iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** I **Month of publication:** January 2024

DOI: https://doi.org/10.22214/ijraset.2024.58157

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue I Jan 2024- Available at www.ijraset.com

A Review on Design and Analysis of Foot Over Bridge

Tanvi Dilip Dongare[1], Prof. Jaydeep Chougale[2], Dr. Ajay Radke[3]
P.G student [1], Professor [2], Head of Department [3] [Structural Engineering] Vidyavardhini's College of Engineering and Technology, Vasai, Maharashtra, India

Abstract: ***foot over, which is defined as the bridge that is constructed for pedestrian crossing purposes. The detail and preliminary survey were performed before any design began. The majority of mass movement analysis is performed for live load purposes. The load are considered for design is live load, dead load, wind load , seismic load for design. The design of the foot over bridge was done with mostly software from Staad Pro. The methodology accepted mostly for design is modeling, defining and assigning material and sectional properties, putting boundary conditions in place, applying loading, analysis and design, interpretation results, and conclusions. The conclusion that the Staad Pro software is mostly claimed to be easy to use and simpler than other. The wind load has a reduced effect on the bridge by giving a large opening. The cable material is mostly suitable for the foot-over bridge. A detailed analysis is required to know the exact live load calculation. The steel truss bridge is mostly used for foot-over bridges.***

Keywords: Design, Analysis, Foot-Over, Bridge, Software, Staad pro, Loads.

I. INTRODUCTION

The river, valley, or railway needs a bridge, whose function is the movement of any pedestrian or vehicle from one place to another. A bridge contains two types of bridges, which are foot-over bridges and vehicular bridges. The foot-over bridge is constructed to cross pedestrians, and the vehicular bridge is for vehicle reasons. The best example of a temporary foot-over bridge is the Ram-Setu Bridge [23]. The bridge consumes the superstructure and substructure [14]. The foot-over bridge is also called a pedestrian overpass bridge, and it is used for not only pedestrian purposes but also for crossing by bicycle or animal [22]. Sometimes called the Skywalk Bridge. There are four types of foot-over bridges available: clapper bridges, zigzag bridges, simple bridges, and simple suspension bridges, and according to material, timber, concrete, and steel bridges [5]. Sometimes it is necessary to cross the road above it in order to avoid disturbing traffic. There are other reasons, too, like safety [4]. The steel bridge is mostly used for foot-over bridges due to its suitable material. Before any design of bridge, it needs a survey for the mass movement from one place to another for the live load idea.[7].

Foot-over bridges (FOBs) are vital infrastructural elements designed to ensure pedestrian safety and facilitate smooth movement across busy roads or intersections. Typically constructed at strategic locations such as near railway stations, bus stops, or areas with high foot traffic, FOBs serve as elevated walkways, allowing people to traverse safely above vehicular traffic. Engineers and architects assess factors like foot traffic volume, surrounding area, and structural feasibility before designing FOBs. Typically constructed with steel, concrete, or a combination of both, FOBs come in various designs and sizes.

This review paper mentions dealing with the design and analysis of a foot-over bridge by using software. This paper helps to gain knowledge about the material used in Bridge, how to get the live load, which loads are mostly considered, which software is used, and their procedure.

II. METHODOLOGY

1) Defining Scope and Objectives: Choose which particular areas of analysis and design to concentrate on.
2) Search Strategy Development: Determine pertinent search strings, keywords, and databases.
3) Literature Search: Use specific databases and keywords to perform thorough searches.
4) Screening and Selection: Examine and choose articles that are pertinent to the subject of the study.
5) Data Extraction: Take important details (e.g., methods, findings) out of chosen publications.
6) Critical Assessment: Consider the reliability and caliber of the chosen literature.
7) Synthesis and Analysis: Arrange and evaluate the data that was taken from the chosen publications.
8) Report Writing: Provide an overview of the results, note any gaps or trends, and draw conclusions.

9) Citation and Referencing: Make sure the reviewed material is properly referenced and cited.

