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"Design and Analysis of a Double-Stage Flyover Considering Various Load Conditions and Design Challenges Using SAP2000"

¹Mr. Vishal Nimbalkar, ²Dr. V.S.Thorat

M.E Civil (Structural Engineering)

¹Research Scholar, Department of Civil Engineering,

²Professor, Department of Civil Engineering,

Maharashtra, India

Peer Review Information	Abstract
<p><i>Submission: 11 Feb 2025</i> <i>Revision: 15 April 2025</i> <i>Acceptance: 22 July 2025</i></p> <p>Keywords</p> <p><i>Double-stage flyover, SAP2000, structural design, load conditions, traffic flow, seismic analysis, wind loads, civil engineering.</i></p>	<p>The principle objective of this project is to design and analysis six lane flyover using SAP2000. The flyover is of 400m length with width of 15 m. The diameter of the pier is about 2.5m and the Beams are of I-section. The height of the columns is 4.2m. The Flyover has a road width of 15 m, in which 0.5m is of median. In the post processing mode after completion of the design we have worked on the structure and studied the bending moment and shear force values. This study focuses on the design and analysis of a double-stage flyover, utilizing advanced structural engineering software SAP2000 to evaluate its performance under various load conditions and design challenges. Flyovers play a crucial role in urban infrastructure by alleviating traffic congestion and enhancing connectivity. However, their design involves complex considerations, including structural integrity, load-bearing capacity, and environmental impact. This research addresses these critical aspects through a systematic approach that incorporates different loading scenarios, including dead loads, live loads, seismic forces, and wind loads, to simulate realistic operating conditions. The methodology begins with the conceptual design of the double-stage flyover, which features two distinct levels of traffic flow. The structural system will be modelled in SAP2000, allowing for comprehensive analysis through linear and nonlinear methods. Key design challenges such as material selection, geometric configuration, and the effects of dynamic loads are examined in detail. The model's response to various load cases is assessed, focusing on factors such as deflection, stress distribution, and stability. Results indicate that the flyover design meets the required safety and performance criteria established by relevant codes and standards. The analysis demonstrates how different loading conditions affect the structural behavior of the flyover, providing insights into critical design elements that ensure safety and longevity. Furthermore, this study identifies potential challenges in the construction and maintenance phases, proposing solutions to mitigate these issues. This research contributes to the body of knowledge in civil engineering by providing a detailed framework for designing double-stage flyovers that can effectively respond to dynamic urban environments. The findings highlight the importance of using sophisticated analytical tools like SAP2000 in modern engineering practice, enabling engineers to make informed decisions that enhance the safety and functionality of transportation infrastructure. The outcomes also serve as a valuable reference for future projects involving similar structures, promoting the adoption of innovative design practices in the field of civil engineering.</p>

Introduction

It is generally assumed that the flyover is related to the Flyover constructed over road or railway tracks as how they are often could be seen in order to deal with heavy traffic. The construction is not limited to that alone, rather it is advantageous to conduct other activities under the construction if the spaces also as they are left empty. High-rise structures might get damaged due to over man-made loads. There are flyover collapses occurring while construction, due to the instability of the substructure. Construction of newer ones in the place of previous ones may lead to economic loss. Repairing/maintaining the damaged structure, though essential, building of such structures with longer life span is also unavoidable.

The difference between Flyover and Flyover is based on the purpose of its usage and the location where it is built. Flyovers are built to connect two points separated by a naturally occurring region like valley, river, sea or any other water bodies, etc. Flyover is built to connect two points in congested areas or roads and intersection of roads. Flyover and flyovers are structures providing passage over an obstacle without closing the way beneath. The required passage may be for a road, railway or a valley. Flyover design is a complex problem, calling a 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. India has a rich history of steel Flyovers and flyovers. These are generally road flyover over low terrains or roads or intersection joining long distance through single span or multiple span constructions. Steel Flyover and flyover are ideal solution for long spans, construction in hilly areas or terrain conditions. For the short and medium span Flyovers and flyovers Steel – concrete composite construction is gaining popularity. Some of steel Flyovers in India are about 100 years old and yet going steady, demonstrating the long-life performance of steel Flyovers. In India due to high population density, most of the cities are saturated and traffic congestion is one of the major problems faced by these cities. Construction of flyovers is a solution to this problem. But construction of flyovers using R.C.C is time consuming, and will affect existing traffic and it has low seismic resistance. Construction of flyovers using steel sections can overcome these disadvantages, even though its initial cost is high. A flyover and Flyover has three main elements. First, the substructure (foundation) transfers the loaded weight of the Flyover and flyover to the ground; it consists of components such as columns (also called piers) and abutments. An abutment is the connection between the end of the Flyover and road carried by earth; it provides support for the end sections of the Flyover and flyover.

