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Comparative Structural Analysis of Steel Girder Bridge with Concrete Girder Bridge

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Abstract: ***Bridges are the structure constructed for sporting the railway and road traffic or other moving Loads which are moving on Bridge. Bridges are constructed on obstruction which includes a river, channel, canyon, valley, avenue or railway. If a bridge is constructed to hold highway site visitors, its miles called a dual carriageway bridge. If, but, it's far built to carry railway site visitors, it's far referred to as a railway bridge. In the present work the two models are modeled using CSI Bridge software. The models are the steel girder bridge and concrete girder bridge. The results obtained in terms of the transverse displacement, horizontal and vertical shear force, axial force and moment about horizontal and vertical axis.***
Keywords: ***steel girder, concrete girder, bridge, displacement & forces***

I. INTRODUCTION

Bridges are the structure constructed for sporting the railway and road traffic or other moving Loads which are moving on Bridge. Bridges are constructed on obstruction which includes a river, channel, canyon, valley, avenue or railway. If a bridge is constructed to hold highway site visitors, its miles called a dual carriageway bridge. If, but, it's far built to carry railway site visitors, it's far referred to as a railway bridge. In maximum part low weight metal structure were regularly prepare to the options which include pre-stress concrete and reinforce concrete. The benefits of steel shape had been its energy, economical and easy to transport and faster assembly. Steel structures were dismantling without loss to the reliability of the authentic shape. Most structural metal gadgets were prefabricated in a workshop with an advanced high-quality manage compared to In-situ production. Tolerance exact inside the Indian Standard codes for metal structural thing at some point of the fabrication erection had been small in comparison to comparable bolstered concrete structures.

II. MODELING

In the present work the structural analysis is carried out for two models i.e. steel girder bridge and concrete girder bridge. The modeling of the bridges are carried out in the CSI BRIDGE software. The modeling of these two models are in terms of the different properties and loading patterns as described follows.

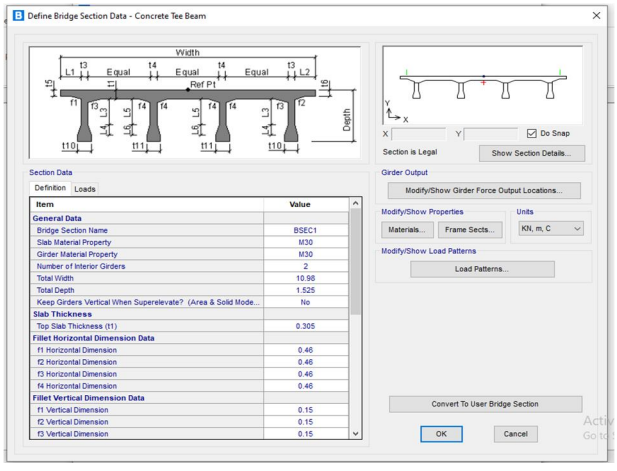

Figure 1: Bridge section data

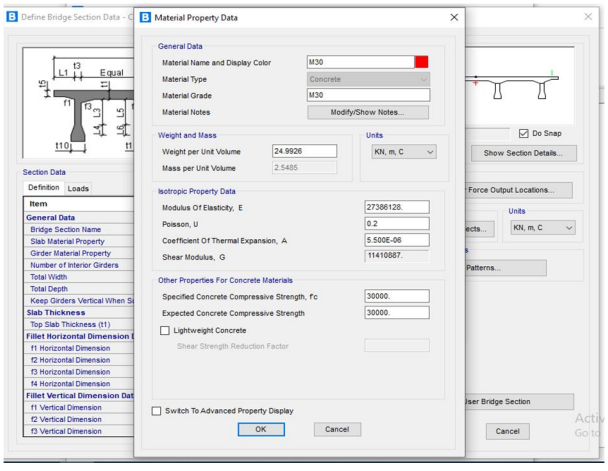

Figure 2:Material property data

The above figures is presented to gives the bridge section data and material property data which is applied for the modeling in CSI-BRIDGE software.Once the modeling is finished in the CSI BRIDGE software the different loading patterns are applied so that the analysis is carried out.

