RESEARCH ARTICLE OPEN ACCESS

Software Analysis of T-beam bridge on staad pro.

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Abstract:
T- girder bridges are commonly used type of bridge. they are easy to construct and maintain because the structural construction of such bridges are easy. Hence mostly they are preferred due to the critical design of other type of bridges as it provides connectivity within shorter and medium distance. The aim of our study was to analysed the t-girder bridge by using staad pro. Software. in this study we have consider span length of 25m. the deck slab has been analyses for IRC class AA loading using carbons method. excel sheet is made to design the maximum Bending Moment, Maximum Shear Force which produced due to dead load and live load of class AA tracked vehicle.

Key words: **T girder bride, courbons method, IRC class AA loading (tracked vehicle).**

INTRODUCTION:
Bridge is very important part of transportation system. The bridge is a structure built to span physical obstacles without closing the way underside such a body of water, valley or road, for the purpose to provide passage over the obstacle. There are many different designs that each serve a particular purpose and apply to different situation-beam, used in construction is load-bearing structure of reinforced concrete with a T-shaped cross section. A beam and slab bridge or T- beam bridge is constructed when the span is between 10-25 m. In this paper we had taken span length of 25 m. and the deck slab has been analysed IRC class-AA loading using courbons method. Excel sheet is made to design the maximum Bending Moment, Maximum Shear Force which produced due to dead load and live load of class-AA tracked vehicle. The loading is as per IRC 6: 2014. Bending Moment and Shear Force value has obtained by applying loading on Inner and Outer girder.

Courbons Method: In this paper we are adopt COURBON'S METHOD to design the bridge. This method is simplest and is applicable when the following conditions are satisfied: -

A. The ratio of span to width of deck greater than 2 but less than 4.
B. The longitudinal girders are interconnected by at least five symmetrically spaced cross girders.
C. The cross girder extends to a depth of at least 0.75 of the depth of the longitudinal girders.
D. Courbon's method popularly used due to simple process of computation as detailed below: - When the live loads are positioned nearer to the center of gravity and kerb the live load acts eccentrically with the center of gravity of the girder system. Due to this eccentricity, the load sheared by each girder's is increased or decreased depending upon the position of girders.

$$P_i = \frac{P}{n}\left[1 + \frac{n.e.d_i}{\sum d_i^2}\right]$$

Where:
P= total live load
e= eccentricity of the live load
d= distance of girders from the axis of bridge
n= number of longitudinal girder

1) LITERATUR REVIEW: -OMKAR VELHAL, JP PATANKAR (Study of RCC T-beam bridge with Skew angle, June 2016)

In this paper, to give a detailed comparative study of the highway skewed T-beam bridges, a number of detailed three dimensional (3D) finite element models were made using CSI Bridge (2015). They used 0˚, 15˚, 30˚, 45˚, 60˚ skew angles. By using this angles the result shows that, maximum value of shear force on longitudinal girder increases at obtuse corner when skew angle is increased, maximum value of bending moment in longitudinal girder decreases when skew angle increases Torsional moment increase when skew angle increases. deflection value in the longitudinal girder decreases when skew angle increases. It is also shows that, skew angle up to 15˚ do not harm the design values of skew bridges, notable amount of difference was observed in results for skew angles more than 30˚.

2) R. SHREEDHAR AND SPURTI MAMADAPUR,(ANALYSIS OF T-BEAM BRIDGE USING FINITE ELEMENT METHOD, VOLUME 2, ISSUE 3, SEPT. 2012)

In this paper, they analysed a simple span T-girder bridge by using IRC loading and specification (dead load + live load) as a 1 dimensional model. Finite element analysis of 3 dimensional model was carried out in STAAD Pro software. Models were subjected to IRC loading to obtained maximum bending moment. The results were analysed and it shows that the results of finite element model are lesser than the result of one dimensional analysis. So the results of IRC loading are conservative and economical design obtained from finite element method.

3) **NEERAJ KUMAR, (EFFECT OF VARYING SPAN ON DESIGN OF MEDIUM SPAN REINFORCED CONCRETE T-BEAM BRIDGE DECK, IN MAY 2017)**

In this paper, author describes the design of 4 lane reinforced concrete T beam bridge deck considering IRC class AA (track) loading with varying span length from 25-40 m are analyse and design by manually and STAAD PRO software. After computing heconclude that with increasing span length the dead load bending moment increases almost square of the span. It is also the bending moment increases in a parabolic manner when span increases.

4) M. G. KALYANSHETTY AND R. P. SHRIRAM, (STUDY OF EFFECTIVENESS OF COURBANS THEORY IN THE ANALYSIS OF T-BEAM BRIDGES, VOLUME 4, ISSUE 3, MARCH 2013)

`In this paper their study is carried out for 4 lane and 6 lane bridges of span 15m, 20m, 30m, 35m using IRC class A loading by extending number of longitudinal girder. They conclude that courbon theory gives high values of bending moments for exterior girder. So to rescue this problem to obtained actual BM they use second degree equation of parabolic function.

