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PLANNING DESIGNING AND ANALYSIS OF FLYOVEER BY USING STAAD PRO

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ABSTRACT

As the population is growing, urbanization is caused which results in increasing of traffic with usage in more number of vehicles for different means of transport. As stated above the growth of population and the usage of vehicles for their different means will automatically result in increase in flow of vehicles which is called as traffic. To overcome the issue of traffic getting jammed (which means having obstacles for free moment or flow at a particular place), there are many different ways implemented to overcome it. When coming to Highways one of the efficient ways of overcoming it is construction of a flyover.

Here in this project we are going to a design a flyover at Morampudi Junction located in Rajahmundry Andhra Pradesh along the National Highway 216A as a proposal in order to overcome the issue of traffic jam and also to reduce the rate of accidents occurring at the junction. By considering all the data collected conducting different examinations I am going to design and analyze the flyover using software STAAD Pro V8i to study Bending Moment, Shear Force, Nodal Displacement values by considering various types of loads considered are Dead Loads, Live Loads, Wind Loads, Vehicle Load which are taken from Indian Standard Codes IS – 456, IS – 800 & IRC: 6 - 2016.

1.1INTRODUCTION

A bridge is a construction having an all out length above 6m for conveying moving burdens or passerby load and across the snag, a bridge is a design which is worked over an impediment and thus giving an entry without hindering the item. The section might be for a railroad, a street, a pipeline, a valley, or a trench. The improvement of the nation in view of the framework accessible in the country. Parkway which permits the progression of people and vehicles is a significant piece of framework. the development of bridge is fundamental where there is a weighty gridlock which brings about delay for the travelers. Development of bridge will lessen the deferral and permit the vehicles to go without interference.

A bridge is a development worked to traverse actual obstructions like a waterway, valley, or street, to give section over the impediment. Plans of bridges fluctuate contingent upon the capacity of the bridge, the idea of the territory where the bridge is developed, the material utilized for development and the assets accessible to fabricate it. A bridge has three primary components. In the first place, the base (establishment) moves the stacked load of the bridge to the ground; it comprises of parts like sections (additionally called wharfs) and projections. A projection is the association between the finish of the bridge and the street conveyed by the earth; it offers help for the end segments of the bridge. Second, the superstructure of the bridge is the even stage that traverses the space between segments. At long last, the deck of the bridge. The rules for Non-direct examination for bridge structure presents an assortment of general proposals for the displaying and investigation of thruway bridges and bridges exposed to tremor ground movements, expected for the plan or assessment of the limit and pliability of basic bridge parts and frameworks.

In bridge there are basically two kind of stacking first is dead burden which is self-weight of bridge going about as a UDL and second is live burden which is consider as vehicle load which go about as a point load on the bridge and the other sort of stacking like breeze burden and effect load and so on which are taken in to the record as indicated by the circumstance. To shape a predictable premise plan, the IRC has fostered a bunch of standard stacking condition, which are considered and use while planning while at the same time planning a bridge.

The conceptional plan of flyover is finished by the assistance of STAAD professional programming. STAAD ace is an underlying investigation and plan programming application. It is quite possibly the most broadly utilized primary investigation and the plan programming item around the world. It upholds north of 90 global steel, cement, wood and aluminum configuration codes. It can utilize different types of examination from the customary static investigation to later investigation strategies like p-delta investigation, mathematical non-direct examination, clasping examination and so forth.. STAAD professional can be utilized for examination and plan of a wide range of primary activities from building and bridges to towers, burrows, metro stations, water/squander water treatment plants and then some

2. COMPONENTS OF PROPOSED SYSYTEM

India is the country with the second biggest street network across the world with 5.4 million Km. This street network helps transportation over 60% of generally merchandise in the nation and 85% of traveler traffic in India. Street transportation framework has step

by step expanded over yearswith the improvement in availability between urban communities, towns and towns across thecountry. One of the significant parts of streets if Flyover‟s.

