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Analysis of PSC Bridge for Highway Structures using Software

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ABSTRACT

Bridge is most useful structure for highway Structures and River & Canal structures in without any obstruction of water, traffic is flow out on structures. In Bridge structures many sort of vehicles like little vehicles, light vehicles and substantial vehicles are streaming in inevitably, so primary idea of bridge is the manner by which to end up a safe under different kinds of stacking state of vehicles in a single bearing. By and large the vehicles are stream in structure, the heap of vehicles are Both side scatter in 45 degree from edge of feel burnt out on vehicle in both longitudinal and parallel bearings implies ranges heading and length of Structure headings. So this scattering of load is specifically influenced to best of bridge (Deck section) and after that longitudinal support and in addition cross brace. After that the long individual from bridge superstructure like brace is transported the heap towards the substructure of Bridge and afterward establishment to soil. The plan of superstructure is by and large utilized with RCC, however nowa days in length range individual from Bridge utilizing with PSC, forget significantly more preferred standpoint and security of Structure.

KEYWORDS: *Bridge, structure, substantial, establishment, transported, security*

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INTRODUCTION

Beam or girder is that part of superstructure structure which is under bending along the span. it is the load bearing member which supports the deck. Span is the distance between points of support (eg piers, abutment). Deck is bridge floor directly carrying traffic loads. Deck transfers loads to the Girders depending on the decking material. Girder bridges are the simplest bridge type in structure and consist of steel beams shaped to an I-section or box section, called a plate girder bridge or a box girder bridge, respectively. Girder bridges are comprised of deck slabs, on which vehicles and people pass, and of main girders supporting the deck slabs. Deck slabs include RC deck slabs, steel deck slabs, composite deck slabs, and PC deck slabs. Bridges where the deck slabs and the main girders work together to resist loads are called composite girder bridges, and bridges designed to resist loads with the main girders only are called non-composite girder bridges. In general, effective spans of about 25 to 150 meters are applied, but the Costa e Silva Bridge (Brazil) was built with the longest effective span of 300 meters. JFE Engineering has the most experience in the manufacture and construction of bridges of this type

One of the fundamental segments of the bridge that associates every one of the Piles shafts. It can comprise from different basic ranges, a solitary nonstop range that is bolstered by various bars, cantilever ranges and cantilever ranges with the suspended range between them. They are generally produced using metal or fortified cement and furthermore can be made as backside braced that can convey more load. Brace segments are normally not produced using a straightforward square of material but rather are produced using bracket system (or Orthotropic pillars) that expands their protection from stack. Supports can likewise be utilized as a piece of unbending edge organize where they are completely associated with outline legs (which can be slanted or fit as a fiddle)

Vikas Shrivastava (2017) (analysis of Box culvert minor bridge under the action of vehicular and seismic loads) The author demonstrated the structure analysis and design of RCC box type minor bridge

using MDR Method along with computational approach using IRS-CBC codes. The results generated from the author's analysis proved that the maximum design forces developed for the loading conditions when the top slab was subjected to the dead load and live load and sidewall was subjected to earth pressure and surcharges when the culvert was empty. While estimating the positives and negative's it was observed that Computational method (Stadd.pro) was comparatively more competent than Moment Distribution Method (MDM) in terms of time consumption along with efficiency of results.

Manohar et al. (2018) (Finite Element Analysis of slabs, cross girders and main girders in RC T-Beam Deck Slab Bridge) Studied that the analysis of a single span two lane T- beam bridge is carried out by varying the span of 8m, 28m for analysis of girders and size of slab 3x2, 3.5x2.5, 4x3, 4.5x3.5, 5x4m by varying the spans of the bridges, deck slab depth as 200,225,250,275,300mm using software SAP 2000. In order to obtain maximum bending moment shear force and deflection, the bridge models are subjected to the IRC class AA Tracked, IRC class 70R and IRC class A loading system. The cross girders and deck slab of varying depth for different live loadings also presented in the study. It can be observed that with the increase in the span shear force, bending moment and deflection in the girder increases and also the models subjected to the IRC Class AA Tracked vehicle gives higher values of shear force, bending moment and deflection in comparison to those subjected to the IRC Class 70 R and IRC class A loadings.

