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A REVIEW ON COMPARISION OF DIFFERENT TYPES OF TRUSSES IN VIBRATION ANALYSIS USING STAAD PRO

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ABSTRACT
Structural vibration control as an advanced technology in engineering consists of implementing energy dissipationdevices or control systems into structures to reduce excessive structural vibration, enhance human comfort and preventcatastrophic structural failure due to strong winds and earthquakes, among other inputs. When the bridge carries heavytraffic, vibrations in the bridge structural elements subjected to high levels of stress. This tension bridge subjected tofatigue.This work presents a review of work done by various authors on vibration analysis of steel truss bridge under moving loads by using STAAD Pro Software. The proposed bridge under study is pratt, warren, howe andK type.

Keywords: steel truss bridge, moving loads, vibration analysis, harmonic loading.

I. INTRODUCTION
Construction of long span bridges has been very active inthe world in the past few decades. Today, modern bridgestend to use high strength materials. Therefore, their structureis very slender. As a result, they are very sensitive todynamic loadings such as wind, earthquake and vehiclemovement. As bridge span gets longer, they become moreflexible and prone to vibrate. Vibration can have severallevels of consequences; from a potentially hazardous effect(causing immediate structural failure) to a more extendedeffect (structural fatigue). In addition, vibration can effectsafety as well as comfort of users and limit serviceability ofthe bridge. Therefore, extensive studies have been carried outto understand mechanisms behind bridge vibration and toreduce this undesirable vibration effect.

The main advantages of structural steel over other construction materials are its strength and ductility. It has a higher strength to cost ratio in tension and a slightly lower strength to cost ratio in compression when compared with concrete. The stiffness to weight ratio of steel is much higher than that of concrete. Thus, structural steel is an efficient and economic material in bridges. Structural steel has been the natural solution for long span bridges since 1890, when the Firth of Forth cantilever bridge, the world's major steel bridge at that time was completed. Steel is indeed suitable for most span ranges, but particularly for longer spans. Howrah Bridge, also known as RabindraSetu, is to be looked at as an early classical steel bridge in India. This cantilever bridge was built in 1943. It is 97 m high and 705 m long. This engineering marvel is still serving the nation, deriding all the myths that people have about steel shown in Fig.1.

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Fig. 1 Howrah bridge

The following are some of the advantages of steel bridges that have contributed to their popularity in Europe and in many other developed countries.

- They could carry heavier loads over longer spans with minimum dead weight, leading to smaller foundations
- Steel has the advantage where speed of construction is vital, as many elements can be prefabricated and erected at site.
- In urban environment with traffic congestion and limited working space, steel bridges can be constructed with minimum disruption to the community
- Greater efficiency than concrete structures is invariably achieved in resisting seismic forces and blast loading
- The life of steel bridges is longer than that of concrete bridges
- Due to shallow construction depth, steel bridges offer slender appearance, which make them aesthetically attractive. The reduced depth also contributes to the reduced cost of embankments
- All these frequently leads to low life cycle costs in steel bridges

In India there are many engineers who feel that corrosion is a problem in steel bridges, but in reality it is not so. Corrosion in steel bridges can be effectively minimised by employing newly developed paints and special types of steel.

II. LITERATURE REVIEW

Shubhank Gupta et al (2017) presented the analysis and design of steel truss railway bridge of span 50 m. The bridge with same railway loadings of 32.5 tonne has been assigned in different types of truss sections to determine the best stable and economical section. Analysis and design is completed using tool staad pro to optimize the section and determine best stable sections for comparison. The design of structural members of the truss is done in accordance with provision of Indian railway standard code and Indian roads congress code.
M. AllaRangaswamy and E.V. Chandrasekhar (2017) considered the case with the emerging fly-over over NH By-pass, ONGOLE, and spanning 600m with a width of 6.6m. Greater seismic resistance, life span, and lesser life cycle cost nullify the excess cost of construction of flyover. Bridges and fly-over are structures providing passage over an obstacle without closing the way beneath. The required passage may be for a road, railway or a valley. Bridge design is a complex problem, calling for creativity and practicability, while satisfying the basic requirement of safety and economy. The basic design philosophy governing the design is that a structure should be designed to sustain, with a defined probability, all action likely to occur within its intended life span. In addition, the structure should maintain stability during unprecedented action and should have the adequate durability during its life span. For easy traffic flow of vehicles without traffic congestion flyover or over bridges is essential to overcome the traffic congestion required. Our project deals with the Design of a flyover in the intersection. The location is at four roads junction at pipeline junction, which is facing major traffic problems due to the construction.

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Mohamad Ibrahim Zaed Ammar et al (2017) studies and focus the effects of vibration of steel truss bridges and finally to suggest future directions of research and innovation. The possibilities of modal properties of global and local vibration method in determining the structural changes in the truss bridges discussed located to the results of finite element analysis.

