DS '11 KOBE
International Symposium on
Disaster Simulation & Structural Safety in the Next Generation (DS'11)
September 17-18, 2011, JAPAN

Seismic Pounding Analysis of Neighboring Buildings under Long-Period Ground Motion

ISOBE, Daigoro*, OHTA, Tokiharu, INOUE, Tomohiro and MATSUEDA, Fujio

***Keywords*:** *Seismic Pounding, Long-Period Ground Motion, Collapse Analysis, FEM, ASI-Gauss Technique*

SUMMARY

Seismic pounding phenomena, namely the collision of neighboring buildings under long-period ground motion, are becoming a major issue in Japan. We focused on a specific apartment house called Nuevo Leon buildings in Tlatelolco district of Mexico City, with three same type buildings consecutively built with very narrow expansion joints in between. Two out of the three collapsed totally in 1985 Mexican Earthquake. Using a finite element code based upon the ASI-Gauss technique, a seismic pounding analysis is carried out on a mimic model of Nuevo Leon buildings to simulate the impact and collapse behaviour of the buildings built in the vicinity of each other. The numerical code used in the analysis provides higher computational efficiency than the conventional code in this kind of problems, and enables us to cope with dynamic behaviour with strong nonlinearities including phenomena such as member fracture and elemental contact. Contact release and re-contact algorithms are also developed and implemented in the code to realize complex behaviours of structural members during seismic pounding and collapse sequence. According to the numerical results, collision of buildings may well be generated by the difference of natural periods between the neighboring buildings. This was actually detected in the same type of buildings due to the damages caused by the past earthquakes. By setting the natural period of the north building to be 25 % longer than the others, the ground motion with relatively long period of 2 s first caused the collision between the north and the middle buildings. This eventually led the middle to collapse, followed by the destruction of the north.

Fig. 1 Nuevo Leon buildings after 1985 Mexican Earthquake (Picture: Marco Antonio Cruz)

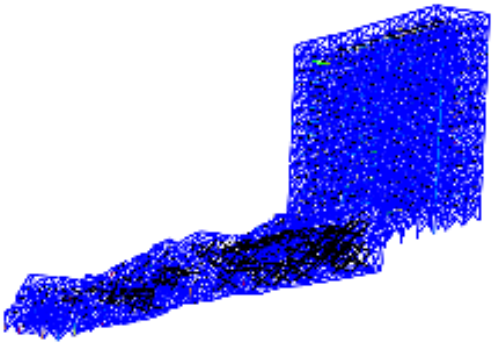

Fig. 2 Seismic pounding analysis of Nuevo Leon buildings using the ASI-Gauss technique