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Foreword

This Japanese Industrial Standard has been established by the Minister of Health, Labour and Welfare and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by Japan Crane Association (JCA)/Japanese Standards Association (JSA) with a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act.

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Cranes — Principles for seismically resistant design

Introduction

This Japanese Industrial Standard has been prepared based on ISO 11031 : 2016, Edition 1, with some modifications of the technical contents to take into account the specific seismic environment of Japan.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanation is given in Annex JD.

Because cranes are long and narrow structures, their capacity of absorbing earthquake energy via plastic deformation of their structural members at the time of an earthquake is considered to be generally less than that of building structures of the like, and this is an important point to be taken into consideration in designing seismically resistant cranes.

An economically acceptable protection against the effects of earthquake is usually based on two design limit states, serviceability limit state (SLS) and ultimate limit state (ULS), which specify the required crane response to a moderate earthquake that the crane may be exposed to during its service life and a severe earthquake that may occur at the installation site, and which are expressed in comparison to the ultimate limit states. Given the limited capacity of cranes to absorb seismic energy, this Standard treats the calculation of seismic design loads for the proof of competence in terms of SLS as mandatory, and that in terms of ULS as optional. The proof of competence in terms of SLS is based on the Modified Seismic Coefficient Method for a moderate earthquake.

1 Scope

This Standard provides requirements regarding the seismic loads and combination of seismic loads for crane structures of all the crane types (excluding mobile cranes) specified in JIS B 0140 standard series or their structural members and machine elements (hereafter referred to as crane structural members).

This Standard evaluates dynamic response behaviour of a crane subjected to seismic excitation as a function of the dynamic characteristics of the crane and of its supporting structure. The evaluation takes into account dynamic effects both of regional seismic conditions and of the local conditions on the surface of the ground at the crane location.

The operational conditions of the crane and the risks resulting from seismic damage to the crane are also taken into account.

This Standard lays out the general concept of ULS, but does not extend to proofs of competence which include plastic deformations. When these are permitted by agreement between crane supplier and customer, other standards or relevant literature taking them into account can be used.