

Computer Aided Steel Tracks On Non-Ballasted Foundations

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Abstract - The transportation of the material like hot metal having temperature more than 1700 degree C is the important material in the industry if the CI pipe production. As the transportation of such material from one point to other point is the concern and therefore the railway road is to be constructed in such industries. Therefore the presented work is to carry out the modeling of the non ballasted railway track to transport the material from one point of the industry to other without any delay or obstruction. The excavation should be minimum as this will lead to the big cost of excavation and therefore avoided. The tracks are modeled in STAAD-PRO considering the steel section to be introduced on the required platform without ballast. The results are obtained in terms of the displacement, reaction, beam forces and stresses.

Keywords: non ballast, standard gauge, steel section

1. INTRODUCTION

The large excavation is carried out in the generalized railway track construction and therefore the different layers of the excavation including the base layer, other layers of ballast and sleepers are to be avoided in the non ballasted railway track foundation in the present work. The optimal solution is the preparation of the track without ballast as the construction is totally for the railway track. The length of the track is about 210 m as the land is in the industry. The material near to the site shall be used to construct such track and the cost shall be minimized as much possible. The optimization in the excavation is to be carried out so that the construction cost shall not be much high.

2. REVIEW OF LITERATURE Konstantinos et al studied the research work related to the application of the plate track as well as the cast in situ track for the network of the railway. The

transitional zones are constructed so that the parts of the ballast less track is possible. It was observed that the unwanted changes in the members are observed and it is quite seen. The transitional zones are the one studied by the author made a smooth transition from the plate track to the ballast bed track and this leads to the proper operation of the track.

Dileyni et al also studied that it was easy way to construct the track with the technique of STEDEF as the slab thickness was found to be minimum and the adaptability at the high speed was the main observation in the study carried out by the authors. The results also stated that the observation of low stress level in the track and that leads to the allow of the concrete but due care is to be taken while construction.

Shengyang et al studied the model with crack length as the length in smaller dimension possible in the study. The comparison was carried out and it was observed that the MIF factors was high and also the high ration of the crack growth in the structure.

3. ANALYSIS

The analysis of non ballasted track is analyzed in STAAD-PRO and consider the length as 210 m, height as 2.05 m and the gauge is to be standard, broad and narrow gauge.

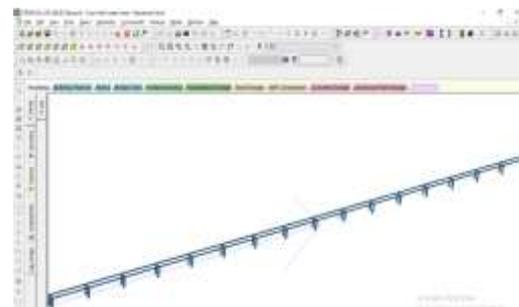


Fig.1: 3D view of non ballasted track

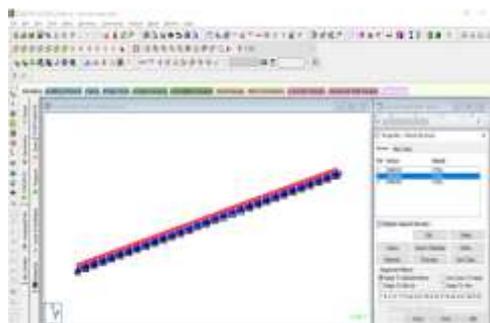


Fig.2: Steel properties assigned to non ballasted track

3. RESULT

The results of the modeling of non ballasted track is as follows:

