

## Seismic Vulnerability of Wine Barrel Stacks

Candia, G., Jaimes, M., Arredondo, C., de la Llera, J. C., & Favier, P. (2016). Seismic vulnerability of wine barrel stacks. *Earthquake Spectra*, 32(4), 2495-2511. <10.1193/111915EQS174M> Accessed 16 Jul 2021.

### Abstract

Recent earthquakes have shown that wine barrel stacks are highly susceptible to collapse, leading to large economic losses, downtime, and longer recovery periods. This study presents a methodology using a probabilistic approach for estimating the fragility functions and economic losses in barrel stacks. The seismic response of these systems was determined from the dynamic equilibrium equations that describe the position and orientation of each element. The analysis considered ground motions scaled at different intensity levels and different barrel stack configurations; the simulations enabled reproducing the most common collapse mechanisms observed in the field and in shaking table experiments. From a statistical analysis of the results, vulnerability functions were evaluated as the probability of being within a specific damage state for a given ground motion intensity. Additional numerical simulations were performed to study the effects of the inherent uncertainty of the interface parameters controlling the dynamic response and collapse sequence of the barrel stacks. Furthermore, this methodology was used to evaluate the impact effect and improvement of a base isolation solution as a damage mitigation measure.