

<Reference>

**Mis-transportation of Accumulated Water to the Incinerator Workshop Building
in the Central Radioactive Waste Treatment Facility
of the Fukushima Daiichi Nuclear Power Station**

April 16, 2014

Tokyo Electric Power Company

1. Outlines (1/2)

- A rising trend in water level in the On-site bunker building and a lowering trend in water level in the Process main building were found on April. 10, 2014. Accordingly, on-site investigation was carried out from April 12, and the next day on April 13, it was found that the temporary pumps^{*1} (four pumps) which were not in use on a regular basis were turned on.
 - ◆ Process building → On-site bunker building (1 pump)
 - ◆ Process building → Incinerator workshop building (1 pump)
 - ◆ Incinerator workshop building → Process main building (2 pumps)
- For the investigation, the temporary pumps in question were turned off from 5:02PM to 5:22 PM, April 13.
- As the result of the investigation, it was found that approx. 203 m³ of water was accumulated in the Incinerator workshop building (Incinerator building: approx. 165 m³/ Workshop building: approx. 38 m³)
- It is noted that there are no pipes passing through the wall in the water level which was mistakenly transferred into the building, furthermore, the building walls have been repaired after the earthquake. In addition, based on the facts that the water level in the building remains the same where the analysis result of subdrain water quality shows no difference, and that the water level of the subdrain is higher than that of the said building^{*2}, it is estimated that there has been no water leakage occurred outside the building.

(*1) To prevent accumulated water from flowing over to outside the system, temporary pumps are installed to be able to transfer the water to the On-site bunker building and the Incinerator workshop building of the Central radioactive waste treatment facility, which are maintained as not in regular use.

(*2) Against the water level that was mistakenly transferred this time (OP4250 to 4400), the subdrain water level measured at OP8000 or more, which is high enough.

