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Comparison between RCC and Composite Buildings: A Comprehensive Review

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Abstract: This review paper presents a comprehensive analysis of Reinforced Concrete (RCC) and Composite buildings, evaluating their performance, design, seismic behavior, cost-efficiency, and sustainability. It outlines their distinct characteristics and structural suitability. The review examines construction methods and technology, highlighting advantages and limitations. Environmental impact, embodied energy, and recyclability are assessed for sustainable construction practices. Economic considerations encompass initial costs, maintenance, and life-cycle analysis. Seismic performance and design strategies are analyzed for resilience in seismic-prone regions. This review paper provides an in-depth analysis of various research papers associated with the topic of RCC and Composite buildings comparison and its various advancements. A thorough literature review has conducted along with analysis of previous works in this field, our study has identified conclusive outcomes from the gap of the study that form the basis of our research objectives that will offer technical insights and propose recommendations for technical research work in this field.

Keywords: Composite frame, Shears connectors, Grade of Concrete, RCC frame, Deck slab.

I. INTRODUCTION

The need for multistorey buildings arises from several critical factors. Firstly, rapid population growth in urban centres necessitates innovative approaches to provide adequate housing and commercial spaces without encroaching on valuable land resources. Multistorey buildings offer vertical expansion, making them an ideal choice for maximizing available urban space. Secondly, economic considerations play a vital role in favour of multistorey construction. As land prices escalate, developers and city planners seek cost-effective alternatives that deliver optimal space utilization. Multistorey buildings present an economically viable solution, allowing more units or businesses to coexist within a single building envelope, thereby enhancing the overall return on investment. In this regard, this paper aims to explore the multifaceted need for multistorey buildings, considering factors such as urbanization, economic viability, sustainability, and enhanced liveability.

II. RCC AND COMPOSITE STRUCTURES

The Reinforced Concrete (RCC) and Composite buildings both systems exhibit unique properties and advantages that cater to the evolving needs of urban infrastructure. This paper explores the characteristics, benefits, and applications of RCC and Composite buildings, providing valuable insights into their respective roles in contemporary construction practices.

Reinforced Concrete (RCC) buildings have long been a staple in construction due to their exceptional durability, versatility, and cost-effectiveness. RCC structures are formed by combining concrete with steel reinforcement, resulting in a composite material that can withstand high loads, making it suitable for a wide range of building types. On the other hand, Composite buildings represent an innovative approach to construction by integrating various materials to enhance specific performance characteristics. Typically combining steel and concrete, Composite structures leverage the best attributes of each material, resulting in improved strength, flexibility, and structural efficiency. This amalgamation has opened doors to creative architectural designs and advanced building techniques.

The choice between RCC and Composite buildings depends on several factors, such as the intended use of the structure, budget constraints, seismic considerations, and sustainability goals. RCC structures excel in applications where durability and affordability are paramount, while Composite buildings thrive in situations where lightweight, high-strength solutions are needed.

III. COMPONENTS OF COMPOSITE STRUCTURES

Composite members in structural engineering are formed by combining different materials to create a unified structural element. These components work together to optimize the overall performance of the composite member. The key components of composite members are:

1. Concrete
2. Steel
3. Adhesive or Bonding Agents
4. Structural Connectors
5. Fibers
6. Reinforced Concrete Slabs
7. Composite Columns
8. Composite Beams
9. Composite Deck
10. Other Composite Materials (like timber, fiber-reinforced polymers (FRP), or aluminum)

Overall, the combination of these components allows composite members to leverage the strengths of different materials, resulting in more efficient, durable, and cost-effective structural solutions for a wide range of construction projects. Figure 1 and 2 shown below shows RCC building with shear wall and a RCC column component. Figure 3 and 4 shows building with composite members and column member with embedded with I - section and steel rebar.

