

Seismic Data from the Unit 3 Reactor Building

February 25, 2021



Tokyo Electric Power Company Holdings Inc.

【Background behind the test installation of seismometers in the Unit 3 reactor building】

- To date, seismic safety assessments that reflect the state of damage of structure have been conducted for the Unit 1~4 reactor buildings, and we have confirmed that the structures retain sufficient levels of seismic safety in relation to standard seismic motion Ss.
- However, for reactor buildings, it is necessary to confirm the long-term integrity of the structures, and we have been deliberating whether or not we can ascertain trends in changes over time that the structures experience by analyzing seismic data records. For this purpose, we installed seismometers on the first floor and on the fifth floor operating floor of the Unit 3 reactor building, and put them into trial use on April 1, 2020.

【Background behind the seismometer malfunctions and events leading up to the earthquake that occurred off the coast of Fukushima Prefecture】

- After the seismometers were put into use, seismic data was obtained without issue until June 2020, and we started to deliberate how to use the data in order to analyze degradation trends. However, even though a rain cover had been installed, the seismometer installed on the first floor level (outside of the west side platform) became water-logged from rain water and malfunctioned on July 3.
- After conducting a detailed field investigation, it was decided that the aforementioned seismometer would be reinstalled at a slightly higher location without building a new foundation in order to prevent the same thing from happening again, after which permanent measures would be implemented that involved building a new foundation. (October)
- During this time, the other seismometer (on the operating floor) started to show noise and missing data in its wave patterns on October 13, so an investigation to ascertain the cause was commenced.
- Since it was thought possible that the same thing would happen again if the instrument was replaced without ascertaining the cause of the noise, repair plans, including for the seismometer that was waterlogged, were changed so that repairs would be made after ascertaining the cause of the problem. (November 2020)

- The results of a detailed investigation into the seismometer that was recording noise revealed a nonconformance with the circuit board, so we began comparing past test data to investigate the possibility of the seismometer being affected by radiation. (January-February 2021)
- In February 2021, we determined that there was a possibility that the investigation into the cause of the malfunction would take longer than expected, and were in the process of making preparations to replace both seismometers with new units in order to continue to acquire data when the earthquake occurred on February 13.

【 Steps to be taken going forward 】

- The aforementioned seismometers will be repaired and we will begin recording data again during March. Along with implementing measures to prevent the recurrence of malfunctions caused by rain, such as building a new foundation (raising the elevation), we will also prepare for malfunctions by having spare units on hand.
- Going forward, based on the results of tests on the Unit 3 seismometer we will deliberate installing seismometers at Units 1 and 2.
- Furthermore, at the Fukushima Daiichi Nuclear Power Station, we have confirmed from data taken from the foundation plate seismometers of Unit 5 and Unit 6 that the earthquake that occurred off the coast of Fukushima Prefecture on February 13, 2021 did not exceed standard seismic motion Ss.

The objective of installing seismometers on a trial basis in the Unit 3 reactor building

- To date, seismic safety assessments that reflect the state of damage have been conducted for the Unit 1~4 reactor buildings, and we have confirmed that the structures retain sufficient levels of seismic safety in relation to standard seismic motion Ss. However, for reactor buildings it is necessary to confirm the long-term integrity of the structures, and we have been deliberating whether or not we can ascertain trends in changes over time that the structures experience by analyzing seismic data records.
- The buildings in which seismometers were installed were greatly damaged by the hydrogen explosions and require that trends in changes that occur over time for the entire structures be ascertained. The operating floor of Unit 3 was selected for trial installation because it can be accessed.
- Since normal seismometers cannot be used due to the high-dose environment, simple wireless seismometers were installed.
- After we have used test data to confirm the usefulness of measurement data, and that measurements can be taken without issue and without being affected by radiation or weather phenomena, more seismometers will be installed at other units.



