# A REVIEW STUDY OF PEDESTRIAN BRIDGE TRUSS STRUCTURE FOR LOW TRAFFIC VOLUME

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**Abstract:** The main aim of this work is to inform structural engineers of potential distortions associated with the lifetime of the steel and composite bridge when subject to the dynamics of the vehicle. This paper allows efforts to review specific literature for the analysis of h bridge structure. The basic focus is put upon the optimization of cross sections, material properties and weight to reduce the deformation of the structural component. The research focused on the study of the complex or simpler truss bridge system, which is used most frequently for steel pathways and footpath crossings.
**Keywords:** Bridge structure, Steel truss, design of bridge, types of bridge truss.

## I. Introduction

Bridges are the structures that enable contact over a distance and provide a way across these gaps for road and train traffic. Bridges are graded according to various criteria. Any of the major classifications are based on: the used materials, composition of the major load carrying components, the configuration of the principal loading components, the location of the track, type of interconnections, the level of the road and railway road crossings and the nature of the links, the level of road and rail crossings and the nature of the bridge movement. The present analytical research is restricted to bridges of steel bows, particularly the bowl segment. Truss systems consist of members linked with a rigid steel frame. For a wide variety of areas including the footbridge, track roads and other transportation bridges, this specific application is suitable. The individual components of a bridge are the carriage components of the frame, which are organized three-fold, resulting in stress or strain of the loads. Bridge today is used in many ways because it is easy to install and economically effective.

## II. Steel Truss

Steel is commonly used worldwide to build bridges of different sizes. The material offers reliable, sustainable solutions and is flexible and durable. The economic choice of a variety of bridges has long been understood by steel. It dominates the long-distance bridge markets, rail bridges, footbridges and intermediate road bridges. The preference for shorter road structures is now also growing. Business benefits from the advantages of bridge approaches in several respects. Steel bridges are characteristic of good architecture, they are easy to build and have stimulated the regeneration of many old industrial areas, dock and canal side areas.
In response to dynamic loads, connected elements can be stressed from strain, compression or often both (typically straight) [4]. Such trusses may be made of wood, steel or composite. Steel trusses for bridge construction are taken into account in this study. The strength, ductility and resilience of steel are greater than many other construction materials, for example concrete or wood. In order to avoid rusting [10], however, steel must be coated.

The truss members may be configured almost unlimitedly, but one of the common forms listed below is the vast majority of trusses found in a bridge. The trusses Baily, Warren truss, Warrene truss with verticals, Warren truss with subdivided truss, Pratt truss, Pratt truss (Baltimore), K truss, and Howe truss are all these specific styles of trusts. Figure 1 demonstrates the integral parts of a steel truss bridge.1.

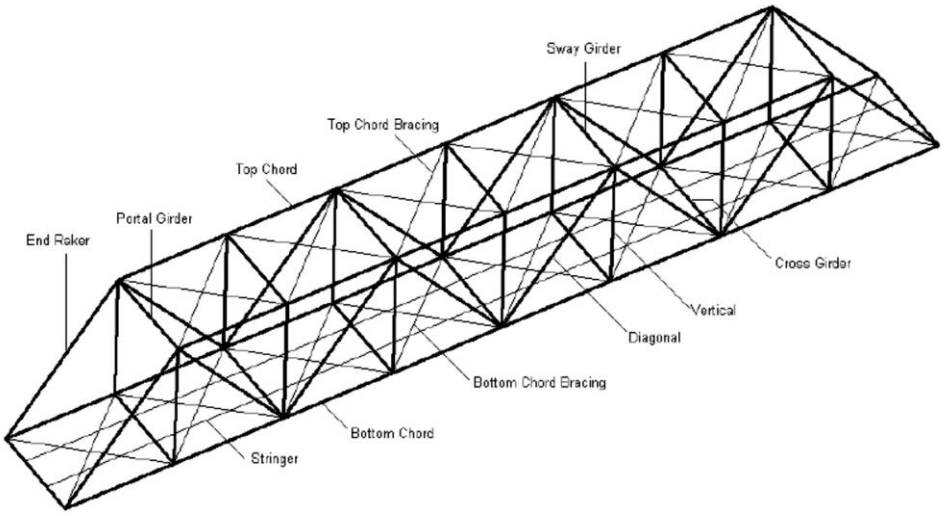


**Figure 1:** Skeleton of a typical steel truss bridge

## III. Members of steel truss

The members usually include a number of triangles forming the structural structure. They work together. The chords are the top and bottom sections that act like a girder's flanges. Within a platform girder, diagonals and verticals function similarly to the Internet. Diagonals provide the shear ability required in general. Vertical shears are supplied with additional panel points, from which trusts can be fitted with deck and vehicle. Vertical tension hangers and compression are generally known as.