Types of Flyovers

1. Railway crossing
2. Road crossing

Parts of Flyover

1. Super structure
2. Sub structure Super structure

The superstructure consists of the components that actually span the obstacle the bridge is intended to cross and includes the following

- Bridge deck
- Structural members
- Parapets (bridge railings), hand rails, side walk, lighting and some drainage features.

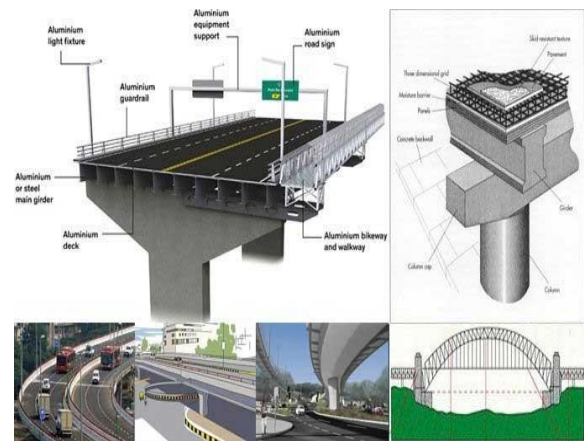


Fig1.1: Cross-section of fly over

Loads on Flyover

1. Dead load
2. Live load
3. Dynamic load
4. Other loads IRC Class 70R Loading:

This loading is to be normally adopted on all roads on which permanent bridges and culverts are constructed. Bridges designed for Class 70R Loading should be checked for Class A Loading also as under certain conditions, heavier stresses may occur under Class A Loading

It is also necessary to eliminate the over Flyovers that remain futile and which pose a threat to the environment. The fact is that, their roles are productive at the beginning stage and as days go on, they lose their originality in the sense of reduction in their structural stability. In the construction of over Flyovers, loop/square topologies were addressed to help in concluding which one suits more.

Proper planning is the most important thing and only after sufficient testing, the built structures must be left for service. Occurrence of problems is common when considering the oversized trucks into account. Smart systems were introduced which deliberately alarm when oversized vehicles head to the flyover. In this case, these vehicles are stopped for a while to pave way

for other vehicles to leave from the Flyover in-order to avoid collision. Since this approach is costlier, computer aided mechanism replaces the previous one. Still, this system delays the vehicles and makes them wait. So, an ideal flyover construction must be built that is strong enough to hold any number of huge vehicles that passes by. Vibro pile construction is elaborated where 318 piles are considered for analysis. It is stated that this type of pile foundation could be preferred for low-volume overpasses. Continuous flight auger piling system was used which is highly recommended in areas where the water table volume is more. Extensive studies and experiments are essential to verify its structural integrity by ensuring apt auger rotation. Furthermore, by economic means, it is not suitable for low budget constructions.

Flyover pier testing such as core and pull-out/off tests are conducted to determine the basic functionalities including thickness, elastic modulus, structural integrity, surface absorption, etc. From the case study of the T-beam girder made of concrete, it is found that the strength of the piers should have been improved by adding reinforcement or other means. [10] By the inclusion of reinforced concrete, occurrence of disintegration of structures because of beam-column interaction is preventable.

The increasing demand for efficient transportation infrastructure, particularly double-stage flyovers, has led to a study aiming to design and analyze such structures using advanced structural analysis software, SAP2000. The study considers various load conditions, including dead, live, seismic, and wind loads, to ensure the flyover can withstand these forces without compromising its structural integrity. The use of SAP2000 allows for a detailed analysis of the structure's response to these loads, identifying critical stress points and deflections. The study also addresses design challenges such as site constraints, material selection, geometric configuration, and dynamic responses to loads. The findings will contribute to civil engineering knowledge and promote innovative practices in the field of civil engineering.

Problem Statement

“By studying different examinations like road survey and traffic analysis that the problem at city by pass road is due to insufficiency of road space for the vehicles to pass through the junction at different instants of time in a day which is effecting the free flow of traffic, and improper movement of traffic also results in occurrence of accident in different instants of time.”

City Bypass Road Problems

- Insufficient road space affecting traffic flow.
- Improper traffic movement leading to accidents.
- Road survey and traffic analysis examinations suggest solutions.