Simple seismometer installed in Unit 3 on a trial basis ※
(1st floor level)

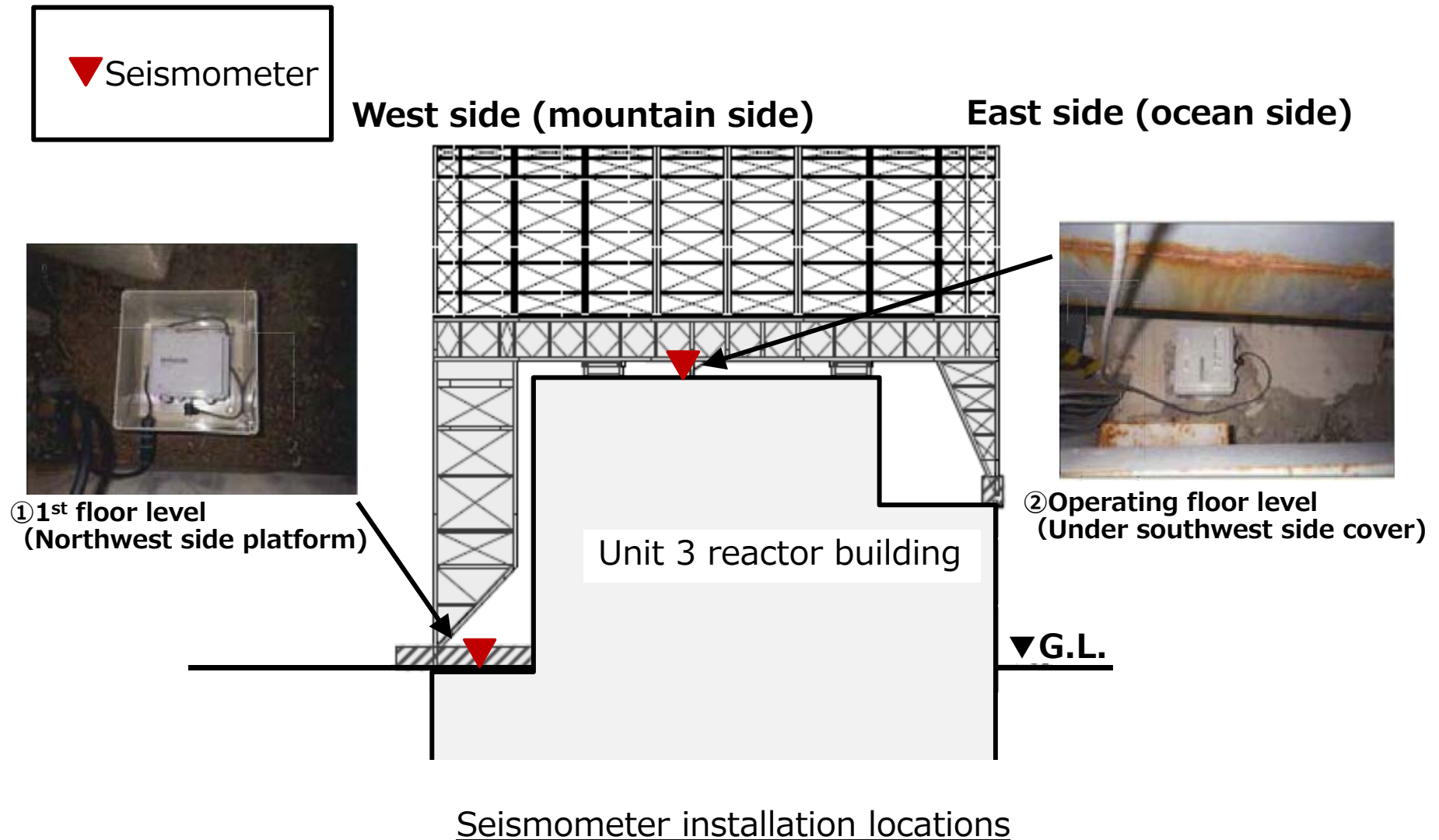


(Reference) Permanent seismometer in Unit 6

※ Simple standalone seismometers that use solar panels for power and send data via wireless transmission were employed ₃

Cross-section of Unit 3 seismometer installation

- A total of two seismometers were installed, one on the first floor level and one on the operating floor level of the Unit 3 reactor building



- The seismometer installed on the foundation plate of Unit 6 is used during operation (for notifying other parties and publicly disclosing data, and conducting inspections in different zones following an earthquake), and used to quickly ascertain maximum acceleration.
- Other seismometers installed in Units 5 and 6 are backups and used for various types of analysis. When the seismometer installed on the Unit 6 foundation plate is being inspected, the seismometer on the Unit 5 foundation plate is used as a substitute to quickly obtain and announce measurement data.
- Free-field seismometers are used to take measurements used during the setting of standard seismic motion.