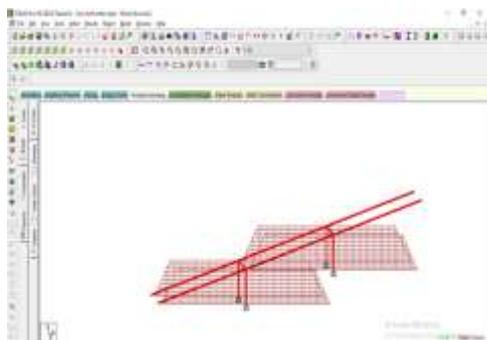


Fig.3: Axial Force on the element of non ballasted track

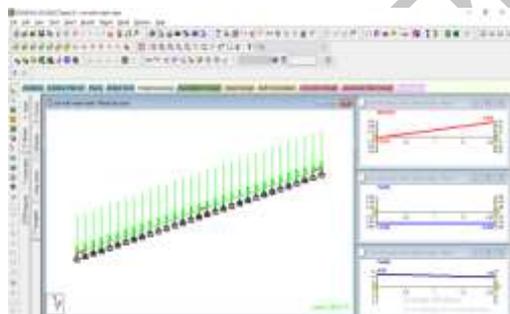


Fig.4: Force & Moment Graph for one element of non ballasted track



Fig.5: Bending moment on the non ballasted track

Table 1: Displacement of non ballasted track

	Node	Hori. X mm	Verti. Y mm	Hori. Z mm	Resul. mm
Max X	3	0.024	-0.01	0	0.026
Min X	123	-1.055	-0.034	0.001	1.056
Max Y	1	0	0	0	0
Min Y	119	-1.002	-0.05	0.001	1.003
Max Z	123	-1.055	-0.034	0.001	1.056
Min Z	124	-1.055	-0.034	-0.001	1.056
Max Rx	123	-1.055	-0.034	0.001	1.056
Min rX	124	-1.055	-0.034	-0.001	1.056
Max rY	124	-1.055	-0.034	-0.001	1.056
Min rY	123	-1.055	-0.034	0.001	1.056
Max rZ	123	-1.055	-0.034	0.001	1.056
Min rZ	3	0.024	-0.01	0	0.026
Max Rst	123	-1.055	-0.034	0.001	1.056

Table 2: Reactions on the non ballasted track

	Node	Hori. Fx kN	Verti. Fy kN	Hori. Fz kN
Max Fx	1	18.487	33.237	0.457
Min Fx	121	-0.675	12.005	0.006
Max Fy	117	15.679	42.862	0.457
Min Fy	1	0.405	7.203	0.004
Max Fz	1	18.487	33.237	0.457
Min Fz	2	18.487	33.237	-0.457
Max Mx	1	18.487	33.237	0.457
Min Mx	2	18.487	33.237	-0.457
Max My	121	6.454	32.238	0.457
Min My	122	6.454	32.238	-0.457
Max Mz	5	-0.221	13.296	0.006
Min Mz	117	15.679	42.862	0.457

Table 3: Beam forces on the non ballasted track

	Beam	Node	Fx kN	Fy kN	Fz kN
Max Fx	144	117	38.287	-15.679	0.457
Min Fx	82	67	-2.751	-9.167	0.088
Max Fy	152	119	7.609	10.428	0.128
Min Fy	1	1	28.662	-18.487	0.457
Max Fz	3	4	0.33	-3.681	2.813
Min Fz	3	3	0.33	3.681	-2.813
Max	149	121	27.663	-6.454	0.457
Min Mx	150	122	27.663	-6.454	-0.457
Max	6	7	0.505	3.681	-2.813
Min My	2	4	18.171	-12.862	-0.457
Max	152	119	7.609	10.428	0.128
Min Mz	144	117	38.287	-15.679	0.457

Table 4: Maximum compressive and tensile stress in non ballasted track

Beam	Max Compressive			Max Tensile		
	Stress	Dist m	Corn.	Stress	Dist.	Corn.
151	0.156	0.5	1	-0.149	0.5	3
	130.93	0.5	1	-	0.5	3
	196.63	0.5	1	-	0.5	3
	157.31	0.5	1	-	0.5	3
	0.234	0.5	1	-0.223	0.5	3
	0.14	0.5	1	-0.134	0.5	3

4. CONCLUSION

The above work gives the following conclusions:

- i. The non ballasted track is possible when to construct the fast tracks.
- ii. The excavation in case of general railway track is not needed.
- iii. This type of track can be constructed in the Industrial zone only.

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