Appendix

Summary of the Report on the Analysis of Observed Seismic Data Collected at Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station pertaining to the Tohoku-Taiheiyou-Oki Earthquake

May 16th, 2011
Tokyo Electric Power Company

The Tokyo Electric Power Company, Inc. (TEPCO) has been analyzing the observed seismic data collected on the day the Tohoku-Taiheyou-Oki Earthquake (hereinafter referred to as "the Earthquake") occurred. With regard to the seismic data observed when the Earthquake occurred, we have completed compilation of the acceleration time history data from each observation points that was available at that time juncture. Therefore, we are reporting these results.

The summary of the report is as follows.

1. Seismic Observations made at Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station

At Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station, seismic observations have been made by seismometers installed in the site foundation, reactor building and turbine building of each unit, and seismic observation rooms. At Fukushima Daiichi Nuclear Power Station, a total of 53 seismometers are installed to make seismic observations. As for and Fukushima Daini Nuclear Power Station, a total of 43 seismometers are installed.

Figure 1 shows the distribution of seismic observation points at Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station.

2. Records of Observations made on the Occasion of the Tohoku-Taiheiyou-Oki Earthquake

Of the observation records collected when the Earthquake occurred, maximum response acceleration provided by the seismometers installed at the base mat of reactor buildings are shown in the table. According to this data, maximum acceleration data have partially exceeded maximum response acceleration against basic earthquake ground motion Ss that was designed according to "Regulatory Guide for Reviewing Seismic Design of Nuclear Power Reactor Facilities". Acceleration time history waveforms and acceleration response spectra for the underground of the open foundation

(O.P.-200m) located at free foundation point (South point) and seismic observation point (North point) at Fukushima Daiichi Nuclear Power Station are shown in Figs.2-1 and 2-2 respectively. As for Fukushima Daini Nuclear Power Station, observation records for the underground of the open foundation (O.P.-200m) located at free foundation system seismic observation points are shown in Fig.2-3 and 2-4.

Acceleration time history waveforms and acceleration response spectra together with acceleration response spectra based on basic earthquake ground motion collected from the base mat of the reactor buildings at unit 1 to 6 of Fukushima Daiichi Nuclear Power Station and unit 1 to 4 of Fukushima Daini Nuclear Power Station are shown in Fig.3-1 to 3-10 and Fig.4-1 to 4-10 respectively.

According to Fig.4-1 t 4-10, acceleration response spectra of observed records and acceleration response spectra based on basic earthquake ground motion are basically in the same range even though observed records have exceeded at certain period.

Currently, we are collecting acceleration time history waveforms from a total of 29 out of 53 seismometers installed at Fukushima Daiichi Nuclear Power Station and a total of 43 seismometers installed at Fukushima Daini Nuclear Power Station. As we confirmed the collected acceleration time history waveforms, we found out that recording time was only approximately 130 to 150 seconds for 7 observation points at Fukushima Daiichi Nuclear Power Station and 11 observation points at Fukushima Daini Nuclear Power Station.

However, we consider this event will not be significant subject on our future study since we have confirmed that maximum response acceleration and acceleration response spectra are in the same range when compared to observation points nearby, and complete data are being collected at the foundations.

Our investigation on this event proved that the cause was a defect in the software installed on the device that records seismic data provided by seismometers. We will update software installed on such devices we have as well as on the same types, while planning to register this event to Nuclear Information Archives “NUCIA” in light of reminding other nuclear power plant operators.

3. Summary

We have compiled the acceleration time history data of the Earthquake that was available at that time juncture. We will continue to make efforts to collect and compile the data of the Earthquake and aftershocks, while analyzing the observation records as well as implementing impact assessment on facilities.

