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NONLINEAR ANALYSIS OF R/C SHEAR WALLS SUBJECTED TO CYCLIC LOADINGS

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A numerical model for the nonlinear analysis of R/C shear walls under cyclic seismic loadings has been proposed by some of the authors. It is here validated by comparison with three experimental tests taken from literature on R/C complex shear walls. The finite element numerical models consider both in-plane loaded membrane elements and out-of-plane loaded plate elements.

Reinforcing bars are modelled as multiple smeared steel layers for which uniaxial stress-strain relation with isotropic hardening according to the Menegotto-Pinto constitutive model was adopted. The concrete material description is based on damage mechanics and uses two independent scalar damage parameters to describe inelastic response of the material. At this stage of the research the bond-slip between concrete and rebars is not taken into account.

Two of the experimental tests considered for the validation were conduced at the NEES MUST-SIM Facility - University of Illinois and concern both planar and coupled complex wall systems. The third experimental program was conduced at ELSA Laboratory (JRC Ispra) within the framework of TMR-ICONS TOPIC 5 program on an U-shaped wall monotonically loaded along two orthogonal directions. All tests were carried out in quasi-static conditions.

The robustness and efficacy of the proposed numerical model in reproducing the cyclic behaviour of R/C members on both two-dimensional and three-dimensional problems is demonstrated by the good fitting of the numerical results with the experimental ones.

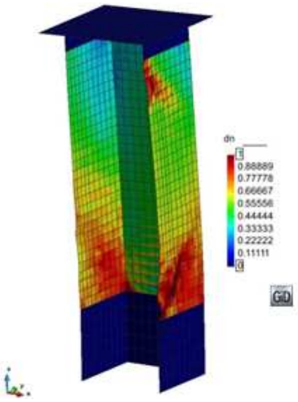

Fig.1: U-shaped wall. contour of compressive damage at imposed top X-displacement ±120 mm.

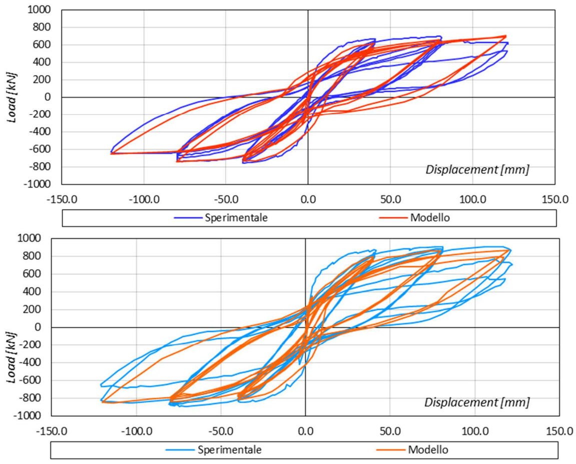

Fig. 2: U-shaped wall. Experimental vs. numerical base shear-top displacement cycles.

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