5) GEOFF TAPLIN AND RIADH AL-MAHAIDI, (MONASH UNIVERSITY) & GEOFF BOULLY, ARMANDO GIUFRE 7 DAVID PAYNE (NEGATIVE MOMENT CAPACITY IN EARLY REINFORCED CONCRETE T-BEAM BRIDGES,)

In this paper, authors explain the behaviour of continuous RC T-Beam Bridge. On Baranduda bridge on the Kiewa valley highway is constructed around 1916. For test two half scale beams were built and tested in the laboratory. Under controlled condition at a load of 10 KN, 6o KN, 77 KN to analysed the negative bending behaviour. After testing results shows that at a load of 10 KN beam cracked at mid span, and at 60 KN the beam cracked in the negative moment region at location where the top bars turn down in span one. Then at 77 KN beam cracked in negative moment region at the location where top bars turned down in span 2. they conclude that, the redistribution of moment from support at midspan was determined by the reinforcing detailing that was used, and did not require yielding of the reinforcing over the support

METHODOLOGY:

The analysis of the models is done by using STAAD pro. Software. The dead load and live load were applied on the models. The self-weight of railings and kerbs was ignored. The live load subjected as per recommendation of IRC 6:2014 and live load of IRC class AA (tracked vehicle) with impact factor.by applying the loading Bending moment and shear force were calculated. The results in the form of graphs are as follows:

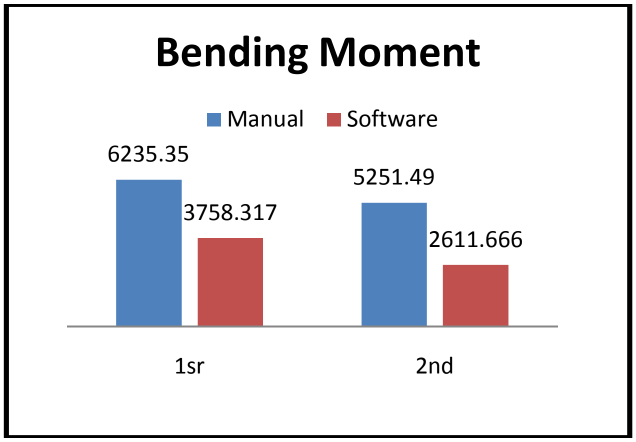

Fig. No – 1 Comparison of bending moment manually and staad software

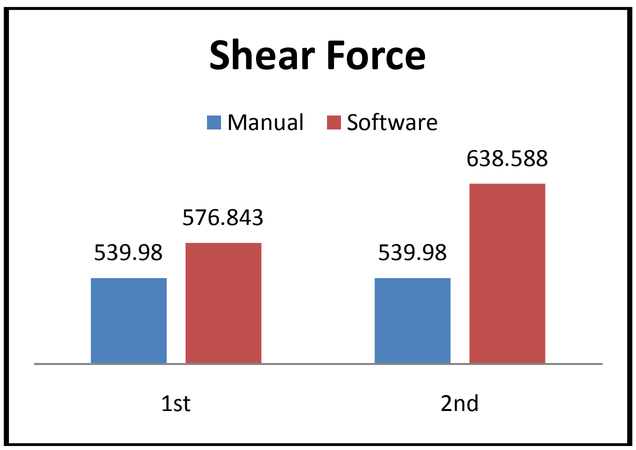

Fig No – 2 Comparison of shear force manually and staad software

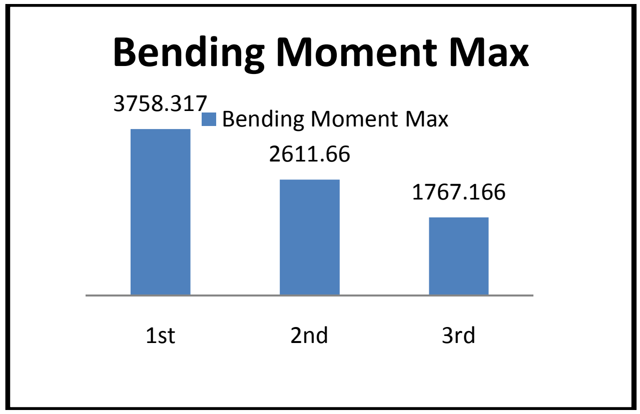

Fig No -3 Maximum bending moment on outer girder (1st girder)

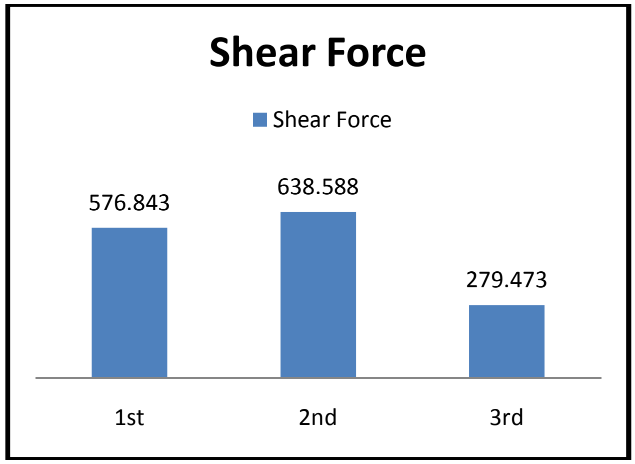

Fig No – 4 Maximum shear force on inner girder (2nd girder)

CONCLUSION:

in this paper the analysis of Bending Moment and Shear force has been studied. In above graphs results acquired as:

Bending moment:
After comparing manual and STADD Pro. Calculation difference in values of outer and inner girder were obtained.

Shear force:
After comparing manual and STADD Pro calculation difference in the values of outer and inner girder were obtained.
Maximum bending moment is takes place on outer girder.
Maximum Shear force is takes place on inner girder.

DESIGN REFERNCES:

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