Prologue to Flyover: Flyover might be alluded as a bridge, a h igh-level street bridge that goes across over a parkway trade or convergence. A development is worked over actual snags, for example, water bodies, valleys and streets which are accommodated section over the impediment. Plans of flyover differ contingent upon the prerequisites and functionalities of the flyover, the idea of the dirt where the flyover is built, the material that are utilized for development and the assets accessible to construct it.

Flyover The primary flyover on the planet was developed and begun in the year 1843 by the London and Croydon Railway division at Norwood Junctionrailway station to convey its barometrical railroad vehicles over the Brighton Main Line. In India the main flyover was built and permitted to access from 14 April 1965 in Kemps Corner in Mumbai. The length of the bridge was 48‟ (foot) which was built in around seven months by Shirish Patel with the consumption of 17.5 needs.

A flyover comprises of, number of ranges with sections (docks), deck, and establishment and so forth. To build a flyover this multitude of components are to be planned appropriately subsequent to investigating. For enormous development the most common way of planning and dissecting for the design becomes confounded when done physically, it consumes part of time and may prompt initiation of blunders additionally, to meet the prerequisites of the proposed development and complete the undertaking with no issues, programming's are utilized for proficient work. The product's are utilized to perform examination and planning with less exertion and no blunders with in brief timeframe, by which the planning of mind boggling flyovers become more straightforward utilizing different programming's. A portion of the product's which are by and large utilized for investigation and planning of constructions are ETABS, ROBOT STRUCTUREL ANALYSIS, STAAD.Pro V8i. A flyover has three principle components. First the base, which is known as establishment, that which assimilates and moves the heap and weight of the bridge to the ground. It comprises of parts like sections (additionally called docks) and projections. A projection is the association between end of the bridge and the street conveyed by the earth; it offers help for the end areas of the flyover. Besides, the superstructure of the flyover is the flat stage that traverses the space between segments. At last it comes to the deck of the bridge.

PRAPOSED SYSTEM

Our country being fundamentally a horticultural country, 90% of populace is relying on it and 10% of populace relying on modern exercises. For conveying the item materials, for example, food grains, modern products the streets are fundamental. The streets and bridges was extremely fundamental for development of economy of the country. The expense of trusting that the sign will change, as well as the deficiency of fuel for ignition, are both not entirely settled to be significant. Whenever it downpours, not just the parkways become overwhelmed; any remaining roads become overflowed too, making it helpful to go by flyover to keep away from flooding.[1]. Numerous strategies was foundation for investigation of bridges, for example, grillage and limited component techniques and so forth. Grillage investigation is the greatest common and comprehensively involved strategy for examination and plan of bridge. For the development of bridges with medium and long ranges Concrete that has been pre-pushed is the most ideal choice. Since Freyssinet's innovation of prestressed concrete, the material has observed boundless use in the development of long-range bridges, step by step supplanting steel, which has a high support cost because of its intrinsic hindrance of erosion in outrageous conditions. Precast braces with cast-in-situ chunks are quite possibly the most well-known kinds of superstructure in substantial bridge. For ranges of 20 to 40 meters, this type of superstructure is utilized. The most common kind of bridge in this classification is the T or I-brace bridge, which are especially famous because of its straightforward math, simplicity of erection or projecting, diminished dead loads, and cheap manufacture costs.

Presentation ABOUT GIRDER

Support:

A brace is a kind of development support bar. It is a design's really even help that

upholds more modest bars. Braces typically have an I-pillar cross area with two burden bearing spines

isolated by a balancing out web, in any case they will in like manner need a crate, Z, or other shape. Bridges

are generally built with braces.

In this current review

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Sorts of braces:

There are 3 kinds of braces, that is

1.Rolled steel support bridge

2. Plate support bridge

3. Box support bridge

1.Rolled steel brace bridge:

A moved steel brace was one that have been made by turning an unfilled steel chamber across a progression of kicks the bucket to accomplish the ideal structure. These produce 100-foot-long normalized I-bar and wide-rib pillar shapes

2. Plate brace bridge:

A plate brace was a sort of support that is made by welding plates together to deliver an ideal shape. Plate supports can be taller than moved steel braces and don't need to adjust to uniform shapes. Plate braces can traverse distances going from 10 meter to in excess of 100 m.