Steel is commonly used in the construction of bridges of different sizes around the world. The material is versatile and efficient, offering green and sustainable responses. The financial choice of Steel for a number of bridges has long been established. The bridge system, railway links, footbridges and medium-range dual carriageways dominates the market. It dominates the markets. The selection of dual carriage systems for shorter durations is now increasingly accurate. In many ways, society gets answers to the gains made by the metal bridge.

## IV. Design

The function of the structural truss makes it possible to analyze the structure using such hypotheses and to apply Newton's movement laws according to the physical industry known as Statics. For research purposes, pin joints are believed to follow the straight components. This theory suggests that truss members (chords, verticals and diagonals) operate only at stress or compression. A more complex analysis is required where rigid joints impose considerable bending loads on components [3].

As the strengths of each of the two main girders is mostly flat, a bowl is typically built on a double plane frame. If the out - of-forces are large, the structure must be modelled as a 3-dimensional space. The study of bands also assumes that loads are only applied on joints and not on mid-. Compared to acceptable loads, the weight of the members is always low and therefore often omitted. Half the weight can be added to each Member's two end joints where appropriate. The moments experienced by the joints are meaningless and can be viewed as either "hanging" or "pin-joints" given the members are long and slender. Each component of the truss is then strictly compressed or in a simple stress-shear, bending moment, etc. are practically zero. This simplifies the study of trusses. It also enhances bowel movements physically more than other material arrangements–as virtually every material has a much bigger load than shear, twisting, twist and other forces.

## V. Types of truss bridge

Sometimes, the authentic designer has called a certain design attribute. Some of the most common truss patterns in truss bridges are: Howe truss, Pratt truss, Warren truss, Quadrangular warren truss, Baltimore truss, camelback truss and k truss. The three major names are the Warren, Howe and Pratt truss, which are prominent on each panel by the route of diagonal men [4].

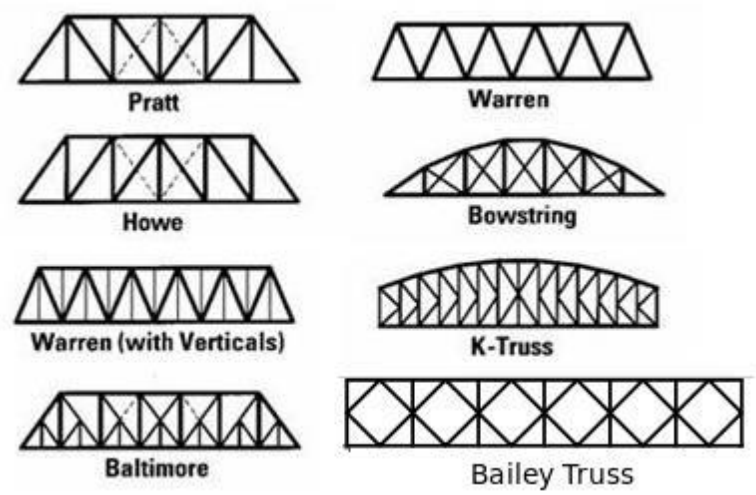


**Figure 2:** Types of truss configuration

## VI. Literature Study

This bridge is known as the truss bridge, which is the load bearing that typically forms a triangular shape. Compression, stress, or each time, in response to dynamic loads, will puzzle the related factors. One of the oldest kinds of modern bridge is steel bridge. The key types of steel bridges illustrated in this text are of simple nature that engineers of the 19th and 20th centuries can easily analyze. You can build a steel bridge by successfully using resources.

**K. Senthil et. al. (2017)** The use of Abaqus / Explicit finite detail implementation is structured by 3d numerical examinations finished on railway bridges. Inside the current research, the period of bridge 30 m and single truck will be regarded. The constitutive and fracture behavior of drugs had been expected using the JC variant to be used in ABAQUS. Within the look at, the material parameters of JC template had to be had for the bridge participants. Bridge answers were anticipated in the light of stress and von-misses. The investigations done by using considering the bridge towards elegance AA loading. The impact of intensity of primary girder turned into studied by using varying the intensity as 1600, 1400, 1200 and a thousand mm. The responses of bridges become studied through dividing the span of the bridges into two considering as strengthening measure. In addition to that the reaction of bridges become studied by using doing away with cross girders inside the center of the bridges thinking about as the contributors are damaged due to corrosion or member failure circumstance.