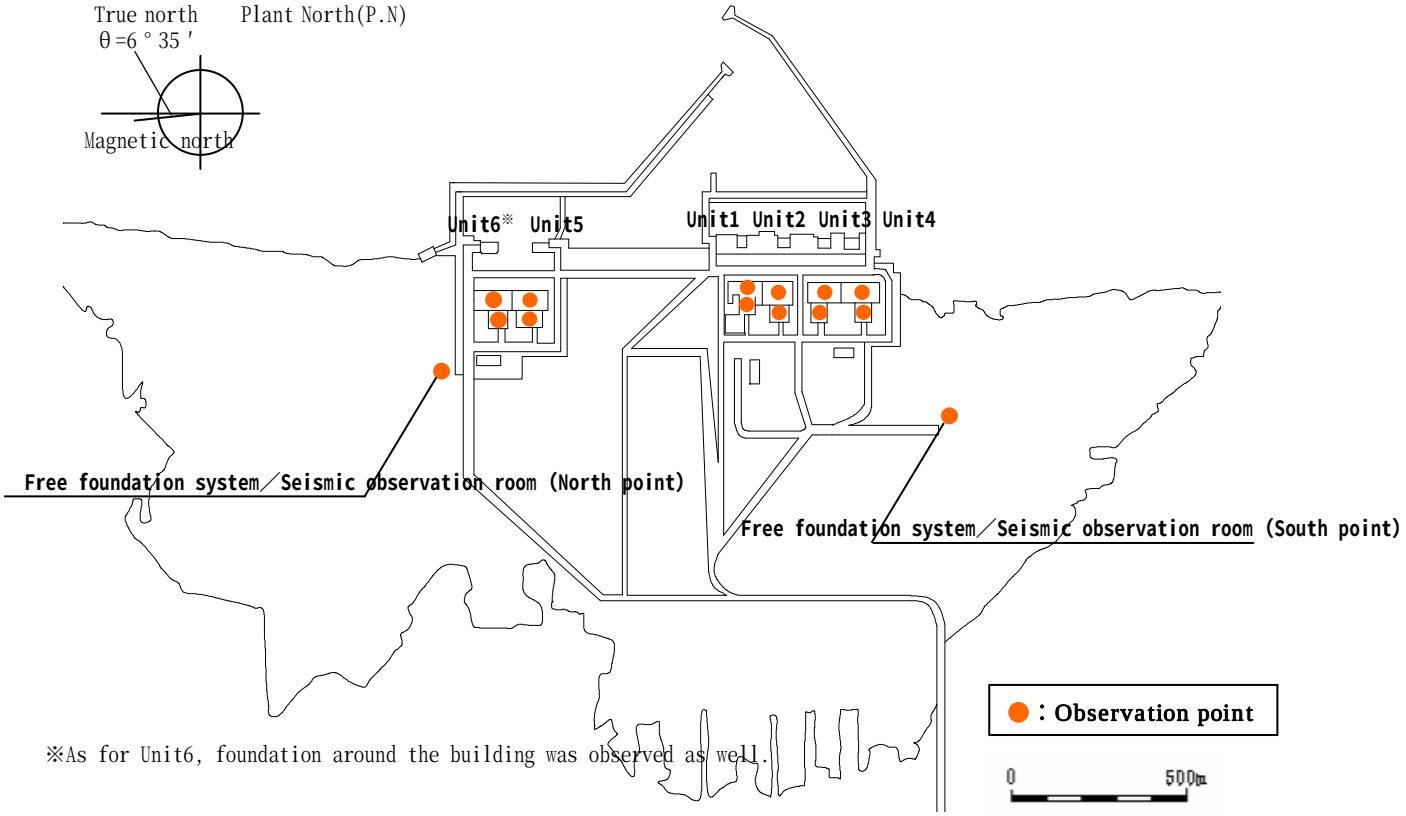
End

[Table]

The comparison between observed data collected in Fukushima Daiichi Nuclear Power Station and Fukushima Daini Nuclear Power Station when the Tohoku-Taiheiyou-Oki Earthquake occurred and maximum response acceleration against basic earthquake ground motion Ss.

