PERFORMANCE OF ESSENTIAL FACILITIES IN THE 2012 VARZAGHAN-AHAR EARTHQUAKES

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ABSTRACT

On August 21st, 2012 two earthquakes struck the northern part of East Azerbaijan Province, Iran with a magnitude 6.2 and 6.0. The earthquake affected three medium-size city centers; Varzaghan, Ahar and Heris. Most essential facilities in the stricken area had suffered minor or moderate structural damages combined with major non-structural ones. Facilities such as hospitals, gas and water systems, electricity network, and important governmental operation centers were damaged in these earthquakes. The major non-structural failure modes involved cracking and collapse of infill walls, separation of facades from back walls, and failure of suspended ceilings. Damage to exterior architectural elements and overturning of medical equipments were also observed in these events. Based on the experience gained from these events, it can be concluded that functionality of a given facility is highly dependent upon the performance of both the building structural system and the non-structural elements.

INTRODUCTION

Essential facilities are those buildings that support functions related to post-earthquake emergency response and disaster recovery. These facilities are considered “essential” since they provide lifesaving functions and render emergency assistance to communities when a disaster strikes (French and Olshansky, 2000). In another word, they includes all buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes (IBC, 2012). According to IBC (2012), they are including but not limited to:

- Surgery or emergency treatment facilities.
- Fire, rescue, ambulance and police stations and emergency vehicle garages.
- Designated earthquake, hurricane or other emergency shelters.
- Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
- Power-generating stations and other public utility facilities required as emergency backup facilities.
- Structures containing highly toxic materials.
- Aviation control towers, air traffic control centers and emergency aircraft hangars.
- Buildings and other structures having critical national defense functions.
- Water storage facilities and pump structures required to maintain water pressure for fire suppression.

Transportation networks, especially highways and bridges, can be also considered as part of these facilities. They play an important role in emergency management. Extensive damage to these systems would seriously impact emergency response and recovery operations (French and Olshansky, 2000).