

Comparative Study of Concrete T Beam Girder Bridge under IRC Loading Conditions using STADD Pro V8i Software

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ABSTRACT

In this study, a comparative study based on different type of bridges i.e. Deck using finite element analysis in STAAD PRO is prepared, considering same loading class 70-R as per I.R.C. loading, comparative study based on different types of bridges that is simple girder deck and T Beam girder, two models have been prepared for the consideration of the study.

STAAD PRO software which is based on the application of Finite Element Method. This software is a widely used in the field of structural design and analysis. Now a day this software is very much friendly for the analysis of different type of structures and to calculate the result at every node & element wise.

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INTRODUCTION T-BEAM

T-beam utilized as a part of construction, is a load bearing structure of reinforced concrete, wood or metal, with a t-formed cross area. The highest point of the t-molded cross segment fills in as a flange or pressure part in opposing compressive stress. The web (vertical area) of the beam beneath the compression flange serves to oppose shear stress and to give more noteworthy detachment to the coupled strengths of bending.



Figure 1 T-Beam Crosssection View

OBJECTIVES

1. Modeling analysis and design of simple girder deck and T Beam girder.
2. To determine the most suitable type of Beam Girder for Deck Slab Bridge.

METHODOLOG

In this study, I am focusing the analysis using finite element method using analysis tool STAAD PRO, which is capable of applying all conditions and methods with respect to preferred standard code.