III. RESULTS

The results are obtained in terms of the displacement, forces and moments at the different locations of the bridge in both the models.

A. Model-I

The following table gives the maximum moment on model-I and it is presented for the different location of the model-I.

Table 1: Maximum moment (0 to 7.5 m) on model-I

Station m	Location Text	Girder Text	GirderDist m	ResistPos KN-m	DemandMax
0	After	Left Exterior Girder	0	0	502.4882
0	After	Interior Girder 1	0	0	251.5195
0	After	Interior Girder 2	0	0	262.9149
0	After	Right Exterior Girder	0	0	513.5138
2.5	Before	Left Exterior Girder	2.5	0	1511.9986
2.5	Before	Interior Girder 1	2.5	0	1564.7225
2.5	Before	Interior Girder 2	2.5	0	1569.5226
2.5	Before	Right Exterior Girder	2.5	0	1523.9405
2.5	After	Left Exterior Girder	2.5	0	1503.3967
2.5	After	Interior Girder 1	2.5	0	1565.8494
2.5	After	Interior Girder 2	2.5	0	1574.0857
2.5	After	Right Exterior Girder	2.5	0	1516.9584
5	Before	Left Exterior Girder	5	0	2433.8466
5	Before	Interior Girder 1	5	0	2389.7812
5	Before	Interior Girder 2	5	0	2394.9589
5	Before	Right Exterior Girder	5	0	2444.3896
5	After	Left Exterior Girder	5	0	2414.8259
5	After	Interior Girder 1	5	0	2393.1346
5	After	Interior Girder 2	5	0	2399.3347
5	After	Right Exterior Girder	5	0	2426.0571
7.5	Before	Left Exterior Girder	7.5	0	2824.9641
7.5	Before	Interior Girder 1	7.5	0	2836.5544
7.5	Before	Interior Girder 2	7.5	0	2841.3988
7.5	Before	Right Exterior Girder	7.5	0	2831.5248

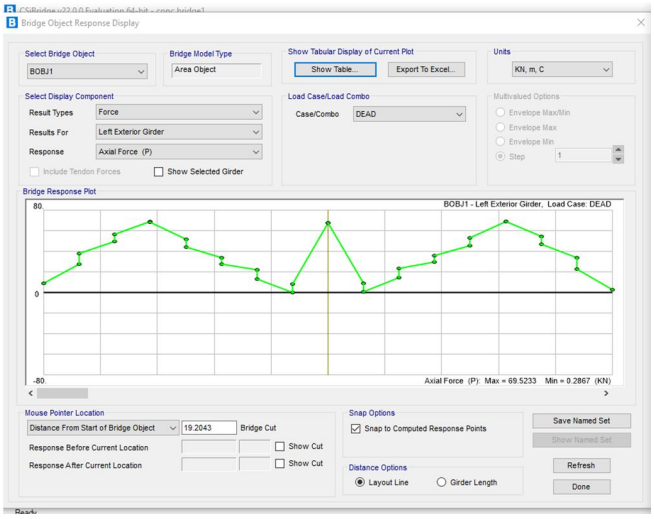

Fig.6: Axial force on left exterior girder

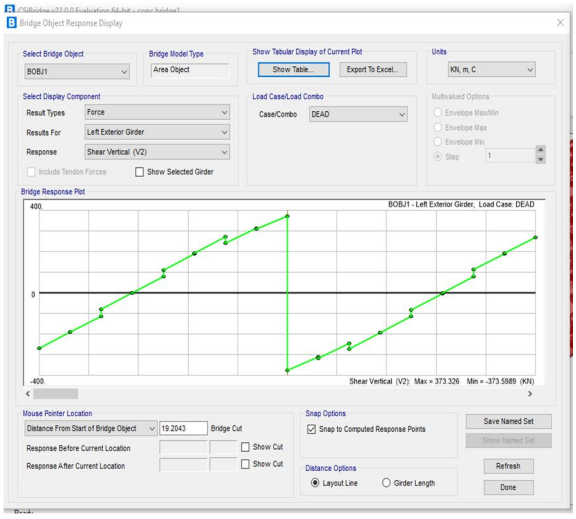

Fig.7: Vertical shear force on left exterior girder

The above figure gives the axial force diagram on the left exterior girder and the vertical shear force diagram on left exterior girder of model-I. The maximum axial force is found to be 69.52 kN while maximum shear vertical force is found to be 373.32 kN and minimum of -373.32 kN.

