1. Abstract

The objective of this case study is to analyze the structural integrity of the Electric Overhead Travelling (EOT) Double Girder (DG) Crane Assembly when subjected to self-weight and the static load at its operating condition (i.e., 120T, 25 T). A finite element analysis (FEA) is conducted to determine the Stresses and Deformed Shape.

Keywords**: Static Analysis, Crane Assembly, Hypermesh, Radioss**

2. Introduction

The Crane Assembly is required to evaluate in the Gravity load/working conditions. There are different cases considered while evaluating the structure like 120T, 25T load acting on the Crab on either sides. Along with these masses there was other case with 6000 kg as a uniformly distributed load. The entire assembly was constrained at the wheels of driving and idle girders. The carb was assumed at the different locations on the girders (extreme left, extreme right and at the center) while loading with the 6000 kg load as a uniformly distributed.

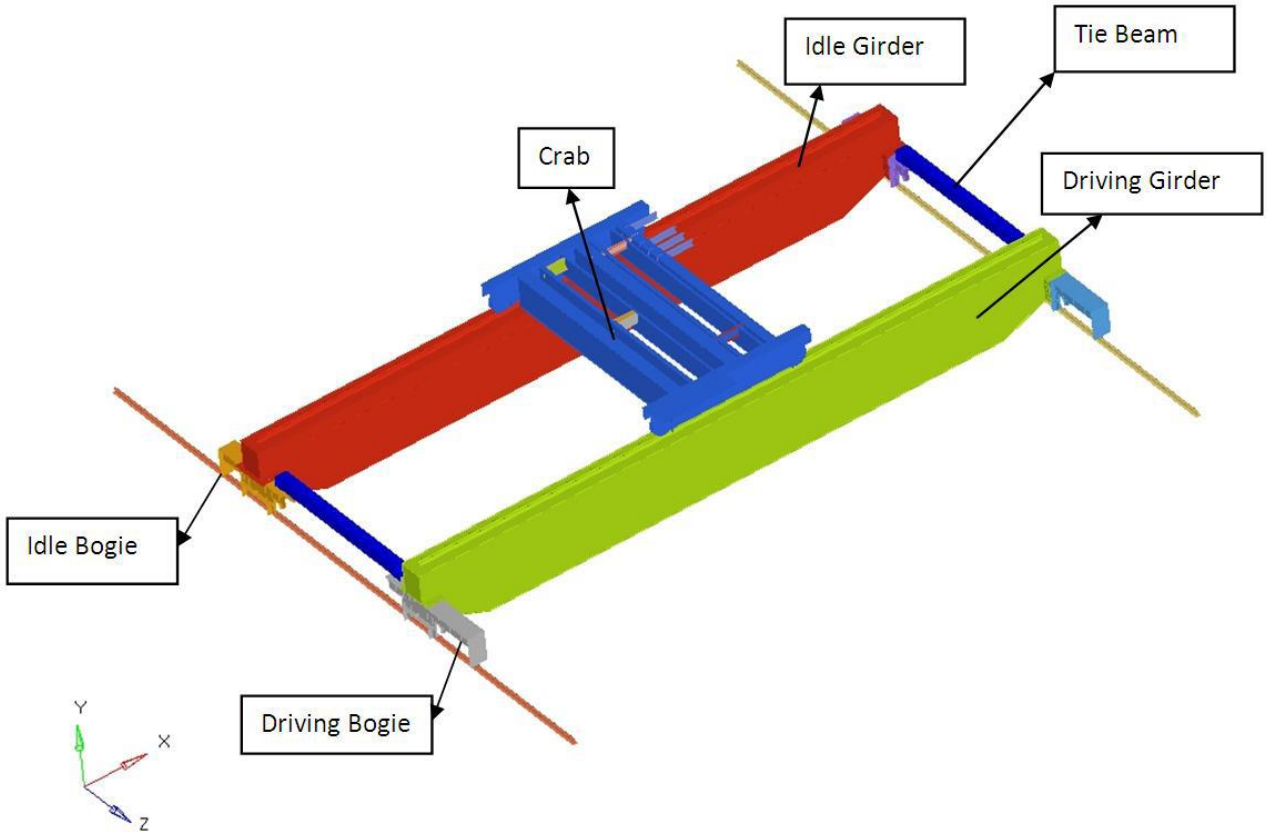

Figure 1: 120/25 Ton EOT DG Crane Assembly

There are some assumptions while analyzing the structural behavior. The assumptions are

- The eight wheels under the bogies and four wheels under the crab are identical.
- Supporting-components for each sub-assembly will be assumed to be rigid
- All connections (bearings, wheels, etc.) will be assumed to be rigidly fixed
- The support locations will be assumed to be fully-fixed
- The self-weight of the component / sub-assembly itself will act as a distributed load
- The self-weight of any supported components will be applied as concentrated loads, distributed equally across supporting points

Welds, bolts, etc. are assumed to be 100% efficient.

