

Tank Displacement Caused by the Earthquake on February 13 and Countermeasures

February 25, 2021



Tokyo Electric Power Company Holdings, Inc.

March 1, 2021 Partially revised
(P2, P4 ,P5)

- Feb 13, 2021 Earthquake occurs
- Feb. 14 Medium/low concentration tanks (1,074) at the Fukushima Daiichi Nuclear Power Station patrolled
 - [It is confirmed that there are no leaks in all tank areas \(publicly announced\)](#)
 - It is found that the multi-nuclide removal equipment (ALPS) sample tanks and treated water tanks have been displaced※
- ※ : The tanks are designed to move if subjected to enough force in order to prevent damage. The foundations of the tanks are therefore not fixed in order to dissipate any force applied to the tanks.
- Feb. 15 A displacement check of all tanks is commenced
- Feb. 18 The tank displacement is publicly announced during the regular press conference
 - (Announcement content)
 - Three ALPS sample tanks were displaced 5cm at most.
 - Tank displacement has been found in other areas and a detailed investigation is underway.
- Feb. 24 Investigation into the amount of tank and coupling pipe displacement (prior to removal of the protective covering) concludes (announced on February 25)

2. Degree of displacement of tanks and coupling pipes in all tank areas

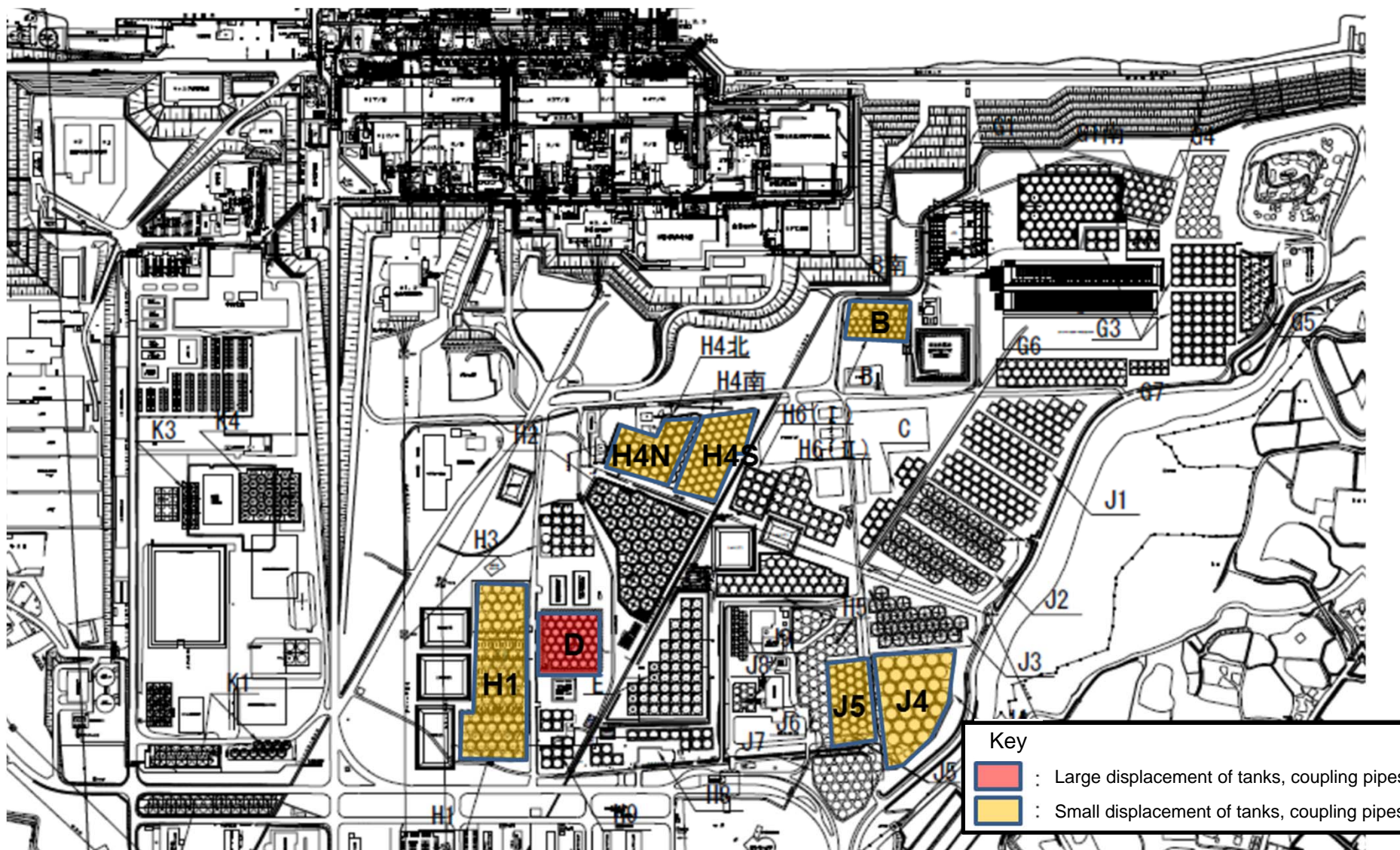
(Overview)

