



SEISMIC ANALYSIS OF MULTISTOREY BUILDING BY CHECKING STABILITY INDICES OF FLOOR IN DIFFERENT ZONE OF INDIA

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ABSTRACT:-

Most truss bridges, both in India and overseas, have structural flaws or are no longer useful. There is a critical need to enhance the performance of these old bridges using an acceptable technique which should be inexpensive and with least interruption to the traffic. The purpose of the present analytical work is to know the effect of Pre-stressing on the member forces, deflections and overall weight of steel of a statically. In this essay, we review the literature on steel bridge and tunnel analyses.

Keywords: Bridges, Truss, Pre-stressing, Cable, Member forces, Deflections and SAP 2000.

INTRODUCTION:-

A bridge is a structure which is built over some physical obstacle such as a body of water, valley, or road and its purpose is to provide crossing over that obstacle. It is built to be strong enough to safely support its own weight as well as the weight of anything that should pass over it.

Steel Bridge Case Studies



A bridge is a building that enables the passage of vehicles and pedestrians over obstacles and bodies of water. There are numerous bridge designs that are suitable for various purposes. Depends on how the bridge behaves.

There are various types of bridge-

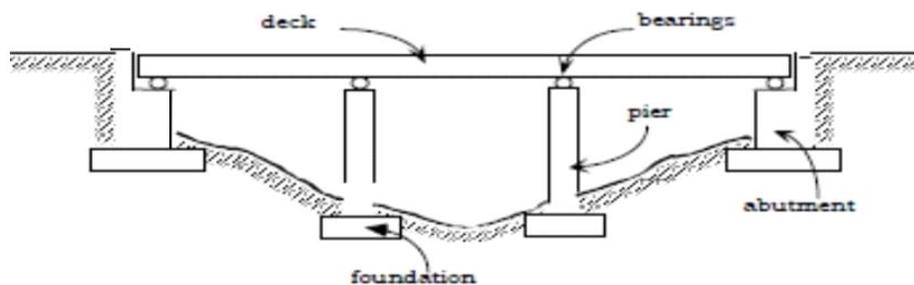
1. Timber bridge
2. Concrete bridge
3. Steel bridge
4. Composite bridge

Bridge includes essentially two elements the superstructure and the substructure. Although the foundation consists of the footer, stem, and cap, the superstructure contains a deck slab, an I girder, and shear connectors. In composite construction, two distinct materials are firmly linked together to form a single unit.

Components of Bridge

o Super-structure: Deck, Truss, Girders etc.

o Sub-structure: Piers/Abutments, Bearing and foundation.



Components of Bridge

HISTORY-

- History of bridges begins with a tree log accidentally fallen across water courses.
- Natural rock arches formed due to erosion beneath. (Arch Bridge).
- Climber suspended above a deep gorge.Hanging creepers from one tree (Banyan trees) to other , by tying a bunch of long creepers with the trees situated on either side of water course.

LITERATURE REVIEW:-

Mohamed Abdel-Basset Abdo (2010)

- In the research work, the effect of rectangular web holes on the behaviour of steel bridges with cross frames and bottom lateral bracings was parametrically studied. .
- The study examined steel bridge deflections, which are a key component of static response, and frequencies, which are a key component of dynamic response.
- According to the findings, the anchorage length should extend 15 cm beyond the opening's margins, with a ratio of each reinforcement area to flange area of 0.15 or 0.3 being preferred.

E. Tapia-Hernández et.al (2014)

- In these research paper presented seismic analysis of a 24 m (80 feet) simple span steel bridge capable of carrying two traffic lane.
- The bridge was designed through the free interactive design software developed by the Short Span Design Standards (SMDI), which adopts the current AASHTO LRFD Specifications (2010).
- Results recommend the development of a second research phase, which is the seismic analysis of a 40 meters (140 feet) simple span steel bridge, the maximum bridge span that can be designed with the eSpan140 tool. So, these results could confirm that the seismic demands do not have a significant influence on the design of short span steel bridges in Mexico.

Li Yuanming and Zhou Zhixiang et.al (2014)

- In these research paper investigated the seismic performance of a steel truss-concrete Combination continuous rigid frame bridge
- Design response spectrum and time-history method was used to calculate the bridge seismic performance.
- Results stated that natural frequency of the bridge was small, its period was long, and this kind of bridge was a new kind of earthquake resistant and energy- saving structure. Therefore, when mode superposition method is adopted to calculate the bridge dynamic response, multiple vibration modes should be considered simultaneously.