1. Outlines (2/2)

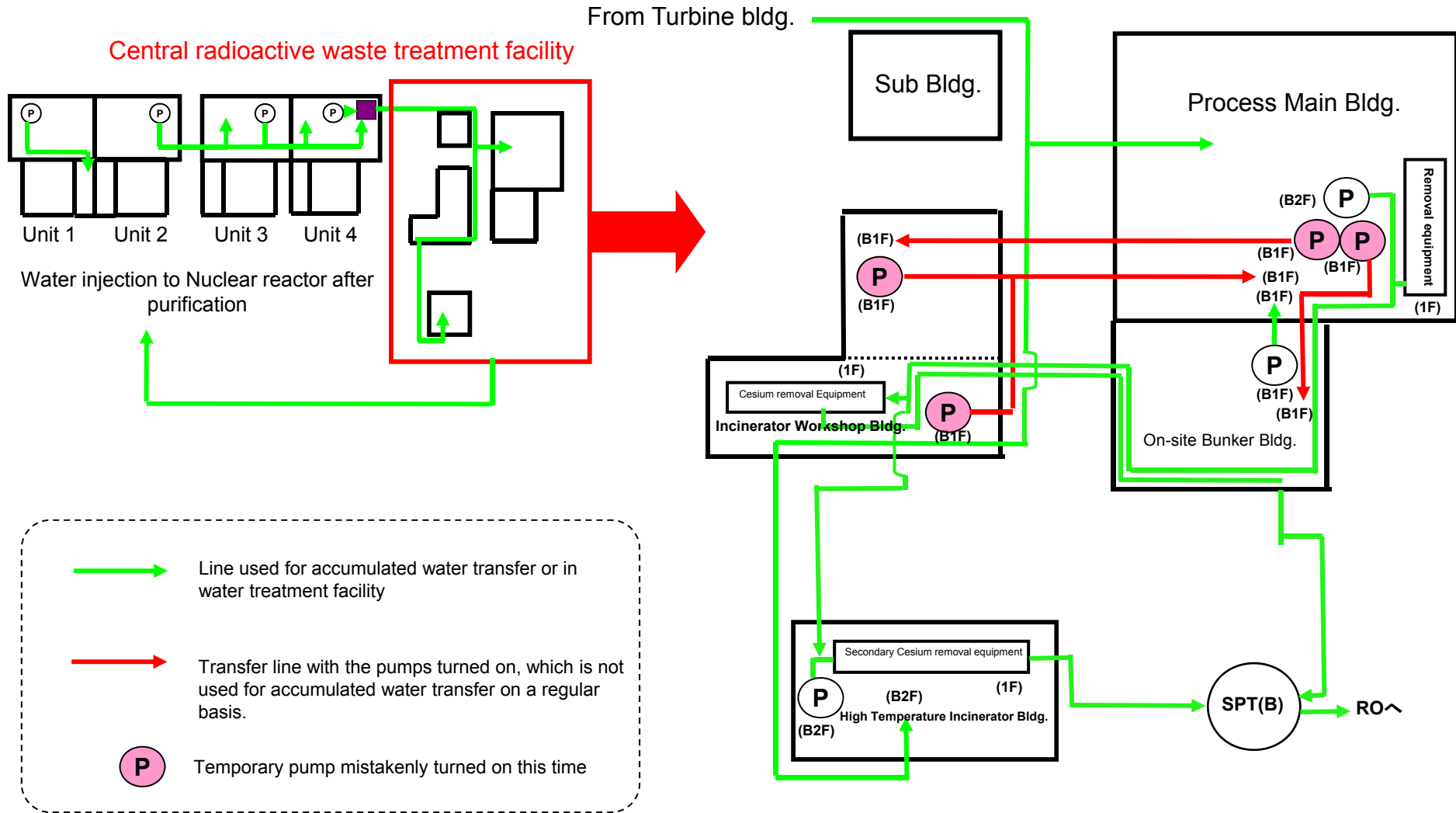
【Outline】

Apr 10, 9:41 – 17:44, Apr 11, Around 12:00,	Carried out water transfer to the Process main building from the On-site bunker building. It was found with the data taken at 12:00 and 16:00 that the water level rising rate of the On-site bunker was high, which was continuously being monitored.
Apr 12, Around 18:00,	The On-site bunker water level kept at high, accordingly, investigation was carried out. (Checked if there was a possibility of reverse flowing as a result of siphon effect, and on the credibility of the water level measurement, etc. with the past data of water levels after the water had been transported from the On-site bunker.)
Apr 12, 19:30 – 21:30,	Checked the water level in the Process main building, to find that the water level remained the same. Enhancing monitoring, the status was to be continuously being checked until the morning.
Apr 13, 6:00 – 7:30, 11:30 – 14:30, 14:30 – 16:30, 17:02 – 17:22, Around 20:00, Around 21:20,	Carried out on-site check on the line up from the On-site bunker building → the Process main building, to find that some kind of flow was found in a temporary hose, which was reported then. Confirmed the temporary pumps were turned on. Checked the temporary distribution board connected to the temporary hose line (from the pump side to outlet location) and the electric power supply. Since no identification was displayed on the temporary distribution board, studied the electric power supply documents to avoid operational error. Suspended the operation of the four temporary pumps. Measured the water level and started to identify the submerged range.
22:15, Apr 14, 2:35, 3:50,	Discovered water being accumulated in the first basement by TEPCO employees working on the on-site investigation. Judged as a trouble related to regulatory compliance. Confirmed that the depth of accumulated water in the Incinerator building was approx. 18 cm which remained unchanged. Confirmed that the depth of accumulated water in the Workshop building was approx. 5 cm which remained unchanged.