- An investigation of tanks found that 53 tanks have been displaced a maximum of 19cm.
- The most displacement was found in Area D. The aforementioned tank area has tanks used to store RO freshwater, Sr-treated water and concentrated waste liquids, but the displacement of the RO freshwater and Sr-treated water tanks, for which coupling pipes are in use, was prominent.
- In Area D, coupling pipes were found in **eight** locations to have been displaced to a degree that exceeds the recommended amount of displacement by the manufacturer during inspections prior to the removal of protective coverings. And, in the six other areas tanks were found to have been displaced to a degree that is lower than manufacturer's recommended amount of displacement. (**Eccentricity : two, Elongation : four, Shrinkage : three (One was confirmed to have eccentricity and elongation in a same pipe.)**)
- At current time, a detailed inspection of coupling pipes is being performed in Area D now that the protective covering (metal plates/insulation) has been removed, so it is possible that the number of locations in which the amount of displacement exceeds the manufacturer's recommended amount of displacement may increase going forward.

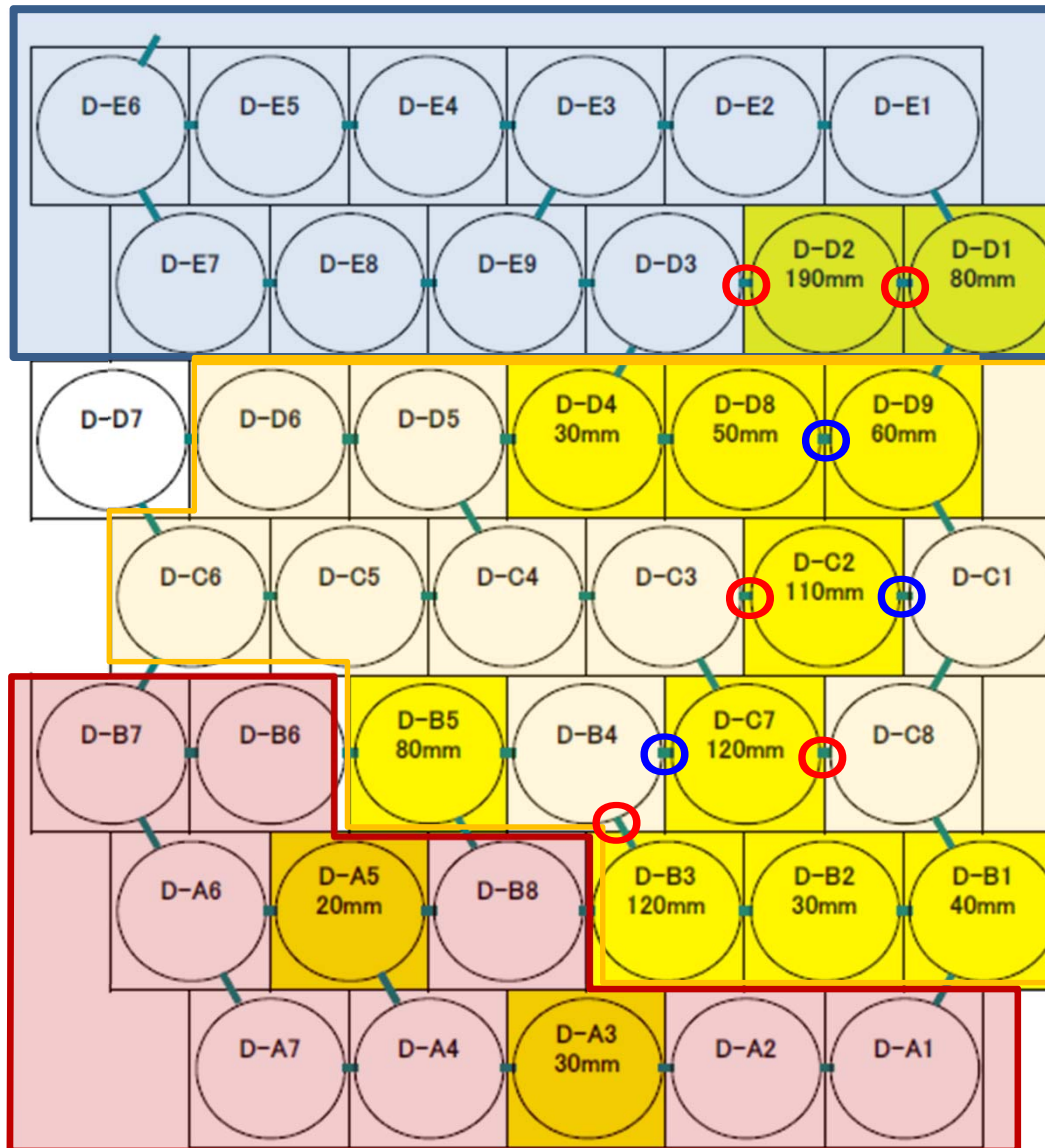
Area	Number of tanks	Tank displacement			Number of locations that exceed recommended displacement	Notes		
		Yes/No	Number of tanks	Maximum displacement (mm)		Manufacturer's recommended amount of displacement (mm)		
						Eccentricity	Elongation	Shrinkage
B	37	Yes	6	50	0	100	100	100
						100	40	60
D	41	Yes	13	190	8	150	50	50
H1	63	Yes	7	30	0	200	200	200
H4S	51	Yes	1	40	0	150	50	50
H4N	35	Yes	13	90	0	200	200	200
J4	35	Yes	3	30	0	Bend radius equals or exceeds 2000mm		
J5	35	Yes	7	30	0	Bend radius equals or exceeds 2000mm		
Sample tanks	10	Yes	3	50	—	—	—	—
Other	767	No	0	—	—	—	—	—
Total	1074		53					

