

Influence of Displacement Amplitude and Vertical Load on the Horizontal Dynamic and Static Behavior of Helical Wire Rope Isolators

Authors : Nicolò Vaiana, Mariacristina Spizzuoco, Giorgio Serino

Abstract : In this paper, the results of experimental tests performed on a Helical Wire Rope Isolator (HWRI) are presented in order to describe the dynamic and static behavior of the selected metal device in three different displacements ranges, namely small, relatively large, and large displacements ranges, without and under the effect of a vertical load. A testing machine, allowing to apply horizontal displacement or load histories to the tested bearing with a constant vertical load, has been adopted to perform the dynamic and static tests. According to the experimental results, the dynamic behavior of the tested device depends on the applied displacement amplitude. Indeed, the HWRI displays a softening and a hardening stiffness at small and relatively large displacements, respectively, and a stronger nonlinear stiffening behavior at large displacements. Furthermore, the experimental tests reveal that the application of a vertical load allows to have a more flexible device with higher damping properties and that the applied vertical load affects much less the dynamic response of the metal device at large displacements. Finally, a decrease in the static to dynamic effective stiffness ratio with increasing displacement amplitude has been observed.

Keywords : base isolation, earthquake engineering, experimental hysteresis loops, wire rope isolators

Conference Title : ICESE 2017 : International Conference on Earthquake and Structural Engineering

Conference Location : London, United Kingdom

Conference Dates : February 16-17, 2017