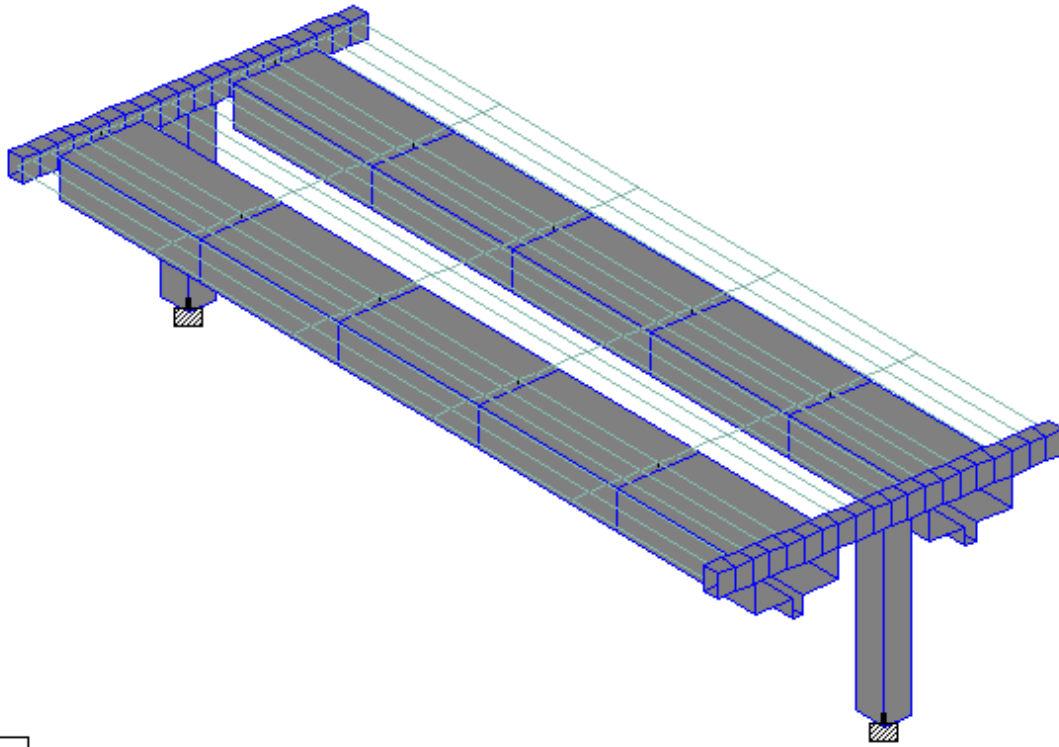


Figure 2 T Beam Bridge

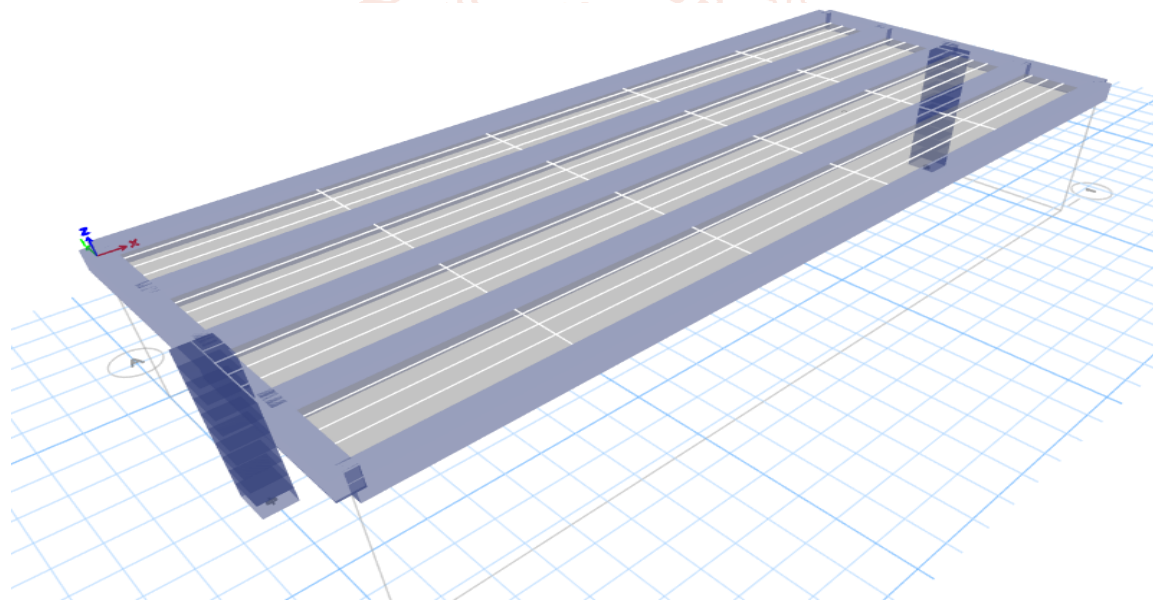


Figure 3 Ordinary deck 3D view

RESULTS

Comparison Between Ordinary Beam Deck & T Beam Ordinary Deck.

Max Displacement

- T Beam Ordinary Deck shows least displacement in all conditions i.e. 4.145mm, 34.378 mm, 25.271 mm in X, Y & Z directions in comparison to Ordinary Beam Deck 7.116mm, 38.742 mm, 29.672 mm in X, Y & Z directions.

Table 1 Shows Comparison of Displacement for Ordinary Beam and T Beam

	Ordinary Beam Deck	T Beam Ordinary Deck
	X mm	X mm
Max X	7.116	4.145
	Ordinary Beam Deck	T Beam Ordinary Deck
	Y mm	Y mm
Max Y	38.742	34.378
	Ordinary Beam Deck	T Beam Ordinary Deck
	Z mm	Z mm
Max Z	29.672	25.271

Max Displacement Graphs
Graphs Shows Comparison of Displacement for Ordinary Beam and T Beam Deck