Aim

“Design of Double stage flyover with different types of load and problems occur in design with SAP2000”

Objectives

- The main objective of designing of Fly-over Bridge on major junction to avoid excessive traffic.
- To study and to make the suggestion and improvement in transportation by providing fly-over bridge for excessive traffic.
- The project area is having very high density of traffic flow. The public felt inconvenient to cross the busy four roads' highways & therefore the flyover is essentially required at the junction.
- For Smooth traffic flow of industrial goods and Agricultural goods without traffic congestion flyover is essential to overcome the traffic congestion required.
- The Pier is designed for the axial dead load and live load from the slab, girders, deck beam. Foundation designed as footing for the safe load bearing in the soil.
- Design and analyse the flyover using software SAP 2000
- To minimize the traffic delay due to heavy traffic & to suggest the fly-over with good Aesthetic and Architectural view.

Analysis and design of single pier double decker flyover by using sap2000

- In Rigid or Flexible pavement road of national highway the structure are design for s per IRC SP 84.
- Flyovers are design on 19 separate piers for lanes.
- We are going to design a Flyover on 19 pier and lane having deck slab 350mm.
- We are going to take this location in congested city area.
- Total length of structure will be 400 mtr having spanned, it will consist of 1 no. obligatory span, 9 nos. of pier of dia. 2.5m
- The foundation type will be open foundation and pile foundation.
- Superstructure will be of segmental type consist of precast wing and precast spine beam, wearing coat.
- There will be also curve section span in flyover.

Project Comparison:

- The comparison will be done for design effect for pier and 19 pier flyovers with estimate cost of view, project completion time of view.
- The project cost comparison will be also as per limitation of ROW and land acquisition, as we know construction of highway project land acquisition is a major part which affects the cost of project. Also it affects the project by financially and time lapse.
- We will also discuss the land which is saved due to construction of structure on single pier.
- The project design will be done on SAP2000 and using various guideline of MORT&H, IRC Specification, and procedure for acquisition of land as per government guidelines.

Literature Survey

This paper the study deals with the problems occurring in high traffic area in Trichy. The analysis influences

traffic behavior of both the structural components of highway and fly over bridge systems. Additionally, it is also demonstrated that beneficial effect on the superstructure response and sometimes produce detrimental effects on the system behavior and is dependent on the characteristics of the high volume of vehicle movement intensity. Here I consider the place to be from Trichy to Chennai Highway because there are more traffic problems especially in peak hours. It is an overpass and underpass together form a grade separation. Stack interchanges are made up of many over passes. For Pedestrians crossing over busy road without impacting traffic.

Survey is a method of research used for collection of data from different sources to execute the project efficiently. In order to execute the project, I have conducted survey to obtain the density of traffic flow and to determine the density of traffic flow in instants of time. Here by I have surveyed regarding density of vehicles at on at different time intervals to obtain adequate results at that particular junction. I also have noticed that there are many different types of vehicles that are passing through on at different instants of time. There is variation in vehicles that. Pass through this junction, I here have noted down the density of traffic follow which passes through

Literature papers

Analysis of flyover structures with different loads M. Alla Rangaswamy, International Journal of Engineering Sciences & Research Technology, and March 2022

Traffic-easing devices; flyover design, construction, and installation take time. Same goes for ONGOLE's 600m-long, 6.6m-wide flyover. Flyover's increased cost is countered by seismic resilience, lifespan, and lower life cycle costs. Bridges and fly-overs avoid roadblocks. This is a road, railroad, or valley route. Bridge design requires creativity, practicability, safety, and economy. A structure should be built to endure all expected activity over its lifetime. The building should be long-lasting. Traffic congestion needs flyovers or over bridges. We're designing a flyover. Four motorways intersect at a pipeline, causing traffic problems

Design of Flyover Construction based on Fibre Reinforced Concrete and Timber Pile Foundation J Prakash Arul Jose, International Journal of Applied Engineering Research, 2022

The project stands unique from other construction systems where the deck and pile foundations are comprised of massive timber concrete vertical support via earth matters up-to the rock layers. The girders of the superstructure are made of fibre reinforced concrete. The design, from its initial stage till its completion, is represented with necessary diagrams. The construction undergoes a series of tests to confirm its stability and durability.