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B. MODEL-II

The following figures gives the results related to stress and moments of the model-II.

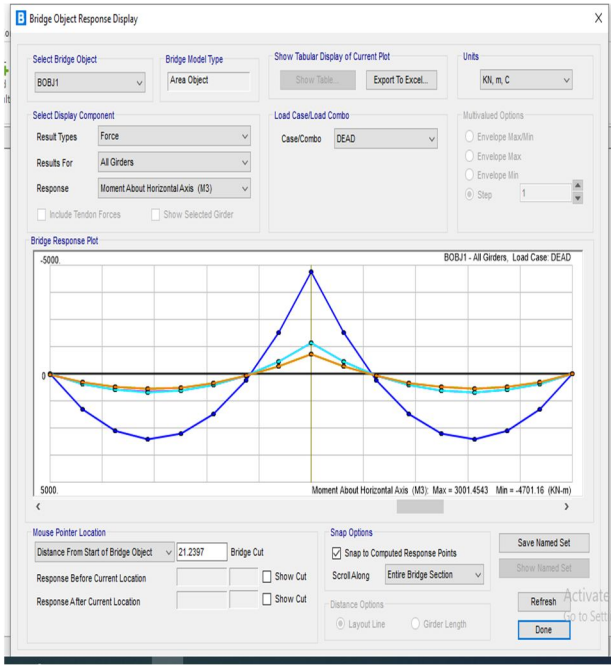

Fig. 8: moment about horizontal axis (Model-II)

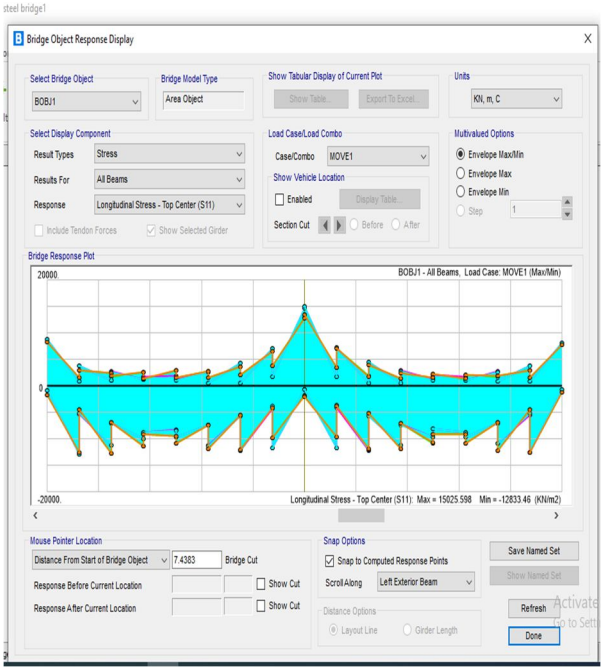

Figure 10:Longitudinal stress (top centre)-all beams for model-II

The above figures explained about the moment diagram about the horizontal axis and the longitudinal stress diagram for all beams in case of model-II. Maximum positive moment is found to be 30001.45 kNm while maximum negative moment is found 4701.16 kNm. The maximum longitudinal stress is found to be 15025.52 kN/m^2.