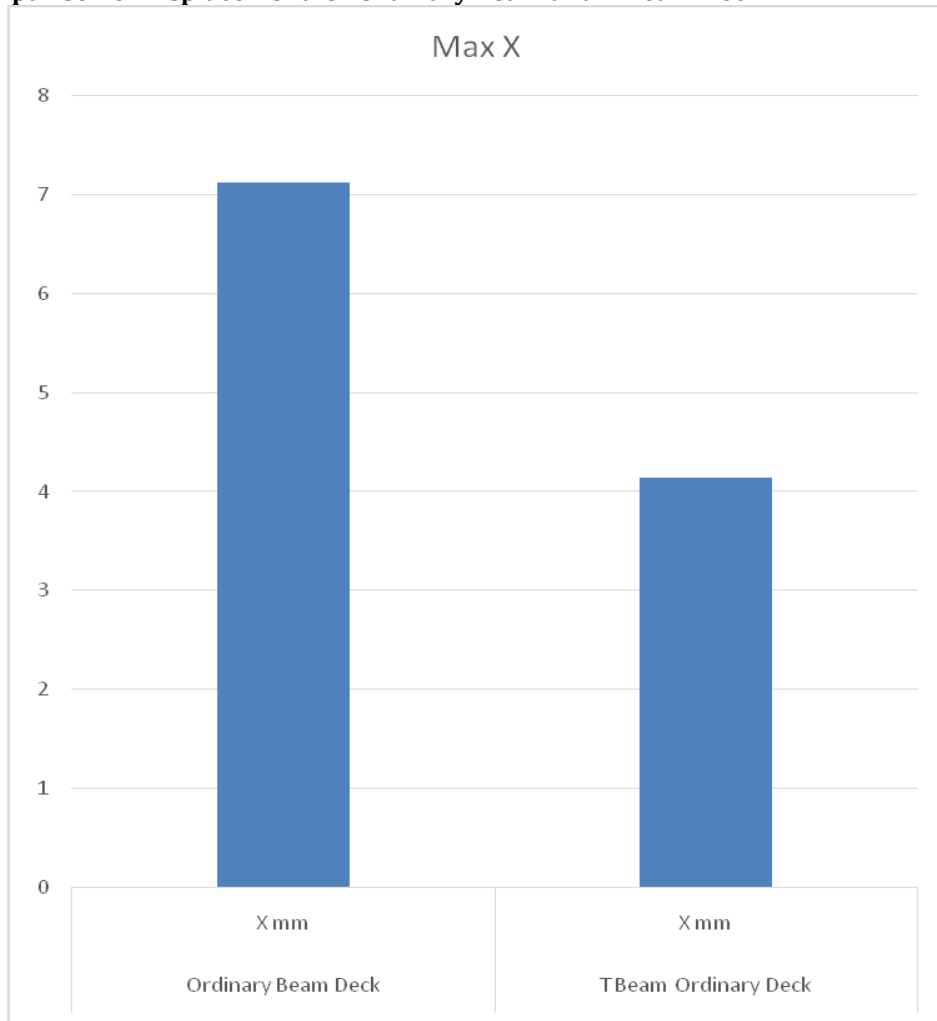


Fig.4: Max. Displacement in X Direction

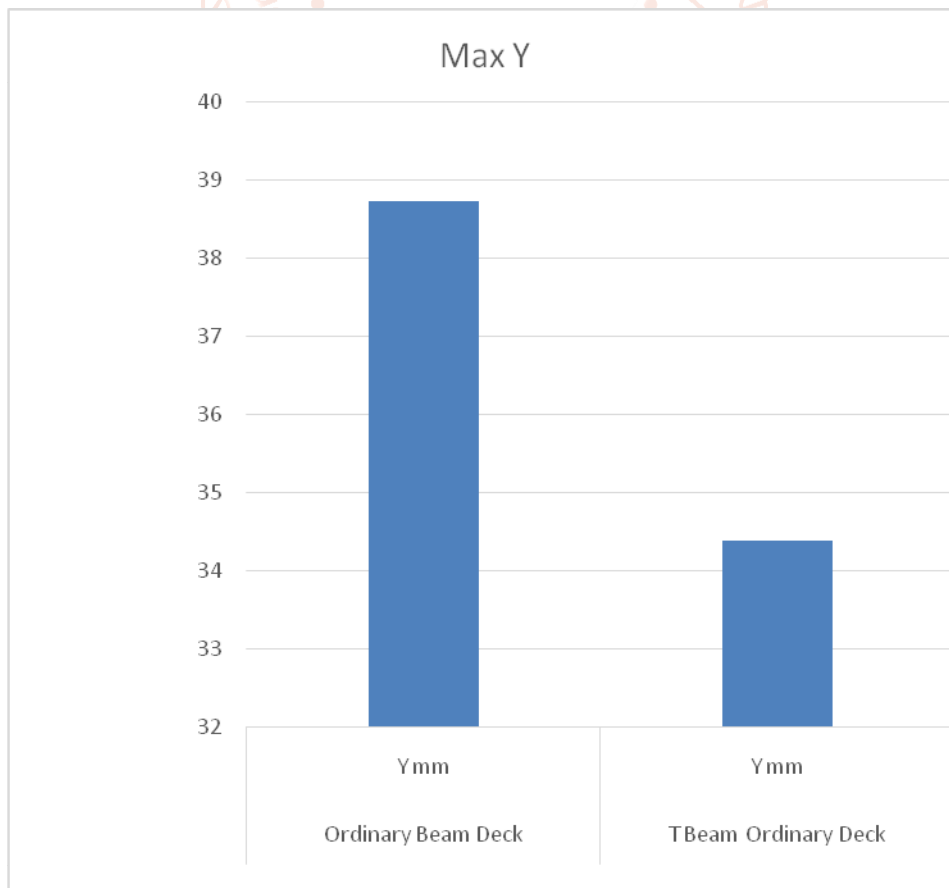


Fig.5: Max. Displacement in Y Direction

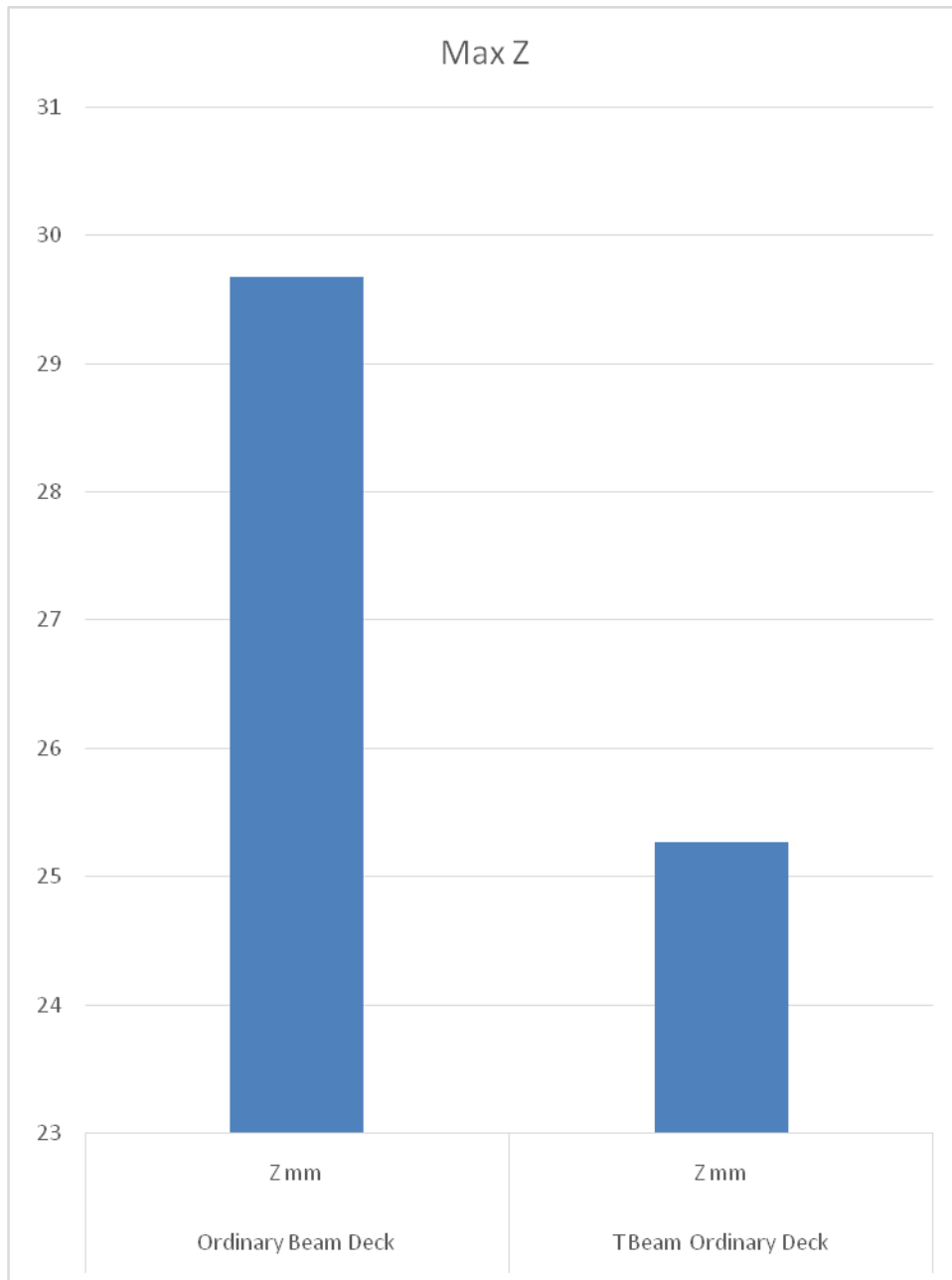


Fig.6: Max. Displacement in Z Direction

Max Forces and Moment

- T Beam Ordinary Deck shows least shear force in all conditions i.e., 9744.066 Kn, 2612.869 Kn & 411.447 Kn in X, Y & Z directions in comparison to Ordinary Beam Deck.
- T Beam Ordinary Deck shows least bending moment in all conditions i.e. 3260.751 Kn-m, 2602.017 Kn-m, 8558.537 Kn-m in X, Y & Z directions in comparison to Ordinary Beam Deck.