【The range and amount of accumulated water in the Incinerator workshop building】

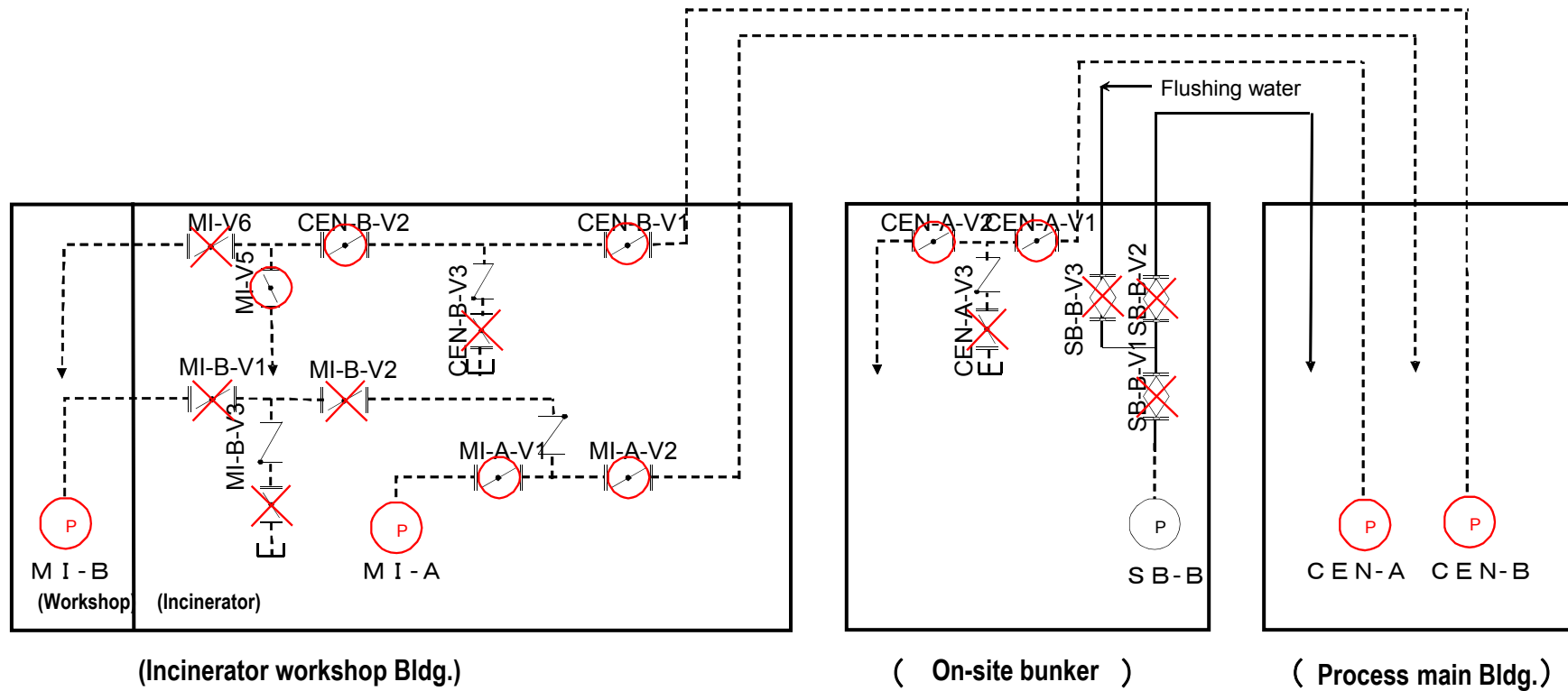
- Incinerator building: approx. 918 m² X approx. 18 cm* in depth.
- Workshop building: approx. 759 m² X approx. 5 cm in depth.
- The amount of accumulated water: approx. 203 m³

【Reference 1】 System layout



* All of the Process main Bldg., the On-site bunker Bldg., and the High temperature incinerator Bldg. have water accumulated in their buildings.

[Reference 2] On-site status (Pump start/stop status and Valve open/close status)