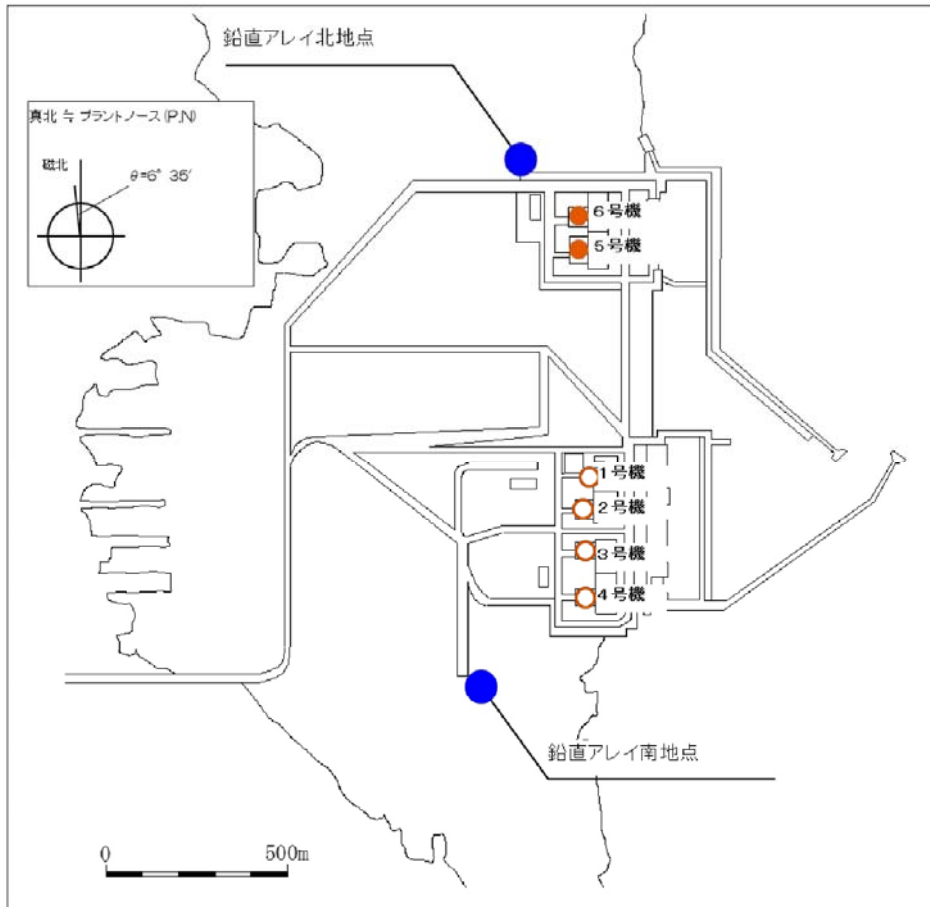


図1 福島第一における地震観測（全体）

		観測点	役割
Reactor building	5号機建屋	R/B (基礎版)	バックアップとして運用に利用
		R/B (中間階)	建屋の振動特性分析（6号機との相対比較）に利用
	6号機建屋	R/B (基礎版)	運用に利用 ※
		R/B (中間階) (最上階) 各1箇所	建屋の振動特性分析に利用
Free-field type	自由地盤系	南地点	基準地震動策定に利用し、今後大きな地震が発生した場合に妥当性検証に利用
		北地点	基準地震動策定の補助として利用

※ 最大加速度値（水平、垂直）をお知らせ済み