BoKoMaT

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Superelastic Nitinol for Improved Structural Resilience of Reinforced Concrete Structures

Over the past two decades, research has intensified on retrofit methodologies and new construction that incorporate Superelastic Nitinol (SE-SMAs) as the main reinforcing material. This is in direct response to several major earthquakes, which highlighted that while structures may not collapse and satisfy the life-safety performance criteria, the damage is often to the extent that demolition is the only alternative. Based on these observations, research with self-centering as a focal point began to emerge as an important criterion for the performance of structures. This provided the foundation to explore other materials not commonly considered in structural engineering.

This presentation will provide an overview of experimental and numerical research that has been conducted over the past 15 years on the implementation of SE-SMAs in retrofit applications or in new concrete construction. Retrofitting applications include diagonal, tension only SMA braces and an SMA buckling restrained brace. New construction has focused on concrete shear walls given their popularity as the main seismic force resisting system. In the construction of these walls, the usage of SE-SMA has been limited to the boundary zone of the plastic hinge region. Complementary to this work has been the performance of the walls after repairing, where the repair incorporated either Self-Consolidating Concrete (SCC) or Engineered Cementitious Composite (ECC) as a replacement for damaged concrete. This presentation will also include numerical modelling on walls and frame buildings to illustrate the impact of SMAs on the response at full-scale.

Peer-Reviewed Journal Papers from Author.