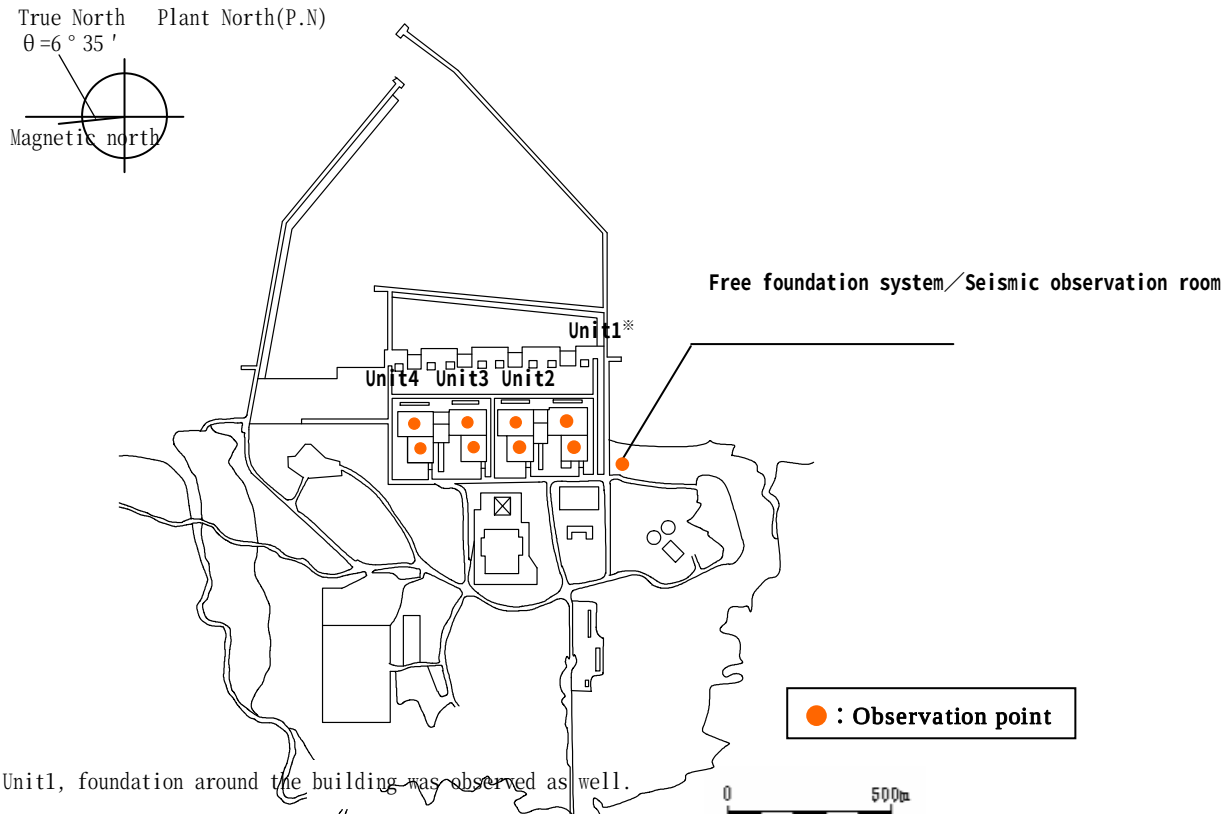
Observation Point (The base mat of reactor buildings)		Observed data			Maximum Response Acceleration against Basic Earthquake Ground Motion Ss (gal)		
		Maximum Response Acceleration (gal)					
		Horizontal (N-S)	Horizontal (E-W)	Vertical	Horizontal (N-S)	Horizontal (E-W)	Vertical
Fukushima Daiichi	Unit 1	460※	447※	258※	487	489	412
	Unit 2	348※	550※	302※	441	438	420
	Unit 3	322※	507※	231※	449	441	429
	Unit 4	281※	319※	200※	447	445	422
	Unit 5	311※	548※	256※	452	452	427
	Unit 6	298※	444※	244	445	448	415
Fukushima Daini	Unit 1	254	230※	305	434	434	512
	Unit 2	243	196※	232※2	428	429	504
	Unit 3	277※	216※	208※	428	430	504
	Unit 4	210※	205※	288※	415	415	504

※ The recording time was about 130-150 seconds.



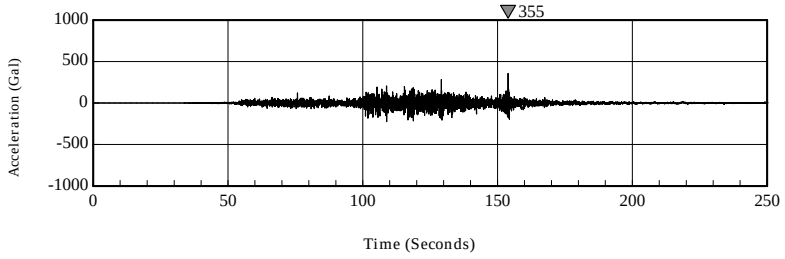
※As for Unit6, foundation around the building was observed as well.

