# Review Paper on Comparative Analysis of T-Beam Bridge and Box Girder Bridge

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***Abstract* - Bridge is a structure that is built over a road, river, or railway to facilitate people and vehicles to cross from one side to the other. Selections of most suitable section in bridges of different span length, comparative studies are conducted. The main objective of the paper is to study the effects of T –beam and Box girder bridge of various spans under moving load using software and by manual methods. Methods of analysis and design carried out are determined. The bridges are designed for different IRC vehicle loadings and T–Beam deck system and box girder system are studied. The results of the software are verified against the manual methods. The parametric study is conducted on the parameters such as Bending Moments, & Shear Forces.**

***Keywords - Bridge; T-beam; box girder; deck system; CSI Bridge ; SAP2000; Courbon's theory***

## I. INTRODUCTION

Bridge is a structure that is built over a road, river, or railway to facilitate people and vehicles to cross from one side to the other. T-beam is a reinforced concrete bridge consisting of monolithic floor slab with supporting beams and its cross section resembles a series of T-beams. It is a load bearing structure that can be made more efficient structurally by inverting T beam with a floor slab or bridge deck joining the tops of the beams. Box girder bridge is a bridge in which the main beams consists of girders in the shape of hollow boxes. The box girder comprises either prestressed concrete, structural steel or combination steel and reinforced concrete. These bridges are usually used as elevated structures of rail transport and highway flyovers.

## II. LITERATURE REVIEW

**Abrar Ahmed (2017)** The aim of the work is to find out the most suitable section for bridges of different spans. The purpose of the work is for designing and analyzing sections for different I.R.C vehicles. Analysis of structure is done by Csibridge software, the validation is done by using working stress method and Courbon's theory. We can observe that I.R.C 70-R vehicle gives maximum impact. Till 30m span of bridge, T beam girder is suitable, and if span is higher makes it uneconomical. Box girder is suitable for higher spans.

**Sandesh Upadhyaya K (2016)** This paper gives a comparative examination of a deck slab system of 20m, 24m, 28m span lengths. Conventional design was made using excel sheets. Shear force and bending moment values are studied. The live load assigned is of Class AA wheeled vehicle. Validation is done by checking between finite element method analysis and manual Courbon's method. It shows T beam slab is more efficient than ordinary slab on girder.

**Tangudupalli (2017**) In this project comparison of all loadings and all methods and same bridge is analyzed using software STAAD Pro V8i. Analysis of the girder is done using the three rational methods (Hendry Jaegar, Guyon-Massonet, Courbon's theory). The loadings assigned are IRC loadings Class A, Class AA, Class 70-R, Class-B). The different country loadings given are Saudi Arabia loading, AASHTO loading, and British Standard loading.

**M.G Kalyanshetti (2013)** Computation of Bending moment due to live load in slab and girders, the live load distribution in the longitudinal girders is done. The method used to determine load distribution is Courbon's method. Here we study the effectiveness of Courbon's theory by varying the spans of number of longitudinal girders. Bridge modeling is done in Staad Pro software and they are analyzed by grillage method. Study is done for 4 lanes of different spans 15m, 20m, 30m, 35m, by using IRC class A loading. Numbers of Longitudinal girders are also different. Study shows that Courbon's method gives higher bending moment for exterior girders. Modified Courbon's equation is used for determining the problem of over estimation of load on exterior girder.

**Amit Saxena (2013)** This paper represents two types of bridge systems, i.e., simply supported reinforced cement concrete t-beam, box girder bridge, based on loadings and other various parameters. Calculation of material that is steel and concrete consumption in construction is calculated. The selection of type of bridge is carried out on the basis of important aspects of civil engineering such as economy, serviceability and safety. The analysis is carried out by using software STAAD Pro. After examining manually and by software, the economical one has been selected out of these two.

**Soumya S (2015)** The main purpose of this study is to design superstructure of a RC T-beam bridge of different spans. T-beam bridge decks are cast-in-situ concrete deck. It comprises of a concrete slab attached with girders. The finite element method is a common technique for the analysis of complicated structure. A T beam bridge was analysed by I.R.C. loadings as a one dimensional model. It is then analysed as a three-dimensional structure using software SAP 2000, v14.2.2 Models are subjected to I.RC Loadings. The result obtained by Courbon's

method is more than that obtained from finite element model, which indicates that the result obtained is conservative.

**Praful N K (2015**) Analysis by rational methods of a T beam bridge is done in this paper, where we use one dimensional structure. Use of various IRC loadings is studied. The three dimensional model is been analysed by Finite element method using the software Staad Pro. The models are been created for three spans of varying lengths that are 16m, 20m, 24m. The results obtained from software are thus compared with manual results. It shows that the results of software are lesser than that of the manual results. So we can come to a conclusion that the manual results are more conservative.

**Y Yadu Priya (2016)** In his study, analysis of Pre stressed concrete bridge is done. The spans are varied by 25m, 30m, 35m, 40m where the width of the bridge is constant. The bridge deck system which comprises t-beam is been subjected to IRC loadings i.e., IRC class AA, IRC Class 70-R tracked vehicle. After the analysis we get the values of Shear Force and Bending Moment. They are then compared manually by Courbon's method with that of Finite element method. The comparison shows that there is no much difference in comparison.

**Manohar R (2018)** According to the study a T-beam bridge of varying slab size 3x2, 3.5x2.5, 4x3, 4.5x3.5, 5x4 and depths of deck (200,225,250,275,300) mm is analyzed using SAP 2000 software. The main bridge components are deck slab, cross girders, longitudinal girder. Here the different dimensions of cross girders and deck slab are selected. Many manual methods are used for the analysis. It is noted that Shear force, Bending moment and deflection in the girder increases with the increase in the span length.

**Pavan D ( 2015**) In this paper a Finite element method (FEM) simulation were conducted to evaluate effect of the variation of cushion depth, coefficient of earth pressure, width or angle of dispersion on the structural behavior of the three dimensional box culvert and to examine the accuracy of FEM by comparing the FEM results with IS Code methods. It guides us in evaluating box culvert behavior under different cushion depths, the box culvert need not be reconstructed during widening of roads.

## III. CONCLUSION

With the growth and progress in bridge construction technology now we have several alternatives to choose a bridge from different types, different methods of analysis which fulfills different parameters i.e., economy, safety, strength of structure. In the review different types of bridges, methods of analysis in construction technology in civil engineering and selection of suitable types are examined.

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