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Analysis and Design of Flyover Bridge

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Abstract The principle objective of this project is to design and analysis of a flyover bridge and structural parts for the flyover. The fly over is of 3km length with 100spans, 30m per span. The principle objective of this project is to design and analysis of a flyover bridge and structural parts for the flyover. The fly over is of 3km length with 100spans, 30m per span. It consists of a deck slab, longitudinal girders, cross girders, deck beams, piers, cantilever beams and pile foundation. A structural design of one span was made for all the above components slab is designed by Limit state method as per the recommendations of IRC 21-2000, clause 304.2.1. Flyover help to streamline the traffic control system by helping to reduce traffic congestion. Reduced horizontal curvature reduces risk-road crashes. The impact of the flyover construction to the curb traffic congestion problem has been assessed in terms of traffic decongestion time saving and fuel saving. The location of the flyover is located at a four road junction Balanagar. Hyderabad which facing major traffic problem at the peak hours. In these we have to done a traffic survey from kukatpally y- junction to shobhana circle. and designed all the structural parts of the flyover. Deck slab is designed for maximum moment due to deck action, and these T- beams are designed as reference from IRC 21-2000. The pier is designed for the axial dead load and live load from the slab, girders, deck beam. The elements are designed by using M20 grade concrete and fe415grade of steel. Designs are based on limit state method as per IRC:21-2000 and IS456:2000.

Key Words—Fly over, Deck bridge, Girders, Piers, T-beams, Pile foundations, Cantilever beam.

I. INTRODUCTION

The first flyover in India was allowed access on 14 April 1965 at Kemps Corner in Mumbai. The 48- foot-long bridge was constructed in about seven months. A flyover is a construction built to span of physical obstacles such as a body of water, valley, or road, for the purpose of providing passage over the obstacle. Designs of flyover vary depending on the function of the flyover, the nature of the terrain where the flyover is constructed, the material used for construction and the funds available to build it. The flyover consists of number of spans with columns (piers), deck, and foundation etc. In order to construct a flyover all these elements are to be analysis and designed properly. A flyover has three main elements. First the substructure i.e., foundation transfers the loaded weight of the bridge 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 bridge and the road carried by the earth; it provides support for the end sections of the flyover. Second, the super structure of the flyover is the horizontal platform that spans the space between columns Finally, the deck of the bridge. The roads and bridges rare very important for growth of economy of the country. Now our country is being developed by developing roads and bridges.

II. LITERATURE SURVEY

Rajeev Sharma (2015); deals with the evaluation studies for the existing, RCbridge using non-linear static analysis. For the seismic assessment of the bridge a 3 span bridge is selected which is located on the hindon river at Ghaziabad (Uttar Pradesh). this area is highly vulnerable to the seismic activity because it is lie in the Zone – 4. So, the high magnitude earthquake may be occurring in this region (may be greater than 7 magnitude). For doing the seismic evaluation of the bridge at the time of earthquake open sees software is used. The open sees model is used to describe the various performances of the bridge.

Sachin Kulkarni (2014); carry out a seismic evaluation case study for an existing RC bridge using nonlinear static (pushover) analysis. In the present study a 4 Span RC Bridge existed in SH-12 in Karnataka, India, was selected and by defining FEMA 356 Auto hinges conducted Nonlinear Static (Pushover)Analysis using (ATC r40) Capacity Spectrum Method and software SAP2000 was used to analyze the Bridge. The evaluation results presented here shows that the selected bridge does not have the capacity to meet the desired performance level and it requires retrofitting. From the Pushover Analysis the performance levels of bridge are studied. From the Analysis it is evident that Spectral

Displacement Demand is more than the Spectral Displacement Capacity in the analyzed Bridge. So the analyzed bridge requires retrofitting.

T. Pramod Kumar et al; deals with the analysis and design of super structure of road cum railway bridge across Krishna river proposed and downstream side of existing bridge between Mahanadu road of Sithanagaram and P.N. Bus station, Vijayawada. The bridge is made of through type steel truss which carries two railway tracks at lower level and a roadway of three lane carriage way in the upper level. The span length matches with that of existing nearby railway bridge. Analyses of top floor members, truss members and bottom floor members are done using STAAD Pro. The design of structural members of the truss, top floor and bottom floor members is done as per Indian railway standard code and Indian roads congress code. In which they concluded that Road cum railway bridge reduce the construction cost by providing single bridge for both railway traffic road traffic instead of providing two separate bridges. It meets the increased railway and road traffic needs across the river Krishna. It reduces the land acquisition problem by providing single bridge.