3. Box support bridge:

Box brace is a one sort of support it is looking like box. They are prepared up of two opposite networks, short top ribs from each, and an enormous base spine that interfaces the networks

In this study A commonplace tee pillar bridge is thinking about having the part longitudinal brace, persistent deck chunk and cross shaft, the cross supports are given a sidelong unbending nature to the bridge deck. The deck piece is plan by pigeaudsmethod and the longitudinal and cross support is configuration by courbon's technique the specific bridge model is taken then that model is examination and plan on the staad expert and furthermore investigation and plan with physically. Result are contrasting between staad expert and physically and considering the class An and class AA followed loadings.

3.1 Staad master method:

Staad master in space is Operated with unit meter and Kilo Newton. the properties of area are doled out to the bridge. Fixed Supports are taken. Quadrilateral cross section is finished by ¼ of the aspect taken followed by doling out of plate thickness.3D delivering can be seen. Loads are taken by the heaps and definitions. By Post Processing mode, Nodal dislodging, Max. Outright Stress an incentive for the bridge can be seen and Run investigation is worked. Then, at that point, go through the bridge model making a deck characterizing appropriate carriageway width in characterize street way after that IRC stacking are applied and afterward pursue as burden generator that for substantial plan code IS 456 is utilized that code is applied on all the component lastly run and investigation order is utilized to look at the outcome.

3. RESULTS AND ANALYSIS

Reaction on outer girder =w1= (350*2.53)/3=295.16kn, w2= (350*0.48)/3=56kn, total on outer girder=349.99kn

Reaction on inner girder=w1= (350*0.475)/3=55.416kn, w2= (350*2.525)/3=294.58kn, total on inner girder=351.16kn

Max S.F on outer girder (349.96*16.2)/18=314.996, max S.F on inner girder = (351.2*16.2)/18=316.04, total S.F(dl+ll) =702.11kn

Ast = 13921.38, 11 number- diameter 40mm, stirrups=10mm @250 c/c spacing provided at support, and at center 10mm @300mm c/c spacing.

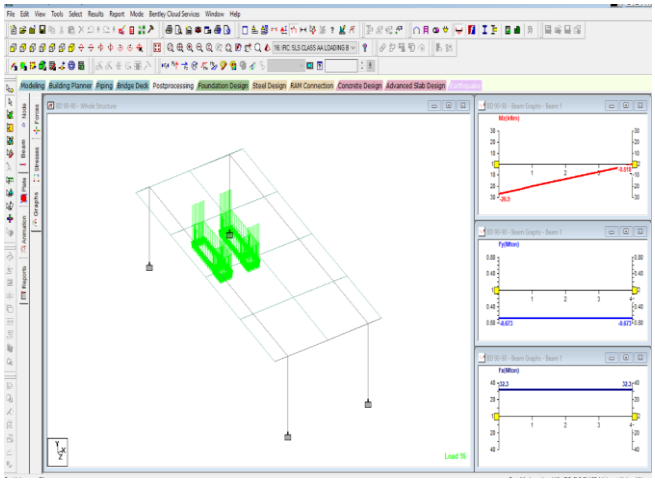


Fig 1 Class AA tracked loading in staad pro

3.1 Design of longitudinal girder for class A loading

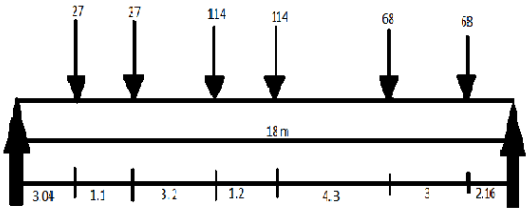


Fig 2 Arrangement of class A loadings

Reaction for outer girder=1.83 w1=0.915, reaction for interior girder= 1.33W1=0.667W

The absolute maximum bending moment always occurs under the wheel load and not in between the wheel load is occur at a section near the center of span under the heavier load which is near the center of gravity of the loading system consider

Total of load =27+27+114+114+68+68=418, x=6.42m

The c.g of the loading lies at a distance of 6.42 - 91.1+3.2+1.20=0.92, impact factor=4.5/ (6+18) =0.1875

