

# Seismometers installed in the Fukushima Daiichi NPS Unit 3 reactor building (Recommencement of trial usage)

<Reference Material>

March 19, 2021

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Fukushima Daiichi D&D Engineering Company

○Seismometers were installed on the first floor and on the fifth floor (operating floor) in the Unit 3 reactor building and were put into trial use on April 1, 2020 in order to ascertain aged deterioration trends for the entire building. However, thereafter both of the units broke down. The seismometer on the first floor malfunctioned due to flooding caused by rain, and the seismometer on the fifth floor started showing noise in its readout. Repair of the seismometers has been suspended in conjunction with the investigation into the cause of the noise, but on March 4~5, 2021 new seismometers were installed on floors one and five.

(History to this point)

- In July the seismometer on the first floor became flooded → As preparations were being made to repair the seismometer, the seismometer on the fifth floor started showing noise in its readout in October. It was therefore decided to suspend repair of the first floor seismometer temporarily out of the need to ascertain the cause of the noise.
- Even though noise in the readout from the seismometer on the fifth floor may be linked to a nonconformance with the circuit board found during a detailed investigation conducted at the factory, it was deemed likely that a detailed investigation will take more time since it must also be investigated whether or not radiation had an impact. Therefore, preparations were underway to replace both of the seismometers with new ones when the earthquake off the coast of Fukushima Prefecture happened on February 13 . Since then, aftershocks have continued and much earthquake data can be collected for research purposes, so the cooperation of the seismometer manufacturer was enlisted to procure and install portable seismometers.

○As a rain countermeasure for the seismometer on the first floor, a new foundation (height: approx. 55cm) will be built to raise the installation location, but for now the new seismometer has been temporarily installed in a higher location (on the part of the existing hatch that sticks up) in order to quickly recommence data gathering.

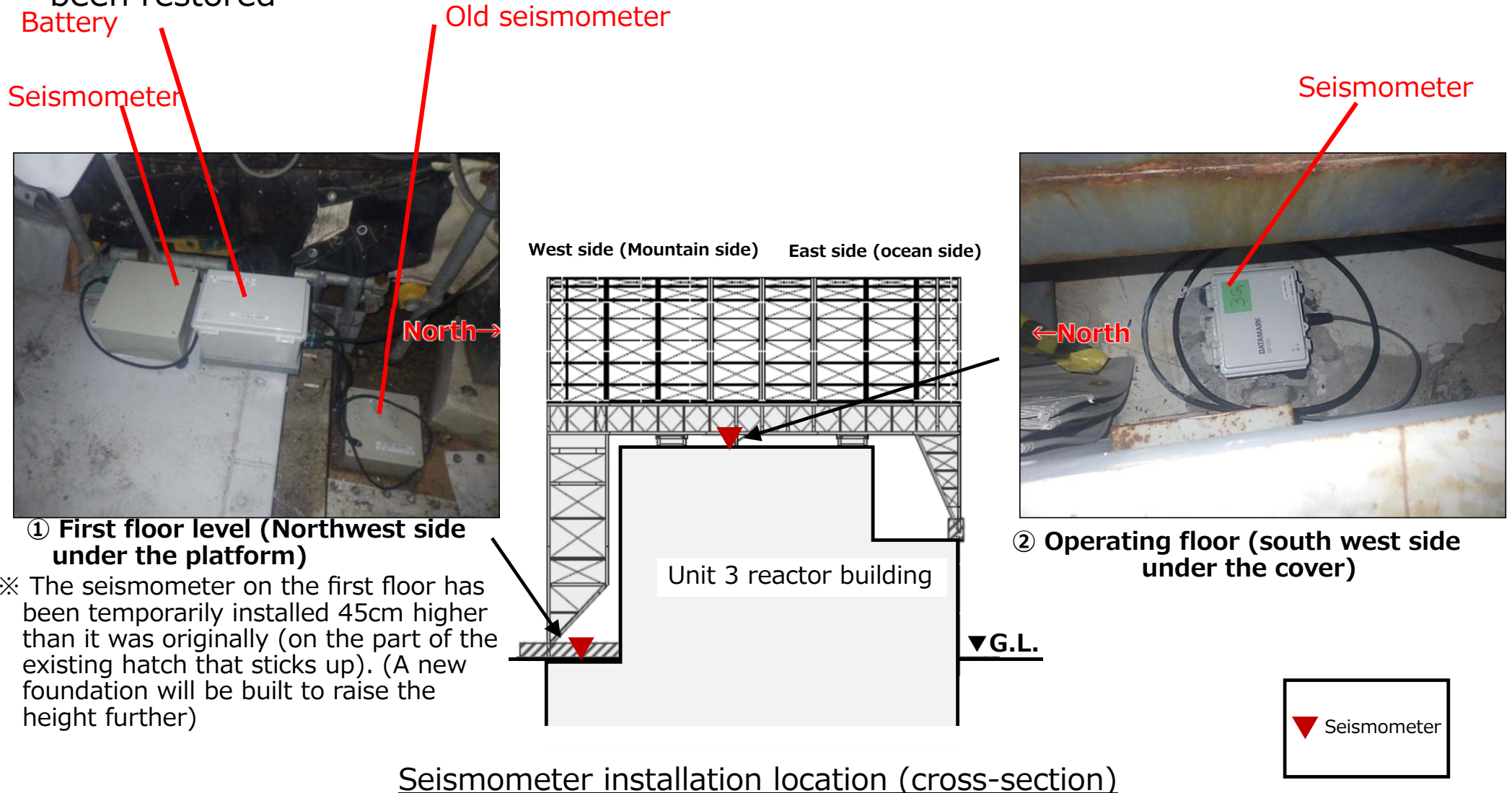
○ From the time of installation until yesterday (March 18) function tests were performed on the seismometer and it was confirmed that there are no problems with function or radio transmission. Going forward, by the end of March we plan to procure a six seismometers to be used as spares as part of countermeasures for malfunctions, including noise in readouts. However, in order to quickly recommence data gathering, trial use of a new seismometer began provisionally today (March 19) while we make preparations to build the new foundation for the seismometer on the first floor and procure spare seismometers. (The seismometer will be relocated after the foundation is built in April and put into regular use)