Dzolev et al; presents the analysis of reinforced concrete Girder Bridge designed according to EN 1998-2, with the determination of the achieved ductility in plastic hinges at the target displacement for the designed seismic action. In this analyses were conducted for RC Girder Bridge with confined and unconfined concrete cross sections r [1, r2] with and without the effects of geometric nonlinearity. Based on the pushover curves, it can be concluded that, for the same level of horizontal displacement, lower values of base shear are obtained if P-Δ effects are applied. Obtained target displacement and achieved local ductility also differ whether concrete is molded as confined or unconfined, giving higher values in favor of confined concrete. Results are presented only for the shorter column.

III. METHODOLOGY

A. Site Selection:

The following points are the guiding factors for selection of suitable site:

1. The roads are crossing perpendicular to reach other.
2. The site should have more traffic congestion.
3. The availability of men and materials are to be ascertained.

B. Location:

Based on the traffic problem faced by the people we proposed a solution by designing a flyover bridge. The location of Flyover Bridge is from kukatpally-junction to shobhana junction. The length of the flyover is 3km. The following are some of pictures of that location

Fig.1. Traffic site Location

C. Traffic Survey:

Traffic survey was made in August 2019, in the project site. This time was selected on the basic of the past traffic study as an average of peak hour. All the four arms of the site was observed and the number of vehicles passed was converted to PCU's(Passenger car unit).

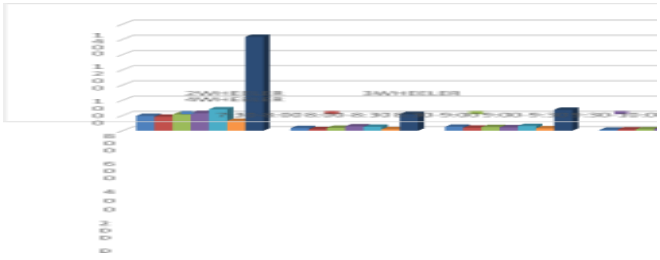

Fig.2. Week day 2019 Traffic at the location

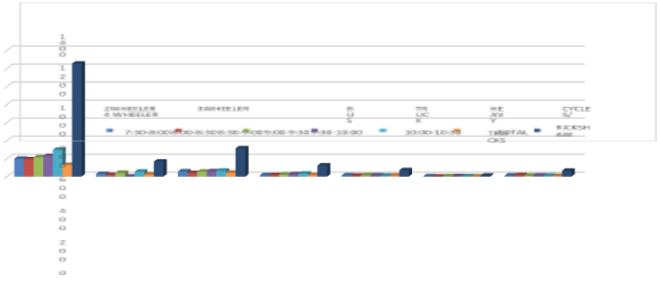

Fig.3. Week Middle Day 2019 Traffic at the location

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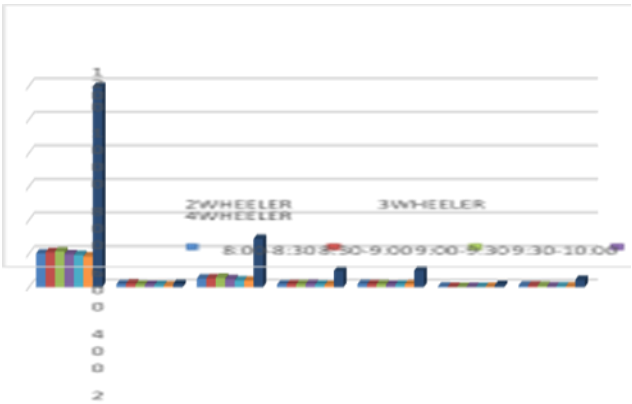

Fig.4. Week end Day 2019 Traffic at the location

The passenger car unit of a vehicle type has been found to be depends up on the size, and speed of the vehicle type and environment. They are not dependent on the flow and road width. As per IRC: 92-2000, the traffic volume limit is10000PCUs/hour. The capacity of junction was estimated at 6547 PCS's / hour. The design period is taken as 30 years. One year would be taken for the construction. So traffic is projection. So traffic is projected for 31 years

D. Planning

Structural analysis is the determination of effects of loads on physical structures and their components. Structures subject to this type of analysis include all that must withstand loads, such as buildings, bridges, vehicles, machinery, furniture, attire, soil strata etc., structural analysis incorporates the fields of applied mechanics, materials science and applied mathematics to compute some structures deformations, internal forces, stresses, support reactions, accelerations and stability.

Fig.5. Reinforcement details of deck slab

The results of analysis are used to verify a structures fitness for ruse, often saving physical tests. Structural analysis is thus a key part of the engineering design of structures.

E. Pier/Abutment

A pier is a raised structure typically supported by foundation. Bridges, buildings, and walkways may all be supported by piers. Their open structure allows tides and currents to flow relatively unhindered, whereas the more solid foundations of a quay or the closely spaced piles of a wharf can act as a breakwater, and are consequently more liable to silting. Piers can range in size and complexity from a simple lightweight wooden structure to major structures extended over 1600meters.