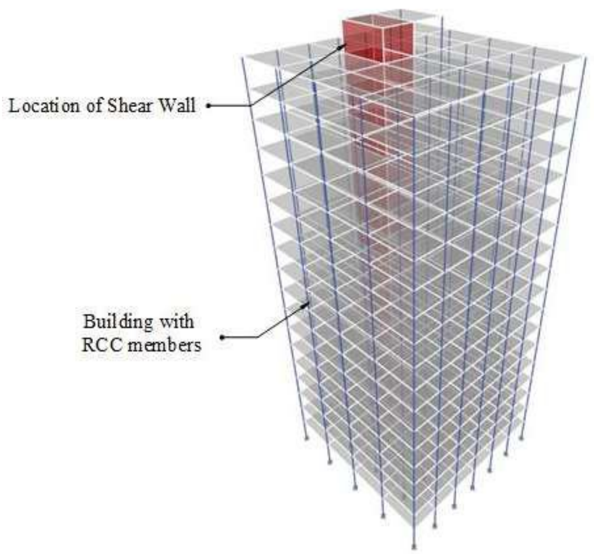

Fig. 1: Building with RCC members with shear wall

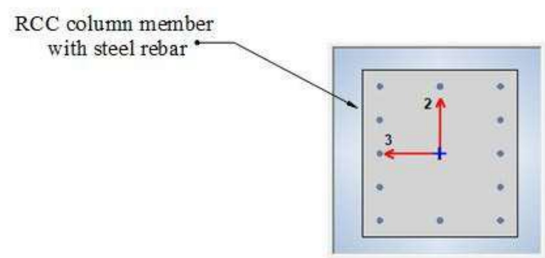

Fig. 2: RCC column component used with steel rebar

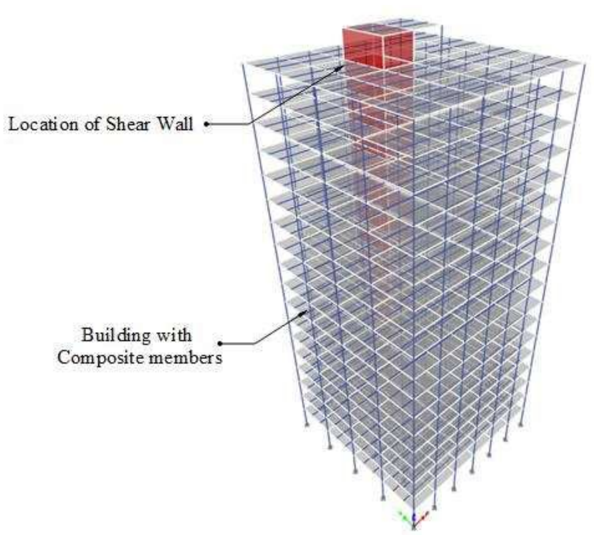

Fig. 3: Building with Composite members with shear wall

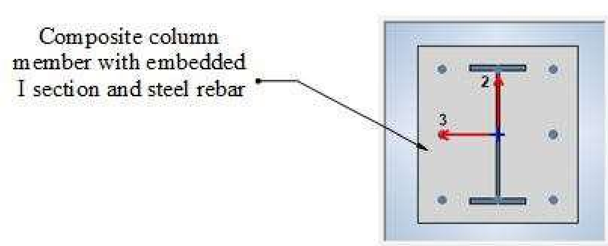

Fig. 4: Composite column member with embedded *I - section and steel rebar*

IV. LITERATURE REVIEW

Yuchen Song et. al. (2023), This paper presents a nonlinear fiber beam-column (FBC) model for analyzing partially encased composite (PEC) columns in high-rise buildings. The model efficiently considers the complex behavior of PEC columns at ultimate and failure states, accounting for steel section local buckling and concrete confinement. It utilizes a 2D Euler-Bernoulli beam element with fiber cross sections for material nonlinearity. The generalized effective width method (GEWM) is integrated into the FBC model to simulate stress redistribution due to local and post-local buckling. Numerical examples demonstrate the model's accuracy and efficiency, predicting behavior under concentric and eccentric compression, and global buckling of long PEC columns. The FBC model's computational cost is notably lower than 3D finite element analysis, making it a viable analysis tool for PEC columns.

Xianhui Li et. al. (2023), This study investigates lateral impact responses of RC and composite columns using dynamic nonlinear analysis in LS-DYNA. Finite element analysis shows good agreement with experimental results. The overall impact resistance of composite columns is significantly better than RC columns. Solid concrete-filled double steel tube (S-DS) column exhibits 20% higher impact plateau force and 15% smaller mid-span deflection. Impact response process is similar for all composite columns. Parametric analysis studies influence of load, material, and other parameters on impact response. Results offer valuable insights for composite column design under lateral impact.

Varunkumar Veerapandian et. al. (2023), This research focuses on the preference of composite columns over Reinforced Concrete columns in modern construction due to their confinement effect. A novel simplified Artificial Neural Network model is developed to determine the ultimate axial load of circular composite columns, regardless of the type of confining tube. A database of existing experimental results is used for training, testing, and validation of the model. Real-time experimental data of composite columns is employed to validate the model's accuracy. The proposed model is presented through a user-friendly graphical user interface, facilitating efficient anticipation of the ultimate axial load of circular composite columns by researchers.