Patel and Jamle (2019) Researched the analysis and design of box culverts using the manual approach. In this study, the design parameters of box culverts are considered, including earth pressure effect, the depth of cushion at the top slab, braking force, impact load, live load, dispersion of loads through tracked or wheeled vehicles, effective width, and so on. The objective of this work is to analyse culverts with and without cushions to obtain bending moments and shear forces with and without culvert cushions under different types of IRC loading conditions. The paper provides a detailed discussion of the provisions and justifications provided by Indian Standards while considering their design implications.

Khan and Mandloi (2020) The study focused on analysing and designing pre cast boxes for underbridge and bridge road applications. It was done using Staad Pro. The paper explains the Box Pushing Method of building a road under a bridge or a subway tunnel. It is normal for traffic to continue overhead during this time, oblivious to the construction beneath. A cycle's inherent ease, effortlessness and economy, as well as its inalienable wellbeing, make it a valuable tool for a practicing structural designer. By means of this report, we intend to give a more in-depth understanding of the container pushing cycle to the perused, and then give a couple of considerations and rules for engineers to help plan an undertaking that can be made using the container pushing strategy. Pushing boxes under rails or streams is a familiar method for designing ducts or passageways to accommodate street or rail traffic under rail banks.

Bhujade and Gaikwad (2020) Researched the design of a RCC box culvert with and without a cushion. The purpose of this paper is to compare the performance of reinforced concrete box culverts without and with a cushion using the limit state method. In accordance with IRC, the culvert section is designed on the basis of vehicular loads. The thick culvert section and vehicular loads combined create a harmful effect for the structure. Using STAAD Pro, the engineering elements and requirements of steel are designed to withstand maximum bending moments and shear forces.

Chaithra et al. (2021) Discussion on "Parametric Study on Single Cell Box Culvert Design Considerations" and the fact that box culverts are a cost-effective alternative to bridges and an important part of transportation networks. The stiffness matrix method is used in this paper to analyse box culverts. Assume discrete boundary conditions for box culverts. Specifically, we assume that the structure consists of a top slab, bottom slab, and two vertical side walls that form a closed rigid box frame. We also assume that the structure has an external design.

OBJECTIVE OF THE PRESENT STUDY

1. Details on how the spans will be configured.
2. Cross-sections like the midspan and support were used as critical cross-sections in the analysis.
3. Information about reinforced and/or prestressed sections around critical areas.
4. A serviceability design moment is the result of a design moment's stress on serviceability.
5. A live load distribution factor to design for different loadings.
6. Calculate the live load.
7. In construction, this is used to check the load capacity of heavy loads at the critical sections.
8. For spread footings, determine the bearing pressure; for pile foundations, specify the pile load.

