

Application of shape memory alloy bars in self-centring precast segmental columns as seismic resistance

ABSTRACT

The objective of this study is to investigate analytically the performance of self-centring precast segmental bridge columns with shape memory alloy (SMA) starter bars under nonlinear static and lateral seismic loading. For this purpose, a 3D finite element model for hybrid post-tensioned bridge column has been developed. The precast post-tensioned segmental bridge columns possessing a central tendon and adequate transverse confinement provided by the steel tube jacketing as self-centring bridge columns have an undesirable high lateral seismic demand due to their low energy dissipation. In order to eliminate this deficiency while keeping the residual displacement small, SMA starter bars are applied in this system. The effect of post-tensioning (PT) forces of the central strands and SMA bar size are investigated. The results indicate that in high seismicity zones, bridge columns with SMA bars at a higher level of PT forces have a superior performance against earthquake loading.

Keyword: Shape memory alloy; Precast segmental bridge columns; Seismic loading; Post-tensioning forces; Finite element method