

SUMMARY

This work is addressed to the vulnerability and seismic risk study of essential buildings. The outstanding role these structures in the earthquake emergencies is emphasised and the necessity of creating a volume of specific prescriptions which allow to adequate the existing structures and to build the new ones with requirements compatible with their level of importance.

A review of the background and the state of the art reveal a *negative* balance in terms of the seismic behaviour of the essential buildings, even under moderate actions. It should be highlighted: (i) the insufficiency of the methodologies found on the updated seismic codes in order to protect these types of buildings, (ii) the necessity of its evaluation from a global point of view that considers the seismic vulnerability (structural and non-structural) and the functional vulnerability, and (iii) the importance of considering the interaction between the elements which conform an essential system, with other systems and lifelines. This interaction is the fundamental part of the so-called *systemic approach*.

A general strategy based on the systemic approach is proposed for the evaluation of seismic vulnerability of essential systems. This strategy is intended to rationalise the decision making, through successive approximations, prioritising the need for more accurate studies, which could justify the intervention measures. In order to measure the response capability of these structures is convenient to use the design concepts based on the seismic performance.

On this basis a simplified model is developed to evaluate the seismic response of the regional health facilities as a paradigm of essential systems in case of a disaster. This model allows the qualification of the global performance of the health system and each hospital through response factors precisely defined for this purpose.

The application of the method to the health system of Catalonia brings up that its response capability is especially sensitive to the location of the epicentre of the seismic event. It is observed a deficient conditioning of the health system for seismic events with epicentres located north and north-west of Catalonia, the surroundings of Barcelona city and the neighbour coast stripe. The results obtained allow a preliminary classification and hierarchization of the 64 Catalonian hospitals. According to these result, 14 hospitals (22%) show an acceptable response, 35 hospitals (55%) show an intermediate response, and 15 hospitals (23%) mainly located in the regional health administration of *Girona, Barcelona Nord and Maresme, Barcelona city and Centre*. It is concluded the necessity of developing more accurate studies on seismic vulnerability on the hospitals that present an insufficient seismic performance.