparative study of Analysis and Design of RC and steel structure”. ISSN: 2229-5518, Volume 6, Issue 2, IJSER.
[6] Sattainathan.A, Nagarajan.N. March, 2015 “Comparative study on the behavior of RCC steel and composite structure (B+G+20 storeys)”. ISSN: 2395-3837, Volume 1, Issue 3, IJACEE, Pg.no:21-26.
[7] Swapnil B. Cholekar, Basavalingappa S. M, July-2015. “Comparative analysis of Multistoried RCC and composite building due to mass irregularity”, ISSN: 2395-0072, Volume 2, Issue 4, IRJET.
[8] Varsha Patil, Shilpa Kewate, August-2015 “Comparative study on dynamic analysis of composite RCC and steel structure”. ISSN: 2349-4476, Volume 3, Issue 8, IJETMAS.
[9] Mohd Amir Khan, July -2017. “Comparative study of RCC and structural steel-concrete composite frame from Linear and NonLinear Analysis”. ISSN: 2395-0072, Volume 4, Issue 7, IRJET.
[10] Gorakh Vinit, Nishit Kadia, Kiranmoy Samanta, October-2018. “Comparative study of RCC and steel structure for different floor Heights”. ISSN: 2349-2163, Volume 5, Issue 10, IJIRAE
[11] Jyothi D N, February-2018 “Comparative Analysis of RCC and Steel structure”. ISSN: 2395-0072, Volume 5, Issue 2, IRJET
[12] Pallavi Harish Wagh, Dr. S. K. Kulkarni, Vishwajeet Kadlag, 2019. “Comparative Study on Analysis and Design of RCC and Composite Structure”, ISSN: 2454-132X, Volume 5, Issue 3, IJARIIT.
[13] Samadhan jagadale, M.R. Shiyekar, Y.M. Ghugal. July-2019 “Comparative study of Steel, RCC and composite frame building”. ISSN: 2395-0072, Volume 6, Issue 7, IRJET.
[14] Madhav Rana, Supervisor ER. Nitin Verma. August-2019. “Dynamic Analysis of Steel frame structure (regular in plane) using curved bracing system”. ISSN: 2278-3075, Volume 8, Issue 10, IJITEE.
[15] Kentan Patel, Sonal ThKentan Patel, Sonal Thakkar. 2019 “Analysis of CFT (Concrete Filled Steel Tube), RCC and steel building subjected to lateral loading”, ELSEVIER
[16] Anil S.Savadi, Dr. Vinod Hosur. “Comparative study of RCC, steel and composite structures for industrial building”. ISSN: 2395- 4396, Volume 5, Issue 4, IJARIIE.

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