Fig.6. Complex structure of pier

F. Deck Slab

Deck, is the surface of a bridge, and is one structural element of the superstructure of a bridge. It is not to be confused with any deck of a ship. The deck may be constructed of concrete, steel, open grating, or wood. Sometimes the deck is covered with asphalt concrete or other pavement. The concrete deck may be an integral part of the bridge structure (T- beam or double tee (structure) or it may be supported with I-beams or steel girders. When a bridge deck is installed in a through truss, it is sometimes called a floor system. A suspended bridge deck will be suspended from the main structural elements on a suspension or arch bridge on some bridges, such as a tied-arch or a cable-stayed, the deck is a primary structural element, carrying tension or compression to support the span.

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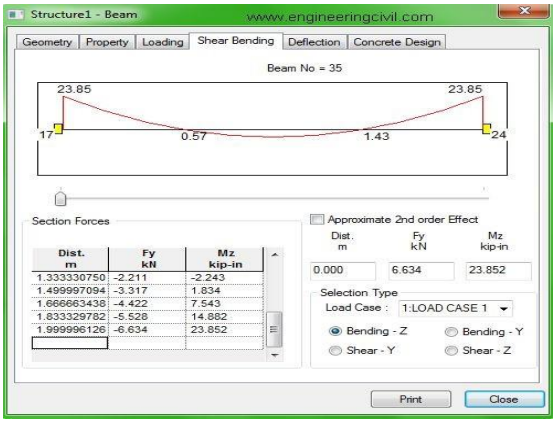
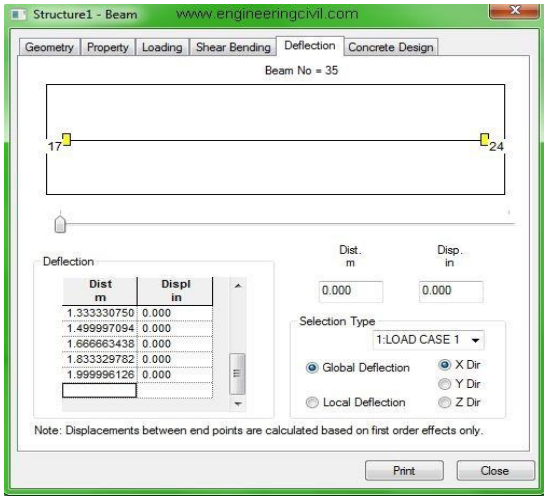
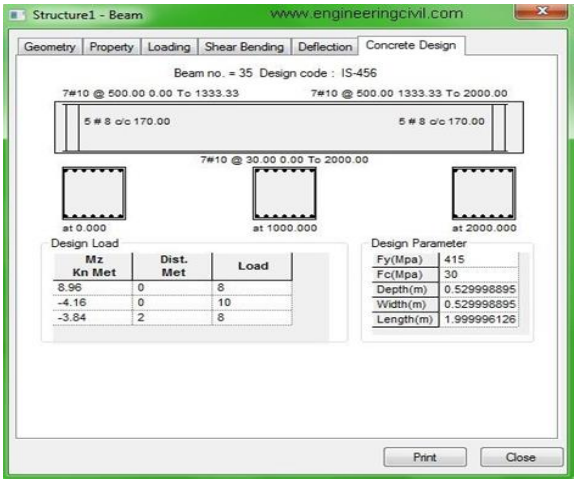
Fig.7. Structural element of the superstructure of a bridge

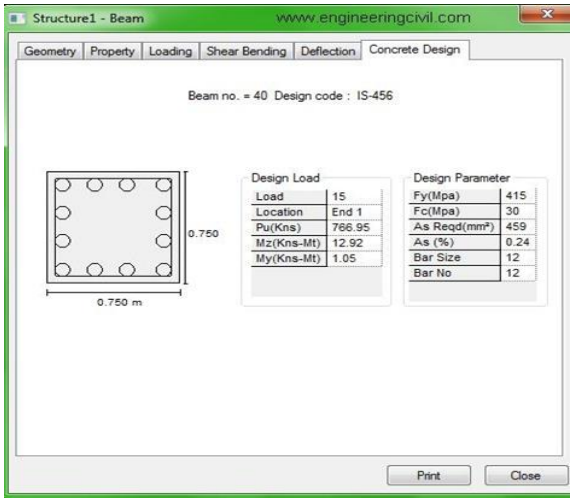
IV. SIMULATIONS

Segmentation and Geometry:









V. CONCLUSION

This project concludes the planning, analysis and design of fly rover structures. This structure reduces the traffic control and enhances the safe driving. The structure is designed as per IRC class AA loading. This project helps to Improve the urbanization of rural areas, also facilitates the connection of various system of road, such as village road, state highway and national highways.

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