※Changes are noted in blue

3. Map of tank and coupling pipe displacement for all tank areas



4. Area D tank displacement



- : Locations where displacement exceeds manufacturer's recommendations
- : Locations where displacement exceeds manufacturer's recommendations (Additional)

RO fresh water

Sr-treated water

Concentrated waste liquid

Tanks found to have been displaced

5. Area D Coupling pipe displacement investigation results

Area D Coupling Pipe Displacement Investigation							
* Red letter indicates exceed of manufacturer's recommendations							
No.	Coupling Pipe	Amount of eccentricity	Coupling pipe length measurement	No.	Coupling Pipe	Amount of eccentricity	Coupling pipe length measurement
1	A1-A2	0	1090	24	C4-D5	0	1075
2	A2-A3	0	1110	25	C5-C6	15	1095
3	A3-A4	0	1100	26	C6-D7	10	1075
4	A4-A5	0	1110	27	C7-C8	80	1210
5	A4-A7	0	1110	28	D1-D2	280	1130
6	A5-A6	20	1105	29	D1-E1	70	1060
7	A5-B8	0	1100	30	D2-D3	220	1160
8	A6-A7	0	1110	31	D3-E9	10	1120
9	A6-B7	0	1100	32	D4-D5	15	1110
10	B1-B2	0	1090	33	D4-D8	0	1120
11	B1-C8	0	1110	34	D5-D6	10	1095
12	B2-B3	120	1140	35	D6-D7	10	1100
13	B3-B4	30	1190	36	D8-D9	40	1020
14	B4-B5	45	1075	37	E1-E2	0	1120
15	B4-C7	20	1010	38	E2-E3	0	1090
16	B6-B7	0	1085	39	E3-E4	0	1100
17	C1-C2	30	1020	40	E3-E9	10	1095
18	C1-C8	0	1090	41	E4-E5	0	1100
19	C1-D9	30	1120	42	E5-E6	0	1075
20	C2-C3	10	1190	43	E6-E7	0	1095
21	C3-C4	10	1100	44	E7-E8	10	1110
22	C3-C7	100	1120	45	E8-E9	10	1090
23	C4-C5	0	1120	Manufacturer's recommendation (mm)		150	1040~1140

