IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Review On Analysis Of Four-Lane Bridge Deck Under Different Loading Condition

[1]Chandrapal Singh Kanwar, [2]Mohd. Zeeshan Khan
[1]M. Tech Scholar, [2]Assistant Professor
[1]Civil Engineering Department Lingaya's University, Faridabad,
[2]Lingaya's University, Faridabad

ABSTRACT

A bridge is a construction built to span physical obstacles such as a body of water, valley, or road, for providing passage over the obstacle. In the present work, the analysisand results have been compared for a two-lane simply supported RC T-frame concreteplate girder bridge deck. This analysis according to IRC Chapter-3 is carried out and structural modeling, load and load combinations is applied according to the conditionsin the STAAD.Pro software with considering various vehicle databases i.e. Class AA and 70R loading. A dynamic analysis has been performed at different lengths of span to evaluate the effect of the structure length. Additionally, the effect of girder thicknesshas also been studied. The effective height of the bridge cross-section is kept 2 meters for all cases. In this work, maximum deformation, von-mises stress, shear stress, in- plane shear stress, membrane stress, bending and twisting moment is achieved and compared with each other.

1. INTRODUCTION

In recent decades, it has been established that a significant part of the world's bridges is not functioning as they should. In some cases, bridges have a significantly higher traffic load than originally intended. Although, among many others, the problem is oneof durability, the widespread use of salt on the roads has resulted in the entry of chlorideinto the concrete. This is often associated with leaking gaskets or details that cause chloride contaminated water to drip onto satellites. Problems have also been reported with later stressful concrete bridges, where tendon corrosion has occurred due to insufficient grating of the groove.

The new awareness of the need to design sustainable bridges has led to a change in attitude towards bridge design. Now there is a significant change from bridges that make it easier to design bridges that will require less maintenance. Bridges that were easy to design were usually laid out, for example, they simply supported spans and cantilevers. However, these structural shapes have multiple joints that are prone to leakage and many bearings that require replacement over the life of the bridge. The modern trend is towards

bridges that are very uncertain and have few joints or supports.

2. LITERATURE REVIEW

Dzolev et. al. [1], presented an analysis of reinforced concrete girder bridges designedaccording to the standard of 19, 2, determining the flexibility achieved in plastic hingesin displacement of targets for seismic action designed for sections. Is with Limited andunconfined of concrete with and without the effect of geometric non-impact.

Kulkarni and Karadi [2], conducted seismic evaluation case studies for an existing RCbridge using static nonlinear (impulse) analysis. In the present study, a 4-span RC bridge was selected at SH-12 in Karnataka, India, and the linear non-linear static analysis (thrust) of FEMA 356 was defined by the capacity spectrum method (ATC 40)and SAP2000 software. To analyze the bridge. The evaluation results presented here suggest that the selected bridge does not have the capability to achieve the desired performance level and requires upgrades. From the pushover analysis, the performancelevel of the bridge is studied.

Sharma [3], performed evaluation studies for existing RC bridges using static nonlinearanalysis. For seismic evaluation of the bridge, a 3-span bridge was selected which waslocated on the Hindon River in Ghaziabad (Uttar Pradesh). The area was highly vulnerable to seismic activity as it is in Zone 4. Therefore, an earthquake of high intensity may occur in this region (it may exceed 7 magnitude). The software was used for seismic evaluation of the bridge at the time of an open earthquake. The open view model was used to describe the various functions of the bridge. By comparing differentresults obtained through nonlinear analysis (static and dynamic). Concrete developed by Chang and Mender was used for evaluation. This new material was used in the evaluation to improve the bridge's existing capacity against damage to the bridge element during seismic activity.

Kumar and Ram [4], deals with the analysis and design of the road superstructure cumrailway bridge over the proposed Krishna river at the bottom of the existing bridge between Sitanagaram and Mahanagar to Mahanadi road. Bus Station, Vijayawada. Thebridge is made of steel-type trusses forming two railroads at the lower level and a three-lane carriageway road at the upper level. The length of the section coincides with the existing nearby railway bridge. Upper deck members, truss members, and lower deck members are analyzed with STAAD.Pro. The design of structural members, upper deckand lower deck of the truss members were performed in accordance with the Indian Railway Standard Code and the Indian Highway Congress Code. In which he concludedthat the road cum railway bridge reduces the construction cost by providing a bridge for rail traffic instead of providing two separate bridges. It caters to the increasing needs of rail and road traffic through the Krishna River. Reduces the problem of land acquisition by providing a single bridge.

Kanth and Prasad [5], deals with a minor bridge design. We plan to cover every aspectof the redesign. This was to include the design of the actual replacement bridge, the impact the bridge would have on the surrounding area through environmental impact, and the logistics associated with the construction phase. While completing this project,we have to use a range of tools. To see the deficiencies of the current bridge we will need to obtain a bridge history report, including elevation issues and the quality of the pier. We must also determine what the ASHHO design standards are and apply them tothis bridge.