Efficient Design Patterns of Road System Fly Overs and Tunnels, Marri Srinivasa Reddy, Journal of Engineering Science, Vol 13, Issue 03, MARCH/2022

One popular solution to the problems of traffic jams and accidents at large at-grade intersections is to build a flyover over the existing crossroads, which will improve traffic capacity in both directions on one of the major routes. However, building a flyover costs a lot of money and won't fix every traffic issue. The effectiveness, advantages, and enhancement of road safety of the flyover were examined in this study. The study concentrated on two circumstances: Flyovers that improve an at-grade signalized intersection and already-existing flyovers.

Flyover Engineering Handbook Superstructure Design, Wai-Fah Chen, Lian Duan, 19 Oct 2021

Construction of segmental concrete Flyovers involves assembling smaller pieces of concrete members called segments using posttensioning tendons to form a Flyover structural system, either superstructure or substructure. These segments can be produced by cast-in-place or precast/prefabricated methods, while the posttensioning system can be bonded, un-bonded tendons, or a combination of both. Bonded tendons typically consist of cementitious grouted internal tendons, while un-bonded tendons could be cementitious grouted or greased, waxed, and sheathed, in the form of external or internal tendons. In segmental Flyover design, it is critical to determine the construction means and methods, prior to proceeding with the design. The construction method will greatly affect the outcome of design and tendon layouts, unlike any other type of structures. In most cases, construction loads will also impact the design, material quantity, and details.

A Comparative Study on T Girder Flyover Deck using Grillage Analogy and Finite Element Method, Gaurav Somani, International Journal of Engineering Research & Technology (IJERT), June-2021

Concrete slabs and t- girder Flyovers have been the dominant Flyovers in India. Especially in recent years, many road constructions are underway, some are under construction, and some road projects are planned to be carried out in the future. As the project becomes larger, it is necessary to improve the design method and make it more effective every day. It summarizes the requirements of the new Flyover and the important features of the planned site and makes it the basis for each design. Initially, the dimensions of the structural members were chosen according to the designer's experience, and at a later stage, the engineering software was used to compare the alternative software and optimize the part size. Finally, a complete analysis and analysis of all important construction phases and detailed shop drawings will be carried out.

Comparative analysis of t-beam flyover by rational method and staad pro praful, balaso hanumant, International Journal Of Engineering Sciences & Research Technology, 2021

The Flyover is a structure providing passage over an obstacle without closing the way beneath. The required passage may be for a road, a railway, pedestrians, a canal or a pipeline. T-beam Flyover decks are one of the principal types of cast-in place concrete decks. T-beam Flyover decks consist of a concrete slab integral with girders. The finite element method is a general method of structural analysis in which the solution of a problem in continuum mechanics is approximated by the analysis of an assemblage of finite elements which are interconnected at a finite number of nodal points and represent the solution domain of the problem. A simple span T-beam Flyover was analyzed by using I.R.C. loadings as a one-dimensional structure using rational methods. The same T-beam Flyover is analysed as a three-dimensional structure using finite element plate for the deck slab and beam elements for the main beam using software STAAD ProV8i, three different spans of 16m, 20m and 24m was analysed.

Design and Analysis of Flyover, Bismi M Buhari International Journal of Engineering Research & Technology (IJERT), July-2021

Our project deals with design and analysis of flyover. The manual design of flyover consists of deck slab, longitudinal girder, cross girder, pier, pier cap, abutment, pile cap and pile based on code such as IS: 456-2000 and IRC: 21- 2000. Here the structural analysis is carried out by using STAAD Pro V8i software.

Numerical Examination of Reinforced Concrete Skew Slabs Boobalan S C, Abirami P, Indhu K, International Journal of Innovative Technology and Exploring Engineering (IJITEE), March 2021

Skew slab structures are frequently investigation used in modern construction in the form of non-orthogonal reinforced concrete slabs supported by skew grid of beams. Skew Flyovers allow roadway alignments to a huge selection of solutions. Skew slabs contribute to a minimal environmental impact for recent road construction projects. Thus, it is difficult to analyse the skew slab Flyovers than the right-angled Flyovers. The primary objective of this project is "Numerical Examination of Reinforced Concrete Skew Slab", is to determine the effect of different arrangement of steel reinforcement in the reinforced concrete skew slabs. For skew slabs, the sides are not orthogonal and so it is a matter of interest to study the effect of different types of reinforcement schemes to arrive at the best arrangement. ANSYS software was used for the analysis of skew slabs. Except the reinforcement alignment, dimensions are similar in all the skew slabs. For identifying the effective reinforcement pattern in skew slabs, deformation, stress, strain behaviour was studied. By comparing the data for three types of reinforcement pattern in skew slab, the effective pattern will be observed in pattern having least values in solution. On analysis, the behaviour of different

reinforcement pattern for the designed skew slab is studied using ANSYS and the effective reinforcement pattern is suggested.

