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Review for Comparative Analysis of R.C.C T-Beam Bridge Girder

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ABSTRACT
This paper present review of literature regarding to comparative analyze and design a T-beam girder by using three rational methods (Courbon theory,Guyon-Massonet,Hendry-Jaegar). The knowledge of Influence line and theories of structures are essential for the analysis and design of R.C.C T-beam bridge.IRC 21-2000 and IS 456-2000 Code guidelines were preferred for the design purpose. The superstructure (RC slab, T-beam girder, Cross girder) Components have been designed using working state of design method under Class AA,70R (Tracked vehicle) Loading as prescribed by IRC were studied.
Key Words: T-beam bridge, longitudinal girder, cross girder, IRC loading, Working stress method, Class 70R loading, R.C.C bridge.

I. INTRODUCTION

Tee beam and slab decks are the most common type of super structures generally adopted in most of the national highways in the country. A typical Tee beam deck generally comprises the longitudinal reinforced concrete girders with an integral continuous deck slab between tee beam and cross girders to provide lateral rigidity to the bridge deck.

The longitudinal girders are normally spaced at intervals of 2 to 3m and cross girders are provided at 4 to 5m intervals along the span Reinforced concrete tee beams are ideally suited for span in the range of 10 to 25m.

The working stress method design a conventional method mostly adopted in the past R.C structures.This method is based on theory,in which the materials,concrete and steel are assumed to be stressed well below their elastic limit under the design load.The critical load for which the structure may be subjected to in its life time are taken as the design loads. Working stress for the materials are determined by dividing the ultimate stree or yield stresses by suitable factor of safety values

The analysis and design of R.C members using the elastic theory are sometimes found to be tedious and time consuming. The design by working stress method is found to be uneconomical and hence this method is fat becoming obsolete.This method is suitable for R.C beam bridge constructions.

II. LITRATURE REVIEW

Tangudupalli Mahesh Kumar, J.Sudhamani (2017)

Before Design of Any Structure we should know what the structural components in the structure, should know the specifications of the components, what are the loads to be considered in the design of structure and should know the analytical concepts. So This thesis gives the brief idea about the meaning of bridge and its classification, loads to be considered and the different methods to be adopted for the analysis of T-Beam deck slab bridge (only deck Slab with girders). This project Analyze the simple T- Beam Deck Slab. In T Beam Deck Slab consists Slab with Longitudinal and Cross Girders. Girders have analyzed with three different Rational Methods (Courbon theory, Guyon-Massonet, Hendry Jaegar) for four IRC Loadings (Class-AA, Class-A, Class-B, Class-70R) and three Different country Loadings which are AASHTO Loading, British Standard Loading, Saudi Arabia Loading.

M.G. Kalyanshetti and R.P. Shriram (2013)

In order to compute the bending moment due to live load in a girder and slab bridge, the distribution of the live loads among the longitudinal girders has to be determined. There are many methods to estimate load distribution. In this project Courbon's method is used to estimate the load distribution as it very popular and widely used because of its simplicity. But the Load factor

obtained by Courbon's method is constant for all spans and this indicates the effect of variation of span is not at all considered. Therefore it is proposed to study "effectiveness of Courbon's theory" for various spans of bridge by varying number of longitudinal girders. The detailed study is carried out for four lane and six Lane bridges of spans 15m, 20m, 35m, 30m, 35m using IRC class A loading by varying a number of longitudinal girders. Also the study reveals that Courbon's theory gives higher values of bending moments for exterior girder. Therefore the problem of over estimation of load on exterior girder is solved by using Modified Courbon's equation.

Neeraj Kumar (2017)

Bridge is a structure providing passageway over an obstacle without closing the way beneath. T-beam Bridge is mainly used by designer for small and medium span bridge. Reinforced Concrete is mostly used for highway bridge construction because of its durability, rigidity, economy, ease of construction and ease with pleasing appearance. This paper describes the design of 4-lane Reinforced Concrete T-beam Bridge deck considering IRC Class-AA tracked loading with span varying from 25 to 40m. After computing manually and STAAD Pro analysis software, it is observed that dead load bending moment with increasing span increases almost square of span.

Shubham Sirse , Prof. Kuldeep Dabhekar , Prof. Nalini Vaidya , Mangesh Saiwala (2020)

Bridges are the structures which are built to associate the route isolated by stream or valley. In India, there are various codes which are utilized to design bridges. Each code have distinctive structural design provisions and methods. This examination incorporates two Indian Road Congress (IRC) codes which are utilized to design bridges those are IRC: 21-2000 and IRC:112-2011. IRC: 21-2000 code of design rest upon the working stress technique and limit state technique of design is utilized to frame IRC: 112-2011 code. In this study, three single span of T-beam girder bridge of 15m, 20m and 25m length are planned and designed according to both IRC codes and American Association Of State Highway Transportation Officials (AASHTO) code and STAAD PRO V8i Software is utilized to dissect the model. Two examinations are made. The primary examination is in between the design and analysis results by IRC: 21-2000 working stress technique with the results of AASHTO and another correlation is in between IRC 112-2011 limit state technique with the consequences of AASHTO and it will be inferred what examination have pretty much similitudes and furthermore the most ideal structural design technique or code for RCC T-beam bridge.

