

Strong ground motions during the 2007 Chuetsu-oki earthquake in Kashiwazaki-Kariwa Nuclear Power Plant

Koichiro Saguchi^{1*}, Susumu Kurahashi², Kazuaki Masaki², Kojiro Irikura²

¹Emsco Ltd., ²Aichi Institute of Technology

Strong ground motions during the Niigataken Chuetsu-oki earthquake occurring on July 16, 2007, were observed in the Kashiwazaki Kariwa Nuclear Power Plant. The maximum acceleration of 99 cm/s^2 (the EW direction) at 255m deep (G10) below ground of No. 1 reactor was obtained during the main shock. The maximum acceleration of 450gal (the EW direction) in 312m deep (G55) below Unit of No. 5 reactor was also obtained. However, there were obtained no time history records and only the maximum accelerations.

In this study, we tried to simulate the strong ground motions of underground observation sites (G10 and G55) in the No. 1 and No. 5 borehole arrays during the main shock by a nonlinear analysis using the two-dimensional finite element method.

First, strong motion records of the main shock observed by the bore hole seismometers were simulated by the one-dimensional multiple reflection method with non-linear coefficients for down-going waves reflected from surface. Moreover, strong ground motion in the seismic bedrock with V_s of 3.0km/s during the main shock was simulated by the same procedure as mentioned above. The maximum acceleration of the EW component in the seismic bedrock is estimated to be 307 cm/s^2 .

Strong ground motions of underground observation sites (G10 and G55) during the main shock were simulated by a nonlinear analysis using the two-dimensional finite element method with estimated strong motion in the seismic bedrock. The results indicate that the maximum accelerations of observation sites (G10 and G55) in simulated waveforms were similar to the observed one.

Keywords: 2007 Niigataken Chuetsu-oki earthquake, Nonlinear simulation, 2-D FEM, Non-linear coefficient, Seismic bedrock