Analysis for earthquake-resistant of flyover structure subjected two earthquakes, LIU Chunguang, MDPI 2021

The Flyover structure damage of two earthquakes is studied deeply in this paper. The Flyover model under two earthquakes effect is built by the way of connecting the end-to-end of two seismic wave, and the elasto-plastic response of Flyover under one and two earthquakes separately are studied and compared in the conditions of different intensities and different peak accelerations. Which illustrate that the cumulate response of Flyover structure is more serious under the effect of two earthquakes than under only one.

Dynamic Behaviour of Flyover Girders with Trapezoidal Profiled Webs Subjected to Moving Loads, Zhiyu Wang, Yunzhong Shi, MDPI 2021

This study is to find out the degradation of dynamic behaviour of Flyover girders with trapezoidal profiled webs when subjected to different vehicle moving loads. Finite element modelling based parametric analysis is demonstrated to be desirable in capturing the dynamic deflection and stress state of critical structural details of girders. The model is validated in the modal analysis through a comparison with theoretical Eigen frequencies. The vibration characteristics are shown to be significantly affected by the corrugation details.

Girder Longitudinal Movement and Its Factors of Suspension Flyover under Vehicle Load Guoping Huang, Research Article, 1 October 2021

In this study, the longitudinal deformation behavior and longitudinal vibration of suspension Flyover under vehicles, as well as the related influencing factors, are investigated. &e underlying mechanism of girder longitudinal movement under the moving vehicles is revealed. Based on the simplified vehicle model of vertical concentrated force, the characteristics of main cable deformation and girder longitudinal displacement under vertical loads are analyzed first. &en, the longitudinal motion equation of the girder under vertical moving loads is derived.

Analysis and Design of Fly Over, Harsha Vardhan G, International Conference on Advances in Civil Engineering (ICACE 2021)

This work provides grillage idealization advice and background information. Explains mesh layout. Using IRC and IS codes, bridge proposals are analyzed. Grillage analyzes the bridge deck. The current work was accepted for a 28.2m external girder with a 12.5m width and 0.225m slab thickness. Members are engineered for maximum shear and bending. Frictional, anchoring, elastic, and steel stress losses are also evaluated. STAAD PRO performed the analysis.

Seismic performance of precast Flyover columns connected with grouted corrugated-metal duct

through biaxial quasi-static experiment and modeling, Xia Zhanghua, Lin Shangshun, 16 July 2021

In this paper, the seismic behaviors of precast Flyover columns connected with grouted corrugated-metal duct (GCMD) were investigated through the biaxial quasi-static experiment and numerical simulation. With a geometric scale ratio of 1:5, five specimens were fabricated, including four precast Flyover columns connected with GCMD and one cast-in-place (CIP) Flyover column. A finite element analysis model was also established by using Open Sees and was then calibrated by using the experimental results for parameter analysis.

Analysis & Design of Flyover by using Staad Pro v8i, Narigiri Vijiya Bhargavi, International Journal for Modern Trends in Science and Technology, 2021

Traffic jams (obstacles to free time or flow) can be avoided in several ways. Flyovers are a good technique to bypass highways. In this project, we'll build a flyover at Morampudi Junction in Rajahmundry, Andhra Pradesh, along National Highway 216A to alleviate traffic jams and accidents.

Using STAAD, I'll design and assess the flyover based on data from many tests.

Pro V8i studies Bending Moment, Shear Force, and Nodal Displacement values for Dead Loads, Live Loads, Wind Loads, and Vehicle Loads from Indian Standard Codes IS - 456, IS - 800, and IRC: 6 - 2016.

Design and Analysis of Flyover Bismi M Buhari, International Journal of Engineering Research & Technology (IJERT), July-2021

The planning and evaluation of flyovers are the focus of our study. Based on codes such as IS: 456-2000 and IRC: 21- 2000, the manual design of a flyover includes a deck slab, longitudinal girder, cross girder, pier, pier cap, abutment, pile cap, and pile. Utilizing the STAAD Pro V8i program, the structural analysis has been carried out on this site.