Tingting Lu et. al. (2023), This study aims to enhance the mechanical properties of prefabricated monolithic composite columns by using high-performance fiber-reinforced cement composite (HPFRCC) material for mold shells. Axial compression tests were conducted on HPFRCC-prefabricated shell composite columns and RC prefabricated shell composite columns. The influence of volume stirrup ratio, longitudinal reinforcement ratio, and shell material on axial compression performance was studied. Results indicated that using HPFRCC-prefabricated shells improved the deformation performance of composite columns. The compressive strain at yielding load for HPFRCC-prefabricated columns was 23.85% higher and at peak load increased by 26.72% compared to RC prefabricated columns. Longitudinal reinforcement ratio had a slight effect on axial compression capacity. Increased volume stirrup ratio improved deformation performance, with compressive strain values corresponding to yielding load and peak load showing variations.

S. M. Priok Rashid and Alireza Bahrami, (2023), Fiber addition enhances composite action between steel tube and concrete core, increasing the concrete core's strength. This article comprehensively reviews confinement approaches of fiber-reinforced polymer (FRP) and carbon fiber-reinforced polymer (CFRP) in steel-concrete composite thin walled columns (SCTWCs). FRP serves as both confining material and reinforcement, finding increased use in column applications. CFRP strips enhance load-carrying capacity by up to 30% compared to un-strengthened columns. External bonding of CFRP strips provides confinement pressure, prevents local buckling of steel tubes, and enhances load-carrying capacity. The article aims to facilitate a clear understanding of SCTWCs, helping structural researchers and engineers comprehend the behavior of FRP and CFRP composite as external reinforcement.

Nikhil Patil et. al. (2023), In India, there is increasing interest in modular precast construction, particularly in light gauge steel (cold-formed steel) and precast ferrocement composite structures. This composite construction is sustainable, with a low carbon footprint compared to conventional RCC construction. It offers fast construction, lower material transportation and labor costs, making it cost-effective. A technology for G+5 residential buildings using precast ferro-cement panels combined with light gauge steel has been established as a practical substitute for RCC structures. To ensure its overall performance, the thermal performance of this innovat ive construction is studied through laboratory prototypes subjected to temperature variation, impacting dwellers' comfort and energy requirements. Analytical and experimental approaches are used to establish the thermal response of this composite construction and support its future development.

Mohammad lack et. al. (2023), This study investigates the dynamic stability of a multi-layer composite beam under a follower force. The stability equation is obtained using the bending equation and matrices A, B, D. Composite columns (steel, concrete) are used in load-bearing structures, offering high compressive strength. Non-linear dynamic analysis by Seismo-struct software is employed to study seismic behavior, and ABAQUS software models 3D composite columns with I-shaped steel sections filled with concrete. Type 1 and 3 composite columns show similar bending behavior with good ductility and lateral force resistance.

Large-scale nonlinear analysis reveals shear failure occurs at the end of the sheet, not due to tensile fields. Ultimate capacity and different regulations/theories are compared, showing isolated shear plates don't fully represent beam plate failure mechanisms.

M Anbarasu et. al. (2023), This article presents an FEM investigation of axial capacities in PFRP composite channel columns. A validated FEM using ABAQUS was utilized to study various geometries and member lengths. Results were compared with Italian guidelines, American pre-standard, and DSM, proposing a new set of design equations for GFRP channel columns. The proposed equations demonstrated higher accuracy and reliability in estimating axial load capacity.

John Cotter and Rasim Guldiken, (2023), In their study they highlighted GRCC that it has explored as a cost effective alternative to conventional materials due to the superior strength-to-cost ratio of bulk glass. Polyurethane resin bonds are used instead of sizing agents to adhere the materials, crucial for the structural system development. Physical testing of GRCCs shows that glass can handle a load of 123 MPa before delamination failure, surpassing the required shear strength. The maximum load for GRCCs reaches 30.8 kN, exceeding the practical GRCC shear strength of 11 MPa. Buckling failure occurs at 30.8 kN due to gradual delamination leading to an unbounded condition, but this is unlikely to happen in practical GRCCs due to lower required shear strengths.

Gaurav Swami et. al. (2023), This paper investigates the impact of concrete-filled steel tube (CFST) columns and inter module connections on the structural robustness of composite modular buildings. Numerical models were developed and validated for CFST columns and semi-rigid frames under column removal scenarios. A 10-storey composite modular building was analyzed with CFST columns to enhance resistance against column buckling. Nonlinear dynamic and static pushover analyses were conducted to examine the behavior and force transmission of the modular building under module removal situations. CFST columns provided increased resistance against column buckling. The pin-joint inter-module connection approach was conservative for modeling connections. The recommended dynamic amplification factor (DAF) values for modular building analysis differ based on module removal location. The modular building showed resilience against progressive collapse, but corner module removal scenario presented shear failure of horizontal inter-module connections, making it more critical than column removal scenario. DAF values of 1.65 and 1.2 were suggested for corner and internal/edge module removals, respectively.

