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Steel Concrete Composite Construction - A Review

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Abstract: ***Now a day in India it is seen that in the construction we are using steel and concrete composite construction such as building structure, bridge, dam etc. steel concrete composite construction is used to reduce the effect uneven load on structure, concrete can resist compression force and steel is strong in tension force. With use of steel concrete composite construction we can make various designs like curved beam, tapered section etc. composite construction saves time of construction because steel is fabricated in factory and installed at site. One of them is Steel-Concrete Composite Design and Construction works where the beneficial properties of Steel and Concrete are optimally used to act together and thereby minimize the material cost and save valuable construction period.***
Keywords: Composite construction, building structure, curved beam, tapered section, bridge

I. INTRODUCTION

In present time we want fast construction of building, bridge and other structures that's why we are in a need of steel concrete composite construction. There are so many structures in India which are composite some of them are kempegowda international airport Bangalore, and so many bridges and buildings. The composite structure includes the Composite columns, Composite Beams and Composite floors used individually or in various combinations to make the design cost-effective and efficient to the service requirements and desired performance. The most commonly used sections are Steel beam anchored to Concrete slab by means of shear connectors of flexible, rigid, or cut channels, bearing types like studs etc.

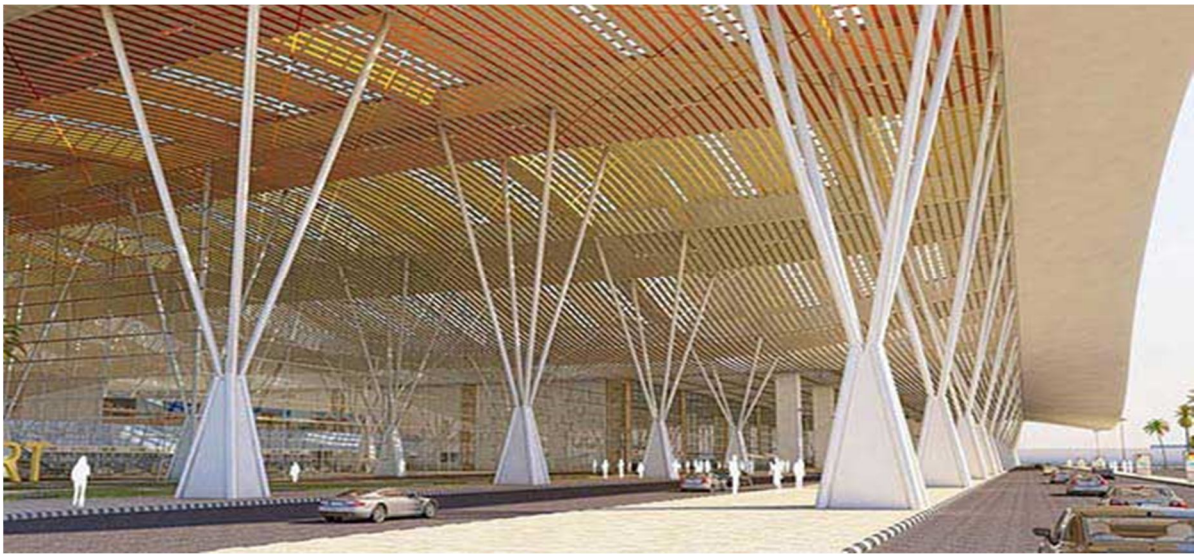


Fig. 1 Kempegowda international airport Bangalore

II. LITERATURE REVIEW

1) *Shweta A. wagh, Dr. U.P. waghe (2014) [1],* analyzed and designed four different buildings In case of a composite structural system because of the lesser magnitude of the beam end forces and moments compared to an R.C.C system, one can use smaller section in a composite structure. It will reduce the self-weight and cost of the structural components. One can use smaller size foundation in case of composite structure compared to an R.C.C construction. Under earthquake consideration because of inherent ductility characteristics, steel-concrete composite structures perform better than a R.C.C structure. Composite construction require less time due to the quick erection of the steel frame and ease of formwork for concrete. Including the construction time period as a function of total cost in the cost estimation will certainly result in increased economy for the composite structure.

