RED-ACT Report

Real-time Earthquake Damage Assessment using City-scale Time-history analysis

Oct. 30, M6.9 Zozekanissos, Greece Earthquake

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Acknowledgments and Disclaimer

The authors are grateful for the data provided by Kandilli Observatory and Earthquake Research Institute. This analysis is for research only. The actual damage resulting from the earthquake should be determined according to the site investigation.

Scientific background of this report can be found at: http://www.luxinzheng.net/rr.htm

1. Introduction to the earthquake event

At 13:51 Oct. 30 2020 (Local Time, UTC +2), an M 6.9 earthquake occurred in Zozekanissos, Greece. The epicenter was located at 26.82 37.89, with a depth of 10.0 km.

2. Recorded ground motions

1 ground motions near to epicenter of this earthquake were analyzed. The names and locations of the stations can be found Table 1. The maximal recorded peak ground acceleration (PGA) is **979.1** cm/s/s. The waveform and corresponding response spectra in comparison with the design spectra specified in the Chinese Code for Seismic Design of Buildings are shown in Figure 1.

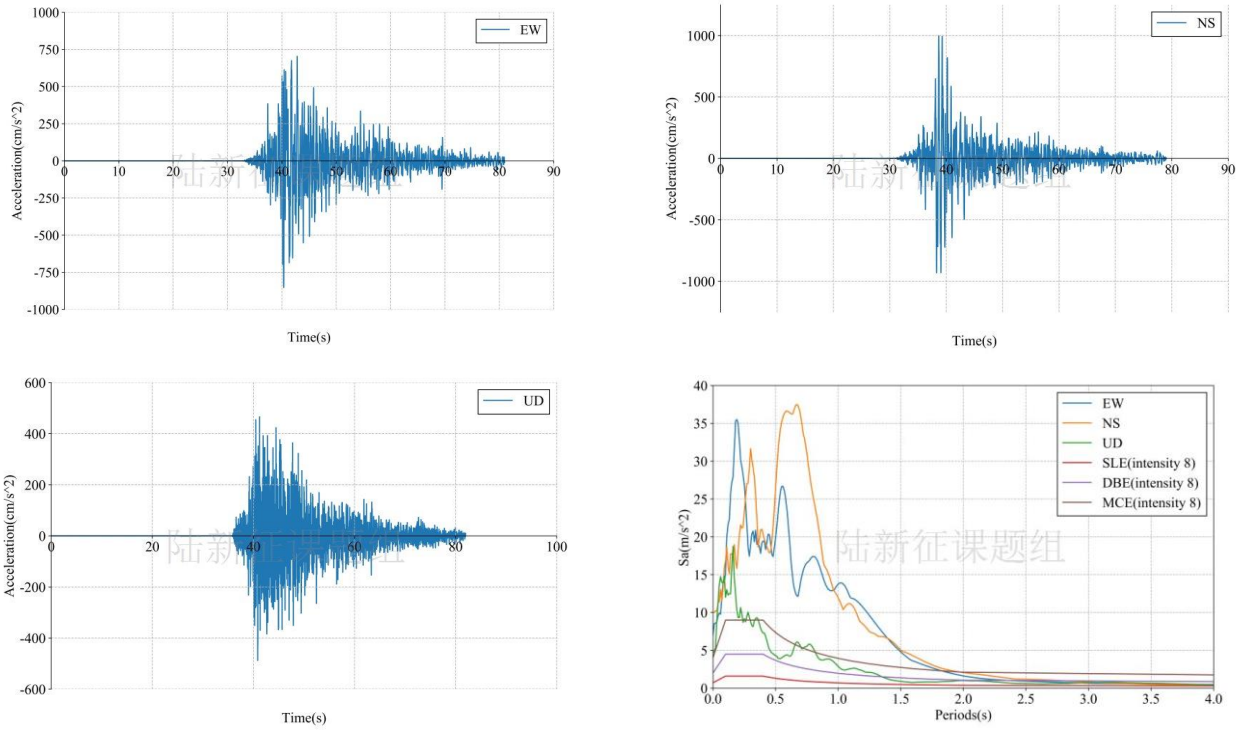


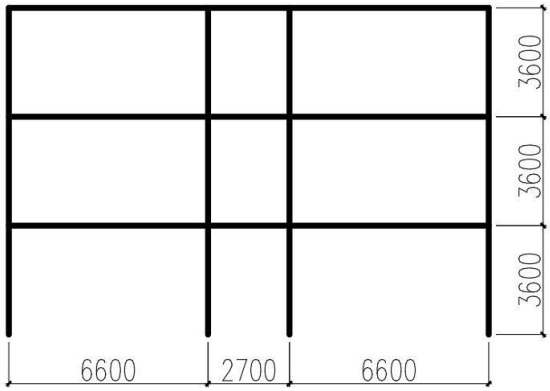
Figure 1 Waveform and response spectra of the recorded ground motions with maximal PGA