Analysis and Design of Foot Flyover Connecting (2nd Floors) of Block A and Block B of MIET, Jammu Akhil Sharma, Ashwani Kumar, Sunil Sharma, Arun Singh Chib, International Journal of Engineering Research & Technology (IJERT), May-2020

Foot Flyover is a Flyover designed for pedestrian traffic which are used to let people cross the road safely without disturbing the traffic below. There was a need to join the two blocks of MIET College, Jammu so as to access the passage in rain and other climatic effects and also to increase the aesthetics of the campus. A foot Flyover is designed two connect the two corridors of the two blocks. This project mainly consists of the detailed design of such a foot Flyover by considering manual and software approach. Survey of the site is done both by QGIS software and manually by Theodolite, plotted using AutoCAD. The design and analysis of foot Flyover is done using STAAD.pro connect edition.

Comparative Study of Grillage Analogy and Finite Element Method for Flyover Heavy Load Assessment, Shojaeddin Jamal, Tommy H.T. Chan, Research Article 2020

It was observed that component-level load effects of two models have notable differences irrespective of vehicle speed, position and loading. However, when global-level load responses are compared, the discrepancy in outputs drops dramatically. Developed modelling ratios are practical and found to be applicable to any modelling techniques for assessment of vehicular loading both in global and component-response basis. Proposed flowchart suggested for heavy load assessment incorporates detailed and simple modelling approaches aligned with experimental data which can be used for periodic and long-term monitoring of Flyovers. It can enhance the proper determination of Flyover condition states, as any conservative estimation of Flyover capacity may result in unnecessary load limitations.

Comparative Analysis and Design of Steel Foot Flyover using Conventional and Hollow Section Anushka M. Pachpute, Nikita J. Patil, International Journal for Research in Applied Science & Engineering Technology (IJRASET), Elsevier 2020

A Flyover is a structure providing passage over an obstacle without closing the way beneath. With the rapid development in urban sector in our country, construction of roadway and railway network is very fast now a days as six lining, four lining of highways and railway track increment. This trend is likely to continue for next ten years thus due to increased traffic and development there is great need for construction of foot over Flyover to safely pass the fast-moving traffic. Foot over Flyovers offer a wide range of opportunities for imaginative and innovative architectural design. Design should be as attractive as possible the structure should be in harmony with surrounding environment the proportion of different elements of Flyover should be proportionate. The external finish and painting should be such as enhance the elegance of Flyover. a proper design of foot over Flyover is very important since the clear span is 20m. the design and analysis carried out by using conventional steel sections and hollow steel sections is done by using staad.pro software, and the comparative analysis is carried out on the economy of the steel sections.

The benefits and use of FE modelling in bridge assessment and design P. Icke, Research Article 2020

Structural analysis has advanced from hand calculations and distribution factors. Grid and grillage analysis approaches evolved from the early computer methods, leading to today's 3D graphical and analytical tools. Because of its cost-effectiveness and accuracy, finite element (FE) modeling and analysis is employed more in bridge engineering. This paper highlights its function in bridge analysis, assessment, and design using examples from global consulting projects.

Nonlinear Analysis of Reinforced Concrete Flyovers under Earthquakes, Hong-Nan Li, International Conference on Advances in Experimental Structural Engineering, 2019

The seismic performance assessment should undoubtedly be considered in the demand and capacity evaluations at various performance levels of the structure. Clearly, a nonlinear dynamic analysis can be used to predict with sufficient reliability the forces and cumulative deformation demands in each element of the structure. In addition, conventional nonlinear dynamic analysis methods incorporating numerical differentiation formulations or numerical integration formulations, are time consuming and unstable since the stiffness matrices are changing throughout the whole computing progress, especially when the nonlinear response is large and the structural strength is degrading. The nonlinear static analysis, particularly the pushover method, is a simplified nonlinear analysis method, which can be viewed as a method for predicting the structural capacities, such as the global drift or inters story drift. Compared with the nonlinear dynamic analysis, the pushover analysis needs less computing effort and is easier for implementation in the engineering practice.

Behavior of Composite Steel Flyover Beams Subjected to Various Posttensioning Schemes William E. Wiley, Transportation Research Record 2019

An initial investigation phase of research on strengthening continuous composite Flyovers by posttensioning has been completed; results are summarized. The effects of various posttensioning schemes were investigated on a one-third-scale continuous three span composite Flyover model. Although various tests performed on the

Flyover model verified that positive and negative moment regions of continuous composite Flyovers could be strengthened by post tensioning, the model size prevented the testing of different tendon profile shapes and the necessary hardware. Thus, the primary objective of this research was to investigate the effectiveness of various posttensioning schemes applicable to the negative moment regions of continuous composite Flyovers through the testing of a full-scale laboratory model. The model was subjected to four different posttensioning tendon configurations with and without the use of strengthening angles. Data from the various tests were compared to the un-strengthened model to determine the more effective posttensioning arrangement. Data from the various tests were also used to determine the extent of composite action remaining after the concrete deck cracked.

