

The Summary of Dissertation

The review on the quakeproof design for harbor structures began at the occasion of Hyogo South earthquake in 1995, and base isolation systems have been considered for these structures.

In this thesis, a rocking type of vibration isolation system (RVIS) is presented as a new vibration isolation system for the container crane. Its modeling and analysis method are investigated by model experiment, and the performance of RVIS is clarified in comparison with a conventional translation type of base isolation system. Furthermore, the improvement of RVIS is tried by installing a semi-active control device.

Chapter 1 shows an outline of the study of quakeproof design and vibration isolation system for the container crane. And a rocking type of vibration isolation system is proposed.

In Chapter 2, an outline of RVIS is described. The experiment results of 1/15 model are shown, and the FEM analysis of this model is presented. In order to verify the adequateness of the analytical results, they are compared with the experimental ones.

In Chapter 3, the dynamical analysis based on the FEM analysis of real size model is performed for various seismic waves, and the fundamental characteristics of RVIS are made clear.

In Chapter 4, the optimal design of RVIS is considered by using several earthquake excitations. The evaluation of the load on the mechanism of isolator is described, and a method of decreasing the vibration of torsion mode is presented.

In Chapter 5, in order to apply a semi-active control method to RVIS, the bilinear optimal control theory accommodating disturbance and the state estimator using Kalman filter are described.

In Chapter 6, a modeling for the semi-active control applied to RVIS is presented. The characteristics of this system are also made clear for various earthquakes and in use of cargo handling.

In Chapter 7, a conclusion of this thesis is described.