Table 2 Shows Comparison of Max Forces and Moment for Ordinary Beam and T Beam Deck

	Ordinary Beam Deck	T Beam Deck
	Fx kN	Fx kN
Max Fx	8447.702	9744.066
	Ordinary Beam Deck	T Beam Deck
	Fy kN	Fy kN
Max Fy	3298.134	2612.869
	Ordinary Beam Deck	T Beam Deck
	Fz kN	Fz kN
Max Fz	2491.052	411.447

	Ordinary Beam Deck	T Beam Deck
	Mx kNm	Mx kNm
Max Mx	1207.316	3260.751
	Ordinary Beam Deck	T Beam Deck
	My kNm	My kNm
Max My	4202.252	2602.017
	Ordinary Beam Deck	T Beam Deck
	Mz kNm	Mz kNm
Max Mz	14848.575	8558.537

Graphs Shows Comparison of Forces and Moment for Ordinary Beam and T Beam Deck

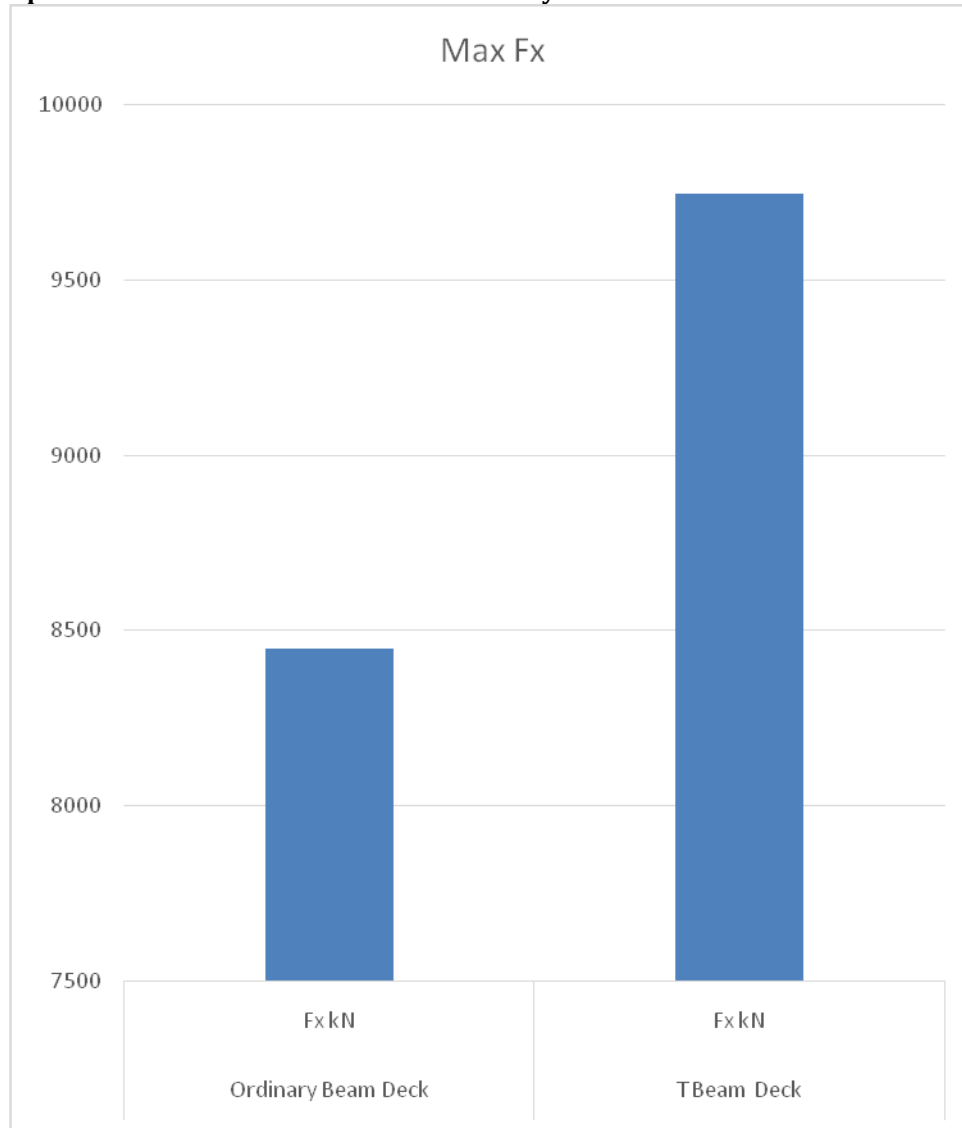


Fig.7: Max. Force in X Direction

