Numerical study on seismic response of steel storage racks with roller type isolator

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Abstract
This research evaluates the effectiveness of using a roller-type base isolation device with tensile strength in reducing the dynamic response of industrial steel storage racks. These were subjected to a seismic input acting separately in both directions of the structure. The seismic record obtained from the earthquake that occurred in Llolleo, Chile, on 3 March 1985, was used as input. This earthquake was scaled in the frequency domain, adjusting its response spectrum to coincide with the design spectrum required by NCh2745. In the calculations of this spectrum, the most haz-ardous seismic zone (zone 3) and soft soil (soil III) that amplifies the effect of the low frequencies of the earthquake were considered. These frequencies are the ones that have the most affect on flexible structures such as high racks and systems with base isolation. Numerical time-history analyses were performed in fixed base racks and base isolation racks. In both cases, the models include semi-rigid connections with capacity for plastic deformation and energy dissipation. Parametric analyses were carried out considering the most relevant variables, using an algorithm programmed in MATLAB software. The maximum relative displacement, maximum basal shear load, and maximum absolute floor acceleration were considered as responses of interest. The results showed the effectiveness of using the base isolation device by reducing the absolute accelerations between approximately 75% and 90%, compared to the same fixed rack at its base. This makes it possible to reduce the vulnera-bility of the stored load to overturn under the action of a severe earthquake.

Author keywords
Carbon steel
Frictional dissipation
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