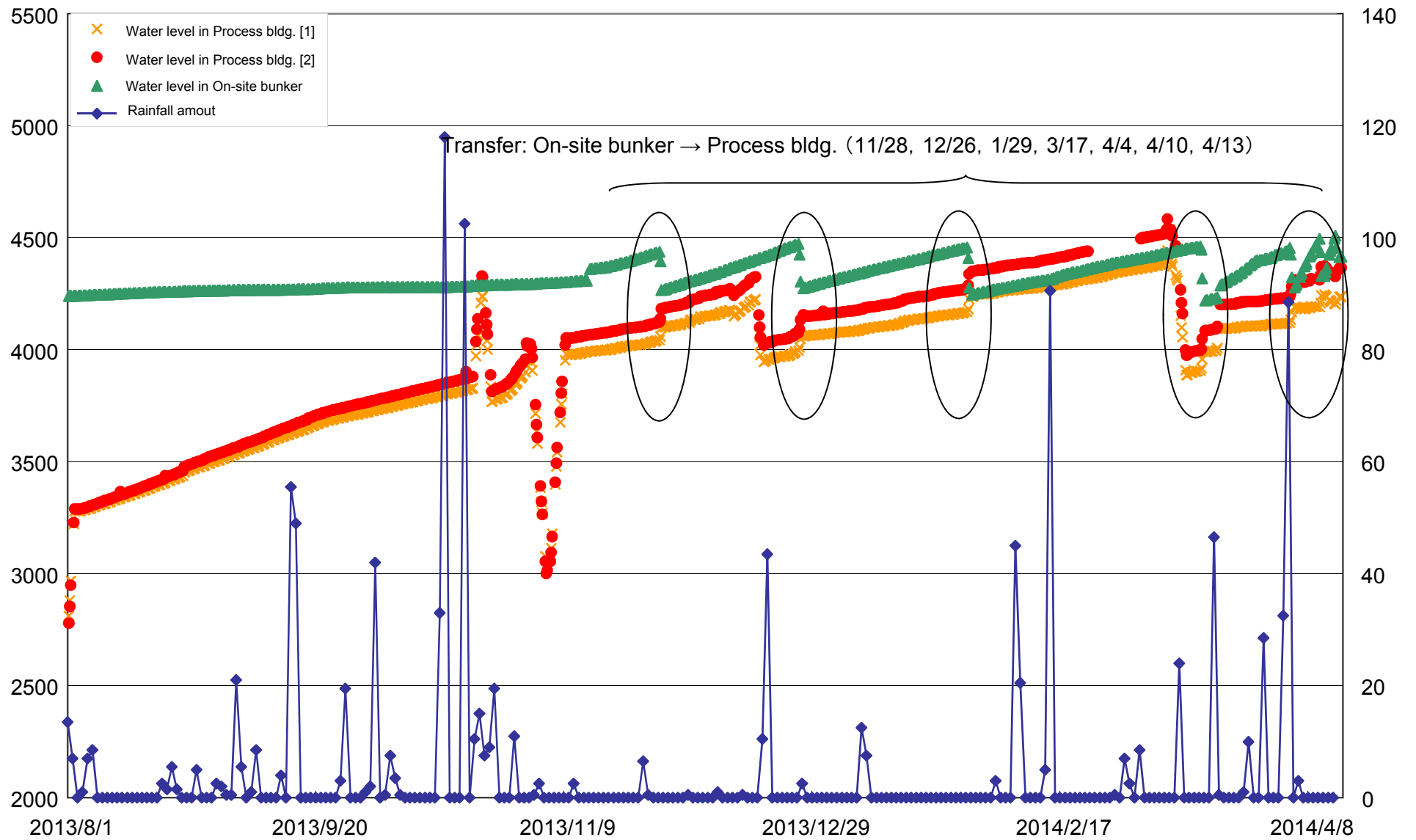
- : PE pipe
- - - : Kanaflex hose
- : Valve in "Opened" position
- ✕ : Valve in "Closed" position
- Ⓟ : Pump turned on
- Ⓞ : Pump turned off

