

A Review on Pre-Stressed Bridge under Vehicular Loading using SAP2000 Software

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Abstract: Bridge is a structure that gives area over obstructions due to rivers, valleys, and long routes for shortening the travel or at intersections of multiple lanes for proper flow of traffic. Prestensioning bridge is a concept to enhance the stability, stiffness and capability of bridge to bear vehicular loading by providing tension to the rebars using jacketing technique. In this paper we are providing literature review, Literature journals, books and internet contents related to prestressing techniques in bridge structure to justify future aspects and formulation of future aspects. In this paper, the main focus is to carry out extensive literature survey and to determine the scope of work regarding lateral load resisting members analysis and design. From the literature it is clear that pretensioning members is the most effective lateral load resisting system which helps the building to sustain even under seismic loads.

Keywords: Pretensioning members, lateral force, seismic analysis, Sap2000, bridge, hydraulic calculation, IRC, vehicles.

1. Introduction

A Prestressed Girder bridge is a bridge that utilize braces as the methods for supporting the deck. A bridge comprises of three sections: The Foundation of projections and wharfs and Substructure of projection and dock and The Superstructure (brace, bracket, or curve) and deck. A Girder bridge is likely the most usually fabricated and used bridge on the planet. Its fundamental plan, in the most improved frame, can be contrasted with a log extending from one side to alternate over a stream or river. Prestressed Concrete is fundamentally concrete in which interior worry of reasonable extent and dispersion are presented pressure coming about because of outer load are concentrated to wanted degree. To provide a detailed review of the literature related to Bridge analysis in its entirety would be difficult to address here, although there has been a lot of work modeled on bridges and culverts - none provide in depth understanding of the prestressed Reinforced Concrete bridges contributions related to Indian Roads Congress loading and hydraulic calculation is seen in past efforts most closely related to the needs of the present work. A brief review on finite element analysis, comparison of different bridges and code provision of previous studies is presented here. This literature review focuses on Analysis method, bridges and tools for analysis and some code provisions will be addressed by area.

2. Literature review

Nurafiqah and Ahmad (2002) Clarified that continuous prestressed bridge are consistently analyzed and organized using the last after effect of advancement without considering their improvement stages. This examination explores the technique and structure of predictable prestressed strong bridge which relies on improvement arranges adjacent. In this examination, the improvement gathering is first considered and grasped. A couple of examination of loadings followed up on boundless bridge is guided using Staad-Pro programming to choose the preview of the bridge at various advancement course of action. By then, the minutes got from the Staad Pro is used to design the connection profile, prestress power and number of tendons of the relentless bridge. The turning minute motivating force due to selfweight got from the important advancement stages are higher than last improvement sorts out as such it is used to design the prestress power and number of tendons required by the reliable bridge on the period of trade. Examination of advancement course of action is crucial in the midst of the organizing system as the advantage of curving moment on the primary improvement stages are progressively essential diverged from the last improvement stages.

Essam A. Mostafa (2003) The creator has presented the idea of utilizing Reference Bridges and Reference Culverts and introduced the dimensionless relationship in the middle of both the structures and determined the point. Non-dimensional relationship, condition to assess the bridge cost proportion " $Costr_b = 1.0 [Wr_b]0.4725 [Sr_b]0.35457 [Hr_b] 1.79314$ " "another non-dimensional relationship connected to appraise the duct cost proportion " $Costr_c = 0.99 [Wr_c]0.20138 [Hr_c]0.2893 [Ir_c]0.1802 [hr_c]0.256$ ". The condition created by the creator was connected to evaluate "bridge to course cost proportion" giving the analytics as though the esteem states short of what one, bridge costing became less expensive while if the proportion was more noteworthy than one duct which was less expensive.

J.M. Duncan (2005) Considered Corrugated metal box courses give a large number of cross –dimensional domains to water transport where vertical elbowroom is compelled. Since they have practically levelled the crowns and extensive widths differentiated their statures, they continue extraordinarily as opposed to standard metal courses, and various procedures are

required for their diagram. The arrangement framework presented reliability upon field understanding, limited component examinations, and instrumented stack tests on box courses.

Kolemanet. al. (2006) Considered Reinforced strong box course contains best segment, base lump and two vertical side dividers covered positively which includes a close rectangular or square single cell. Various telephone reinforced box ducts are faultless structure, if the discharge in a drain crossing the road is more and if it further reaches the limit of the soil is low, the single box course winds up in light of the higher thickness of the segment and dividers. In such cases, more than one box can be produced alongside one another decidedly. In standard procedure thickness of box course is acknowledged and later on check for thickness is taken. In any case, this may prompt uneconomical arrangement therefore an undertaking is made to evaluate perfect thicknesses for the right framework. In the present work 12 m channel length is considered for examination with 2m to 6m stature assortment which is again divided into single cell, twofold cell and triple cell. IRC class AA pursued live load is considered. The examination is done by using robust organized strategy and a PC program in C vernacular which is delivered for the cost appraisal. The rate decline in expense of single cell, twofold cell and triple cell in perspective of perfect thicknesses are presented. The perfect thicknesses showed here are used to achieve the proficient diagram of box duct. In perspective of these perfect thicknesses perfect expense per meter width of single cell, twofold cell and triple cell is evaluated. The examination reveals that the expense of box duct reduces if the perfect thicknesses which are shown in this examination are considered.