**Darius Bačinskasa et. al. (2017)** Experimental investigation of structural behavior of glass fiber strengthened polymer (GFRP) area truss bridge version subjected to static loading is mentioned on this take a look at. Bridge prototype become assembled the use of GFRP profiles produced with the aid of fiber line Composites Ltd, metallic bolts and GFRP brackets. In order to load the shape, wooden bridge deck turned into mounted. Total load of 13.3 KN was implemented in 4 ranges while measuring the bridge node displacement. Flexural behavior of the truss shape changed into monitored at every loading stage. Comparative analysis has proven right agreement between experimental and numerical outcomes. The acquired consequences display that designed and tested bridge model has a sufficient reserve of structural stiffness. Performed research well-known shows that GFRP profiles are suitable for real pedestrian bridge superstructures.

**Z. Zheng et. al. (2017)** they studied analyzed the possibility of structural progressive collapse. Results for the load cases from below indicate that it will be more destructive if impact load is arranged on 3rd side pillar and progressive collapse will occur if pillar fails after crashed. In this study, the finite element truss model with six trusses was established with ANSYS/LS-DYNA dynamic analysis software. It simulated the situations that structures were crashed by heavy truck. Through changing variables, such as the crash positions, the impact load intensity and structural height-span ratio, this study concluded their effects to the stress and strain in truss structure. Besides, considering the component failure, this paper analyzed the possibility of structural progressive collapse.

**Emdadul Hoque et. al. (2017)** studied harmonic response of the model of a simply supported steel truss bridge as a mechanical structure. The geometric modeling and the simulations were done by using ANSYS Workbench 15.0. The natural frequencies were determined by means of modal analysis for the first fifteen modes whereas the harmonic response was observed by subjecting the bridge to an excitation sinusoidal force of 100N distributed over the deck of the bridge with an analysis range of 0-1000Hz. The bridge-load interactions are graphically and analytically portrayed in terms of total deformations and equivalent stresses with respect to the variation of frequencies. All these analytical and graphical results reflect the possibilities of multiple degrees of vibrations and provide a comprehensive geometric optimization to prevent potential resonance to the model of the steel truss bridge which would lead to a practical implementation of such a steel truss bridge.

**Huili Wang et. al. (2017)** The fatigue efficiency is measured based on multi-scale FEM in the steel truss integral joint. For experimental results, numerical findings are checked. A crossing of a suspension bridge as its context is used to evaluate the fatigue efficiency of the steel belt integrated joint. For the beam and three-dimensional components, the link components are used. The relation aspect has two joints, one having six degrees of freedom, three freedom degrees of translation and three freedom rotation, all freedom degrees being combined. The multi-scale FEM and the experimentally one result in very similar tests. In order to make the multi-scale FEM simpler, the key testing component can be accurately measured and a fatigue life forecast can be ensured. It is a very effective and workable process. The multi-scale FEM provides a new and effective method of structural analysis fatigue efficiency.

**Jayakrishnan. T J et. al. (2017)** The seismic portion bridge analysis of cross-girders using ANSYS has been investigated. In the field of aerospace, civil infrastructures and building, composite structure provides many useful applications. Composite bridge seismic behavior is studied by spectrum response system. The structure's response depends on the geometry, material, setup, selected response spectrum and device construction information. In this study, finite element tool ANSYS Workbench is used for the study of seismic behavior of composite bridge.

**Mohamed Ghannam et. al. (2017)** studied the effect of post tensioned cables in strengthening double span steel trusses. Different truss's systems (Warren and N truss system) are included in this study. Different techniques using post tensioned cables are used in strengthening different truss's systems. The main difference between these techniques is the profile and the locations of the post tensioned cables. Comparisons between these techniques are made in order to determine the suitable post tensioning technique for each truss system. The analysis and results are obtained by using ANSYS program.

**NajlaYas V et. al. (2017)** Analysis of Box Girder using ANSYS software is done. Box girder bridges are commonly used for highway flyovers and for modern elevated structures of light rail transport. Although normally the box girder bridge is a form of Beam Bridge, box girders may also be used on cable-stayed bridges and other forms. In this study analysis of different shapes of box girder is done A section of box girder is selected with a certain mass. Box girders of different cross sections such as Rectangle, Square, Trapezoidal and curved are modelled. Mass of all sections is kept constant so that it becomes comparable with each other. Analysis of these sections is done in ANSYS Software for results such as Moment, Stress, Deformation, Frequency and Time period. The results are compared to find a better sectional shape.