○We will continue to ascertain aged deterioration trends for the entire building by analyzing earthquake observation records, and examine the applicability of wireless seismometers. We continue to investigate the cause of the malfunction of the operating floor seismometer, and will deliberate our next step as soon as we understand the cause, which may include replacement with a new seismometer. Furthermore, in light of the results of the trial use of the Unit 3 seismometers, we plan to also install seismometers at Units 1 and 2

# Unit 3 seismometer repair

## Seismometer installation status (cross-section)

- Seismometer function on the first floor and the operating floor of the Unit 3 R/B has been restored

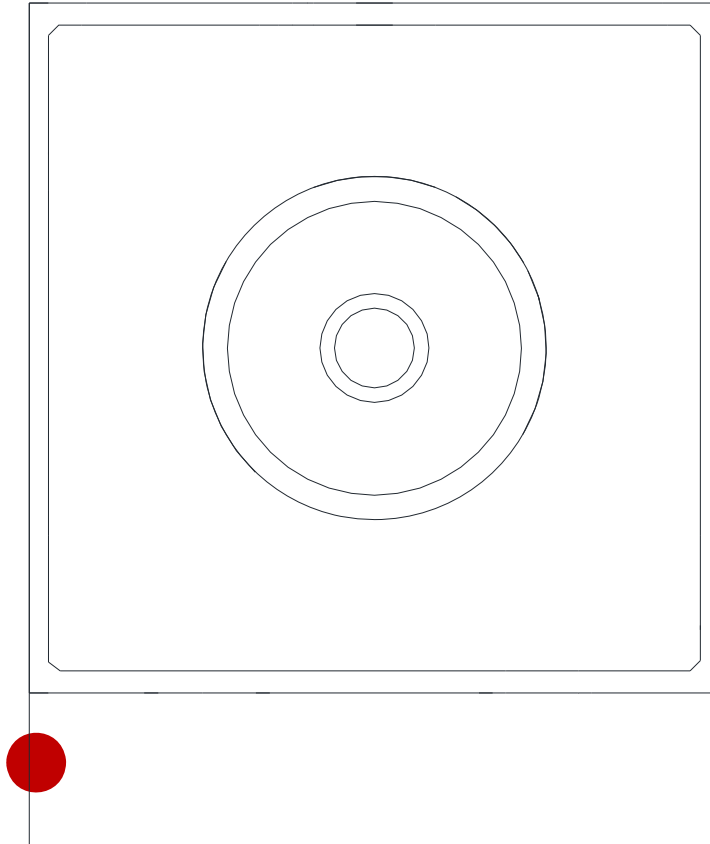


(Reference) Since seismometer installation in Unit 3 must be conducted in a high-dose environment, a MEMS acceleration sensor was selected for use as a seismometer because it has wireless transmission functions, is energy efficient and takes little space. Since this type is different from the seismometers normally installed at the Fukushima Daiichi Nuclear Power Station, we will continue to examine its applicability.

# Unit 3 seismometer repair

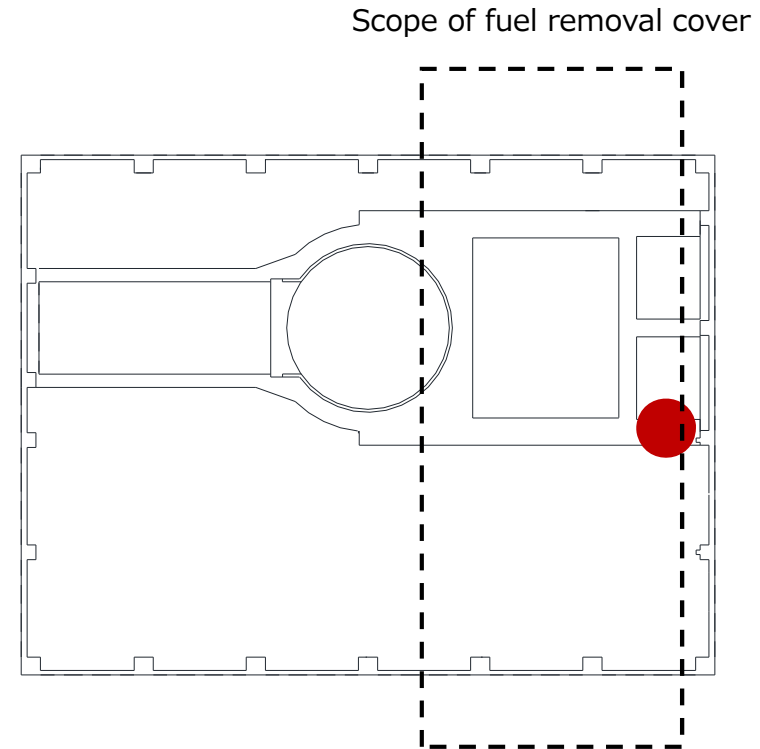
## Seismometer installation status (top view)