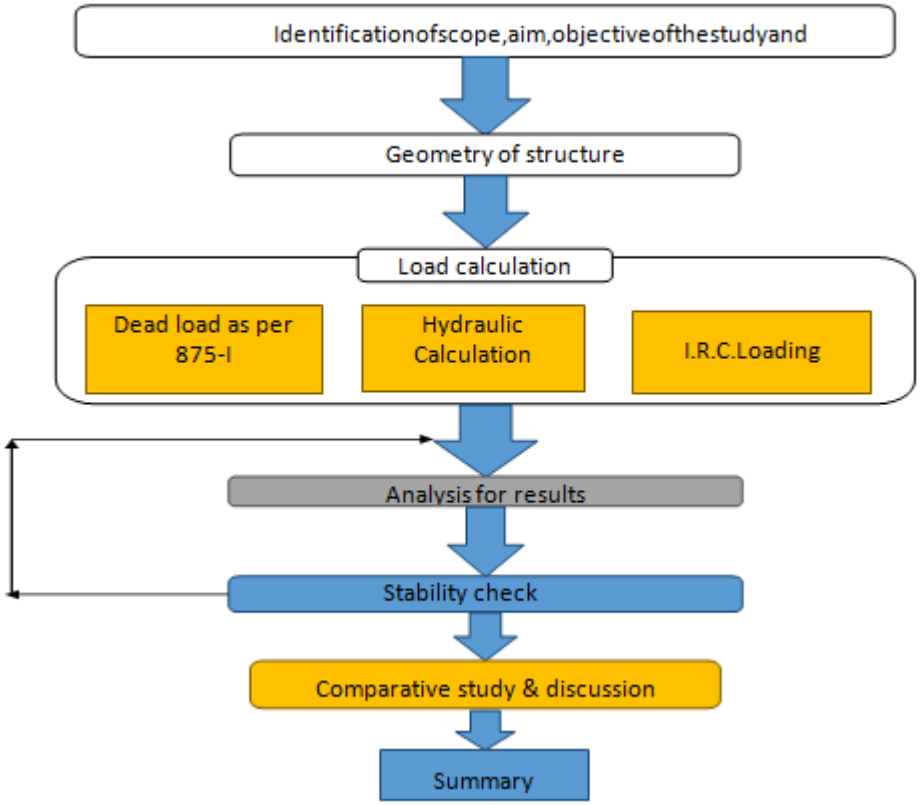
FORMULATION & Methodology

No detailed study on suitability of materials has been done in past researches were conducted on different materials including RCC, prestress foam concrete

however information on techno-economic feasibility of materials to be used in bridges is lacking.

In this research work our motive is to justify the variation in strength and cost of four cases of bridges for same loading and hydraulic conditions to carry out the best of them.

In this study, I am focusing the analysis using finite element method using analysis tool SAP 2000, which is capable of applying all conditions and methods with respect to preferred standard code.



RESULTS AND DISCUSSION

Maximum Shear Force

Max. Shear Force in Pier			
Deck Bridge (RCC)	Deck Bridge (Foam Concrete)	Pre-stressed deck bridge	Pre-stressed deck bridge (Foam Concrete)
543.23	501.34	520.34	500.21