2. Progress status of root cause investigation

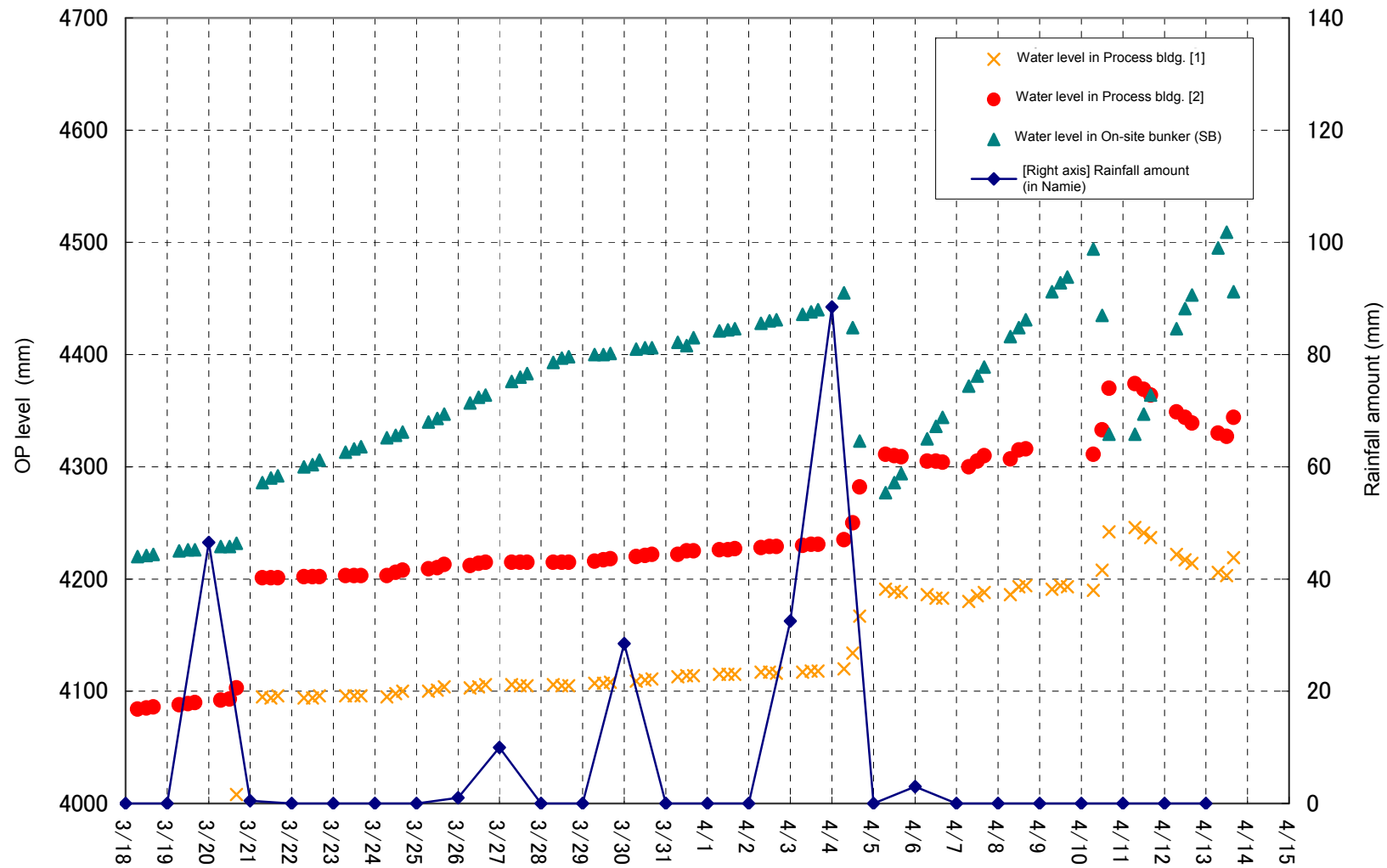
In light of the mis-transporation occurred this time, trends in the past are organized and summarized.

- Currently, the analysis of each phenomenon is proceeding and has found a increase in the water level rising rate of the On-site bunker after April 4, and a decrease in that of the Process main building after April 10.
- Looking at a long term trend, a rise of the water level in the On-site bunker has been observed since last November, and therefore, a possibility whether the pumps in question were turned on during the period mentioned above will be evaluated with a comparison to the amount of water level to be increased after turning off the temporary pumps.
- This trend analysis will narrow down the period when the temporary pumps were turned on and will also find the existence of any works involved in it, etc., which may lead to identifying the root cause. Therefore, its further study is to be carried out towards identifying the cause, paying attention to the change in the water level rising rate and the influence by raining, without jumping to conclusion quickly.