3. Seismic damage analyses for typical buildings subjected to the recorded ground motion

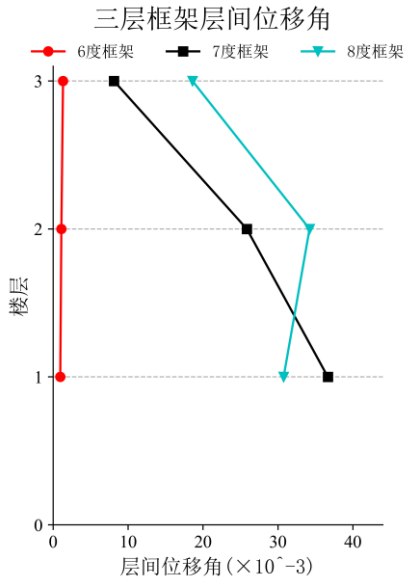
(1) Multi-story reinforced concrete frames

Model 1: 3-story reinforced concrete frame (Thanks Prof. Wang Qi from China Architecture Design & Research Group for providing the model)

The typical records are input into three typical 3-story reinforced concrete (RC) frames (Figure 2(a)), with seismic design intensities of 6-, 7-, and 8-degrees, respectively. The envelope of the inter-story drift ratios obtained from the nonlinear time-history analyses are shown in Figure 2(b).



(a) Elevation view (unit: mm)



(b) Envelope of the inter-story drift ratios (6-degree design building collapsed)

Figure 2 Three typical 3-story RC frames

(2) Multi-story reinforced masonry structures

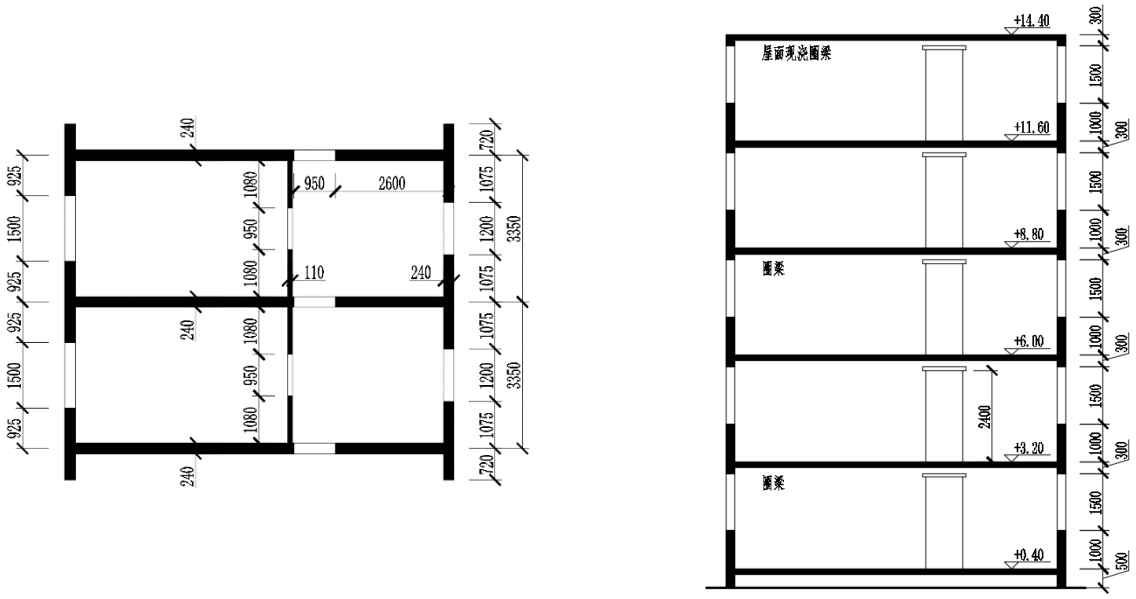
Model 1: 1-story unreinforced masonry

The typical records are input into a single story unreinforced masonry in Figure 3. The damage state of the structure is **Collapse**. (Ji X D, et al. Shaking table test of unretrofitted and retrofitted brick-wood structures representative of existing rural buildings in Beijing. 2012, 11, 53-61.)

Figure 3 The shaking table test of a 1-story unreinforced brick-wood residential structure with three rooms

Model 2: 5-story simple masonry

The typical records are input into a 5-story simple masonry in Figure 4. The damage state of the structure is **Extensive damage**. (Zhu B L, et al. Seismic resistance capacity analysis of a five-story masonry test building in Shanghai)



(a) Plan view (b) Section view

Figure 4 A 5-story simple masonry

(3) Typical bridges

Model 1: Highway bridge built in 1980s (Thanks Prof. Gu Yin from Fuzhou University)

Typical records are input into a highway bridge built in 1980s in Figure 5. The damage state of the bridge is **Extensive damage**.