*Blue letter indicates additions

※A detailed investigation of coupling pipes is being performed now that the protective covering (metal plates/insulation) has been removed so the number of locations where displacement exceeds recommendations may increase going forward

Area D tank conditions

- Connecting valves on all tanks in Area D have been closed since the detailed inspection began on February 24, and use of the tanks has been temporarily suspended.
- On the same day, the operation of ALPS equipment was temporarily suspended while a check was made to confirm that the tanks needed for ALPS-treated water (RO freshwater tanks, SR-treated water tanks), some of which are located in Area D, do not have any issues.
- ALPS equipment was put back into operation on the afternoon of the next day, February 25, after safety was insured by changing which tanks are to be used.
 - RO fresh water tanks: Only tanks that have no impact on Area D were put into use on a limited basis
 - Sr-treated water tanks: Tanks in area H8, which were not displaced, are being used.

Status of treated water tanks other than those mentioned above

- ALPS-treated water tanks
 - Connecting valves are closed after tanks become full. This has been done since prior to the earthquake on February 13. (At current time the connecting valves on most of the tanks are closed).
 - At the time of the earthquake, tanks in the G4 South/G1 areas were being used as receiving tanks, but they were not displaced.

Steps to be taken going forward

- Coupling pipes that were displaced will be replaced as soon as preparations are completed.
- Going forward, the necessity for earthquake countermeasures will be examined, procedures for responding to earthquakes will be revised, and securing an inventory of spare parts will be reexamined based upon the data obtained from seismometers on site.

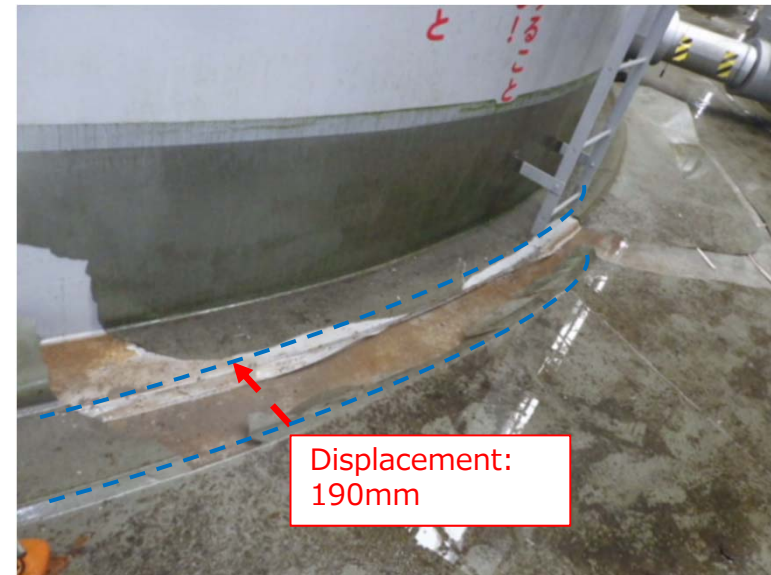


Coupling pipe (Connecting D1-D2)
(A small amount of rain water has accumulated inside the dyke)

Coupling pipe specifications

Manufacturer recommended displacement※ Eccentricity: 150mm
Elongation/Shrinkage: ±50mm

※ : Minimum for guaranteeing stable functionality. The pipes will not immediately break/rupture if the amount of displacement exceeds the amount of displacement mentioned above.



Tanks displacement and waterproof paint
(Polyurea) damage (D2 Tank)
(A small amount of rain water has accumulated inside the dyke)

(Reference) The role of Area D tanks and future use

RO-treated water (fresh water) tanks: **(Role)** Used as tanks for storing RO-treated water used as reactor coolant
(Future use) No other tank groups with same function

Use of groups D-D and E tanks will continue*

※ Displaced tanks will be taken out of use, and only tanks that were found not to have been displaced will be used on a limited basis.

Sr-treated water tanks (RO concentrated water) **(Role)** Used as buffer tanks prior to treating water with multi-nuclide removal equipment (ALPS)
(Future use) H8-A group tanks that have the same function will be used

Use of D-B and C group tanks will be suspended (substitute measures are being deliberated)

Concentrated waste water tanks **(Role)** Used to store concentrated waste liquid separated from concentrated salt water using evaporation condensation equipment immediately following the accident

