

## **Seismic Performance of Helical Piles**

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### **Abstract**

Helical piles (HP) have been increasingly used in major projects due to their reduced installation duration and labour cost and superior capacity and performance compared to straight shaft pipe piles. They are typically manufactured of straight steel shafts fitted with one or more helices and are installed using mechanical torque. They can sustain static and dynamic loading and are increasingly used in applications that induce complex loading conditions on them. The response of helical piles to monotonic and cyclic axial and lateral loading and their axial capacity considering different parameters are well characterized. However, a few studies investigated the seismic behavior of single helical piles and their group behavior. Meanwhile, recent case histories demonstrated that HPs exhibited outstanding performance during earthquakes in New Zealand, Japan, and the United States. This paper presents recent advances in evaluating the axial and lateral capacity and performance of helical piles and their response to seismic loads. It covers the seismic response of single and grouped HPs in dry, dense sand deposits through full-scale shaking table tests employing the largest outdoor shake table in North America. It also presents numerical investigation of the seismic behaviour of HPs in liquefiable and non-liquefiable soils.