

Improving the Seismic Performance of Non-structural Elements Using Building Information Modelling

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Abstract. The post-earthquake functionality of critical facilities, such as hospitals, relies on the continued operation of non-structural elements including piping systems, partitions, ceiling systems and other medical equipment. The damage observed during past earthquakes showed the poor seismic performance of non-structural elements and the need to improve their design and installation strategies. The application of performance-based seismic design to the entire building environment could be the possible solution to achieve desirable performance objectives for various seismic hazard levels. In this context, the use of Building Information Modelling is a promising approach to apply the seismic design of non-structural elements into practice. The data available in Building Information Models could be used to perform automatically the seismic design of non-structural elements and then to identify the interferences (i.e. clash detection) between all structural and non-structural elements in the building. In this paper, a conceptual framework to perform the automatic seismic design of non-structural elements using the information available in Building Information Models is presented. The effectiveness of the procedure is demonstrated through a simple application in which the seismic design of pressurized fire suppressant sprinkler piping systems and of ceiling systems installed in a reinforced concrete building is performed. The bracing elements required by current seismic provisions for non-structural elements considered are automatically re-introduced in the original Building Information Model. The automatic updating of the Building Information Model allowed to perform the clash detection and to verify if the bracing positions needed to be modified in order to optimize efficiently the seismic design of the entire building environment.

Keywords: Non-structural elements, Building Information Modelling, Seismic design, Clash detection.