Fig.1（1） Location of seismic observation points at Fukushima Daiichi Nuclear Power Station

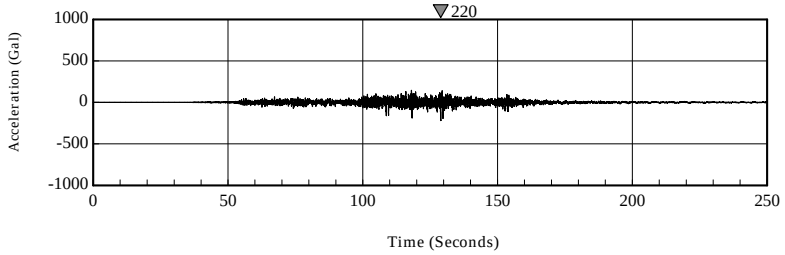


※As for Unit1, foundation around the building was observed as well.

Fig.1（2） Location of seismic observation points at Fukushima Daini Nuclear Power Station

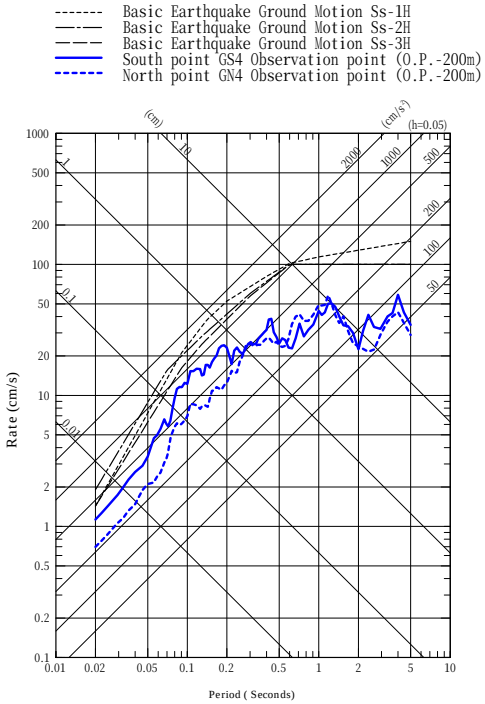


(a)South Point GS4 Observation Point



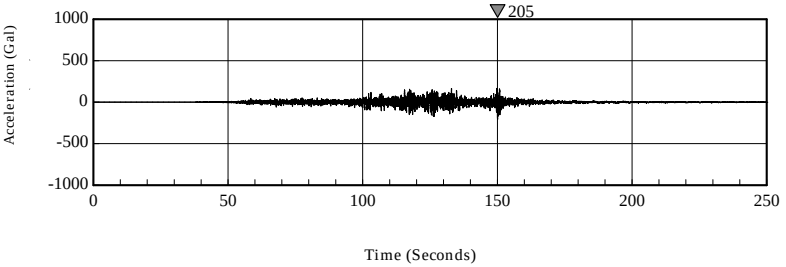
(b)North Point GN4 Observation Point

Fig.2-1 Fukushima Daiichi Nuclear Power Station
Acceleration time history waveforms for the
O.P.-200m at free foundation system (south point)
and seismic observation point (north point)
(East-West direction)



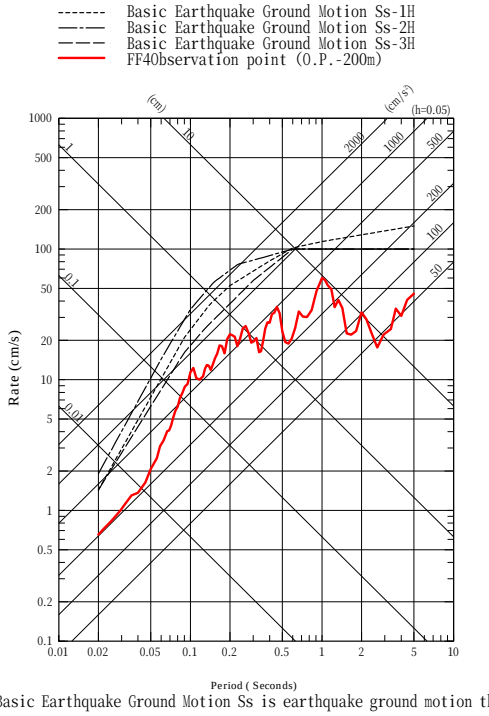
※Basic Earthquake Ground Motion Ss is earthquake ground motion that is defined on open foundation surface. The data is collected underground.