Table 1. Maximum Shear Force

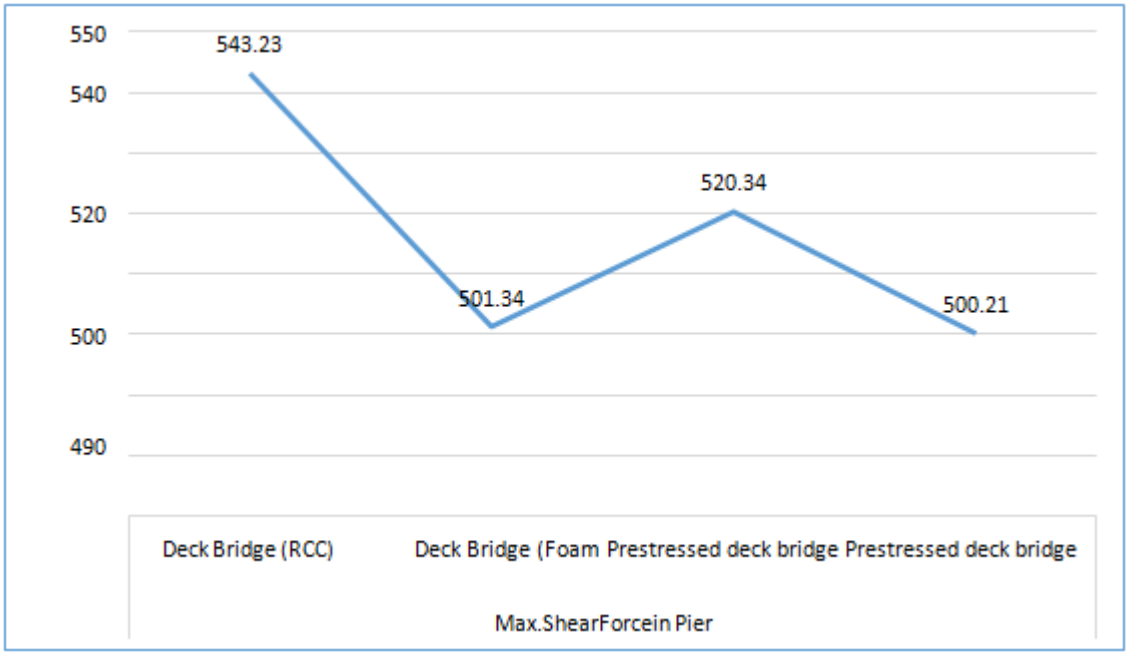


Fig 1. Shear force

CONCLUSIONS

Findings of the project can be concluded as below:

1. In this comparative analysis it is clearly stated that Pre-stressed Bridge (Foam concrete) is more stable in resisting load.
2. In this study Hydraulic calculation is determined using topography sheet available as per Indian standard using dickens formulae.

REFERENCES –

[1] IS-1893:2002 Criteria for earthquake resistant design of structures.

[2] J.S.Mundrey, RAILWAY TRACK ENGINEERING 2015.

[3] Karthiga P, Elavenil S, Kmp D. A Comparison of Road Over Bridge and Rail Over Bridge. The IUP Journal of structural engineering, ISSN 1786 online, Vol III, 2016.

[4] Li Z, Zhiyun S. Progress in high-speed train technology around the world. Transport Bureau, the Ministry of Railways of China, Beijing, China. Traction Power State Key Laboratory, Southwest Jiaotong University, Chengdu 610031, China a. Astaneh A. Progressive Collapse of Steel Truss Bridges, The Case of I-35w Collapse, Asla a University of California, Berkeley, USA, 2015.

[5] M.J.M.M. Steenbergen_, A.V. Metrikine, C. Esveld, Assessment of design parameters of a slab track railway system, Journal of Sound and Vibration 306 (2007) 361–371.

[6] Niels. J. Jimsing, “Cable supported Bridges, Concept and Design”.

[7] N. Krishna Raju, “Design of Bridges”, fourth edition. 2010.

[8] Parag R, Padmakar J and Trupti N: “parametric investigation of cable stay bridge using macro based program,Vol. 4 Issue9, 2015

[9] Shetty RS, Prashanth MH, Channappa TM, Ravi Kumar CM. Information vibration suppression of steel truss railway bridge using tuned mass dampers. ISSN 1955:1298, Vol. 7, 2017.

[10] Siddharth G, Desai G. H and Solanki C. H: “Effect of Pylon Shape on seismic response of Cable stay bridge with soilstructure interaction”. Vol. 1, No 3, ISSN 0976 - 4399, 2010.

[11] Xueyi L, Pingrui Z, Feng DM. Advances in design theories of high-speed railway ballastless tracks. Key Laboratory of High-Speed Railway Engineering, Southwest Jiaotong University, Chengdu, China. 1999.

[12] Xueyi LIU*, Pingrui ZHAO, Feng DAI, Advances in design theories of high-speed railway ballastless tracks, Volume 19, Number 3, September 2011.

[13] Xiaoyan Lei1 and Bin Zhang, Analysis of Dynamic Behavior for Slab Track of High-Speed Railway Based on Vehicle and Track Element, Journal of transportation engineering © ASCE / April 2011 / 227.

[14] IS-432 Part 1-1982 Mild steel and medium tensile steel bars.

[15] EN 1991-2 Euro code for traffic loads on bridges.

[16] IRC: 6-2014 Section –II (Loads and Stesses) standard specifications and code of practice for road bridges.