IV. CONCLUSION

The conclusions from the above study are as follows:

A. Steel girder bridge and concrete girder are presented in the present work
B. CSI Bridge software can be used effectively for the modeling and obtaining the results.
C. The displacement for the concrete girder bridge is minimum as compared to steel girder bridge
D. The axial force is higher in the steel girder bridge compared with the concrete girder bridge
E. The longitudinal stress is higher in the concrete girder bridge

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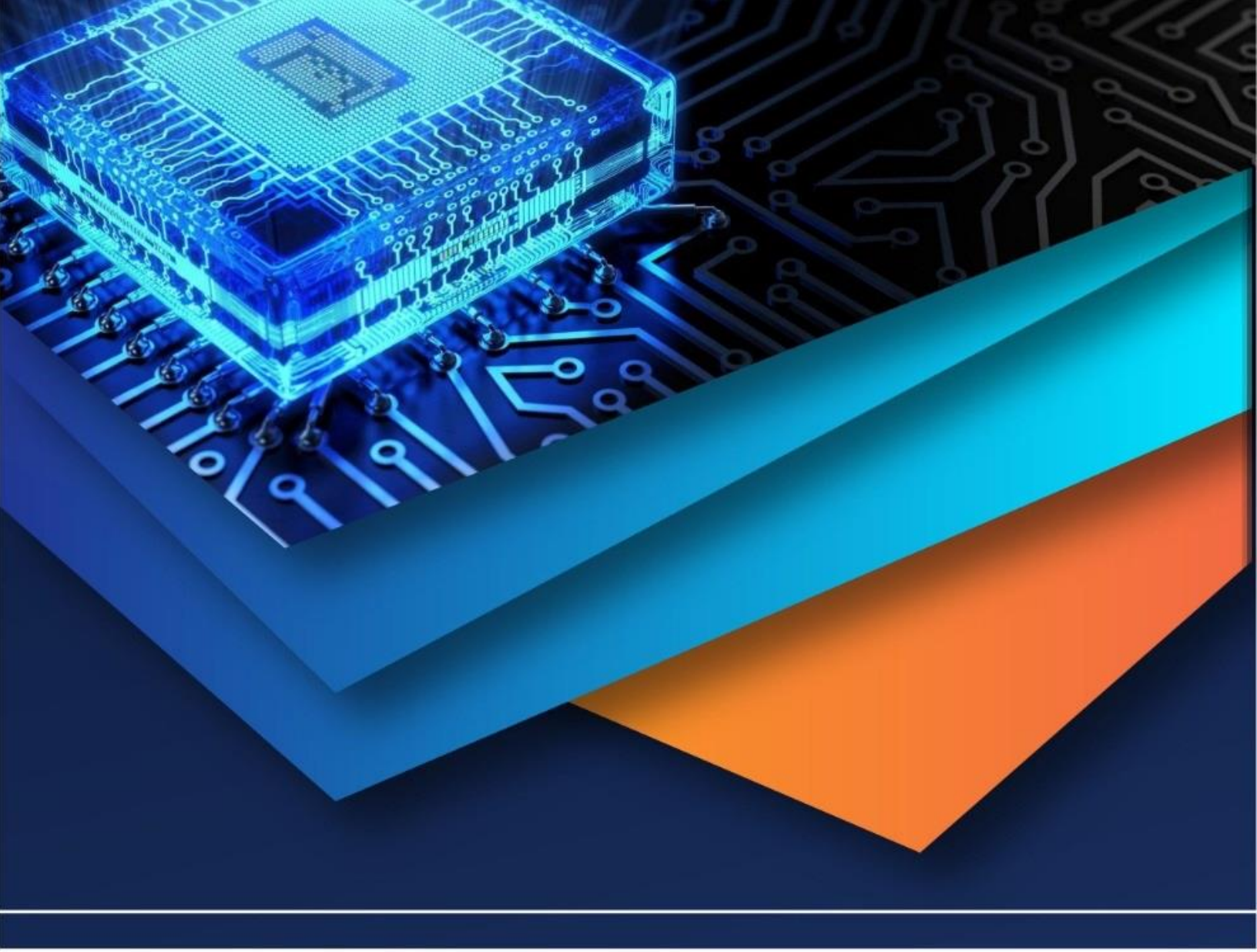

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