3 Results and Discussions

3.1 Loading conditions

The deck structure was evaluated under a series of crane loading cases corresponding to different slewing positions. The critical lifting condition considered in this study was defined by a boom length of 2 100 mm and a crane load of 6 300 kg. After applying a safety factor of 1.3, the effective lifting load increased from 61 803 N to 80 344 N. In addition, the boom self-weight of 12 753 N was applied at the boom center of gravity for each slewing position, and a uniformly distributed load of 0.3355 N/mm² representing the crane self-weight was also applied to the deck surface. The crane loading was examined from 0° to 315° at intervals of 45°, with clockwise rotation taken as the positive direction (Figure 14, Figure 15). The loading analysis was conducted under calm sea conditions in order to isolate the local structural response of the crane foundation region from wave-induced global effects.

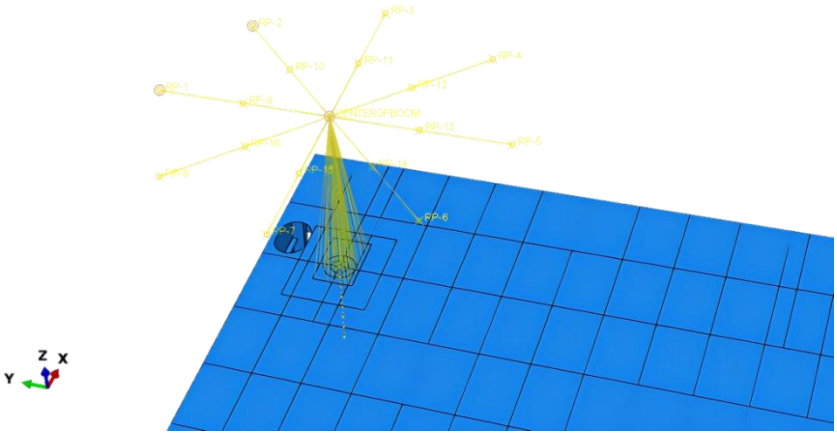

Figure 14 Crane loading cases

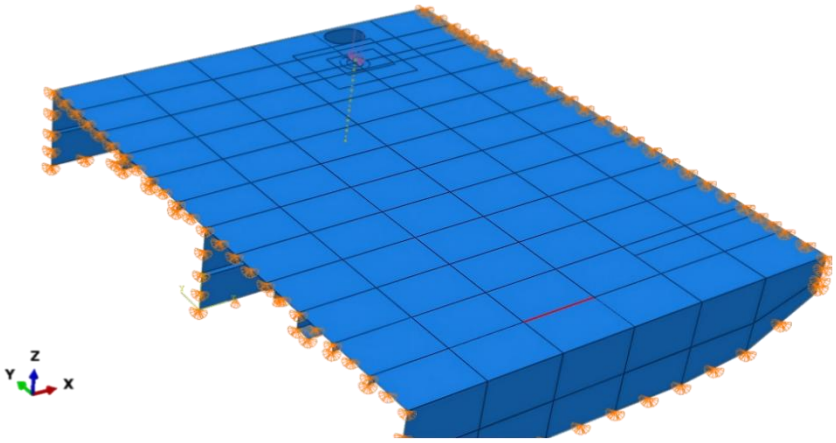

Figure 15 Application of crane self-weight as a static load

3.2 Control criteria

The structural assessment was carried out using the allowable stress criterion specified in the ABS Rules for Building and Classing Steel Vessels under 90 Meters. For conventional steel, the allowable stress is defined as:

σ_{allow}=0.78 Sm Fy

Where Sm=1 for conventional steel and Fy is the stress modification factor, which equals 1 for conventional steel, is the yield strength of the material. Because hull girder strength effects were not included in the present local model, the allowable stress was further reduced by 10% in accordance with the ABS requirement. As a result, the limiting stress adopted for the deck structure was 165 MPa (Figure 16). This criterion was used as the primary basis for evaluating the structural adequacy of the crane foundation region under all investigated loading angles.