Fig2-2 Fig.2-1 Fukushima Daiichi Nuclear Power Station
Response spectra for the O.P.-200m at free foundation system
(south point) and seismic observation point (north point)
(East-West direction)



FF4 Observation point

Fig.2-3 Fukushima Daini Nuclear Power Station
Acceleration time history waveforms for the O.P.-200m
at free foundation system/Seismic observation point
(North-South direction)



※Basic Earthquake Ground Motion Ss is earthquake ground motion that is defined on open foundation surface. The data is collected underground.

Fig2-4 Fukushima Daini Nuclear Power Station
Response spectra for the O.P.-200m at free
foundation system/Seismic observation point
(North-South direction)

※ Among horizontal directions in the table, larger directions are indicated. (F1：East-West direction, F2：North-South direction)

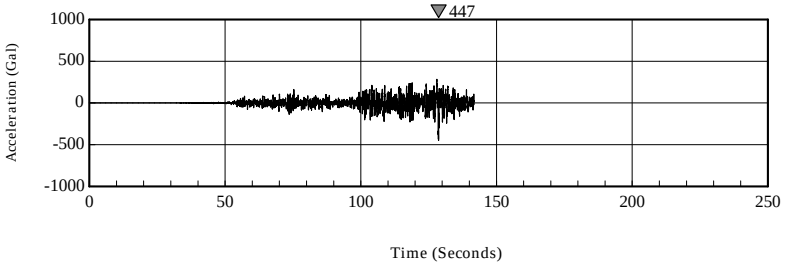


Fig.3-1 F1 Acceleration time history waveforms for the base mat of the unit 1 reactor building (East-West direction)

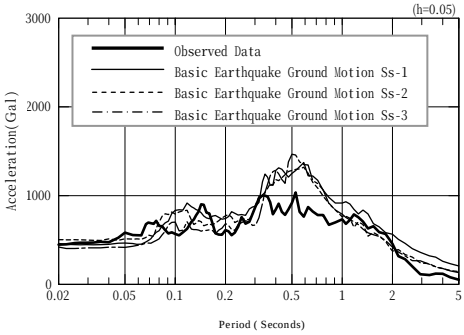


Fig.4-1 F1 Acceleration response spectra for the base mat of the unit 1 reactor building (East-West direction)

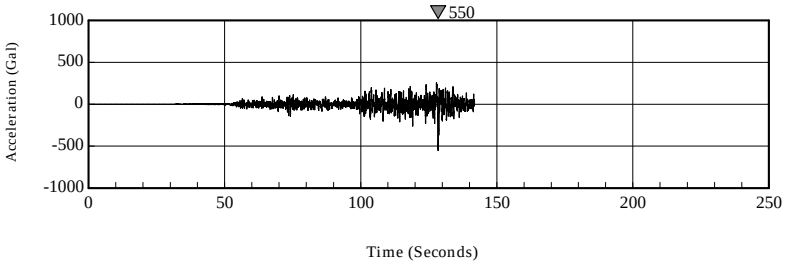


Fig.3-2 F1 Acceleration time history waveforms for the base mat of the unit 2 reactor building (East-West direction)

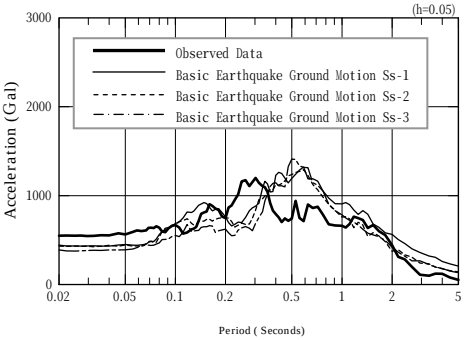


Fig.4-2 F1 Acceleration response spectra for the base mat of the unit 2 reactor building (East-West direction)

