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Implementation of Superelastic Nitinol in New Reinforced Concrete Construction – Experimental Research

The occurrence of earthquake events can be detrimental to the infrastructure of the affected areas in addition to the immediate risk to human life. Even if structures in these areas are built to modern seismic design codes, and successfully avoid collapse ensuring life safety, it is still common to find many buildings deemed unsafe for occupation due to significant residual displacements. These residual displacements need not be significant for people to subconsciously perceive an issue in their built environment, even a 0.2% lean in vertical elements of a structure can cause unease and discomfort in building occupants with the required repairs being economically and logistically daunting. Wanting to address the issue of residual displacements in new construction reinforced concrete structures, the use of Superelastic(SE) Nitinol bars as a replacement for traditional steel rebar presents a way to make these structures passively recentering and capable of eliminating most residual displacements after being subjected to an earthquake. To demonstrate this recentering approach using SE-Nitinol bars in a practical and real-world context, a U-shaped shear wall, a common structural element used to resist seismic forces in structures will be constructed and tested under combined axial load and reverse cyclic lateral loading. To the author's knowledge this will be the first test that will incorporate SE-Nitinol as the main reinforcement in U-Shaped walls, extending only a portion of the total wall height, to demonstrate the optimization required for financial feasibility.