←North



First floor level

※The repaired seismometer on the first floor is located approximately 50 cm to the south than it was originally



5<sup>th</sup> floor operating floor

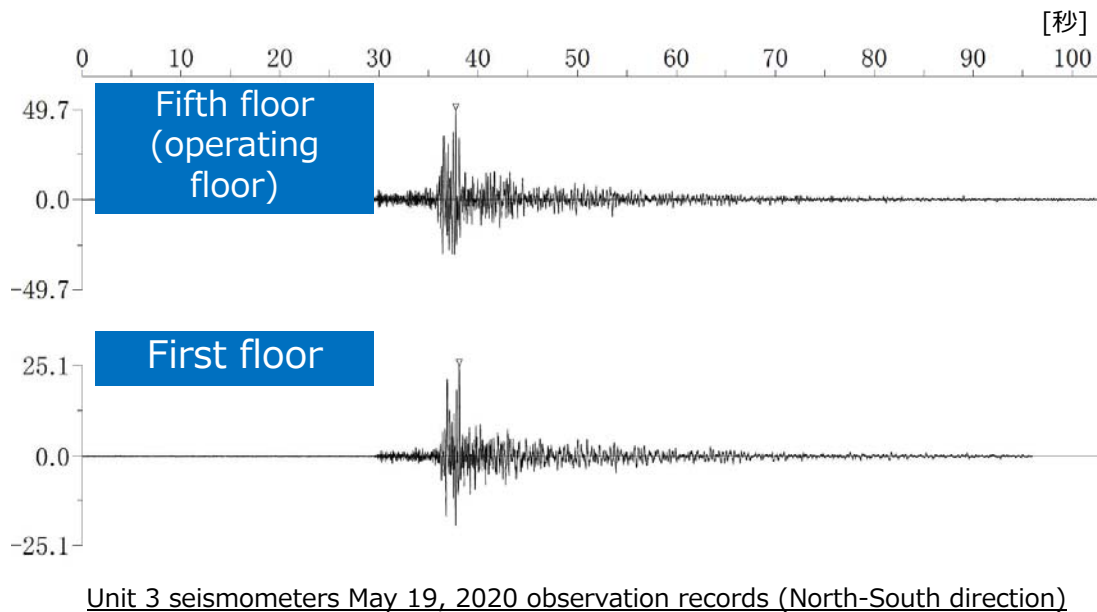
※The repaired fifth floor seismometer is in the same location it was written

### Seismometer installation location (top view)



# (Reference) Unit 3 seismometer observation records

- Earthquake data was recorded a total of 13 times※<sup>1</sup> between April and July 2020 by the seismometers installed provisionally in the Unit 3 reactor building to examine if aged deterioration trends can be ascertained for the building. (April: 5 times, May: 4 times, June: 3 times, July: 1 time)
  - ※<sup>1</sup> Number of earthquakes that both seismometers recorded
- The earthquakes with the largest acceleration out of those recorded is as follows:
  - [Time/date] 12:17 AM, May 19, 2020 [Location of epicenter] Off the coast of Fukushima Prefecture [Magnitude] 5.4
- The maximum accelerations recorded by each seismometer for the earthquake mentioned above are as follows:
  - The accelerations cannot be simply compared because the structure of the buildings and the seismometer installation locations differ, however the maximum acceleration seen at Unit 3 was not especially different from that seen at Units 5 and 6.



R/B	Installation location	Maximum acceleration (GAL)			Installation objectives
		NS	EW	UD	
Unit 3	Fifth floor (operating floor)	49.7	44.3	22.0	To gather earthquake data, and examine whether seismometers can be used to ascertain age degradation trends of buildings
	First floor	25.1	25.7	23.5	
Unit 5	Second floor	26.3	20.8	17.8	Used to analyze building vibration characteristics
	Subfloor 1 (foundation unit)	24.2	14.7	12.9	Used for power station operation (backup)
Unit 6	Sixth floor (operating floor)	44.6	38.2	18.7	Used to analyze building vibration characteristics
	Subfloor 2 (foundation unit)※ <sup>2</sup>	13.4	16.7	16.0	Used for power station operation

List of observation records for May 19, 2020

※<sup>2</sup> Data for the 6-R2 seismometer, which recorded the maximum acceleration, is shown