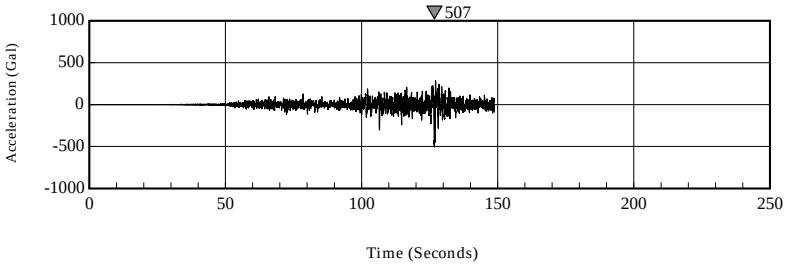


Fig.3-3 F1 Acceleration time history waveforms for the base mat of the unit 3 reactor building (East-West direction)

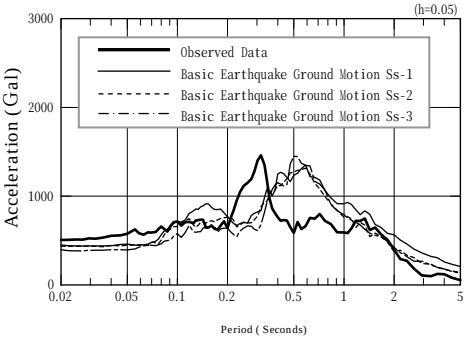


Fig.4-3 F1 Acceleration response spectra for the base mat of the unit 3 reactor building (East-West direction)

※ Among horizontal directions in the table, larger directions are indicated. (F1 : East-West direction)

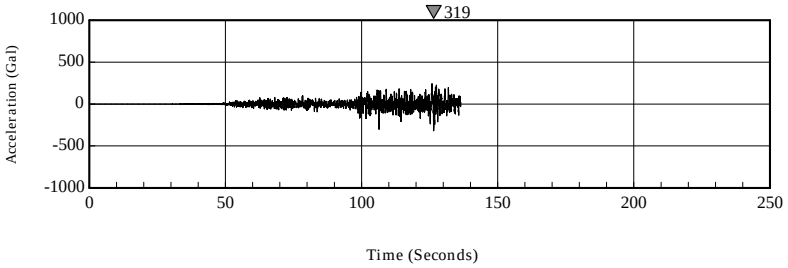


Fig.3-4 F1 Acceleration time history waveforms for the base mat of the unit 4 reactor building (East-West direction)

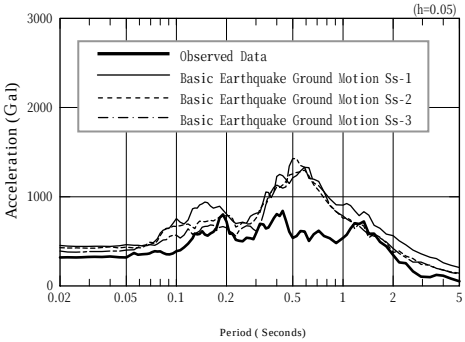


Fig.4-4 F1 Acceleration response spectra for the base mat of the unit 4 reactor building (East-West direction)

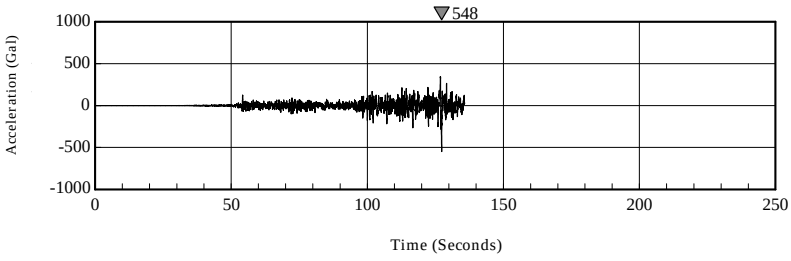


Fig.3-5 F1 Acceleration time history waveforms for the base mat of the unit 5 reactor building (East-West direction)

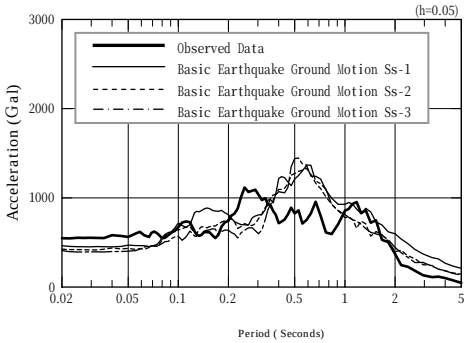


Fig.4-5 F1 Acceleration response spectra for the base mat of the unit 5 reactor building (East-West direction)