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2) *Dr. D.R. panchal (2014) [2],* analyzed VB.NET is object oriented and provides managed code execution that runs under the CLR (Common Language Runtime), resulting in robust, stable and secure applications. Composite steel-concrete structure is relatively a new design concept in the Indian context and no appropriate updated codes are available for the design of the steel-concrete composite section, A simplified approach discussed in this paper, not only eliminates costly experimentation required for design purpose but also facilitates design with multiple options for the steel sections and shear connectors with adequacy checks. There are so many forms developed, as part of pre- and post- processor, to facilitate design of different types of composite slabs, columns and beams not only make the software easy to use and versatile but also make the application of the software attractive. for composite columns with a variety of steel sections encased in concrete and different concrete filled sections, is found to provide accurate results.
3) *D. Datta [3],* Analyzed in topic steel concrete composite structure new trend in India, Technological innovations are required to create interest in the builders to keep the real estate business competitive. The use of Steel-Concrete Composite construction methodologies will help the developers to make more profit and the customers could also get more carpet area and durable structure at their affordable price. The benefits of designing Green Buildings had been perceived in terms of total energy saving. Benefit of steel structure construction compared to other building materials is significant with respect to such considerations also. Americans Institute of Architects (AAI) in their Environmental Resources Guide recommends that Steel is environmentally less harmful than other construction materials. Generally steel construction is fully recyclable provides improved environmental performance and such construction offers a sustainable development to the society with very less consumption of energy, minimization of waste and utilization of renewable resources etc. Hence, in the coming decades, steel could be utilized by the Engineers to make the growth of Indian society more user- friendly matching with the National Housing and Habitat Policy and Housing needs of citizens.
4) *Dharti D. Soni, Nirav K. Patel [4],* analyzed using the software STAAD Pro.V8i for evaluating the performance of Composite structure comparing support reaction, support moment & nodal displacement for R.C.C. & Steel. They analyzed for medium soil for earthquake zone III using Equivalent static method of analysis and Response spectrum method of analysis. For designing Limit state method is used. Maximum and minimum nodal displacement of R.C.C. frame, Steel Frame and Composite frame. In this paper observed that the nodal displacement value of composite frame is comparatively less as compare to R.C.C. and Steel Frame. Minimum and maximum support reactions, and observed that the value of Fy is Considerably less in Composite frame as compare to R.C.C.
5) *B. Uy (2007) [5],* analyzed in topic Modern design, construction and maintenance of composite steel concrete structures: Australian experiences, this paper has introduced modern construction, design and maintenance of composite steel-concrete construction from the view of case studies in Australia. So many innovations on these buildings have driven the research efforts in these areas in Australia. Recently, the research has become more pro-active and solutions for design industry have had some of their fundamentals founded in the research that has been conducted by Australian universities. The design approaches by way of Australian Standards from an Australian design perspective has been provided and this has shown to be slightly lacking, thus showing the requirement for local engineers to use overseas design provisions. Much of the research conducted in Australia; finally this paper has identified some of the new areas of research that have eventuated due to sustainability principles.
6) *Y. C. wang (1998) [6],* analyzed in topic Deflection of Steel-Concrete Composite Beams with Partial Shear Interaction, the maximum deflection of the composite beam with partial shear interaction at working load may be calculated based on the stiffness of their shear connectors and 3 new equations are given by analysis, they are derived for a simply supported beam with uniformly distributed load. These equations are also applicable for other type of loading and support conditions with some extra calculation and numerical study using the finite element method. Some limits are given, the stiffness of the shear connectors may be conservatively calculated by assuming that, at the shear connector design strength (0.8Pu). the shear connector has an equivalent slip of 0.8mm.
7) *David Leaf, Jeffrey A Laman (2013) [7],* analysed on topic TESTING AND ANALYSIS OF COMPOSITE STEEL-CONCRETE BEAM FLEXURAL STRENGTH, failure have been observed to consistently fail before the nominal flexural strength predicted by AISC is reached, indicating a deficiency in present design standards. For the complete data, the numerical prediction error in accordance with AISC ranged from –0.30% to +19% with an average of a 6.6% over prediction. So Many observations during these tests have highlighted problem areas. The interlayer slip, indicating that full interaction is not achieved. Longitudinal cracking of the slab in the vicinity of the shear studs, indicating that stress concentrations are experienced in the slab at the shear stud locations. Shear forces in the end shear studs were higher, based on post-test

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examination. A model was developed using SAP2000 to analyze the test beam behavior. The results show consistency with observations made during full-scale beam testing.

8) *Kapil Grover , Sakshi Gupta [8]*, studied on topic Flexural Capacity of Composite Beams (Steel & Concrete) Keeping the span and loading unchanged; a more economical and efficient steel section in view of depth and weight is capable in composite construction in comparison to the conventional non-composite construction. The construction depth will reduced as the depth of beam lowers which results in enhanced headroom. As compare to steel beam there is less deflection in composite beam. Composite construction provides productive and efficient arrangement to cover large column free space. Composite construction is susceptible to "fast-track" construction due to the use of rolled steel and prefabricated components, rather than cast-in-situ concrete. As we apply load at the initial stage of loading, there was a greater flexibility stiffness of the beam in case of composite beams. Encased steel beam have improved corrosion resistance and fire resistance.