Sinha et al (2009) According to the author bridges are required to be given under earth dike for intersection of water course like streams, Nallas over the bank, as street dike cannot be permitted to discourage the common duct. The ducts are additionally required to adjust the flood water on the two sides of earth dike to lessen flood level on one side of street in this way diminishing the water head therefore decreasing the flood hazard. Courses can be of various shapes, for example, curve, chunk and box. These can be built with various material, for example, workmanship (block, stone and so forth) or strengthened bond concrete. Since duct go through the earthen dike, these are exposed to same traffic stacks as the street conveys and thus, required to be intended for such loads. The size, upset dimension, design and so on of the duct are chosen by water driven contemplations and site conditions. The pad relies upon street profile at the duct area. The extent of this Paper has been additionally confined to the basic plan of box. The auxiliary plan includes a lot of load cases (box vacant, full, sur-charge loads and so forth) and components like live load, viable width, braking power, dispersal of load through fill, affect factor, co-effective of earth weight and so on. The auxiliary components are required to be intended to withstand most extreme bowing minute and shear constrain. Pengzhenet.

al. (2012) Outlined the basic conduct of T-outline bridges which is especially muddled and it is troublesome utilizing a general scientific strategy to specifically secure the inward powers in the structure. They exhibited a spatial grillage demonstrate for investigation of such bridges. The proposed model is approved by correlation with results acquired from field testing. It is demonstrated that examination of T-outline bridges might be advantageously performed utilizing the spatial grillage display.

Phaniet. al. (2016) Considered that Bridge development today has accomplished an overall dimension of significance. Bridges are the key components in any street system and utilization of prestress brace type bridges is very common within the building club as a result of its better security, workableness, economy, stylish appearance and auxiliary proficiency. In this proposal investigation and plan of prestressed solid bridges (Deck Slab, T-Girder and Box Girder) are completed utilizing IRC:112-2011. They brought together solid code (IRC:112) distributed by the Indian Road Congress in November 2011 consolidating the code for strengthened cement and prestressed solid structures speaks to another age code, which is fundamentally extraordinary when contrasted with past codes (for example IRC:21 for RCC structures and IRC:18 for PSC structures). IRC:21 and IRC:18 stands pulled back, with the production of IRC:112. The key distinction among IRC:112 and old codes is that IRC:112 dependent on limit state hypothesis while the past codes depended on working pressure plan logic.

Neeladharan et.at (2017) In general, a suspension bridge, the pinnacle of bridge technology is highly capable of spanning up to 7000 feet managing such feat dealing with the two forces namely compression and tension. The authors report is based on a Suspension Cable Bridge of 1000m span with single lane road where the intensity of road was captured as 20 number of vehicles each loading with 350 KN using the application SAP1000. The maximum bending moment along with the values of shear force were analyzed on the application software SAP 1000 and a detailed comparison was done with the manual design of Suspension Cable Bridge.

VikasShrivastava (2017) The author demonstrated the structure analysis and design of Reinforce cement concrete box type minor bridge using Multifactor dimensionality reduction (MDR) Method along with computational approach using IRC-CBC codes. The results generated from the author's analysis proved that the maximum design forces developed for the loading conditions when the top slab was subjected to the dead load and live load and sidewall was subjected to earth pressure and surcharges when the culvert was empty. While estimating the positives and negative's it was observed that Computational method (Staad.pro) was comparatively more competent than Moment Distribution Method (MDM) in terms of time consumption along with efficiency of results.

Sung (2018) a nonlinear examination technique was proposed to assess the workableness survey of a rail affixing

framework on cement piece track at railroad bridge closes. (e-functionality audit of the end deck is tedious in that it is important to compute the power of clasp; likewise, the structure is mind boggling as a result of the numerous supports, latches, and loads. Moreover, there is additionally a case in which an extraordinary, costly affixing gadget is introduced on the grounds that the solidness of the rail attaching gadget is thought to be straight, and over the top structure results are delivered by the straight examination strategy. In this examination, a clasp power trial of the attaching framework was performed to affirm the genuine firmness and the power versus uprooting relationship. (e test results were connected in the customary direct investigation technique and the proposed nonlinear examination strategy to a railroad bridge demonstrate example with solid chunk tracks. (e aftereffects of the nonlinear investigation technique considering the nonlinear solidness of the rail attaching framework through the clasp power test affirmed that the inspire compel following up on the rail latch was impressively diminished contrasted and that in the straight investigation technique.

Landgeet. al. (2018) Delineated that Bridge development today has accomplished an overall dimension of significance. Bridges are the key components in any street system and utilization of pre-push support type bridges became famous among bridge building crew as a result of its better dependability, usefulness, economy, stylish appearance and basic effectiveness. I-shaft bridges are a standout amongst the most normally utilized kinds of bridge and it is important to always contemplate, refresh investigation procedures and plan technique. Basically they are easy to develop. Henceforth they are favored over different sorts of bridges with regards to interfacing between short separations. This present paper portrays the examination and plan of longitudinal brace bridge. For this situation examination is finished utilizing STAAD-Pro programming.

3. Conclusion

The literature review has suggested that use of a finite element modeling of the Pre-stressed bridge. So it has been decided to use SAP2000 for the Finite Element Modeling. With the help of this software study of bridge structure has been done considering Vehicular loading. SAP2000 also helps in Finite Element Modeling in view of that different type of forces can apply to get the actual results. In this literature review it is revealed that live project work to implement the same at site and to develop a relation between software and practical work

implementation.

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