More, F.M.D.S., Subramanian, S.S. (2023), This research investigates the structural behavior and cost-effectiveness of steel-concrete composite columns using different types of fiber-reinforced concrete (FRC) additives. Axial compression tests on 24 columns, including hollow steel columns and FRC-infilled composite columns, were conducted. The load-carrying capacity of FRC-infilled columns increased by 203.88%, 193.48%, and 190.03% compared to hollow cold-formed steel tubular columns in stub, short, and medium columns, respectively. FRC infilled columns showed superior strength, ductility, and energy absorption capacity compared to conventional composite columns. The load-strain plots demonstrated excellent ductility in FRC-infilled columns, while conventional columns failed through localized buckling and infill crushing. The study suggests that FRC-infilled composite columns are a favorable choice for civil engineering structures due to their improved performance in seismic conditions.

Farid Boursas, et. al. (2023), This study conducted thermal and thermo mechanical analyses using the finite element software SAFIR for two columns: a steel profile column and a steel profile partially encased in concrete (SPPEC) column. Both columns were subjected to ISO834 standard fire curve heating on four sides for one hour, considering simply and doubly supported boundary conditions with eccentric loading. The analysis revealed temperature field distribution and time-temperature curves for selected nodes. The thermo mechanical study determined the impact of slenderness on the fire resistance of steel and SPPEC columns. The results demonstrated that slenderness negatively affects fire resistance, and SPPEC columns exhibited significantly better performance compared to steel columns.

Baoquan Cheng et. al. (2023), This study focused on investigating the mechanical properties of full-scale ultra-high performance concrete-filled steel tube composite columns (FUCFSTCs) in real-world engineering applications. Using finite element software ABAQUS and various design parameters, 21 FUCFSTCs were analyzed and compared with experimental curves, verifying the rationality of the models.

The study analyzed the impact of different parameters on the ultimate bearing capacity, ductility coefficient, and stress-strain relationship of the columns. The results showed that cross-sectional size had the greatest influence on bearing capacity, with a maximum increase of 145.90%. The research proposed an axial compression limit bearing capacity formula for FUCFSTCs, meeting engineering accuracy requirements and laying a strong foundation for their practical application.

Md. Yaser, Ajith Kumar Dey, (2022), RCC is commonly used in low and medium rise buildings in India, while composite construction is preferred for high-rise buildings due to its ductility for earthquake resistance. Steel concrete composite construction is popular for its speed and economy, utilizing the properties of both materials. The present study aims to compare the structural behavior of low, medium, and high rise buildings in seismic zone-IV, using RCC, steel, and composite construction. ETABS software is used for analysis, and cost analysis is performed in MS-Excel.

The results show that composite construction is best for high-rise buildings, providing better structural performance and earthquake resistance compared to RCC and steel. Response Spectrum analysis gives superior results than Static analysis.

Ankit Kumar, Dr. Savita Maru, (2021), This study focuses on the increasingly common use of composite structures in developing countries. The study involves a dynamic analysis of a G+25 storey commercial building with uniform and optimized sections, located in seismic zone IV. RCC and steel-concrete composite structures are considered for analysis. The Response Spectrum analysis method is used, employing CSI ETABS v19 software to compare various results, including time period, maximum storey displacement, stiffness, shear, and overturning moment. This research aims to highlight the advantages and feasibility of using composite structures for high-rise building construction.

Preetha Vellaichamy et. al. (2020), Steel-concrete composite construction is gaining global acceptance as an alternative to pure steel and reinforced concrete construction. However, in India, the use of composite elements in the construction sector is relatively low compared to other developing countries. There is a significant potential for increasing the volume of steel in construction to meet current development needs. Composite construction reduces the dead weight of the structure, leading to faster construction work. In this study, a G+10 multi-storied building with RCC columns and two different composite columns (encased column and infill rectangular tubes) is analyzed using ETABS software. The comparison focuses on the variation in storey drift, storey shear, time period, and displacement between buildings with RCC and composite columns.

Mohammed Akif Uddin, M. A. Azeem, (2020), This paper compares three building models: a composite structure with concrete-filled steel tubular columns, a composite structure with concrete encased I section columns, and a RCC structure. The models are G+15 storey and irregular in plan to satisfy IS 1893-2002 irregularity conditions (T shape and Plus Shape models). Response spectrum analysis shows that composite structures have lower stiffness compared to RCC structures, resulting in greater displacements and drifts in composite structures. However, the displacements and drifts are still within permissible limits. The base shear and base moments are lower in composite structures due to their lower dead weight. There is no significant difference between the response parameters of the two composite structures.

