

Seismic and Tsunami Damage on Building Structures Caused by the 2011 Tohoku Japan Earthquake

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ABSTRACT:

The Committee of Steel Structures of the Architectural Institute of Japan conducted earthquake damage reconnaissance over cities where severe ground motion was recorded among Miyagi and Fukushima Prefectures. Tsunami damage reconnaissance was also performed along the coastlines of Iwate, Miyagi, and Fukushima Prefectures. The observed damage to steel buildings are classified into those caused by ground motion and those caused by tsunami. Steel buildings generally exhibited excellent seismic performance. Buildings that used older cladding construction systems sustained damage to their cladding even though their structural performance was excellent. In some older buildings, severe ground motion caused damage to structural members and connections, which are the same modes of damage reported from past earthquakes. A distinctive feature is the damage caused by tsunami. In the most extreme cases, buildings were displaced from their original location and completely destroyed. In other cases, fracture of members and connections caused the building to incline or collapse. In buildings whose cladding was completely washed away by tsunami, structural damage was minor. The extent of tsunami damage varied substantially depending on the locality of tsunami attack.