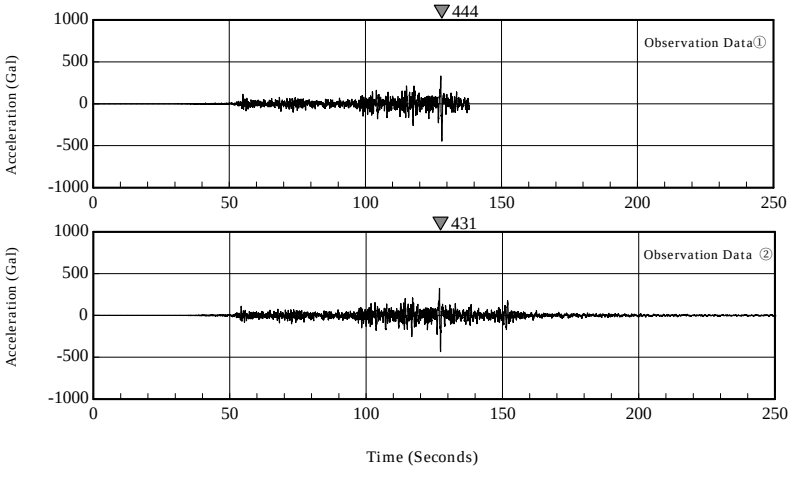


Fig.3-6 F1 Acceleration time history waveforms for the base mat of the unit 6 reactor building (East-West direction)

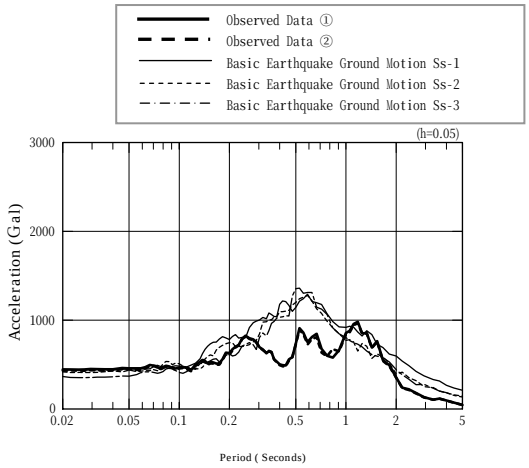


Fig.4-6 F1 Acceleration response spectra for the base mat of the unit 6 reactor building (East-West direction)

※ Among horizontal directions in the table, larger directions are indicated. (F1 : East-West direction)

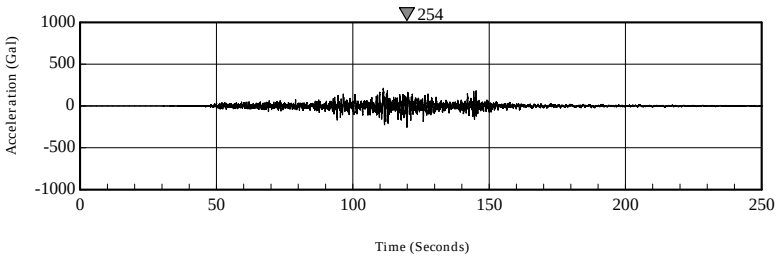


Fig.3-7 F2 Acceleration time history waveforms for the base mat of the unit 1 reactor building (North-South direction)

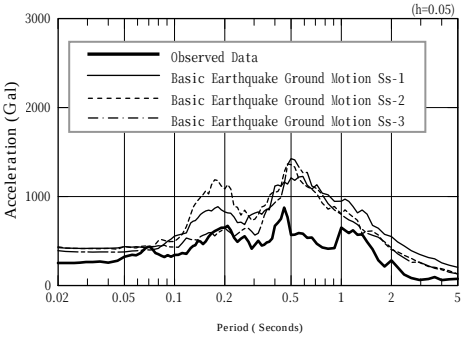


Fig.4-7 F2 Acceleration response spectra for the base mat of the unit 1 reactor building (North-South direction)