Krunal P Suthar, Arjun M Butala, (2020), This study aims to compare the seismic performance of a G+10 story RCC, Steel, and Composite building frame situated in earthquake zone IV. All frames are designed for the same gravity loadings with RCC slabs used in all three types of buildings. Seismic analysis using Equivalent Static and Response Spectrum methods is performed in ETABS 2017 software. Results are compared based on fundamental time period, displacements, story drift, base shear, story weight, and story stiffness. The comparative study concludes that RCC construction is best suited for low-rise buildings, while Composite construction is a better option for high-rise buildings among the RCC and Steel structures.

Karthiga et. al. (2020), This research focuses on studying the behavior of concrete and composite framed structures under special loadings, particularly seismic forces. Response spectrum analysis, a linear dynamic statistical method, is used to evaluate the forces and failures in the buildings subjected to seismic loading. An RC framed structure of M25 grade concrete with G+7 storeys and a composite structure of G+6 storeys are modeled in ETABS according to Indian Standard Code 1893: 2002 Part(I). The buildings are located in Himachal Pradesh with a seismic intensity of zone factor V. The concept of strong column weak beam is adopted, and response spectrum analysis is performed using ETABS for both structures. The results are compared for parameters such as base shear, storey deflection, and storey drift.

Dr. Ramakrishna Hegde et. al. (2020), This research compares RCC, steel, and composite structures under the same seismic conditions. Analysis results are compared to assess the suitability of each type of building under seismic conditions. RCC structures are found to be less suitable due to increased dead load, span limitations, and lower stiffness. Structural engineers seek more efficient design solutions by using different materials, with potential for increased steel volume in construction. Steel-concrete composite sections are considered to increase the percentage of steel. The paper focuses on the effect of Fully Encased Composite (FEC) on a G+15 storey special moment frame, analyzed and designed for seismic loading using ETABS software. Results are compared for Base shear, Time period, Storey displacement, and storey drift for all three structures, and the composite structure shows higher lateral stiffness and improved performance.

Vedha M, Mr. Umar Farooq Pasha, (2019), This study utilizes ETABS software to compare the seismic behavior of three types of multi-storey framed structures: RCC framed structure, Steel frame with deck, and Steel beam deck with concrete filled steel tube (CFST) composite columns. Base shear, displacement, storey drift, column forces, and beam forces are compared and studied. Performance point and performance level of the buildings are assessed through equivalent static and response spectrum analysis. Results are compared, and conclusions are drawn to identify the most suitable structure for seismic action. The methodology involves a G+18 storied framed multistory structure with assumed grids of RCC, Steel, and Composite. Seismic analysis follows IS1893:2002 and euro code (EC4) provisions for the design of composite columns. Steel columns are designed as per IS800:2007.

Two alternative structures are compared with the reference RCC frame, considering base shear, storey drifts, storey overturning moments, and roof displacements.

Sunita Dahal, Rajan Suwal, (2019), This study focuses on comparing seismic behavior of 10 multistoried commercial buildings in Nepal using steel concrete composite (both full and half composite) with RCC options. SAP2000 software is used to model the structures, and seismic analysis is conducted using equivalent static method. Parameters like time period, axial force, shear force, bending moment, deflection, storey drifts, base shear, and storey stiffness are compared. Composite structures demonstrate better performance in various aspects, proving to be efficient, economical, and innovative for seismic resistance in multi storied buildings.

Phatale Swarup Sanjay, Prof. S. R. Parekar, (2019), The study compares seismic performance of a 3D (G+8) storey RCC, Steel, and Composite building frame in earthquake zone V. All frames have the same gravity loadings and use RCC slabs. Beam and column sections are made of RCC, Steel, or Steel-concrete composite. Seismic analysis using ETABS 2015 software and equivalent static and response spectrum methods shows that RCC is best for low rise buildings.

Parag P. Limbare, Prof. P. A. Dode, (2018), In this study, RCC structure with steel concrete composite options is analyzed for a G+20 story building located in earthquake zone-II, using IS: 1893 (Part1)-2002 provisions for earthquake loading. The design and analysis are conducted using STAAD-PRO software. The results of the comparative study show that the composite structure is more economical.