Review of annual progress of Flyover engineering, Renda Zhao, Yuan Yuan, Research Article 2019

This paper introduces the main research progress in China and abroad in 2019 from 13 aspects, including concrete Flyovers and the high-performance materials,

the latest research on steel-concrete composite girders, advances in box girder and cable-supported Flyover analysis theories, advance in steel Flyovers, the theory of Flyover evaluation and reinforcement, Flyover model tests and new testing techniques, steel Flyover fatigue, wind resistance of Flyovers, vehicle-Flyover interactions, progress in seismic design of Flyovers, Flyover hydrodynamics, Flyover informatization and intelligent Flyover and prefabricated concrete Flyover structures.

Analysis of Skew Flyovers Using Computational Methods, Vikash Khatri, P. R. Maiti International Journal of Computational Engineering Research,

The effect of grid spacing on different skew angles on same-span of reinforced concrete Flyovers using the finite-element method and grillage analogy method is compared. Maximum reactions force, deflection, bending and torsional moments is calculated and compared for both analysis methods. A total of nine different grid sizes (4 divisions to 12 divisions) have been studied on skew angles 30°, 45° and 60° to determine the most appropriate and efficient grid size. It is observed that finite element method (FEM) and Grillage method results are always not similar for every grid size. Bending moment calculated by using FEM overestimates the results obtained by grillage analysis for larger grid sizes. Torsion moment behavior shows reverse of bending moment and difference between reaction values of grid sizes between two methods decreases as skew angle increases. FEM gives lesser variations of bending and torsional moment with the change of grid sizes than Grillage one. Deflection doesn't vary much on the change of the grid sizes

An Improved Approach for Monitoring and Controlling of Flyovers and Bridges Using Internet of Things Alok Kumar Pani, International Journal of Computer Sciences and Engineering, Jan 2019

This needs health monitoring and a way for the private owner or government to care for the nation. Lack of technology and human attention causes accidents worldwide. Accidents can't be eliminated, but some actions can lessen them. Introduce new technologies to prevent human deaths. This work uses real-time bridge/flyover health monitoring and automated gate control. The above solution uses Raspberry Pi-3 embedded with sensors in the bridge/fly-over.

Analysis and Design of Skew Flyovers Nikhil V. Deshmukh, International Journal of Science and Research (IJSR) 2018

Flyovers are very special type of structures. They are characterized by their simplicity in geometry and loading conditions. The reinforced concrete Flyovers usually carried uniformly distributed dead load, vehicular live load to its surface and transfers same to the support by flexure, shear and torsion. Newly designed Flyovers are often skew. This is due to space constraints in congested urban areas. It can be also needed due to geographical constraints such as mountainous terrains. However, force flow in skew

Flyovers is much more complicated than straight Flyovers. Therefore, careful investigation and numerical analysis needs to be performed, in which a skew Flyovers can be modeled in several ways. Skewed slab Flyovers were modeled using finite-element methods using CsiFlyover computer software to study their behavior under uniform and moving loads with to determine the most appropriate force response for design.

Social impact assessment of road infrastructure projects Ms Nirali Shukla & Dr. H.J.Jani, (January-February, 2018)

The main objectives of the Social Assessment exercises are to assess the Social Impact of the project, identify issues and assess consequent risk to the project due to positive and negative impact, measures to mitigate the negative impacts and risk due to the road interventions

Design of Flyover Construction based on Fibre Reinforced Concrete and Timber Pile Foundation J Prakash Arul Jose, International Journal of Applied Engineering Research, 2018

The project's deck and piling foundations are made of huge timber concrete vertical support via earth concerns up to rock layers. The superstructure's girders are FRC. Diagrams show the design from start to finish. The building's stability and durability are tested.

A Study of a Flyover-Bridge - Improved Intersection Narabodee Salatoom, Research Article, 2018

This article, part of the first author's thesis, analyzes challenges at the flyover-improved junction and gives solutions to maximize the flyover's benefits, such as creating a new cycle and phase periods and upgrading the physical area under the bridge. SIDRA software determines the proper fixed time plans, and Road Safety Inspection (RSI) audits the site's safety and presents improvements.