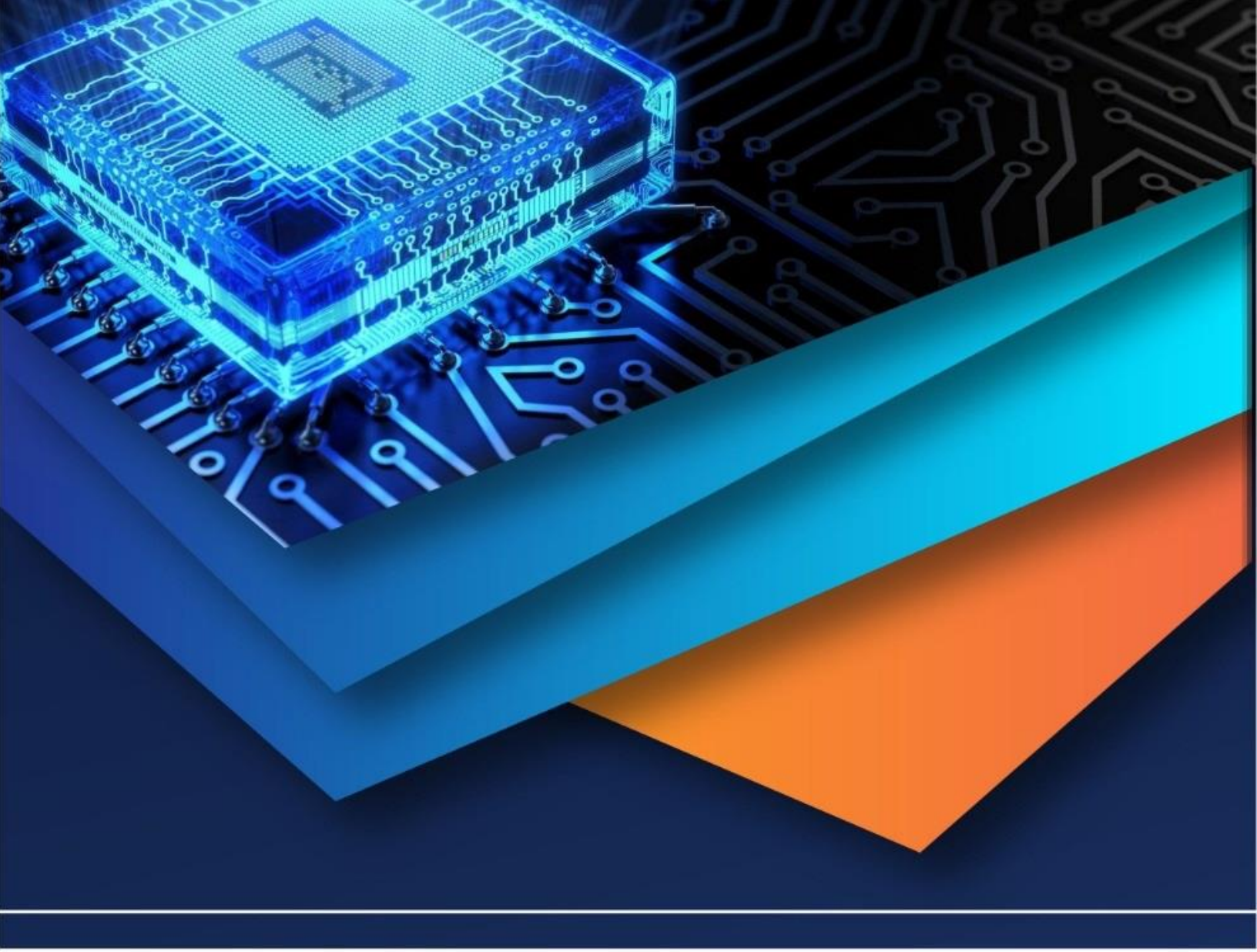
III. PROBLEM STATEMENT

Based on the following study I found out the direct equation for the calculation of deflection, rotation, shear force, and bending moment is not available for composite structures. And if we are talking about steel concrete composite construction the main problem is shear connectors in between two materials steel and concrete, there should be proper shear connector for composite construction. We can study on connection of steel and concrete material, proper position and strength of material.

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