

Integrated Design and control of Sustainable communities during Emergencies



A new design methodology for civil engineering structures called “Resilience-Based design (RBD),” which can be considered as the next generation of Performance-Based Design (PBD) is presented. The goal of RBD is to make individual structures, infrastructures and communities as “resilient” as possible, developing technologies and actions that allow each structure and/or community to regain its function as promptly as possible. The fundamental concepts of community resilience are analyzed and a common reference framework is established. Focus is given to strategic facilities (hospitals and schools) and infrastructure networks (gas, water etc.) that are the basis of life and economy of every community. Initially the traditional performance-based earthquake evaluation tools are used to estimate repair costs and downtimes for a healthcare and a school and two design strategies are compared in term of resilience index using the proposed methodology. At the regional level, the framework has been applied to single infrastructures (water distribution network of Calascibetta and gas network of Sulmona). However, a method to take into account interdependencies for the evaluation of resilience at the regional level is also presented and applied to the prefectures which were affected by March 11th 2011 Tohoku Earthquake in Japan. The impact of disasters on different economic sectors and their dependencies on lifeline disruption is also investigated, by considering the economic model of the Bay area in California. Finally, the use of new information technologies to improve resilience and disaster management is also investigated showing a new multiplatform application for smartphones which can be used for field reconnaissance. The proposed app can also be used in a simplified version by normal citizens to give an initial and quick damage evaluation of the area, which is going to be very useful when resources (e.g. the number of specialists is limited). The application has been tested for the first time during 2012 Emilia earthquake in order to enhance the emergency response.

Dr. Cimellaro is the Chair of the ASCE Disaster Resilience of Structures, Infrastructures and Communities *SubCommittee* and Assistant Professor in the Politecnico di Torino. He is currently visiting professor at the University of California, Berkeley. He received his Ph.D. degree in Civil Engineering, University at Buffalo (SUNY), NY, USA in 2008, M.S. Earthquake Engineering, University at Buffalo (SUNY), NY 2005; B.s. Civil Engineering, University of Rome "La Sapienza" 2001. He has received the Fib Achievement Award for Young Engineers 2011 to recognize outstanding contribution to structural concrete, sponsored by *fib*. Dr. Cimellaro primary field of investigation is Earthquake Engineering with emphasis on defining Quantification of Resilience of physical infrastructural systems. He is currently P.I. of the Project IRUSAT-Improving Resilience of Urban Societies through Advanced Technologies which is mainly developed at the University of California, Berkeley. He has authored 35 journal papers and 90 international conference proceedings, and 11 book chapters and 1 edited book. For details please refer to URL: <http://www.cimellaro.org>

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Seminar is **FREE and open to the public**. Attendance is required for all enrolled Civil Engineering graduate students. For parking please see link for visitors at www.jhu.edu and select information on Homewood Campus.