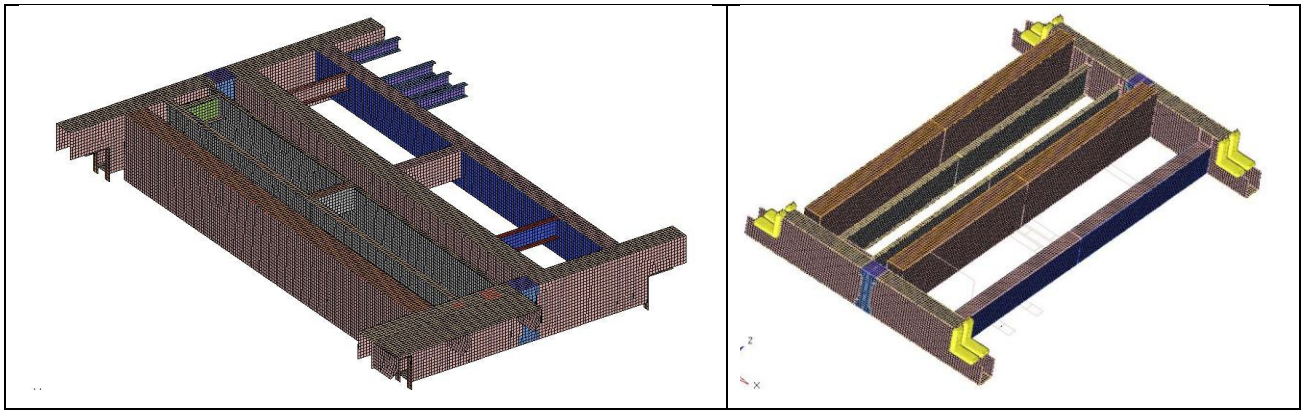

Figure 2: FE Model and Boundary conditions of the CRAB

3. Discussion of FEA approaches

The FE Model is being generated with the help of CQUAD4 and CTRIA3 element types for the entire crane assembly. A pictorial view of FE Model of CARB can be observed at the Figure 2. Some of the analysis cases were done assuming the carb is at extreme left and extreme right and at the center. The Different loading cases are 120T live load on CARB, 25T live load on CARB, 6000kg load on carb with positioning at middle of the girders, 1600kg load on carb with positioning at the extreme right of the girders and 1600 kg load on carb with positioning at the extreme left of the girders.

4. Numerical Simulation

The linear static analysis is done using commercially available software like Radioss 12.0 and Hyperworks.

5. FEA Results

The numerical analysis was conducted linear static analysis, were modelled with mild steel material behavior. Displacement & Stress distribution at the different locations in the below figures can be observed.