R.Shreedhar, Shivanad Tenagi (2015)

T-beam Bridge is composite concrete structure which is composed of slab panel, longitudinal girder and cross girder. Present study is mainly focuses on design of longitudinal girder by IRC: 112-2011 and IRC: 21-2000. In India, till now girders are designed and constructed according to Indian road congress guidelines as per IRC: 21-2000 code in which working stress method is used. Recently Indian road congress has introduced another code IRC: 112-2011 for design of prestress and RCC bridges using limit state method. Present study is performed on design of longitudinal girder using "working stress method" using IRC: 21-2000 and limit state method using IRC: 112-2011 code specifications. It is observed that L/d ratio of 10 in working stress method and L/d ratio of 14 in limit state method is most preferable. Quantity of materials required in limit state method is compared with quantity of material required in working stress method and it is found that concrete can be saved up to 25 to 30% using limit state method.

Singh Shailendra, Jain Utkarsh, Nimoriya Manish Kumar, Faraz Md. Islamuddin (2015)

In general Reinforced concrete slab type deck are often referred to as culverts and are commonly used for small spans. This type of super structure is economical for spans up to 8 m. The Continuous solid slab bridges are economical for shorter spans while Tee beam and slab continuous bridges are economical in the span range of 10 to 35 meters. The object of the present work is to convert the simply supported bridges into continuous bridges and then to compare the behavior of continuous bridges with that of simply supported bridges.

The bending moments developed in continuous bridges are considerably less and consequently smaller sections can be adopted resulting in economy of steel and concrete. The ultimate moment capacity of continuous bridge deck is greater than that of simply supported decks due to the phenomenon of redistribution of moments in continuous structures. Provision of two span in place of one span results in reduction in moment from 80% to 90%.

B.H.Solanki & Prof.M.D.Vakil (2013)

Current practice in world for shear design many various practice is going on, As Shear is more critical force than other actions on bridge's

members ,new code IRC 112:2011 has improved in shear criteria compare to old IRC 21:2000.This paper presents shear strength, steel required for shear & shear resisting capacity of the member without shear reinforcement for LSM & WSM. Also this paper will shows which combinations of fy grade of steel & fck grade of concrete gives more shear strength so member requires minimum or no shear reinforcement. IRC 112:2011 changes shear design procedure quite similar to old procedure but equations for each step changed. In old code IRC 21:2000 , shear resisting capacity of member is calculated with amount of longitudinal reinforcement & grade of concrete fck, than difference is check whether applied shear is more than without shear reinforcement or not if it is than it is provided for excessive shear force or if not required than minimum shear reinforcement is provided, but there is no clause for maximum shear reinforcement criteria.

Sudip Jha, Cherukupally Rajesh, P.srilakshmi (2015)

This paper focuses on the methodology of design and analysis of Slab Bridge by working stress method and limit state method.

Bridge design methods are different in different parts of the world. While many codes are currently dealing with limit state method, South Asian countries like India, Nepal etc are new to this design practice. IRC has published new code IRC 112:2011 combining specifications for both RCC and prestress concrete bridges.

They introduces durability of concrete, general detailing requirements of different bridge members, grade of concrete and grade of steel compared to IRC:2000 which is working stress method. One of the most important types of bridge is Slab Bridge which is economical up to 8m. Due to its easy fabrication of formwork, reinforcement detailing and placement of concrete it is considered to be the simplest and are designed as one way slab to support the dead load and live load with impact.

Manjeetkumar M Nagarmunnoli1 and S V Itti (2014)

The increased traffic demand, material ageing, cracking of bridge components, physical damages incurred by concrete, corrosion of reinforcement and inadequate maintenance of bridges necessitate the assessment of bridges periodically for their performances. The accuracy of analytical assessment of bridges depends on the ability of the tool to simulate the problem.

To study the effects of deck thickness of RCC T-Beam bridge on the properties like Arching action by varying the thickness of the bridge and keeping all the other parameters same. From the present study, it is concluded that decrease in the deck slab thickness by a small value decreases the bending stiffness by about 40% to 50%. Analysis yields deck stresses far in excess of permissible stresses. The cracking propensity increases with decrease in the deck thickness by about 45%.

III. CONCLUSION

From the literature study made on Design of R.C.C T-beam bridge girder ,It was observed that

- Guyon-Massonent method is considered to be more accurate than the other methods and result in realistic estimates of the moments in the girders in a Tee beam bridge deck.
- The working stress method gives better serviceability performance(less deflection,less crack width)under working loads.

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