Design of flyover transverse vertically by using hydraulic jack, M. Hari Sathish Kumar, K. S. Binitha, K. Balaji, International Research Journal of Engineering and Technology (IRJET), 11 Nov 2017

This paper deals with the purpose of Passover in congested area. Now a day's flyover plays a vital role in reducing and diverting the intensity of traffic on major cities. By using Hydraulic jack the over pass can be transverse vertically. The over pass is made up of composite materials i.e. concrete and steel structures. With the help of pile foundation, loads are transferred deep into the soil. The structural members of deck and pier are made up of Aluminium and steel structures. The proposal of this project is to implement the over pass where land acquisition cost is high and also in congested areas. In this project, analysis and design of flyover is done.

Future trends and developments in bridge and flyover construction, Mohd Sajid Ali, International Journal For Technological Research In Engineering Volume 4, Issue 9, May-2017

The construction of bridges and flyovers is an essential component to the growth of any city, state, or nation. Through our investigation, we were able to identify numerous creative flyovers and bridges, and we also determined whether or not it would be possible to construct such flyovers and bridges in our city of Jaipur.

Comparative study of Grillage method and Finite Element Method of RCC Flyover Deck R.Shreedhar, Rashmi Kharde, International Journal of Scientific & Engineering Research Volume 4, Issue 2, February-2013

The simplest form of Flyover is the single-span beam or slab which is simply supported at its ends. Many methods are used in analyzing Flyovers such as grillage and finite element methods. During this period the processing power and storage capacity of computers has increased by a factor of over 1000 and analysis software has improved greatly in sophistication and ease of use. In spite of the increase in computing power, Flyover deck analysis methods have not changed to the same extent, and grillage analysis remains the standard procedure for most Flyovers deck. The grillage analogy method for analyzing Flyover superstructures has been in use for quite some time. An attempt is made in this paper to provide guidance on grillage idealization of the structure, together with the relevant background information. Guidance is provided on the mesh layout. The Flyover deck is analyzed by both grillage analogies as well as by finite element method. Flyover deck analysis by grillage method is also compared for normal meshing, coarse meshing and fine meshing. Though finite element method gives lesser values for bending moment in deck as compared to grillage analysis, the later method seems to be easy to use and comprehend

A Computational Approach of Pre-stressed Concrete Flyover Deck Slab Analysis for various IRC Classes of loadings using Pigeaud Charts Dr. M. Siva

This paper aims at solving the difficulty in arriving the bending moment coefficients of Flyover deck slab from cumbersome Pigeaud charts. In this study, the bending moment coefficient values from pigeaud charts are tabulated for different IRC (Indian Road Congress) classes of loadings using interpolation technique. For this study, IRC classes of loadings viz., Class AA tracked and wheeled, 70R tracked and wheeled, Class A and Class B vehicle loadings are taken into considered. A program using MATLAB software is developed to interconnect these tabulated bending moment coefficient values in the analysis of pre-stressed concrete deck slab. It is observed there is a good agreement between computational analysis and theoretical analysis. This study facilitates the analysis of pre-stressed concrete deck slab to be easier and systematic.

Design & Modelling

Input Data Flyover Design

- LENGTH 400M
- WIDTH 15. M
- CLASS 70R, IRC CLASS A TRACK

- IRC CLASS A WHEEL
- PIER 2.5 m Dia
- NO OF PIER 19
- BEAM 1.5mm x1.5 mm (Longitudinal Beam Along X-axis)
- BEAM 1200mm x 2 m (Longitudinal Beam Along Z-axis)
- Deck Slab Thickness 350mm
- LOADING
- DEAD LOAD, BRIDGE LIVE LOAD, LIVE LOAD, EARTHQUAKE LOAD X AND Y DIRECTION

Expected Outline

- This project concludes the planning, analysis and design of fly over structures.
- This structure will be reduces the traffic control and enhances the safe driving.
- The structure will be designed as per IRC class loading.
- This project helps to improve the urbanization of rural areas
- Also facilitate the connection of various system of road such as village road, state highway, national highway etc.
- This project concludes with planning, design and analysis of a fly over.
- Based on study area flyover construction is best and economically low cost which is essential at National Highway NH which is always busy with traffic moment. Located at Solapur junction in Hyderabad naka, Maharashtra, India.
- The maximum flow of traffic is along National Highway NH64 which includes transportation of agricultural goods and industrial goods, so path chosen for the execution of flyover is along at National Highway NH65.
- Construction of this structure at that junction results in the traffic control and enhances safe driving.

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