Chandresh Kumar Jha and M.C. Paliwal (2017) presented the study of optimization of Howe Truss by Fully Stressed Design (FSD) technique utilizing STAAD.Pro software version STAAD.Pro V8i (SELECT series4). Three span ranges of the trusses i.e. 8m, 10m and 12m have been considered and each truss has been subjected to 24 sorts of load cases by changing nodal load locations but load applied will always be symmetric. The four arrangements of load condition are taken, i.e., 100 kN, 125 kN, 150 kN and 175 kN. The total 72 number of trusses have been optimized in this study to achieve a target stress of 100 MPa. The optimal mass of all the trusses for each case and maximum deflection for each case have been calculated. Further deflection per unit mass have also been calculated and compared for each span with graph. Results of the study will be helpful in the designing of a truss that must fulfill the requirement of economy as well as strength.

Ramesh Kumar Dhaka and Pradeep K. Goyal (2017) presented the design of a steel arch bridge which is located at Jaipur using STAAD.Pro. The arch bridge is proposed with 350 meter span and 13.3 meter width with an average height of 29.977 meter in this study. The design is carried out by considering wind load, seismic load, live load & dead load for the arch bridge. The design is carried out as per the Indian Standards and by the help of the structural analysis and design software STAAD.Pro.

M. Prabu and R.Vijayasarathy (2016) design a bridge and bridge site is located in SANTHA PILLAI GATE, Thanjavur. There exists a railway crossing amidst the state Highway, in order to avoid traffic on that area this proposed bridge is to be constructed. By collecting vehicle population data the necessity of one way road for all two lane road is clearly understood. Precast deck slabs are designed according to IRC CLASS AA TRACKED VEHICLE loadings. The necessary details are provided and bridge is designed according to Indian standard code practices.

Alpesh Jain and Dr. J.N. Vyas (2016) modelled a bridge with four different material using ANSYS software and to perform a modal analysis of bridge problem. For all four materials eight node solid element is selected and meshing is done individually for each modal. The material property of each material is selected as per literature database in ANSYS software. The modal analysis in ANSYS is performed to obtain the natural frequency and mode shapes of bridge to avoid the resonance of the bridge.

Vipin A. Saluja and S. R. Satone (2016) performed seismic analysis of foot over bridge for different soil conditions are carried out. This paper highlights the effect of different soil conditions in different earthquake zones with Response Spectrum analysis using Staad-Pro.

Patel S G and Vesmawala G R (2015) measured dynamic response of the bridge structure. With this measured response modal parameters as well as system parameters can be obtained. These identified parameters can be used to monitor the performance of the bridge structures. Analytical models can also be used to validate using these parameters. In this paper, detailed review of the ambient vibration testing of bridge is given.

ThiriPhyoe and Kyaw Lin Htat (2014) presented vibration analysis of steel truss bridge under various moving loads by using STAAD. Pro software. The proposed bridge is warren truss, through type. The bridge length is 240ft. The considered loadings on bridge are dead loads, live loads, wind load, impact effect, seismic effect and temperature effect. For vehicle live load, two types of loading (train and truck loadings) are considered. Truck is HS25-44 truck of AASHTO Specification and train is Meter Gauge train of IRS Specification. For the bridge model, AASHTO (2010) loading combination is used. Design calculation of structural steel members are considered according to the design criteria of AISC-ASD Specifications. Deflection checking is carried out in order to ensure that the structure is safe under the various loads. In the vibration analysis, moving loads are considered as harmonic loading and then, vibration effect is analysed. Finally discussions and conclusions are made for this vibration analysis.

Kavita K. Ghogare (2014) described the stability analysis of industrial shed subjected to wind load. For present work the equivalent static analysis is carried out for single storey steel building with pitched roof in zone II. It is nothing but the industrial structure. The industrial structures shall be designed and constructed to resist the wind

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effects in accordance with the requirements and provisions of IS:875 (Part 3):1987. This standard describes the procedure for wind resistant of such structures .The stability analysis of single storey steel building with pitched roof is carried out using Software Computer Aided Design i.e., (STAAD PRO) .The main parameters consider in this paper to compare wind performance of buildings are bending moment ,shear force ,deflection and axial force. In this paper we only focus on industrial shed i.e., pitched roof truss.

VrushaliBahadure and R.V.R.K.Prasad (2013) compared between various configurations of industrial shed. There are various types of industrial sheds. But here we compare the various configurations of industrial sheds, such as hot rolled steel shed such as shed using Howe truss, A-type, portal truss etc. This paper will gives us the suitable configuration of industrial shed by making and comparing design and analysis of various configurations of industrial sheds. Design of industrial shed, by using STAAD-Pro 2007 which gives results very quickly and accurately. This paper work compares the design of various configuration of industrial shed and concluded that which is suitable & economical in all views. The comparison gives us suitable configuration which suitable strength point of view.

III. CONCLUSION

This paper reviewed the bridge vibration issues underlinedinnovation and research in the future. The future directionproposed by the current review of the study, based on thegap or shortfall in existing studies linked with bridgesconventional vibration test for detecting the effects ofvibration scouring the work on the bridge. In addition, aninvestigation into the effect of vibration promotesintegrated bridges also in the apparent since thebehaviour of the bridge is an integral a static and differentfrom the conventional part of the bridge. The effects ofdifferent types of sediment also are a possibility ofestablishing a new area of research to study the effect ofvibration on the bridge.

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