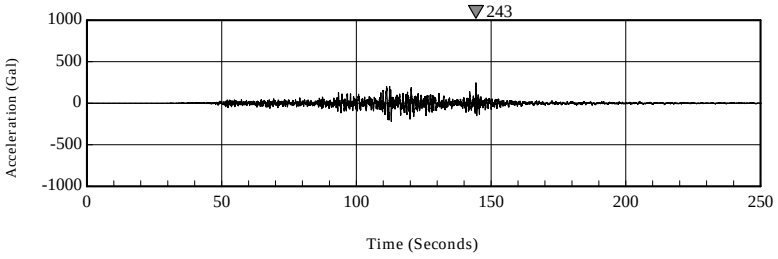


Fig.3-8 F2 Acceleration time history waveforms for the base mat of the unit 2 reactor building (North-South direction)

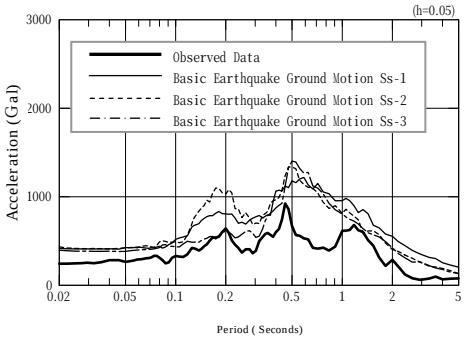


Fig.4-8 F2 Acceleration response spectra for the base mat of the unit 2 reactor building (North-South direction)

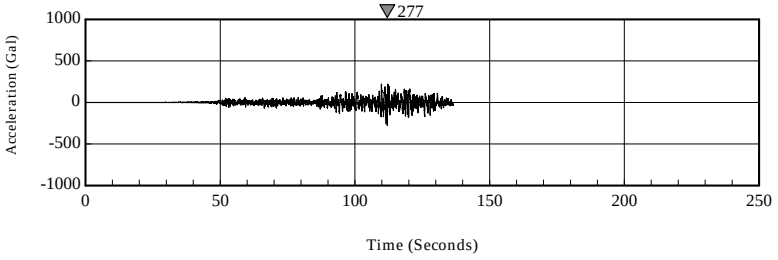


Fig.3-9 F2 Acceleration time history waveforms for the base mat of the unit 3 reactor building (North-South direction)

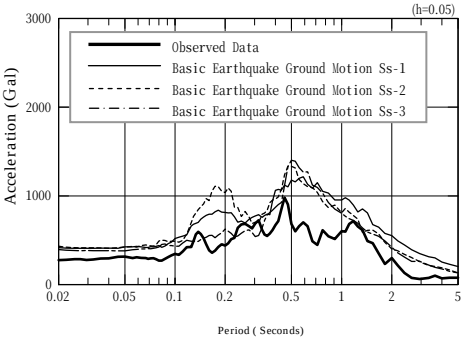


Fig.4-9 F2 Acceleration response spectra for the base mat of the unit 3 reactor building (North-South direction)

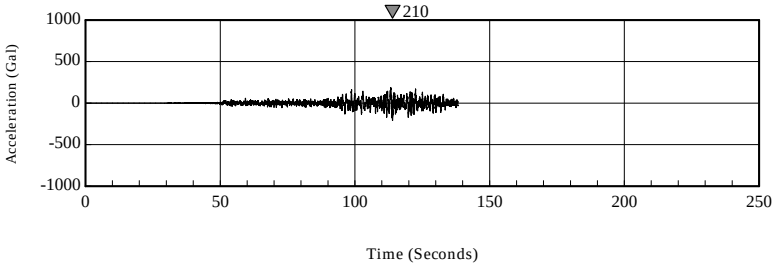


Fig.3-10 F2 Acceleration time history waveforms for the base mat of the unit 4 reactor building (North-South direction)

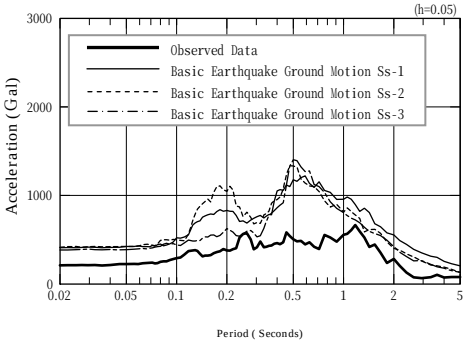


Fig.4-10 F2 Acceleration response spectra for the base mat of the unit 4 reactor building (North-South direction)

※ Among horizontal directions in the table, larger directions are indicated. (F2：North-South direction)