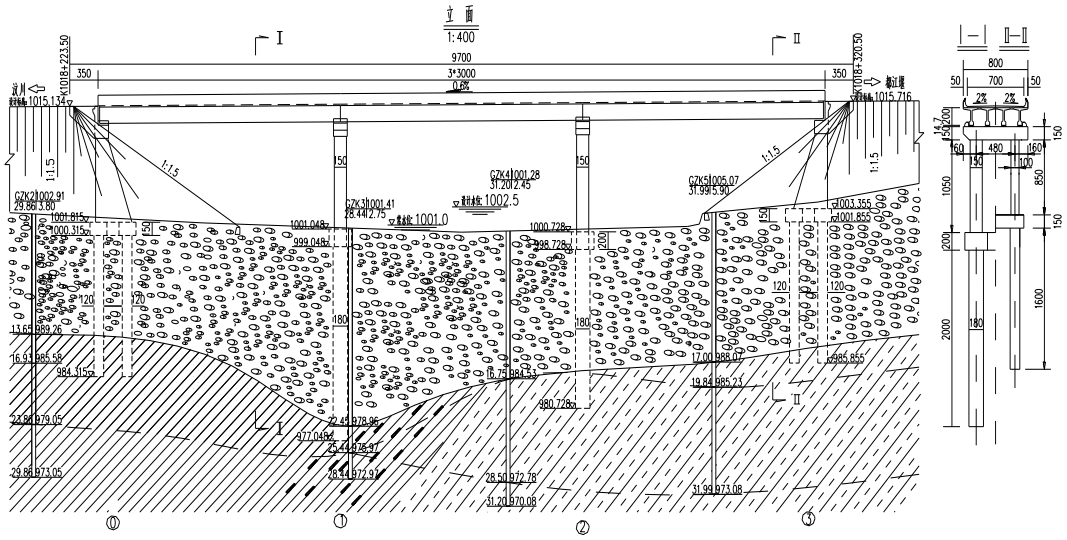


Figure 5 A highway bridge built in 1980s

Model 2: Approach bridge of a super large bridge (Thanks Prof. Gu Yin from Fuzhou University)

The typical records are input into the approach bridge of a super large bridge in Figure 6. The damage state of

the bridge is **Extensive damage**.

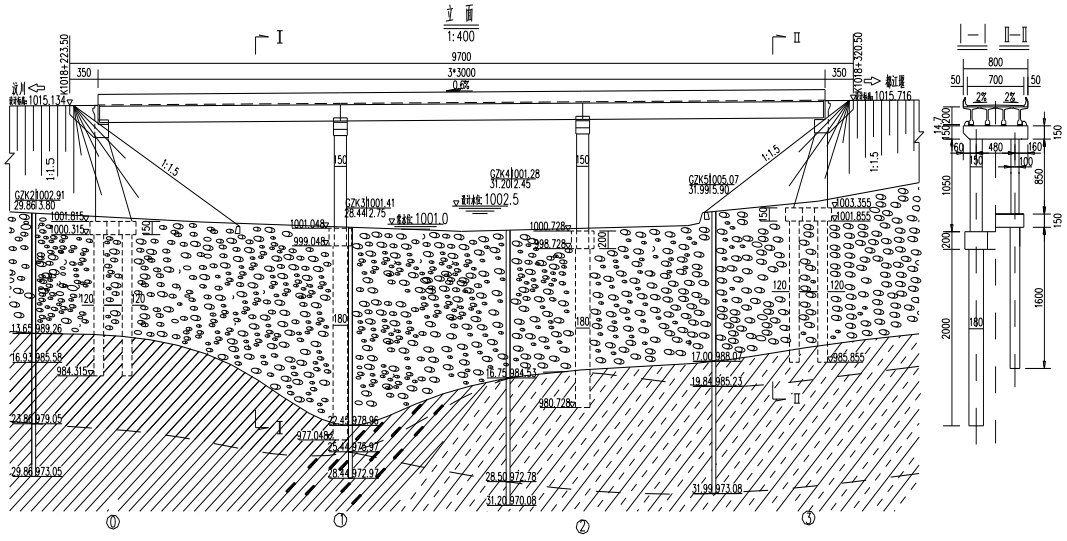


Figure 6 The approach bridge of a super large bridge

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Table 1 Names and locations of the strong motion stations

No.	Station Name	Latitude	Longitude
1	GMLD	38.076	26.875