Vignesh Kini K, Rajeeva S V, (2017), In this study, they said during earthquakes, the storey shear developed in the building needs to be transferred to the ground through the shortest path. The presence of floating columns causes discontinuity in the load transfer path, altering the behavior of the structure and load transfer path. Response spectrum analysis is used to analyze building models, assuming that the structure will experience all loads at once when fully constructed. Construction sequence analysis is performed to understand non-linear material and structural member behavior. The study involves analyzing a G+20 multi-storey RC and steel-concrete composite building with floating columns, comparing parameters like maximum bending moment, maximum shear force, and maximum deflection of the transfer beam. CSI ETABS 2016 software is utilized for the analysis.

Vidhya Purushothaman, Archana Sukumaran, (2017), In densely populated areas with limited land availability, tall buildings with various shapes, including oblique corners, are necessary. As earthquakes pose significant risks to buildings, designing tall structures that can resist seismic forces becomes crucial. Concrete-filled steel tubular columns offer excellent earthquake-resistant properties, such as high strength, ductility, and energy absorption capacity. This paper aims to compare the structural behavior of multi-storey buildings with different plan configurations (Rectangular, C, L, and H-shape) using two types of composite columns: concrete-filled steel tubes and composite encased I-section columns. The analysis is conducted using ETABS 2015 software for 15-storey buildings, and the results are tabulated, compared, and conclusions are drawn from various graphs.

S. Prabhu Booshan, S. Sindhu Nachiar, S. Anandh, (2017), The country's overall development relies heavily on infrastructural development. To achieve cost and time efficiency in construction, RC structures are being replaced with steel-concrete composite structures due to their structural efficiency. During earthquakes, damage occurs due to structural discontinuities, which are caused by irregularities in the structure. Irregular structures are highly vulnerable to seismic forces, making it crucial to analyze their performance under such forces. This paper analyzes different vertical irregularities (stiffness, mass, and geometric) in both RC and composite structures. A 10-storey RC and steel-concrete composite structure are modeled and analyzed using the response spectrum method in ETABS 2015. The comparison reveals that steel-concrete composite structures with different vertical irregularities outperform irregular RC structures in seismic performance.

Mohd. Amir Khan, (2017), Structural Steel-Concrete composite structures are gaining popularity due to their advantages over conventional concrete and steel constructions. Composite construction combines the benefits of materials, offering cost-effectiveness, rapid construction, and fire protection. This study aims to compare the seismic performance of RCC, Steel, and Composite building frames in earthquake zone IV. All frames are designed for the same gravity loads, with concrete slabs used in RCC buildings and deck slabs in composite buildings. Beam and column sections are made of either RCC or Structural Steel-concrete composite sections. Seismic analysis using Equivalent static method, Response Spectrum method, and Non-linear static pushover analysis is conducted using software, and results are compared.

S. R. Sutar, P. M. Kulkarni, (2016), Reinforced concrete (RCC) structures have been commonly used in building construction due to material availability and construction simplicity. However, RCC is no longer economical due to increased dead load and hazardous formwork. Composite construction, a new concept, is gaining popularity in the construction industry. Modern composite systems enable the swift erection of multi-story structural frames. Reviews indicate that composite structures are best suited for high-rise buildings compared to steel and reinforced concrete structures. Unfortunately, many available nonlinear analysis programs are not directly applicable to composite frames. This work aims to understand the nonlinear behavior of composite frames using ETAB 9.7.

Pavan kumar Raikar and M.B. Mogali, (2016), The main objective of earthquake engineers is to minimize structural damage during earthquakes. This paper presents a seismic analysis of composite and RCC buildings with asymmetrical configurations. A G+9 storey commercial building in earthquake zone III is considered, analyzed using ETABS software. Parameters like story drift, story shear, and torsion are determined. Both symmetrical and asymmetrical configurations are analyzed using equivalent static and response spectra methods. The results show that composite structures perform better in several aspects, especially under torsional effects.

Nilesh kumar. V. Ganwani1 S .S. Jamkar, (2016), Steel-Concrete composite constructions offer advantages over conventional Concrete and Steel structures, providing a balance of strength, ductility, and cost-effectiveness. This study compares the seismic performance of a G+5 story RCC building with a Steel-Concrete Composite building in earthquake zone IV. Both structures are designed for the same gravity loads. Seismic analysis using the Equivalent static method is conducted using ETABS 2015 software. Results show that the composite frames exhibit better seismic behavior and are more suitable in terms of materials and weight compared to concrete constructions.