Karthiga et. al. [10], presented a linear analysis of the rail substructure on the bridge considering the road bridge considering IRS 25T rail load and Class A IRC load. Thereare road bridges on the bridge, on which the road can be operated. On the other hand, on the rail above the bridges, can be operated on the railway bridge. The purpose of thiswork was to determine the different types of loads acting on the structure and to analyzethe railroad and bridge intercepts on the bridge using STAAD PRO. Pall for the road over the bridge was obtained from the Stad Pro. The bridge is compared for the criticalsection of the rail and the pier. Load and load combinations are considered in relation to IRS and IRC codes.

Monteiro et. al. [11], intended to fix this problem from a modeling type of viewpoint. Currently, most structural seismic analyzes consider plastic or fiber-based hinge structural models. Depending on the choice, different methods of considering the non-linear behavior of the elements are considered and different parameters and calibrationprocedures must be established. To investigate the accuracy of both modeling possibilities, a parametric study was carried out in different bridge configurations, comparing the thrust curves and NSP results, which use these thrust curves. Applicationproblems, such as advantages and / or limitations, are discussed in each of the modelingtypes.

Paolacci et al. [12], they were designed for gravity loads and often equipped with smooth steel bars. As a result, most bridges do not have seismic expansion, and therefore their structural performance was generally insufficient under seismic earthquakes. Existing state of the art in the area of existing bridges was rare, therefore,it was necessary to propose reliable procedures to assess seismic vulnerability of existing bridge structures. Its purpose was to provide comprehensive guidelines for seismic evaluation and modernization of existing bridges.

Li et. al. [13], studies seismic responses to rust damage damages RC bridges under seismically different seismic earthquakes. Chloride induced corrosion damage was considered in the analysis. Based on the chloride corrosion current density of variationover time, the extent of strong corrosion at the bridge piers was estimated. The probability distribution of the reinforcement diameter of the bridge column and the elastic limit at different time steps after service in the bridge are calculated using the Monte Carlo simulation method.

Cao and Yuan [14], deals with the simple analysis of bridges with elevated pile foundation systems, the inelastic contribution of the second mode cannot be ignored. Generalized analysis cannot be directly applied in this situation. A modified generalizedpush procedure was developed to estimate the seismic demands of bridges with elevatedpile foundation systems. Modified generalized impulse procedures, modal impulse analysis, and incremental dynamic analysis of the bridge are performed with elevated pile foundation systems.

Mahmood and Al-Ghabsha [16], used the finite element method representing the cross-section of the prism and the Fourier series were chosen to represent the behavior of theprism in the longitudinal direction appropriately, which supported the boundary conditions in the bus. Satisfies Extremes. An explicit time integration scheme was usedto solve the equation of motion for each of the bridges and vehicles. In the present works, damping was neglected in formulating the bridge motion equation. This avoidssolving the global system of equations because each equation diverges from the other equations.

Lu et al. [17], presented a spatial grid model for the analysis of a T-frame bridge. The results of static and dynamic analysis of the spatial grid model for the T-frame bridge are compared based on the results obtained from field tests. Research results have shown that T-frame bridge analysis can be easily performed using the spatial grid model.

Bhil [18], was structural deficiencies were not identified, was at risk of failure. A widerange of bridges built around the world were designed at full volume when there were no unstable design provisions in the bridge code, or once these provisions conformed to this standard. Furthermore, due to aging and hence, development of transport in hundreds of magnitude and volume, many existing bridges in India are deteriorating. Because the construction of recent bridges takes an excessive amount of time and money, repair and rehabilitation of old and broken bridges inside the gift studio is necessary to maintain their load capacity and repair performance.

Abbasi and Pahwa [19], summarized and calculated various dynamic and static properties of cable suspension-based bridge structure. It has been shown through simulations that most displacement on a cable suspension bridge arises due to heavy traffic rather than air pressure. Therefore, our study clearly indicates that traffic monitoring should be taken care of at the cable suspension bridge. Additionally, we have produced results for static analysis that explicitly ignore traffic but it is worth giving a more holistic picture of the entire effort.

Powar and Khurd [20], studied the modal and transient analysis of bridge deck slabs subjected to mobile loads using ANSYS software. The results of the modal analysis arecompared with previous literature and are closed to the solution. Parametric studies were performed to account for the variation of model

amplitude as deviation, stress, and strain. The study suggests that the finite element method can be an applicable and reliable tool for the analysis of bridge deck slabs.

3. Conclusion and Proposed Work

In general, the bridge structure can be divided into two categories. One type is a closedsystem and the other is an open system, such as a box-type girder or a plate-type girdersystem, respectively. The box girder system is beneficial in torsion and durability, but is detrimental in terms of construction costs. The plate type girder system is detrimentalin terms of construction durability and capacity, but is beneficial in relative constructionand maintenance costs compared to other girder systems. Currently, the most importantproblem in bridge construction is cost efficiency for performance, many bridge engineers and designers prefer a plate girder system due to cost advantage. A plate girder bridge is a bridge built on RC girders by placing or type T-Frame concrete girder.Therefore, the plate girder bridge is usually a precast type that can save construction time and transportation by transporting and placing tasks. Precast beams on top of pre-built bridge columns on site. The analysis is carried out with the help of IRC loading conditions in STAAD.Pro. The results are finally analysed and compared to produce the better results for dynamic conditions.