B.M due to live load (27*1.59) + (27*1.64) + (114*3.325) + (114*4.48) + (68*2.20) + (68*0.70) =1174.18

B.M of outer girder=0.915*1.19*1174.18=1278.50kn*m, B.M for inner girder = 0.667*1.19*1174.18=931.98

Total max B.M moment (dl=ll) = 1278.50+1784.38=3062kn*m

Reaction on outer girder w1= (114*1.9)/3=72.2kn, w2= (114*0.7)/3=26.6 total w=98.8kn

Reaction on inner girder w1= (114*1.1)/3=41.8, w2= (114*2.3)/3=87.4 total w =129.2kn

Ast = 11100.6, 10 number- diameter 40mm, stirrups=10mm @250 c/c spacing provided at support, and at center 10mm @300mm c/c spacing.

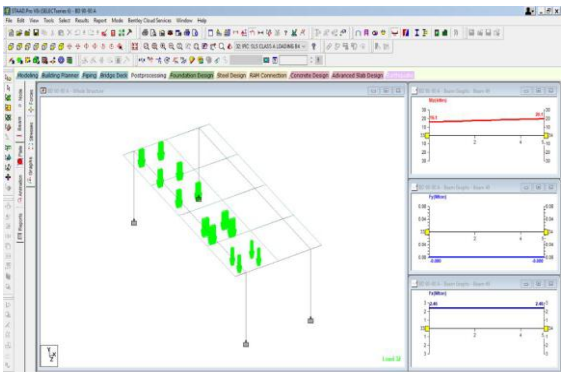


Fig 3 Class A loading in staad pro

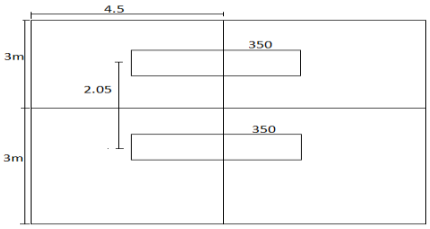


Fig 4 Design of cross girder for class AA tracked loading

Total dl on slab = 23.638kn/m

As an approximate the reaction on each girder is given by, = (23.638*6)/3=47.28

Live load bending moment and shear force for class AA loading occur for the position of the load as shown in fig

The maximum load transfer to the cross girders= (350*2.1)/3=245, assuming equal reaction on each girder = (245*2)/3=163.33kn

Live load shear force =1.1*163.33=179.66, max B.M due to L.L =354.83, max B.M due to D.L =47.27

Design B.M =402.10kn*m, design shear force= 226.93knm

Area of steel = 1557.92, 5 number - 20mm diameter, stirrups 10mm diameter @ 300mm c/c spacing

3.2 Design of kerb:

As the kerb is also a part of the deck slab the vehicular load will have influence in generating B.M in the kerb this bending moment is normally taken as 50% of the live load obtained for the slab.

Total dead load on kerb=8.2

Bending moment due to dead load= 22.68

Bending moment from slab =51.95*0.5=25.975

Design moment (dl+ ll) = 48.655 kn.m, safe in depth

Area of steel: 487mm^2, 3numbers, diameter 16mm, stirrups 8mm-@300 c/c spacing

3.3 RESULTS AND DISCUSSION:

The output data for the IRC Class AA tracked and class A loadings are considered from staad pro which include, nodal displacement summary, beam end force summary, reaction summary, axial forces, beam moments, live load effect and many more effect are consider by staad Pro. As per IRC 6-2016 bridge design for class AA loadings should be checked for class A loadings also as it is found that under certain cases heavier stress may occur under class A loadings. And as given in IRC 6-2016 for class A loading that this type of loading is adopted on all roads in which permanent bridge are constructed.