III. LITERATURE REVIEW'S

Limje Mayur et al. [2019], The author performed bridge design for pedestrian reasons by using steel trusses. In this bridge design, the authors studied the mass movement of the bridge and how many people can cross that location to get knowledge of the live load. This bridge is located near the station in Surat. The top elevation of the bridge looks like a C shape. The bridge is designed for dead load and live load only, considering a value of 5 KN per square meter for live load. The Staad Pro software is used for analysis purposes. The steel design uses IS 800-2007. The load passes from the deck slab to the steel truss, then from the column to the footing. The author concluded that all checks are safe during design and by using software. [4]

Aishwarya Kulkarni et al. [2016], This analysis is only based on the material used for the design of the bridge, especially the foot-over bridge. The paper mentions different types of materials used in design. The steel, timber, concrete, and cables mentioned are used mostly in bridge design. The design software used for Staad Pro and by using this software analysis for material suitability. The analysis was also performed with the finite element method. The author concluded that cable material is a better and more suitable material for a bridge than other materials. [5]

Rahul Kapse et al. [2023], This paper mentions the design of a foot-over bridge using Staad Pro software. The design is performed with the use of an analysis of accidental loads as well as the intensity of traffic influenced during the working of the bridge. The methods they follow are: prepare the model, select the loading and material, investigate the model, interpret the result for a 3-D model, check for dynamic conditions and requirements of ISO, and determine the life span of the design. [6]

Akhilesh Kumar Maurya [2015], This paper is related to the foot-over bridge. The analysis of pedestrians passing over the bridge. The authors deal with how many people and what age of people are crossing the bridge at what speed, and they also study what gender is mostly crossing the bridge with and without luggage. This study is only for the live load perspective. To know mass flow with time, their speed, and density during the crossing. The author calculated the kurtosis, skewness, t-stat, and R*2 values with the help of graph plotting, and the graph is plotted for the relation between flow, speed, and density. The observation is that younger and older pedestrians move more quickly and more slowly, respectively, than the average older pedestrians, who walk 9% slower than the average walking speed, whereas younger pedestrians walk 1% faster, and middle-aged pedestrians travel at a speed that is virtually similar to the normal walking speed. On FOB, females walk 12% more slowly than guys do. [7]

Umesh Rajeshirke [2013], This paper mentions the design of the present bridge, which is situated in Navi Mumbai, Kharghar. IIT Bombay did the survey for the design. The design of a bridge is based on Its life span, safety, and economy. The life span of the bridge is designed for 20 years. The various cases for load are considered to be two-span loaded, one-span loaded, and half-span loaded. The design of the bridge for dynamic conditions, dead load, and live load. The bridge is designed using seismic conditions, and they studied the behavior of the bridge against seismic The conclusion is that these bridges have the purpose of transiting pedestrians, and their design has 1.02% of a peak acceleration considered for the dynamic resistance. [15]

Mallikarjun I Pattanshetti et al. [2022], This paper is mentioned for the design of a foot-over bridge with the help of Staad-Pro software for dynamic conditions.

They specially considered the live load, dead load, wind load, and seismic load. The design methodologies accepted are a preliminary survey and a detailed survey, a review paper study, setting the objectives, scopes, and needs for research purposes, Defined the properties in software, ensuring the material and section properties, analysis and design, result interpretation, and conclusions.

The author concluded that the opening is a must in design for the relief of wind loads. (16)

Dr. Vinayak Vaidya [2023], This paper is regarding the design of a bridge for pedestrian purposes using Staad Pro. The bridge is located in an urban area. The dead load and live load are only used for design. The design methodology accepted by the author is a survey for design, selecting the geometry for the bridge, a ready model, applying loading and its combinations, analysis, and design. They concluded that this design fits urban locations, and all checks are okay. [19]

Rajesh [2017], This paper mentions the design of a bridge for pedestrian purposes by using Staad Pro software. The span of the bridge is 28 meters.

The design methodology accepted is that of collecting data, studying literature, surveying, choosing a location for the bridge type, modeling, applying loads, analyzing, and designing. The load shifted from the truss to the gangway, from the column to the footing. The outcome demonstrates that every member—aside from Gangway—is cast by the ISA section and the ISMB section for Gangway. They came to the conclusion that the design is secure and all checks are okay.

