

The Seismic Behaviour of a Kit for Connection of Precast Concrete Façade Elements to Concrete Structures

Antonio Bonati¹, Sara Cattaneo^{1,2}, Orsola Coppola¹, Antonio Occhiuzzi^{1,3}

¹ Construction Technologies Institute - National Research Council of Italy
Viale Lombardia, 49 20098 San Giuliano Milanese (MI) - Italy
antonio.bonati@itc.cnr.it, orsola.coppola@itc.cnr.it

²Department of Architecture, Built environment and Construction engineering - Politecnico di Milano
Piazza L. da Vinci 32, 20133 Milan - Italy
sara.cattaneo@polimi.it

³ Engineering Department - University of Naples “Parthenope”
Centro Direzionale - Isola C4 - 80143 Naples - Italy
antonio.occhiuzzi@uniparthenope.it

Abstract. The envelope system of precast concrete structures, widely used for industrial and commercial buildings, is generally made up of large cladding panels, which can be horizontally or vertically positioned. These façade panels, although classified as secondary elements, i.e. non-structural components, can heavily influence the response of the primary structure, especially when subjected to seismic events. The dynamic features of the main structure could be modified and additional forces in the connection system between primary and secondary elements, not considered in the design phase, can arise. The most recent Italian earthquakes, Abruzzo (2009), Emilia Romagna (2012) and Central Italy (2016), have shown several collapses of precast concrete façade panels. The greatest source of vulnerability is associated to the connection systems between non-structural component and primary structure, not adequately designed for the absorption of earthquake actions and for the prevention of the interaction between façade element and load-bearing structure. This paper will try to summarize the main results of an experimental campaign aimed at the seismic assessment of an innovative connection system, based on anchor channels, for precast cladding panels. The connection kit is conceived in order to ensure the panel-to-structure constraint, but also to allow relative displacements between the non-structural and structural components, limiting interaction phenomena. Real scale tests are carried out on the complete system including a cladding panel: quasi-static dynamic tests, both in plane and out of plane of the panel, are executed according to American standard FEMA 461. Furthermore, bidirectional dynamic tests are performed by applying displacements time histories, obtained from acceleration recordings of the Norcia earthquake (October the 30th 2016).

Keywords: Precast Structure, Façade Panels, Connection System, Anchor Channel, Dynamic Tests.