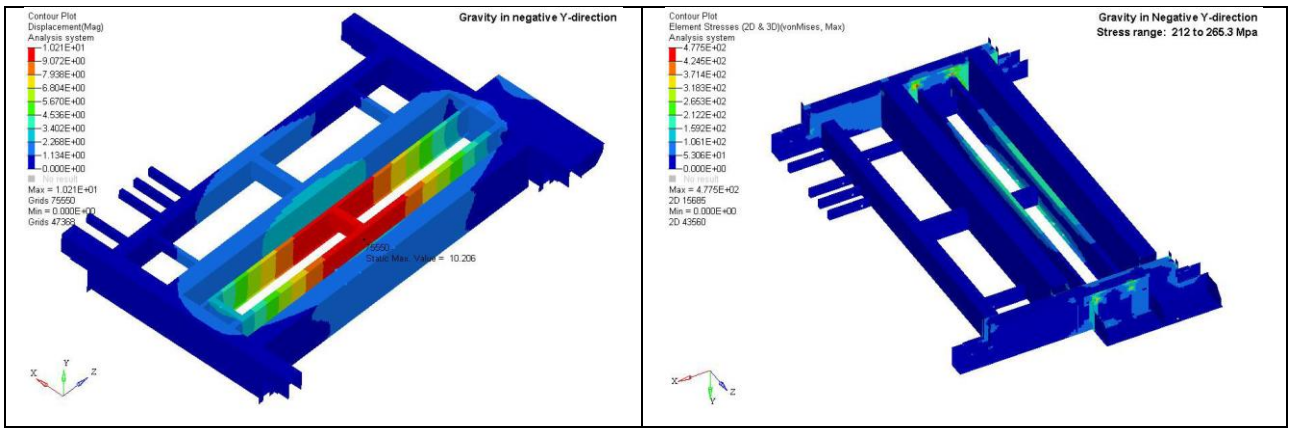

Figure 3: Displacement and Stress Contour Plots of CRAB in 120T load case

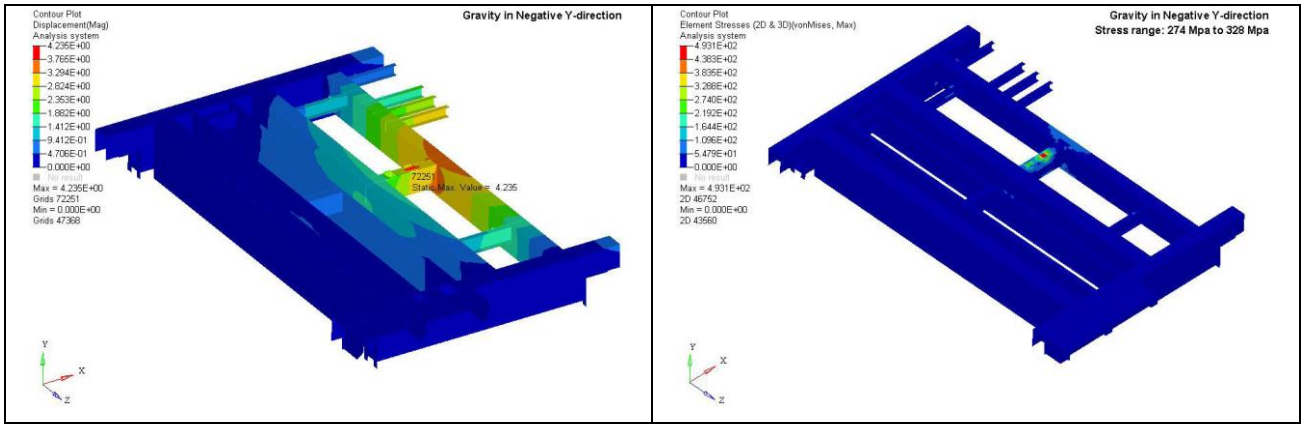

Figure 4: Displacement and Stress Contour Plots of CRAB in 25T load case

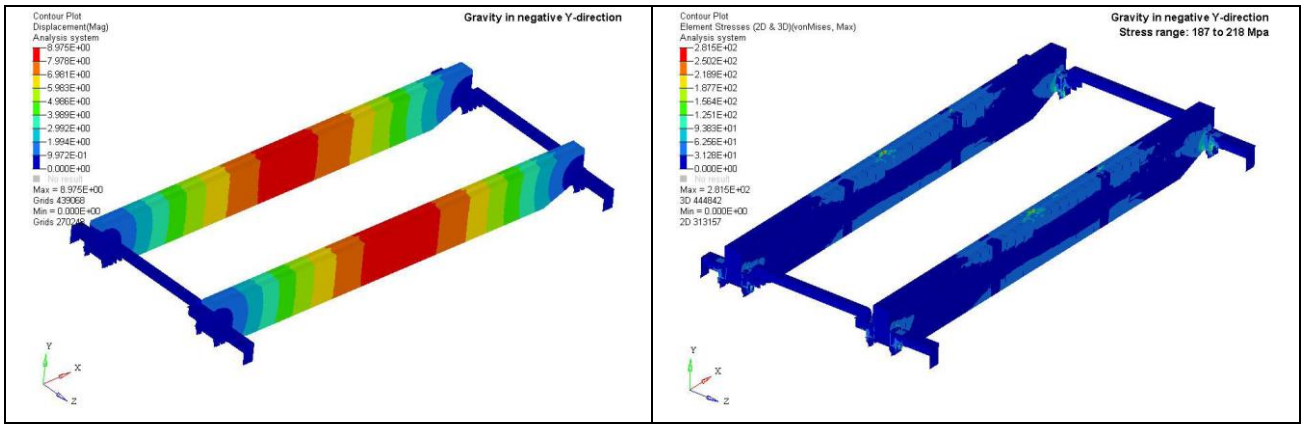

Figure 5: Displacement and Stress Contour Plots of CRAB load at the center of girders

6. Conclusion

From the linear static analysis of the 120/25 Ton Double Girder EOT Crane Assembly the critical areas are identified for various cases shown above.