[20

IV. CONCLUSIONS

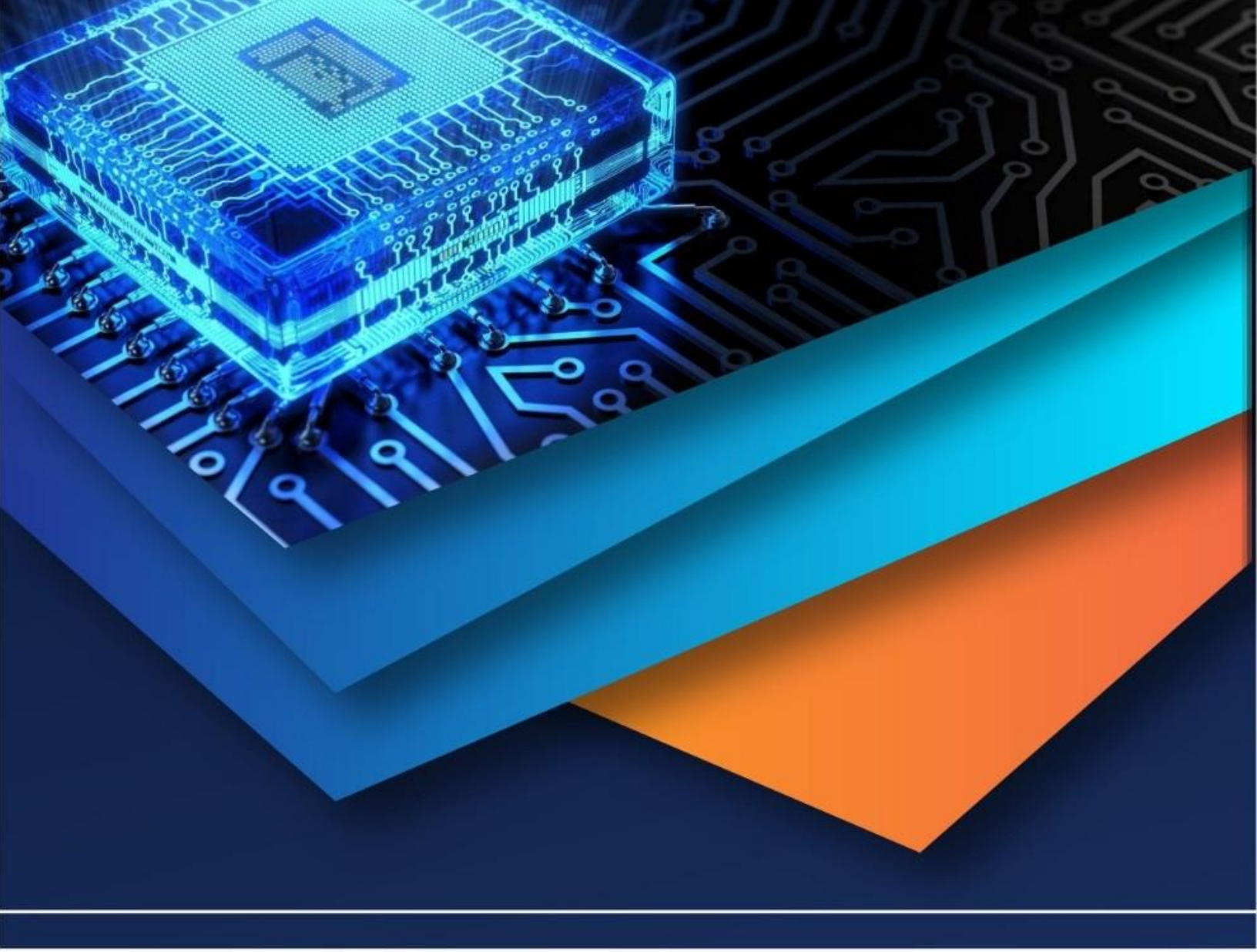
This study mentions the design and analysis of foot-over bridges, how to calculate the live load by analysis of mass movement, which materials are available for design, and their suitability. This review paper has scopes where the design and analysis of bridges are done by using the software, which is Staad Pro, materials study for bridges, and how to calculate the live load.

This is the following assumption made by going through literature reviews:

1) The Staad Pro software is mostly claimed to be easy to use and simpler than others.
2) The wind load has a reduced effect on the bridge by giving it a large opening.
3) The cable material is mostly suitable for the foot-over bridge.
4) A detailed analysis is required to know the exact live load calculation.
5) The steel truss bridge is mostly used for foot-over bridges.