3.4 Result of deck slab panel:

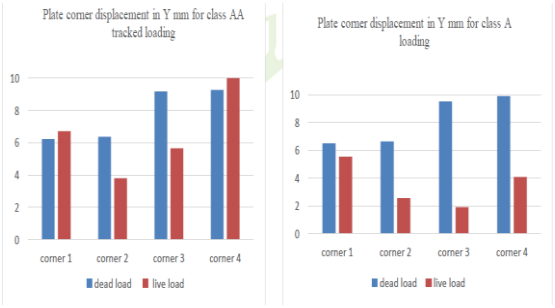


Fig 5 Staad pro result in maximum plate corner displacement Y mm

Slab bending moment and shear force result

class of loadings	bending moment(kn.m)	shear force(kn)	depth(mm)	area of steel (mm)
class aa tracked	40.664 along short span	62.689	safe	12mm @ 100mm c/c spacing
	21.13 along long span			12mm @ 150 c/c spacing
class a loading	22.45 along short span	26.28	safe	12 mm @ 170c/c spacing
	13.73 along long span			10 mm @ 190 c/c spacing

class of loadings	bending moment (kn.m)	shear force (kn)	depth(mm)	area of steel (mm)
class a	51.95	89.37	safe	main 12mm @75mm c/c spacing
				distribution 8mm @120mm c/c spacing

As the result are showing that the heavier stress is develop in class AA tracked loading, the depth in both the type of loading is safe.

3.5 Result of longitudinal girder:

Bending moment and shear force value of longitudinal girder

class of loading	bending moment (kn.m)	shear force (kn)	depth (mm)
class aa tracked (og)	3593.11	701.06	1550
class aa tracked (ig)	2814.00	702.11	1550
class a loadings (og)	3062.88	486.07	1550
class a loadings (ig)	2716.37	506.65	1550

Staad pro result

class of loadings	bending moment (kn.m)	shear force (kn)	depth (mm)
class aa tracked (og)	3315.26	688.39	1550
class aa tracked (ig)	2679.65	691.76	1550
class a loadings (og)	2843.92	465.12	1550
class a loadings (ig)	2508.46	487.54	1550

Result of cross girder

class of loadings	bending moment (kn.m)	shear force (kn)	depth (mm)
class aa tracked loadings	402.10	226.93	1550
staad pro result	370.287	204.36	1550

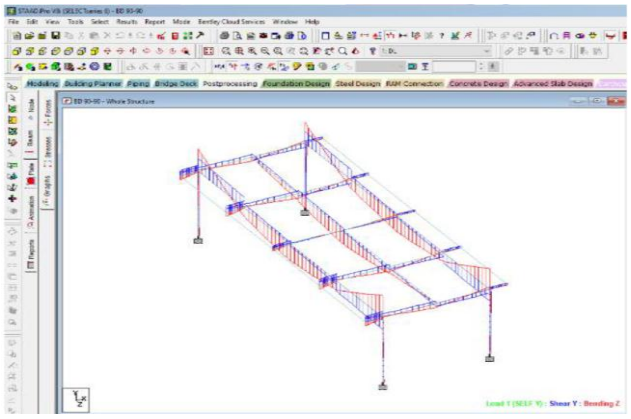


FIG 6 Bending moment and shear force due to dead load

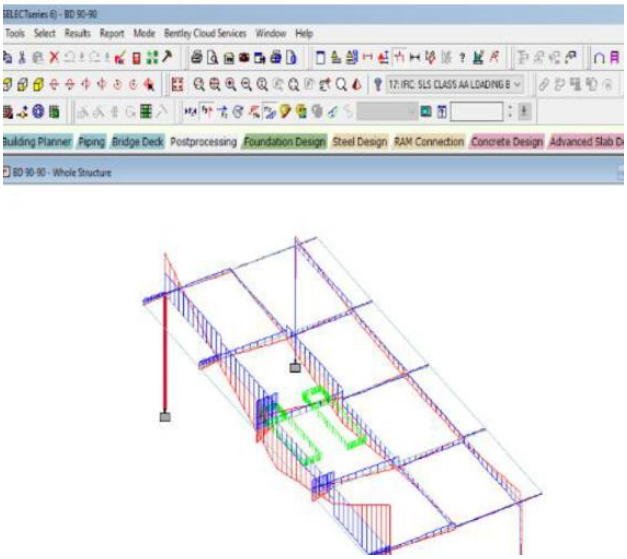


FIG 7 Live load class AA tracked loading bending moment and shear force

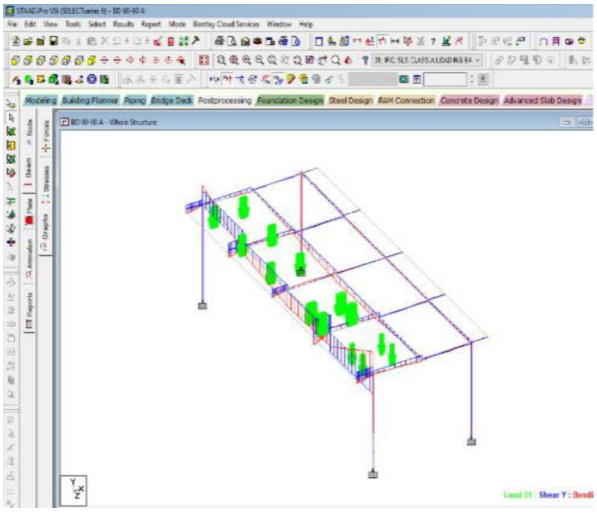
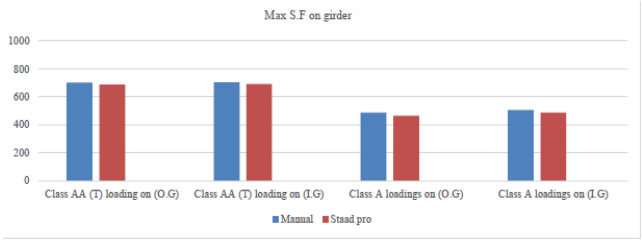
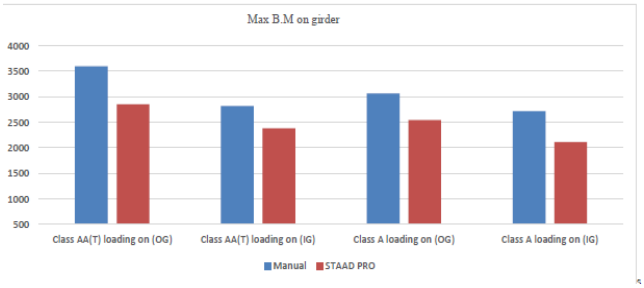


FIG 8 Live load class A loading bending moment and shear force





In this project the analysis and design of Bending Moment and Shear force has been studied. from above graphs results of bending moment and shear force are compared by manual and STADD Pro. It is also observed that the density of concrete taken in the STAAD pro is 24kn/m^3, where the density of concrete taken manually is 25kn/m^3.

CONCLUSIONS

The predefined support and separating for the bridge will be sort out by investigation the worth from staadpro. This will give the whole review and conduct of bridge Structure under various IRC loadings condition on staadpro. The product are exceptionally useful for developing the monetarily bridge structure. It's seen that the plan combination of cement taken in the staad expert is M30, physically plan by M35.Maximum BM happens inside the class AA Tracked stacking vehicle so this stacking is the most pivotal case for greatest BM in longitudinal support. The bowing second worth happen in the external support is over the twisting second worth happen inside the internal brace. The shear force esteem happen inside the internal brace is more than the shear force esteem inside the external support. Greatest SF happens for class AA Tracked vehicle stacking so class AA Tracked vehicle stacking case is the most urgent case for ideal Shear force in longitudinal brace.

Inside the plan of piece board, Maximum shear force and the greatest twisting second worth happen in the in the class AA followed stacking thus class AA followed vehicle case is the most urgent case in the term of greatest shear power and bowing second. As indicated by the courbon's technique, the absolute best significance given to the Outer Girder and Second for Inner Girder. Here we will plainly see the impact of the pigeauds strategy over the compelling width technique inside the chunk board where the pigeauds technique will be utilized for higher range, and use for two-way piece too. The staad star result almost arrives at the qualities got by courbon's strategy for class AA followed vehicle and for class A stacking, for class AA Tracked and class A loadings the staad expert outcome is diminished by 5% to 10% when contrasted with courbon's technique.

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