E Bhargavi and G.V. Rama Rama Rao et.al (2015)

- In these research paper aimed to present analytical work to understand the effect of Pre-stressing on the member forces, deflections and total weight of steel of a statically determinate three types of trusses such as Pratt type (Type A), Warren truss (Type B), Lattice Truss (Type C).
- The truss is pre- stressed with high tensile steel cable and the profile of the cable is straight.
- Results stated that there was a Member forces have been reduced significantly in the entire truss members and there is a reduction in deflection at the centre and material requirement after pre-stressing.

Ebrahim Amirhormozakia et.al (2015)

- In these research paper proposed an efficient and accurate simplified modelling approach for primarily horizontally curved steel girder bridges.
- The analysis time that is required for nonlinear response history analyses was reduced by 80%, making the modelling approach especially appropriate for studies that require substantial number of analyses such as fragility curve development.
- The proposed modelling approach was used to model the experimentally recorded response of a 2/5 scale model of a curved bridge which involved one of five highly nonlinear configurations.

Jayakrishnan. T J and Lekshmi Priya. R et.al (2017)

- In these research paper presented seismic behavior analysis of composite bridge without cross girders using ANSYS.
- The equivalent stresses formed in both the bridges are observed to be within the permissible limit.

Mohamed Ghannam et.al (2017)

- In these research paper presented the effect of post-tensioned cables in strengthening double-span steel trusses considering different truss's systems namely (Warren and N truss system).
- Comparisons between these techniques was made in order to determine the suitable post tensioning technique for each truss system. The analysis and results were obtained by using ANSYS program.
- Results concluded that post-tensioning was an effective method in strengthening different types of steel trusses.

Heena Dewangan and Kaushik Majumdar et.al (2018)

- The research paper presented the vibration analysis of steel truss bridges under moving loads by using STAAD Pro Software.
- Design calculations of structural steel members were considered according to the design criteria of AISC-ASD Specifications.
- Results stated that maximum deflection was observed in Pratt bridge whereas least in howe, which indicates that in terms of deflection how was more stable than pratt.

Mehmet F. Yilmaz and Barlas O. Caglayan et.al (2018)

- In these research paper presented a seismic assessment of multi-span steel railway bridges in the Turkish railway system.
- Truss piers elements were critical components in the bridge and strongly affected the system fragility curve. System fragility curve derived using Monte Carlo simulation was between upper and lower bound.

Mohd Waseem and Mohammad Saleem et.al (2019)

- Objective of the research paper to evaluate and examine multi-span seismic output with up to five spans of 100 meter long Girder Bridge frame designed and analyzed using CSiBridge v 21.1.0. Box Girder Bridge's seismic performance is very complex.
- The performance is based on the intensity of peak ground motion and ground motion acceleration.
- Results stated that the value of the acceleration, displacement, velocity, and base shear with respect to time in the x-direction is higher than the acceleration, displacement, velocity and base shear with respect to time in both directions, while the base moment with respect to time in the y-direction is higher than the remaining two directions.

Purevdorj Sosorburam and Eiki Yamaguchi et.al (2019)

- The research paper presented a study on the seismic behaviour of the truss bridge with BRD was conducted by changing the length, the cross-sectional area, the location and the inclination of BRD.
- The performance-based verification proves that the BRD is applicable for the existing truss bridge to sustain its resistance against large earthquakes.
- Results indicated that the axial compressive and tensile stresses of damaged members could be reduced by BRDs with different design parameters that are shown to be effective.

Daihai Chen et.al (2020)

- In the research paper, finite element analysis of a 122-meter concrete-filled steel tube arched chord truss bridge was performed using ANSYS to obtain the natural vibration characteristics of the bridge, both before and after reinforcement.
- The results show that the transverse stiffness of the bridge's main truss was relatively low.
- Thus the reinforcement measures significantly improved the vertical stiffness of the bridge.

Nitin Indlkar et.al (2022)

- In these research paper investigate the factors that causes the seismic forces in the system.
- It is applicable for seismic design of bridges with a design service life of 100 years, considering Design Basis Earthquake (DBE).
- Results stated that the maximum resultant force in zone III increased by 112% in Zone V and the maximum and minimum resultant moment in zone III was increased by 123.6% and 128.8% respectively in Zone V.

OBJECTIVE OF RESEARCH

- To determine the effect of vehicular loading over steel bridge connected with tunnel.
- To study utilization of analysis tool SAP2000 as per I.R.C. guidelines for bridge analysis.
- To determine the most suitable type of steel bridge in comparison with tunnel section.
- Analysis of a steel bridge considering lateral load using I.S. specified sections.

CONCLUSION

Here, authors looked at numerous bridges and analysis techniques for bridges while taking into account diverse vehicular loading conditions. The authors came to the additional conclusion that using an analysis tool is more exact and accurate than using standard techniques when constructing bridges.

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