REFRENCES

[1] Augustinj, Asst. Prof. Alfrite, (2021). ‘’Review for Comparative Analysis of R.C.C T-beam Bridge Girder”. International Journal of advances in Engineering and Management, Vol. 3, Issue 8.
[2] Harsh Singh, Himanshu Yadav, (2020). ‘’Design of composite girder deck type bridge”. International Journal of Creative Thoughts, Vol. 8, Issue 6.
[3] Ravikant, Jagdish Chand, (2019). “Design and Analysis of Bridge Girders Using Different Codes”. International journal of Engineering Research and Technology, Vol8, Issue 7.
[4] Limje Mayur, Solanki Dharmendra, Patel Darshan, Patel Neel, Patel Hiren, Dixit, (2019). “Appraisal and Design of Foot Over Bridge”. International Research Journal of Engineering and Technology, Vol. 6, Issue 4.
[5] Aishwarya Kulkarni, Priyanka Kumbhar, Pooja Mandge, (2016). “Material For Foot Over Bridge”. International Research Journal of Engineering and Technology, Vol. 3, Issue 4.
[6] Rahul Kapse, Dr. R.A.Dubal, Prof. B.V.Mahajan, (2023). “Review on Design and Analysis of Foot Over Bridge Using Plated Fabricated Steel Member”. International Journal for Research in Applied Science and Engineering Technology, Vol, 11, Issue 2.
[7] Akhilesh Kumar Maurya, (2015). “Study of Pedestrian Movements Over Foot Over Bridge”. The International Daily Journal.
[8] Ahmad M. Itani, Michel Bruneau, Lyle Carden and Ian G. Buckle, (2004). “Seismic Behavior of Steel Girder Bridge Superstructure”. Journal of Bridge Engineering, Vol. 9, No.3.
[9] Endah Wahyuni, Heri Istiono, Data Iranata and Indra Komara, (2016). “Non- Linear Analysis of Failure Mechanism of Steel Truss Bridge”. ARPN Journal of Engineering and Applied Science, Vol. 11, No.24.
[10] Rui Juan Jiang, Francis Tat Kwong Au and Yu Feng Xiao, (2014), “Prestressed Concrete Girder Bridges with Corrugated Steel Web”. Journal of Structural Engineering @ ASCE, Vol. 141, Issue 2.
[11] Erin Santini Bell, Paul J. Lefebvre, (2013). “Objective Load Rating of Steel-Girder Bridge Using Structural Modelling and Health Monitoring”. Journal of Structural Engineering@ ASCE, Vol. 139, No.10.
[12] Alessio Pipinato, (2018). “Extending the Lifetime of Steel Truss Bridges by Cost- Efficient Strengthening Interventions”. Structure and Infrastructure Engineering, Vol. 14, Issue 12.
[13] Madhuri Yadav, Kaushik Majumdar, (2018). “Behavior Analysis of Stayed Bridge with Different Cable Arrangement Using Staad pro”. International Journal of Engineering Science and Research Technology.
[14] V. Swathy Padmaja, T. Ramya, K. Gayathri, P.Lakshmi Devi, (2019). “Analysis and Design of Flyover by using Staad pro”. International Research Journal of Engineering and Technology, Vol. 6, Issue 6.
[15] Umesh Rajeshirke, (2013). “Design and Construction of Pedestrian Bridge at Kharghar, Navi Mumbai. 36th IASBE Symposium, Kolkata.
[16] Mallikarjun I Pattanshetti, Deepak Patil, (2022). “Dynamic Analysis of Pedestrian Steel Bridge”. International Research Journal of Modernization in Engineering Technology and science.
[17] G. Venkata Siva Reddy, P. Chandan Kumar, (2014). “Response of Box Girder Bridge Span”. International Journal of Bridge Engineering.
[18] B. Vaignan, Dr.B.S.R Prasad, (2014). “Analysis of Voided deck slab and Cellular Deck Slab Using Midas Civil”. International Journal of Engineering Research and Technology, Vol. 3, Issue 9.
[19] Dr. Vinayak Vaidya, (2023). “Analysis and Design of Foot Over Bridge”. International Journal for Research in Applied science and Engineering Technology, Vol.11, Issue.4.
[20] S. Rajesh, (Aug 2017). “Design of a Steel Foot Over Bridge in a Railway Station”. International Journal of Civil Engineering and Technology, Vol.8, Issue.8.
[21] Vikas, Bhupinder Singh, (July 2017). “Effect of Variation in Geometrical Parameters on the Roof Trusses”. International Journal on Recent and Innovation Trends in Computing and Communication, Vol.5, Issue.7.
[22] Manjusha Nathe, Dr. Sachin Mulay, (2021). “Comparative Study of Cold Formed Steel Foot Over Bridge Under Different Configuration”. International Research Journal of Engineering and Technology, Vol.8, Issue 8.
[23] Salunke Rohit Ram, Dr. B.H. Shinde, (2020). “Mountain Foot Bridge: Temporary Bridge Designed and Analyzed by Software STAAD Pro”. International Journal for Research in Applied Science and Engineering Technology.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY