ANALYSIS OF METRO BRIDGE BY VARYING COLUMN DISTANCE USING E- TABS

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ABSTRACT

A metro framework is a railroad transport framework in a urban region with a high limit, recurrence and the level partition from other activity. Metro System is utilized as a part of urban communities, agglomerations, and metropolitan zones to transport expansive quantities of individuals. A raised metro framework is more favoured sort of metro framework because of simplicity of development and furthermore it makes urban regions more open with no development trouble. Extensions are the helps and supporters for the spontaneous creation of the street organize. Not exclusively do the scaffolds help in activity stream with no impedance yet in addition keep up the wellbeing of streets. Because of this reason the scaffolds configuration has increased much significance. This undertaking is essentially worried about the investigation and outline of lifted metro connect by E-tabs utilizing IRC Loading. Which contains a traverse of100m X 16m and has a 4-support framework? The goal is to check the outcome for specific information outline, properties and parameters and the approach has been taken from AASHTO standard plan. The nodal dislodging, pillar property, vehicle stacking points of interest; solid plan can be effortlessly discovered playing out the investigation and outline strategy.

***Keywords** : Elevated Metro Structure, Performance Based Design, Force Based Design*

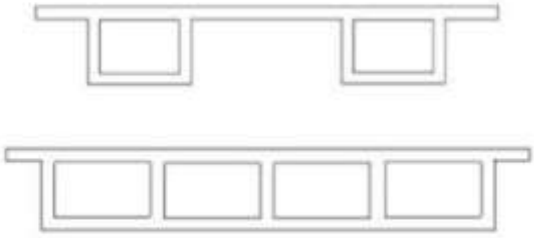
CHAPTER-1
INTRODUCTION
1.1 OVERVIEW:

A metro framework is an electric traveler railroad transport framework in a urban zone with a high limit, recurrence and the level partition from other activity. Metro System is utilized as a part of urban communities, agglomerations, and metropolitan territories to transport huge quantities of individuals at high recurrence. The review division enables the metro to move unreservedly, with less intrusions and at higher general paces. Metro frameworks are regularly situated in underground passages, hoisted viaducts above road level or level isolated at ground level. A hoisted metro auxiliary framework is more favored one because of simplicity of development and furthermore it makes urban territories more open with no development trouble. A raised metro basic framework has the favorable position that it is more financial than an underground metro framework and the development time is considerably shorter.

(A) TYPICAL ELEVATED METRO BRIDGE

Box supports are utilized widely in the development of a lifted metro rail connect and the utilization of evenly bended in design enclose brace spans present day metro rail frameworks is very reasonable in opposing torsional and distorting impacts actuated by ebbs and flows. The torsional and twisting unbending nature of box support is because of the shut area of box brace.

1.1 SINGLE SPINE BOX GIRDER



1.2 Multi Spine Box Girder

1.2 BRIDGES:

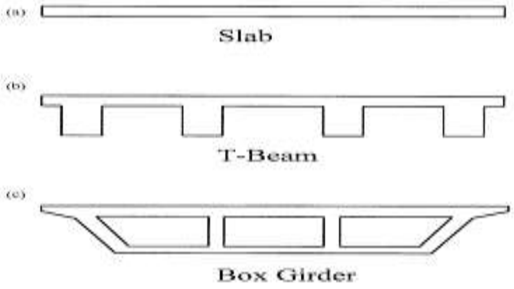
The structure of a raised metro railroad is like that of an extension. A scaffold is a structure that traverses a stream, valley or other block. Along these lines it allows a protected and smooth entry of vehicles, trains and walkers. For a raised metro railroad checks are for example streets, structures and streams. By height of the railroad it will be level isolated from different methods of movement. This empowers the metros to drive quick and safe without obstruction.

TABLE 1.1SPAN RANGE FOR COMMON BRIDGE TYPES

BRIDGE TYPE	SPAN RANGE
Pressurised concrete girder	10-300
Steel l / box girder	15-300
Steel truss	40-550
Steel arch	50-550
Concrete arch	40-425
Cable stayed	110-1100
suspension	150-2000

1.3 REINFORCED CONCRETE:

TYPICAL 1.3 REINFORCED



CONCRETE SECTIONS IN BRIDGE SUPERSTRUCTURES:
(a) solid slab; (b) T-beam; and (c) box girder
(c) Multi Cell Box Girder

SLAB:

A strengthened solid section is the most temperate extension superstructure for ranges of up to around 12 meters. They by and large require more fortifying steel and basic cement than brace sort extensions of a similar traverse. In any case, the plan points of interest and formworks are simpler and more affordable.

T-BEAM:

T-pillars are by and large monetary for ranges of 12 to 18 meters (see Figure 29b). They however require more convoluted formwork, especially for slanted scaffolds. Basic profundity to-traverse proportions are 0.07 for straightforward ranges and 0.065 for persistent ranges. The separating of braces in a T-pillar connect relies upon the general width of the extension, the piece thickness and the cost of the formwork. As general guideline the dividing of T-shaft supports might be taken as 1.5 times the auxiliary profundity.

CAST IN-SITU BOX GIRDER:

Box supports are frequently used to traverse 15 to 36 meters Its formwork for slanted structures is less difficult than that required for the T-shaft.

1.4 PRE-STRESSED CONCRETE:

Cast-in-situ pre focused on solid pieces utilizing high-quality materials are more costly than fortified solid chunks. A pre focused on piece can however convey bigger burdens and additionally traverse bigger separations than a strengthened section. A precast pre focused on section is efficient when many ranges are included. Basic traverses go from 6 to 15 meters. Basic profundity to-traverse proportions are 0.03 for both straightforward and nonstop traverses.

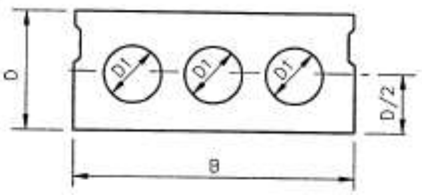


FIG 1.4 PRECAST PRE STRESSED VOIDED SLAB SECTION

PRECAST I-GIRDER:

Precast I-supports rival steel braces and by and large cost more than strengthened solid supports with a similar profundity to-traverse proportions The formwork for this support is muddled, particularly for slanted structures. Precast I-supports are prudent for ranges of 9 to 36 meters. These supports are accessible up to a length of around 50 meters. Basic profundity to-traverse proportions are 0.055 for straightforward ranges and 0.05 for constant ranges.

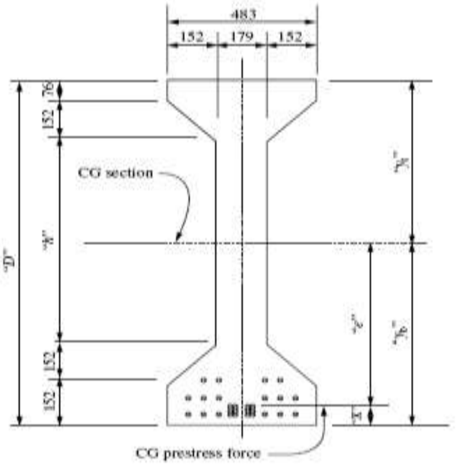


FIG 1.5 PRECAST I-GIRDER SECTION

BOX GIRDER:

The state of a cast in-situ pre focused on solid box brace is like the traditional fortified solid box support. The dispersing of the supports can be taken as double the auxiliary profundity. Pre focused on box supports can achieve ranges of 300 meters yet are generally utilized for ranges of 30 to 183 meters.

Once the traverse turns out to be too substantial the crate brace turns into a cast in-situ segmental support. Auxiliary profundity to-traverse proportions are 0.045 for basic ranges and 0.04 for nonstop traverses. Precast pre focused on box supports are accessible for ranges up to roughly 50 meters (see Figure 32). For bigger traverses various precast box brace components are associated with each other by mean of post-tensioning.

TABLE 1.2 RANGE OF APPLICATION OF SOME PRE STRESSED BOX GIRDER BRIDGES BY SPAN LENGTH

SPAN (M)	BRIDGE TYPE
30-91	Cast –in-situ post tensioned box grinder
30-91	Pre cast –balanced cantilever segmental constant depth
61-183	Pre cast –balanced cantilever segmental variable depth
61-305	Cast- in – situ cantilever segmental

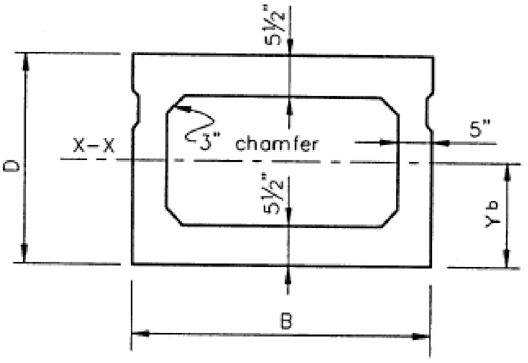


FIG 1.6 PRECAST BOX GIRDER SECTION

TRUSS BRIDGE:

The auxiliary format of a truss is appeared in Figure 33 for an extension with the deck situated at the level of the lower harmonies. The floor piece, which conveys the live load, is bolstered by the floor arrangement of stringers and cross-bars.

The heap is transmitted to the principle trusses at nodal associations, one on each side of the scaffold, through the floor framework lastly to the direction. Sidelong supports are appended to the upper and lower harmonies to oppose flat powers and additionally torsional minutes. The gateway outline at the passage gives change of flat powers from the upper harmonies to the substructure. Truss spans are frequently produced using steel, however wooden trusses can likewise be found. There are many sorts of truss scaffolds and they not all have an indistinguishable structure from portrayed previously. The capacity of truss connects however concentrates on exchanging loads through the fundamental trusses towards the orientation. Trusses are a get together of bars, not plates, and are in this manner relative simple to erect nearby and are frequently the decision for long scaffolds. Truss scaffolds can make productive utilization of the materials.

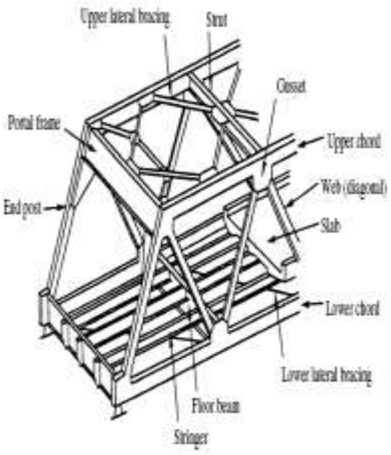


FIG 1.7 STRUCTURAL LAYOUT OF A TRUSS BRIDGE

CHAPTER-II

LITERATURE REVIEW

[1] Chu and Pinjarkar (1971)

proposed a limited component detailing of bended box-brace spans, comprising of even division plates and vertical barrel shaped shell components. The strategy can be connected just to just bolstered spans without middle of the road stomachs. Completed a limited component examination on steel and solid box-support extensions to contemplate the impact of middle of the road stomachs on the twisting and distortional stresses. proposed a component that has a shaft like-in-plane removal field. The component is trapezoidal fit as a fiddle, and consequently, can be utilized to investigate right, skew, or bended box-brace spans with steady profundity and width.

[3] William and Scordelis (1972)

Exhibited a versatile examination of cell structures of steady profundity with subjective geometry in the plane utilizing quadrilateral components.portrayed the use of the limited strip technique for the assurance of the normal frequencies and mode states of vibration of straight and bended shaft piece or box-brace spans. used the thin-walled shaft hypothesis to assess the regular modes and frequencies of a bended essentially bolstered brace of awry multi cell area. Comes about because of testing two bended cell Plexiglas models were utilized to check the proposed strategy examined the conduct of bended box-support spans utilizing the limited component technique for connected dynamic burdens. Comes about because of testing a solitary cell Plexiglas show having high bend were utilized to confirm the proposed technique.

[2] Bazant and El Nimeiri (1974)

Ascribed the issues related with the disregard of curvilinear limits in components used to show bended box shafts to the loss of progression toward the end cross areas of two assistant components meeting at a point. They built up a skew-finished limited component with shear disfigurement utilizing straight components and received a more exact hypothesis that takes into consideration transverse shear misshapenings.

[3] Fam and Turkstra (1975)

depicted a limited component conspire for static and free-vibration investigation of box braces with orthogonal limits and discretionary blends of straight and on a level plane bended areas utilizing a four-hub plate twisting annular component with two straight spiral limits, for the best and base spines, and funnel shaped components for the slanted web individuals. led a limited component strategy for the dynamic examination of bended numerous case brace spans, which framed the reason for the effect factor received by AASHTO (1980). The vehicle was recreated by two arrangements of concentrated powers having parts in the outspread and transverse headings, and moving with steady precise speeds on circumferential ways of the extension.

[4] Heins and Lee (1981)

displayed the trial comes about got from vehicle-instigated dynamic field testing of a two-traverse nonstop bended composite solid deck-steel single-cell connect, situated in Seoul. distributed consequences of exploratory tests for minute effect factors for box supports with straight arrangements. inspected the impact of a few parameters on the distortion of the cross area in bended single-cell confine shafts over those straight single-cell box bars. The parameters considered in this examination were transverse and longitudinal areas of outer burdens, traverse to-span proportion, width-to-profundity of the cell, and number of cross stomachs. introduced basic outline approximations for deciding the transverse minutes in single-traverse single-cell solid box-support spans.

[5] Mirza et al. (1990)

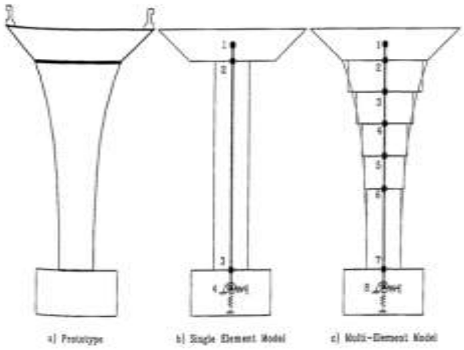
led free-vibration tests on pre focused on concrete basically upheld one-and two-cell box-support connect models. Galdos (1988), Galdos et al. (1993), and Schelling et al. (1992) examined the dynamic reaction of on a level plane bended composite multi spine box-brace extensions of various ranges, in view of a planar network limited component investigation. The moving vehicle was spoken to by two steady powers with no mass, going with consistent precise speed in a circumferential way

CHAPTER-III
METHODOLOGY

3.1 STUDY AREA:

Hyderabad is aumber city that spreads 625 sq. km. of metropolitan organization range and 6852 sq. km. of metropolitan range. It is quick rising as the centre of IT, Biotech, Parma and Tourism area. Its vital geological area, multilingual and cosmopolitan culture, enormous development potential and speculation amicable monetary arrangement are on the whole making it an alluring goal for corporates, business people, academicians and homemakers alike.

FIG 3.1 ANALYSIS AND DESIGN FLOW CHART



Outline components, viable twisting firmness, top with extensive torsional and transverse bowing solidness to catch superstructure, and powerful solidness for outriggers ought to be considered. figure demonstrates single section twisted models.

The loading vehicle details are given:
Design Code = IRCChapter 3
Loading Class = Class 70R Loading
Max. Effect = 9.39626m
Unit of Length = m
Unit of Force = kN
Combination Factor =1
No. of Traffic Lanes = 6

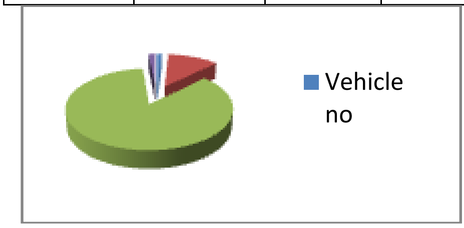
TRAFFIC LANE NUMBER 1

Lane Factor = 1
The loading vehicle details are
Width = 2900
Front Clearance = 31675
Rear Clearance = 31675
No. of Axles = 3
Vehicles travel in the roadway direction
End Lane
Traffic Lane No. 2
End Lane
Traffic Lane No. 3
Lane Factor 1
The loading vehicle details are
Width = 2900

Front Clearance = 31675
Rear Clearance = 31675
No. of Axles = 3

TABLE 3.1 VEHICLES TRAVEL IN THE ROADWAY DIRECTION-1

Vehicle no	Position x	Position y	Orientation
1	11.9501	88.219	1.5708
2	11.9501	49.689	1.5708
3	12.05	-4.35305	1.5708



GRAPH 3.2 VEHICLES TRAVEL IN THE ROADWAY DIRECTION

End Lane
Traffic Lane No. 4
Lane Factor 1
The loading vehicle details are
Width = 2900
Front Clearance = 31675
Rear Clearance = 31675
No. of Axles = 3

MATERIAL PROPERTY:

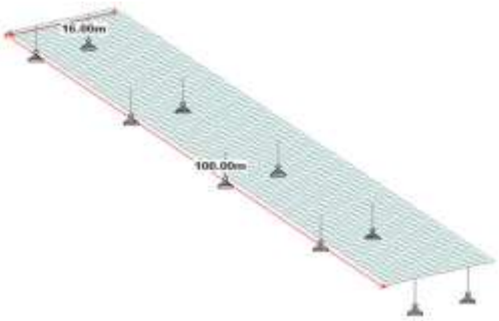
The material property considered for the present pier analysis for concrete and reinforcement steel are given in Table 3.4.

TABLE 3.2 STRUCTURE TYPES

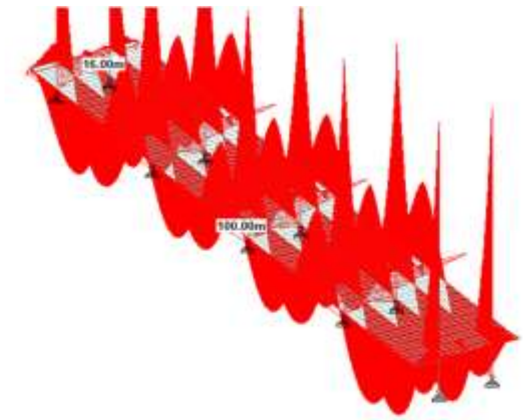
number of loads	1728	highest node	1728
number of elements	590	highest beam	2188
number of plates	1600	highest plate	2190

LOAD CASES

load of basic load cases	3
number of combination load	0



FIGS 3.3 IN STAAD.PRO



3.4 BENDING Z

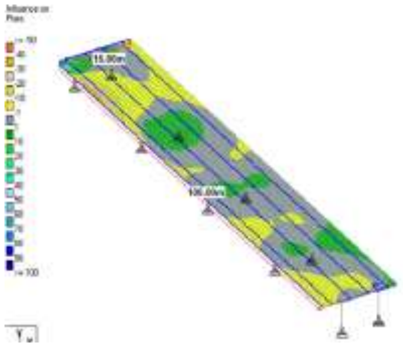


FIG 3.5 PLATE STRESSES

CHAPTER-4

RESULTS AND DISCUSSIONS

4.1 OVERVIEW

The yield information for the IRC Class 70R Bridge loadings are considered which incorporate nodal removal, nodal dislodging rundown, pillar powers, shaft end relocations, bar end uprooting outline, responses, response synopsis, hub powers, bar minutes, live load impact and numerous more by STAAD. Ace V8i. As every one of them can't be portrayed in this venture, the information result tables being expansive, a portion of the look at the yield brings about the forbidden structures is given in this beneath

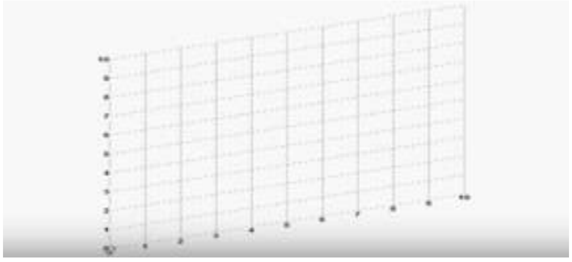


FIGURE 4.1 BASE VIEW OF BRIDGE

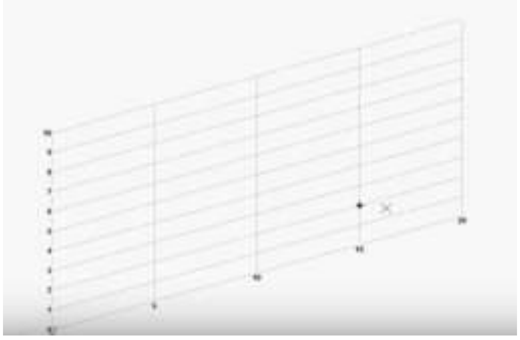


FIGURE 4.2 BASE STRUCTURE OF HORIZONTAL VIEW

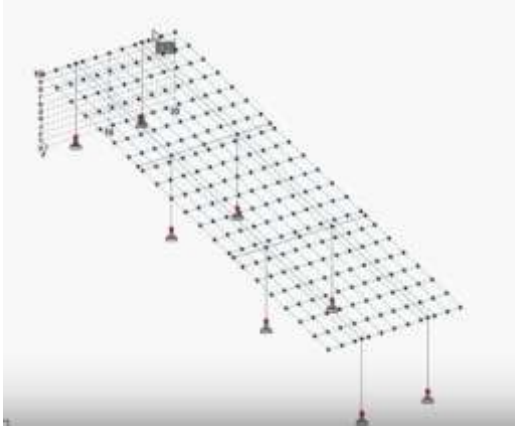


FIGURE 4.3 LINER GRIDE MODEL OF THE BRIDGE MODEL

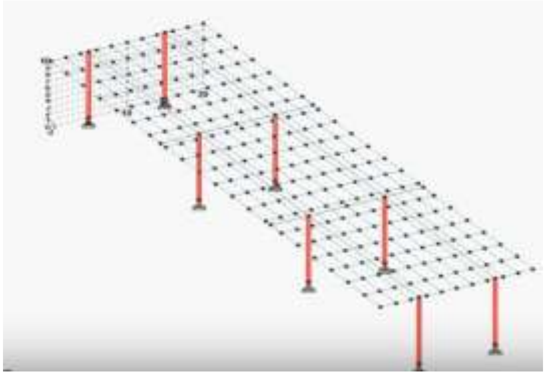


FIGURE 4.4 SELECTED BEAMS OF WHOLE STRUCTURE

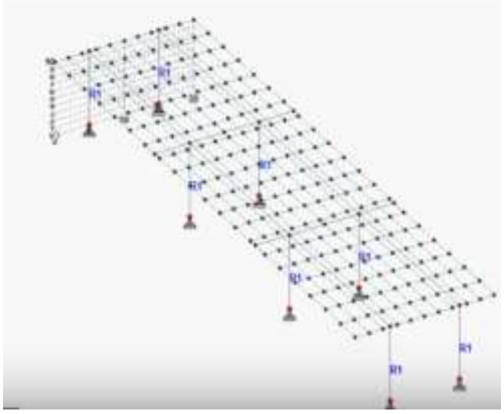


FIGURE 4.5 SHOWS THAT NODE MODEL

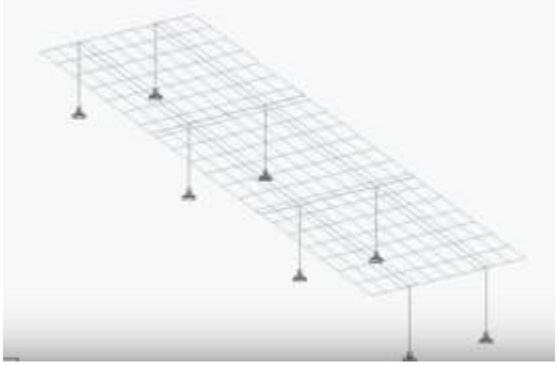


FIGURE 4.6 SELF WEIGHT OF THE WHOLE STRUCTURE

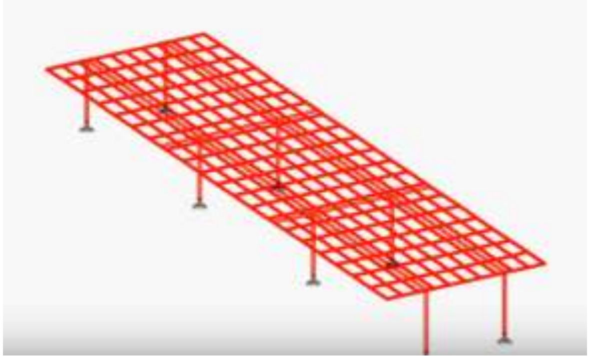


FIGURE 4.7 WHOLE STRUCTURE INITIAL LOADS

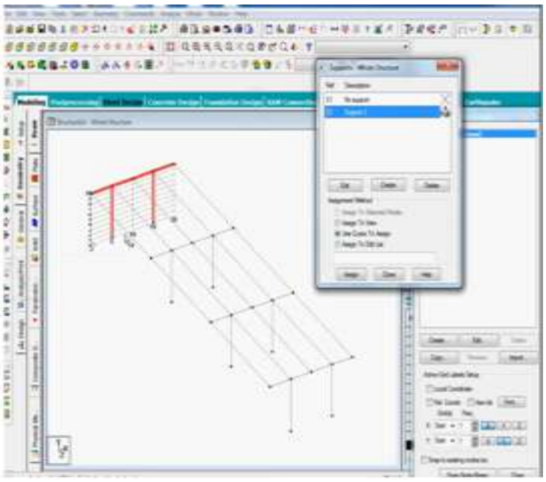


FIGURE 4.8 SHOWS THE FRAMED STRUCTURE

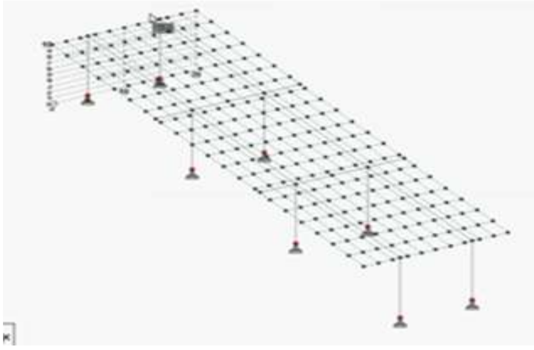


FIGURE 4.9 SHOWS NODE POINTS FOR DECK PREPARATION

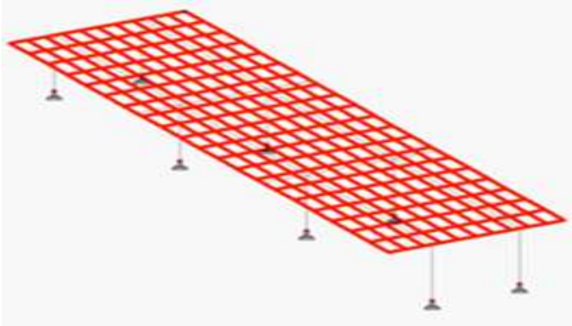


FIG 4.10 LOAD IMPACT OF THE WHOLE STRUCTURE

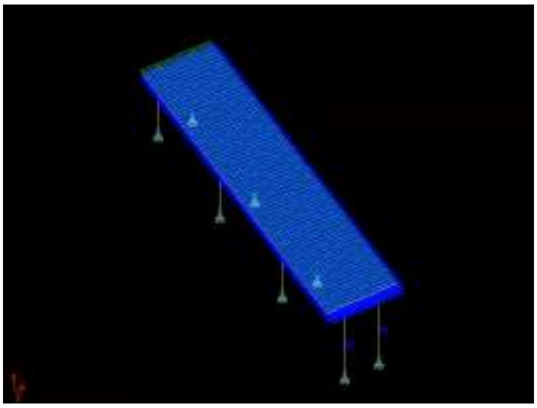


FIGURE 4.11 STATIC LOADS OF THE WHOLE STRUCTURE

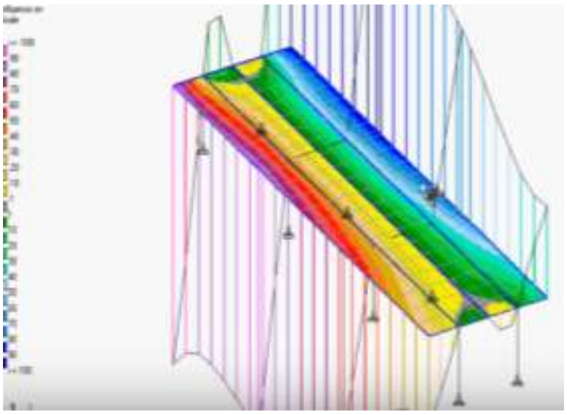


FIGURE 4.12 SHOWS THAT INITIAL DEAD LOADS OF METRO BRIDGE

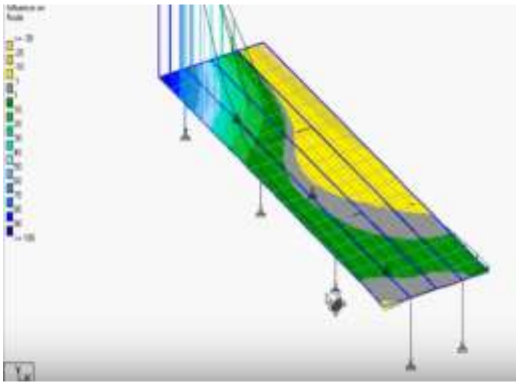


FIGURE 4.13 SHOWS THAT END DEAD LOADS OF METRO BRIDGE

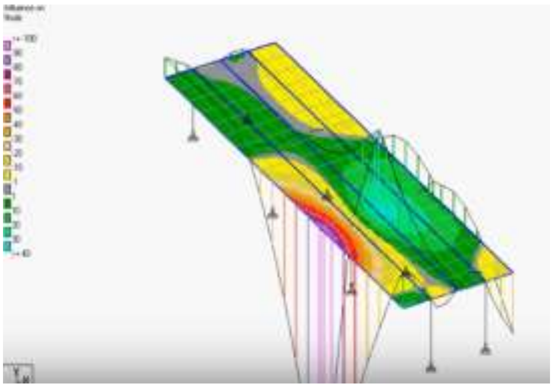
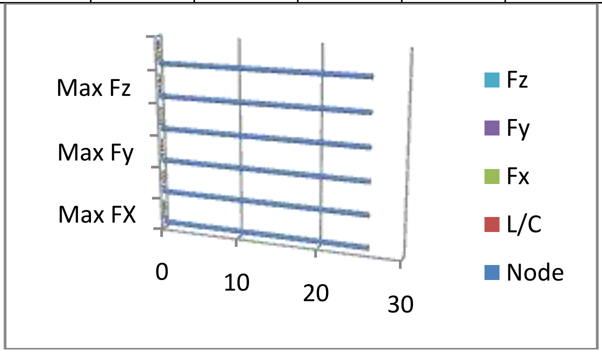


FIGURE 4.14 DIS PLACEMENT MOMENT OF THE METRO BRIDGE

TABLE 4.1 BASE PRESSURE SUMMARIES

	Node	L/C	Fx	Fy	Fz
Max FX	26	1:DL	0.000	0.000	0.000
Min Fx	26	1:DL	0.000	0.000	0.000
Max Fy	26	1:DL	0.000	0.000	0.000
Min Fy	26	1:DL	0.000	0.000	0.000
Max Fz	26	1:DL	0.000	0.000	0.000
Min Fz	26	1:DL	0.000	0.000	0.000



CHAPTER 5
CONCLUSIONS

- ➢ Analysis and plan of the lifted Metro Bridge according to IRC codes (here IRC 70R stacking) can be effectively done by STAAD.Pro. regarding STAAD.beava. component is surely knew.
- ➢ The greatest resultant nodal uprooting is for hub 1529; 0..015mm in x, -51.203mm in y and - .287mm in x.
- ➢ The greatest resultant bar end removal is for shaft 1930 and hub 1529 identical to 51.204.
- ➢ The greatest and least esteems for shaft most extreme powers by area property are figured for pivotal, shear and bowing.
- ➢ The impact of vertical stacking for 6 activity paths indicating width, front leeway, raise freedom, no. of axles, positon in x, position in y with introduction can be resolved. The introduction differs from 0 to 1.5708.
- ➢ The solid plan for component 61 gives the best and base longitudinal support is 0.540 and 0.545. The best and base transverse fortification are 0.540 and 0.780 for component 61. Additionally, for other component, it can be discovered.
- ➢ It is must for the present specialists, originators, inquire about researchers to influence a powerful commitment to what to is the reason for every top notch outline and for the change of nature of condition in which we as a whole are dwelling. In this way advancement of programming must be legitimately utilized so it meets the recipient needs.

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