REFERENCES

[1] I. Dzolev, D. Ladjinovic, A. Raseta, A. Radujkovic, “Pushover analysis of RC bridge designed according to EN 1998-2”, Construction of Unique Buildings andStructures, pp.116-125, 2014.

[2] S. Kulkarni and U.N. Karadi, “Nonlinear Analysis of Existing RC Bridge Using SAP 2000”, Civil and Environmental Research, Vol.6, No.12, pp.30-37, 2014.

[3] R. Sharma, “Nonlinear Static Analysis of RC Bridge”, International Journal of Civil Engineering, vol.2, Issue.5, pp.1-4, 2015.

[4] T. P. Kumar, G. P. Ram, “Analysis and Design of Super Structure of Road CumRailway Bridge Across Krishna River”, International Journal of Engineering & Science Research, Vol-5, pp.830-838, 2015.

[5] S. N. K. Kanth, V. A. Prasad, “Design and Analysis of Bridge Design Using STAAD.Pro”, International Journal of Research Sciences and Advanced Engineering, Vol.2, Issue.12, pp.211-224, 2015.

[6] M. Al-Emrani, B. Engström, M. Johansson, P. Johansson, B. K. Del (Load bearing structures part 1. In Swedish). Department of Civil and Environmental Engineering, Chalmers University of Technology, Goteborg, 2008.

[7] J. Blaauwendraad, Plates and FEM - Surprises and Pitfalls. Springer, Dordrecht,2010.

[8] H. Broo, K. Lundgren, M. Plos, A guide to non-linear finite element modelling of shear and torsion in concrete bridges. Department of Civil and Environmental Engineering, Chalmers University of Technology, Goteborg, 2008.

[9] Caselunghe, A. & Eriksson, J., Structural Element Approaches for Soil Structure Interaction. Thesis. Department of Civil and Environmental Engineering, Chalmers University of Technology, Goteborg, 2012.

[10] P. Karthiga, S. Elavenil, K. M. P. Dinesh, “A Comparison of Road Over Bridge and Rail Over Bridge”,

Vol. 7, Issue 4, p35-47, 2014.

[11] R. Monteiro, R. Ribeiro, M. Marques, R. Delgado, A. Costa, "Pushover Analysisof RC Bridges Using Fiber Models or Plastic Hinges", The 14th World Conference on Earthquake Engineering, October 12-17, 2008, Beijing, China.

[12] F. Paolacci, R. Giannini, S. Alessandri, L. D. Sarno, G. D. Corte, R. D. Risi, M. Erdik, C. Yenidogan, A. Marioni, F. Taucer, P. Pegon, R. Ceravolo, "Seismic analysis and retrofitting of an existing R.C highway bridge: investigation throughpseudo-dynamic", World Conference on Earthquake Engineering, September 2012, Lisboa.

[13] C. Li, H. Hao, H. Li, "Life-Cycle Seismic Response Analysis of RC Bridges Considering Chloride Induced Corrosion", Australian Earthquake Engineering Society 2014 Conference, pp.1-9, 2014.

[14] S. Cao, W. Yuan, "Modified generalized pushover analysis for estimating longitudinal seismic demands of bridges with elevated pile foundation systems",Latin American Journal of Solids and Structures, pp.2696-2711, 2014.

[15] Abdul Raheem, A. S. Patil, "Push over Analysis on Existing Bridge", International Journal for Scientific Research & Development, Vol.3, Issue.5, pp.1213-1217, 2015.

[16] M. N. Mahmood and A. T. S. Al-Ghabsha, "Dynamic Analysis of Bridges Subjected to Moving Vehicles," AL-Rafdain Eng. J., vol. 14, no. 4, pp. 34–50, 2006.

[17] P. Lu, F. Li, and C. Shao, "Analysis of a T-frame bridge" Math. Probl. Eng., vol.2012, pp. 1–15, 2012.

[18] P. S. Bhil, "Vibration Analysis of Deck Slab Bridge," Int. Res. J. Eng. Technol.,vol. 6, no. 8, pp. 667–670, 2015.

[19] F. Abbasi and S. Pahwa, "Dynamic Analysis of Suspension Bridge using MatlabSimulation," Int. J. Sci. Res., vol. 6, no. 7, pp. 1175–1178, 2015.

[20] A. R. Powar and V. G. Khurd, "A Study on Dynamic Response of Bridge Deck Slab," Int. J. Res. Appl. Sci. Eng. Technol., vol. 5, no. XII, pp. 111–116, 2017.