M. D. Vaseem and Dr. B. R. Patagundi, (2016), In India, the use of steel in construction is limited due to its high cost. Therefore, comparing the cost and seismic analysis of Reinforced Concrete (RC) and steel structures becomes crucial. The seismic analysis involves parameters such as joint displacement, story forces, stiffness, drift, natural time period, and base reaction. The study analyzes 10-storied RC and steel structures in seismic zone-4 using ETABS 2015 software, and estimates are made using MS Excel. Slab design is performed using Mathcad Prime software. The dynamic analysis uses the Response Spectrum method. For the steel structure, ISMB450 beams and ISWB600 columns with cover plates of 400x20mm are used. In the RC structure, steel columns (ISWB600 with cover plates) are placed at the periphery and four corners of the building in different models.

Ch Geetha Bhavani, Dr. Dumpa Venkateswarlu, (2016), The present study aims to compare the seismic performance of a 3D (G+7) storey RCC, Steel, and Composite building frame situated in earthquake zone V, known as a very high damage risk zone. The zone covers areas with a risk of MSK IX or greater, and the IS code assigns a factor of 0.36 for this zone. Regions like Kashmir, western & central Himalayas, and north & middle Bihar fall under this zone. All frames are designed for the same gravity loadings, with RCC slabs used in all cases. Beam and column sections are made of RCC, Steel, or Steel-concrete composite. Seismic analysis is conducted using Equivalent static and Response Spectrum methods in STAAD PRO software. The study also evaluates cost-effectiveness based on material cost, and the comparative analysis shows that composite frames are best suited among all three types of constructions due to material cost benefits and better seismic behavior.

Zafar Mujawar, Prakarsh Sangave, (2015), Steel-concrete composite construction has become a popular alternative to traditional pure steel and pure concrete constructions worldwide. This study aims to compare reinforced concrete, steel, and composite structures under static and dynamic loads. It is found that composite structures are more suitable for high-rise buildings due to their advantageous properties. The comparison is performed using the response spectrum method with the assistance of ETABS software. The results demonstrate the superiority of composite structures in terms of performance and suitability for high-rise buildings.

Prof. S. S. Charantimath, Prof. Swapnil B. Cholekar, Manjunath M. Birje, (2014), Steel-concrete composite construction has gained widespread acceptance worldwide as an alternative to traditional pure steel and pure concrete constructions. This approach is relatively new in the construction industry. Composite elements, such as composite columns, beams, and deck slabs, with structural steel sections encased in concrete, are extensively used in modern buildings. Extensive research has been conducted on these composite elements. In medium to high-rise buildings, traditional R.C.C structures are no longer economical due to increased dead load, less stiffness, span limitations, and hazardous formwork. The study results demonstrate that composite structures are the optimal solution for high-rise buildings compared to R.C.C structures.

Mahesh Suresh Kumawat and L G Kalurkar, (2014), Steel-concrete composite construction involves connecting the concrete slab to the steel beam using shear connectors, effectively making them act as a single unit. In this study, both steel-concrete composite and RCC options are considered for a comparative analysis of a G+9 story commercial building located in earthquake zone-III. The earthquake loading follows the provisions of IS: 1893 (Part1)-2002. The structure is modeled and analyzed in three dimensions using SAP 2000 software. Both Equivalent Static Method of Analysis and Response Spectrum Analysis are used for the analysis of both composite and RCC structures. The results show that the composite structure is more economical.

Anamika Tedia, Dr. Savita Maru, (2014), Steel-concrete composite construction involves encasing steel sections in concrete for columns, while the concrete slab or profiled deck slab is connected to the steel beam using mechanical shear connectors to act as a single unit. In this study, a G+5 storey office building with a height of 3.658 meters, located in earthquake zone III (Indore) with a wind speed of 50 m/s, is considered. The overall plan dimensions of the building are 56.3 meters x 31.94 meters. The Equivalent

Static Method of Analysis is used for seismic analysis. The structures are modeled using STAAD.Pro software, and the results are compared. It is found that the composite structure is more economical than the RCC structure.

D. R. Panchal and P. M. Marathe, (2011), Steel-concrete composite systems for buildings involve connecting the steel beam to the concrete slab or profiled deck slab using mechanical shear connectors to act as a single unit. This study compares steel-concrete composite, steel, and R.C.C. options for a G+30 storey commercial building located in earthquake zone IV. The Equivalent Static Method of Analysis is used for seismic analysis. The structures are modeled using ETABS software, and the results are compared, showing that the composite structure is more economical.

V. CONCLUSION AND OUTLINE OF PROPOSED WORK

It seems that there is a research gap in the literature regarding the different analysis and design work done previously on composite and RCC comparison of structures. Further research is needed to investigate the effect of the factor to develop suitable guidelines for justifying the impact of use of composite structures.