**Alpesh Jain et. al. (2016)** studied a bridge structure with four different material using ANSYS software and to perform a modal evaluation of bridge hassle. For all four substances 8 node solid elements is selected and meshing is done for every modal. The material belongings of each material are chosen as in step with literature database in ANSYS software program. The modal evaluation in ANSYS is accomplished to achieve the natural frequency and mode shapes of bridge to keep away from the resonance of the bridge. It is concluded that that the bridge isn't to be utilized at received frequencies which might be same to natural frequency at applied hundreds. If it is used at natural frequencies, resonances will occur and bridge may harm or fail. The future scope consists of temporary evaluation and harmonic analysis of bridge, additionally the deflection of the bridge with time may be obtained with FEA software approach.

**Alika Koshi et. Al. (2016)** studied approximately comparison of through arch bridge at various arch positions. An arch is a pure compression form. It can span a massive area by way of resolving forces into compressive stresses and, in turn casting off tensile stresses. This is on occasion known as arch motion. As the forces inside the arch are carried to the floor, the arch will push outward at the bottom, known as thrust. Arch peak has a wonderful significance inside the carried forces and stresses. This study explains the behavioral components of thru arch bridge with special arch positions and to evaluate them with the actual structure by way of the usage of three-D bridge model in Finite Element Analysis software program – ANSYS.

**Jianing Hao et. al. (2015)** they studied Natural vibration analysis of long span suspension bridges. The basic frequency of the suspension bridge is calculated by the specification formula, and the results compared with the finite element results, it shows that the calculation results are very close. The error is within 5%, and the specification calculation formula can reflect the dynamic characteristics of the structure more accurately, and it can be used to calculate the fundamental frequency of the suspension bridge at the beginning of the design. In the design of the final stage, the frequency and vibration type can be calculated by the numerical analysis of the suspension bridge, for the further analysis and the analysis of the flutter analysis.

**Yongjian Liu et. al. (2015)** A novel tubular composite bridge of concrete slab and rectangular concrete chords has been identified. The doubling composite bowl bridge was a relatively acceptable solution in a negative time area with a concrete plate plus a truss system and joints strengthened by the concrete and PerfobondLeiste rib. An erection method and a full structural bridge review were then implemented. In order to analyze the impact of PBR, typical joints were selected in the pilot Bridge. The effect of PBR on filled concrete tubular joints was researched. It was developed. Comparison reveals that PBR tubular concrete-joints have much higher limiting potential than PBR-joints.

**J. Eckermann et. al. (2014)** The reliability effect of various Hybrid Electric Vehicle (HEV / EV) half-bridge module configurations was investigated. Throughout the study, two separate simplified half-bridge modules performed computer simulations. In this case, the plastic strain in a solder under heat-shake loading was determined by means of the viscoelastic Anand model. The work was extended by choosing the different soldering materials, which were prepared under thermal shock and electricity cycles. The content data for the Ansys is selected and applied in this sense from SAC 105, SAC205, SAC305,

SAC405 and Sn36Pb2Ag. 2D models replaced 3D models to reduce computing time. In order to demonstrate any adverse effects impacting the joint compatibility, metallurgical analysis was carried out.

**Rahul et. al .(2014)** This research has made efforts to design this footbridge and optimize it. The basic focus is put upon the optimization of cross sections, material properties and weight to reduce the deformation of the structural component. The structural part is a rectangular panel 1.5 meter long, 0.5 meter wide and 3 meter thick, which is connected to, and in-between, the framework of the prismic beams. SolidWorks created a three-dimensional model. In ANSYS 11.0, six separate cross sections of the beam with three different materials (Alu, Structural and Titanium alloy) with identical loading and supporting conditions were investigated (circular, rectangular and square with hollow and solid parts). The findings were compared after examination of various cross sections and various materials.

**Wan Yi-pin et. al. (2014)** by using ANSYS software under the working condition of the most unfavorable load small railway steel Bridges the strength of the initial model is used for calculation, by calculating the initial model satisfies the requirement of strength and stiffness; Second, the initial model for the optimization design, and select reasonable according to the results of the optimization design theory of I-steel to replace all beams in the initial model; In the final analysis to calculate the optimization model of strength, stiffness and weight of steel, the optimization model in meet the design requirements at the same time than the initial model saves 23.98% of the conclusion of h-beam steel.

## VII. Conclusion

From this study we can conclude that truss study is very insightful. The study looked at evaluating and constructing stainless steel bridges with local steel profiles. The study has shown that the construction of the steel bridge with local steel profiles is an option worth considering based on research and the design done so far. Although the cost of local production is comparable to importing, it is still a good choice as it helps to develop the ability of local design, manufacturing and construction firms, it creates jobs for many and saves money. Such local built steel bridges can be used as temporary bridges for several short-temporary bridges in road construction projects. Besides being suitable in the inappropriate places, these built steel bridges often require very little time to construct.

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