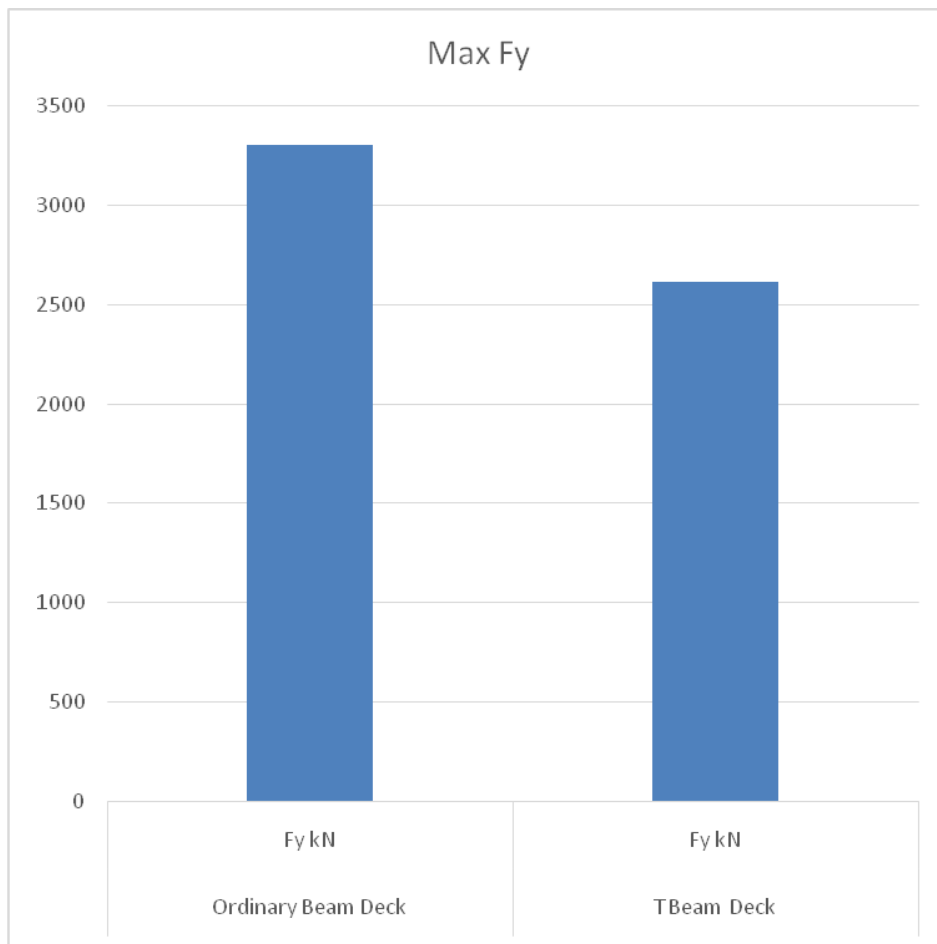


Fig.8: Max. Force in Y Direction

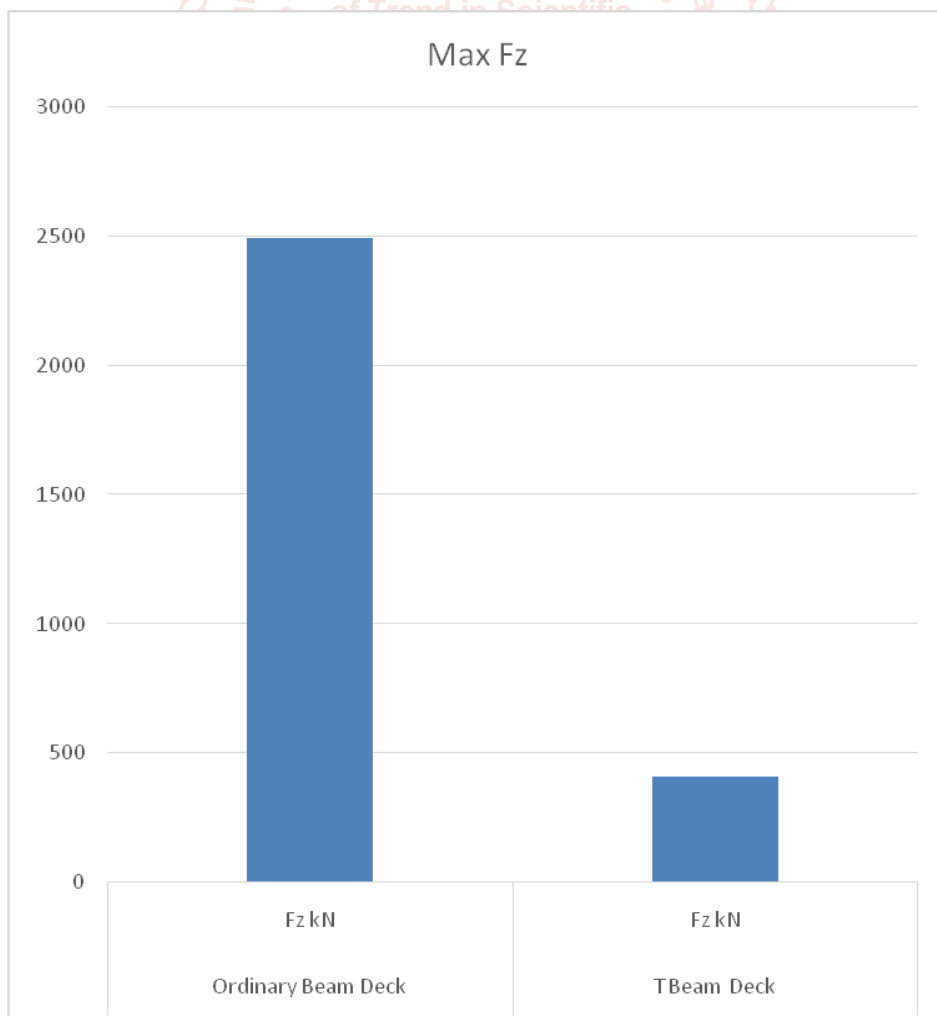


Fig.9: Max. Force in Z Direction

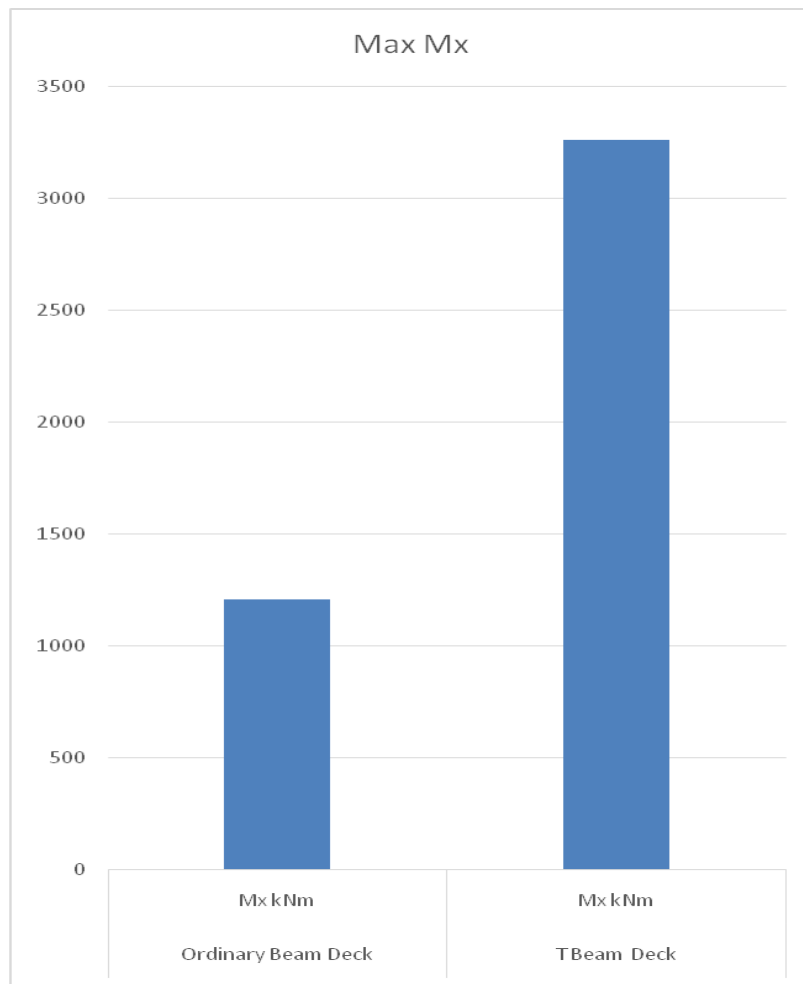


Fig.10: Max. Bending Moment in X Direction

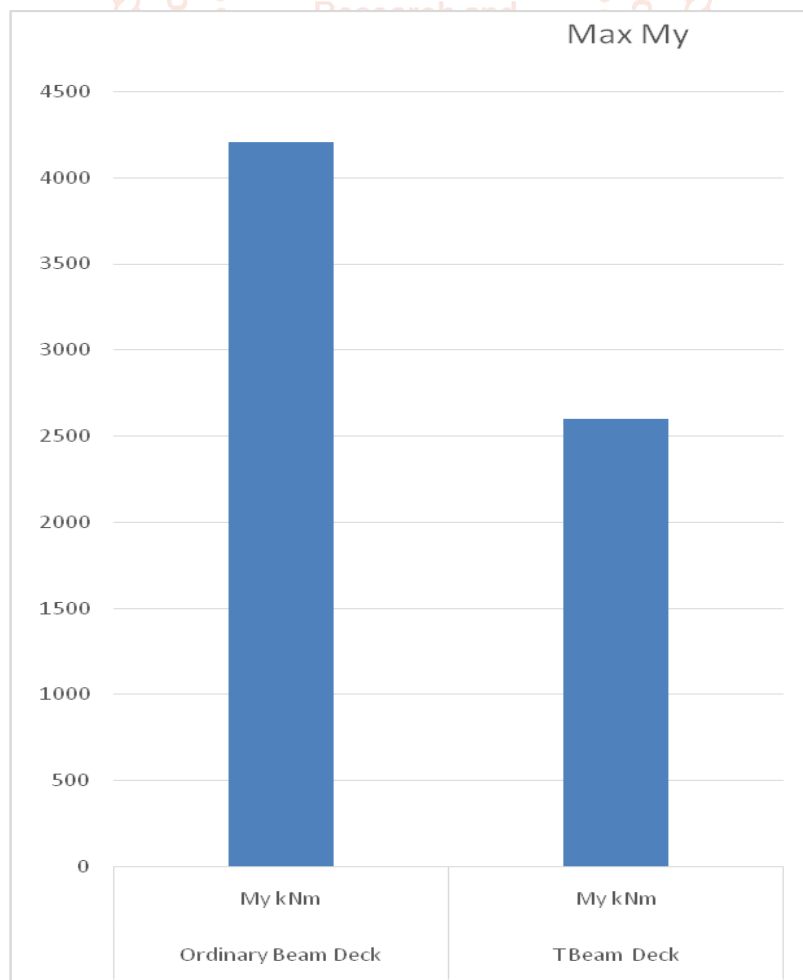


Fig.11: Max. Bending Moment in Y Direction

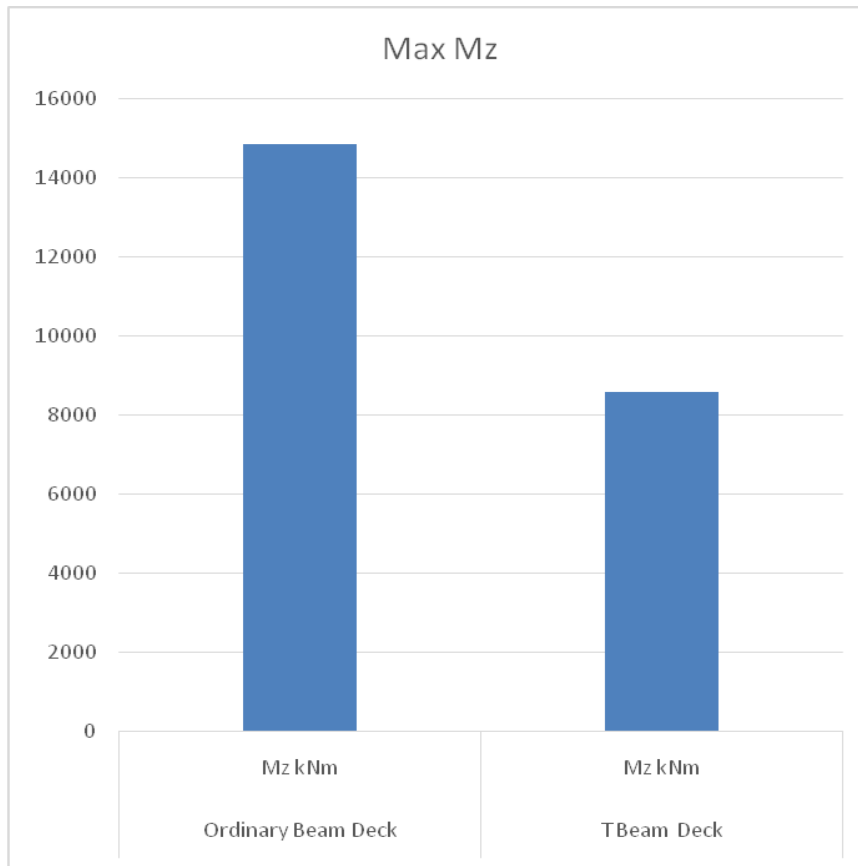


Fig. 5.9: Max. Bending Moment in Z Direction

CONCLUSION

- T Beam Ordinary Deck shows least displacement in all conditions i.e. 4.145mm, 34.378 mm, 25.271 mm in X, Y & Z directions in comparison to Ordinary Beam Deck 7.116mm, 38.742 mm, 29.672 mm in X, Y & Z directions.
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