Based on the literature review, we have reached a conclusion that highlights the key findings of the research and lists the necessary outcomes:

1) It is essential to compare the RCC structures and Composite structures.
2) Conducting a study on comparison over different soil conditions.
3) It is important to use IS 1896:2016 for analysis of the structure over earthquake prone area with seismic loading conditions.
4) To ensure accuracy in the analysis, it is recommended to use response spectrum method of analysis over regular plan section, T section and L section respectively.
5) Different parameters such as Displacements, Base shear, Axial Forces and Storey Drift since these parameters should be necessary to determine the behaviour of Composite structures on comparing the RCC structures.

The primary objective of this study is to determine the robustness and feasibility of using composite structures due to comparison with RCC, its analysis over different soil conditions over regular and irregular plan to see the behavior of the structural performance that has going to be a major study for upcoming proposed work.

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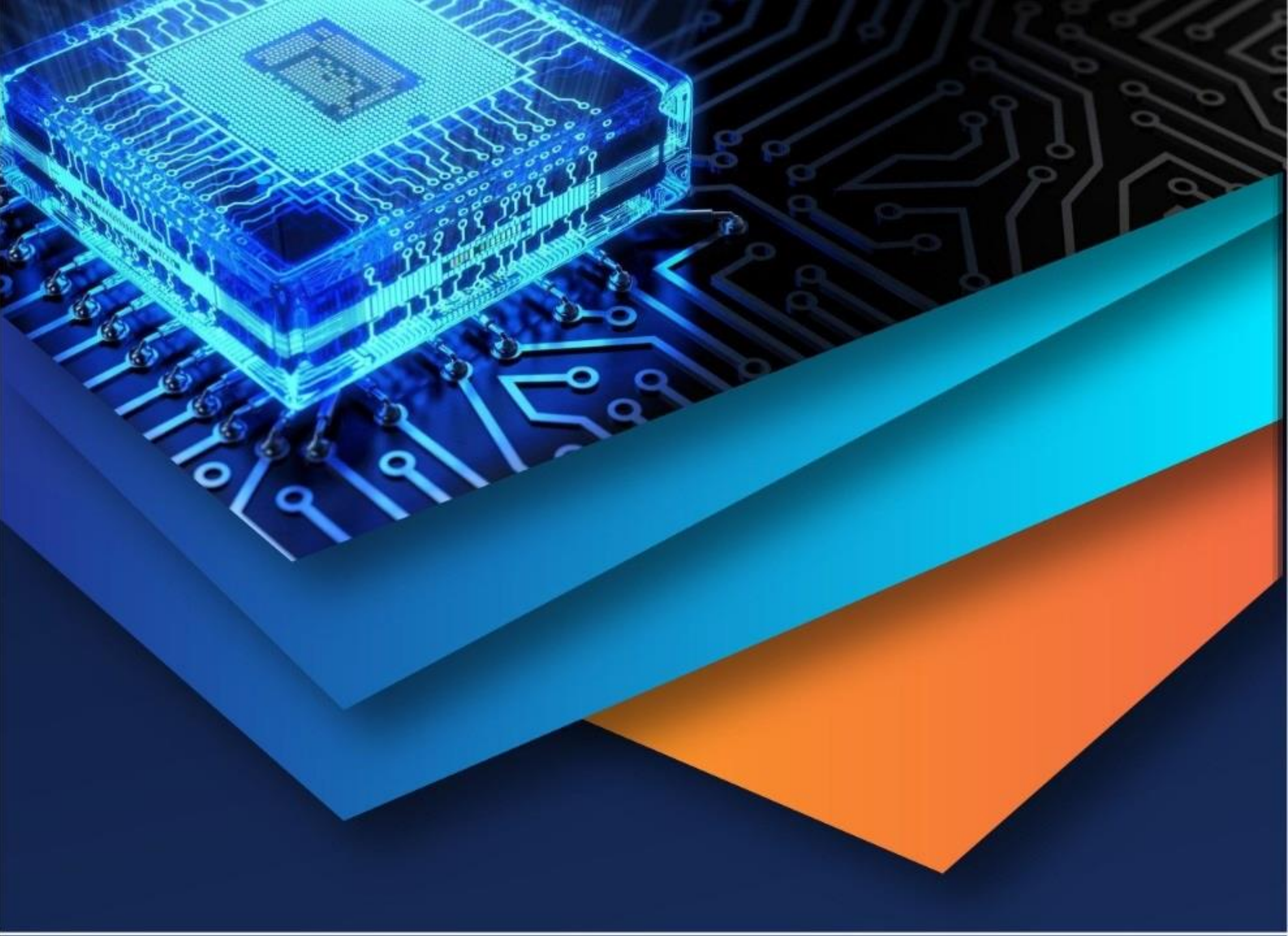

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