NUMERICAL AND EXPERIMENTAL CYCLIC RESPONSE OF ALTERNATIVE COLUMN TO FOUNDATION CONNECTIONS OF REINFORCED CONCRETE-PRECAST STRUCTURES: COMPARISONS

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The cyclic response of a column to foundation connection system based on the mechanical connection between steel shoes embedded into the column base and protruding steel bolts anchored into the foundation, is examined in this presentation. This connection is to be considered as an alternative solution compared to the traditional reinforced concrete precast pocket foundations. The hysteretic behaviour and the global collapse mechanism of the connections, to be compared to an equivalent monolithic solution, are studied through three full scale specimens subjected to a constant axial load and to a quasi-static cyclic horizontal top displacement history at increasing drift levels.

Contemporaneously a three-dimensional finite element models, characterized by non-linear properties of materials and geometry, are developed and calibrated in order to analyze and capture the local experimental response of the connections and to compare it to the behaviour of a cast-in place equivalent connection. Tetrahedrical 4 node element and contact surface element have been used in order to capture the local behaviour at the interface between mortar and concrete (246438 degrees of freedom corresponding to 459676 number of elements). The concrete has been modelled using and elastic modulus of 34500 MPa, Poisson ratio of 0.15 and weight density of 2.5e-5 N/mm^3; a total strain crack approach with fixed scheme has been used together with a secant stiffness calculation during the iterative approach; the lateral crack effect uses the Vecchio and Collins approach and the confinement effect has been taking into account using the Selby and Vecchio method. The steel has been model with a classical Von Mises approach: elastic modulus E=210000 MPa.

The aim of this research is to develop a global numerical model able to carefully predict the response of similar connection typologies to cyclic loading.