【Supplement 3】 Trend in water transfer (long-term)



[Supplement 3] Trend in water transfer (short-term)



2. Estimated causes

For the mis-transportation occurred this time (the temporary pumps had been started up), the root cause investigation is to be carried out to seek and identify the cause taking into consideration the trend analysis and timeline study mentioned before without ruling out the possibility of equipment defective (operational error, etc. attributed to the design flaw of electric control system such as control board.) or human error (operational error, etc. attributed to the mishandling of switches).

3. Actions to be taken

■ Lack of the thorough controlling of the control board.

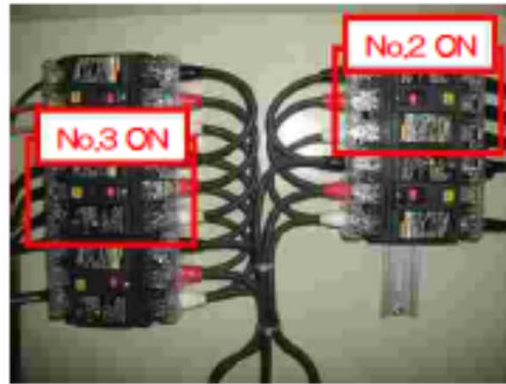
On/off operation of the temporary pumps is carried out with switches of the control board, but it was not controlled by locking. (The locking control of the control board in question has been started.)

In addition, although the switches of the control board were handled with number controls, there were no names displayed on them which makes it hard to deny the possibility of human error. Consequently, the improvement of identification of any temporary items in the highly-important facilities will be studied and addressed.

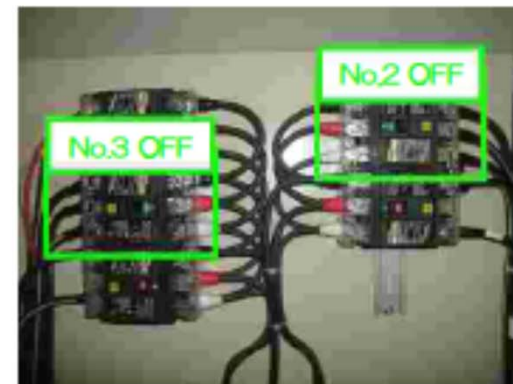
[Reference 1] On-site situation (Distribution boards)



Temporary distribution board
(2F, Process main bldg.)



[Before stopping the pump]

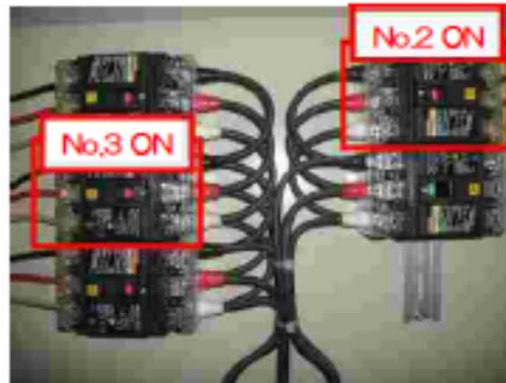


[After stopping the pump]

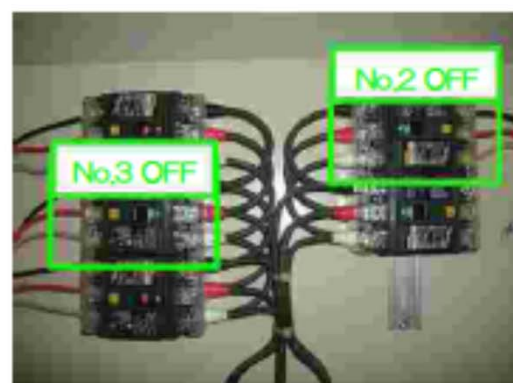
No.2 Discharge pump of Process main bldg. (CEN-A)
No.3 Discharge pump of Process main bldg. (CEN-B)



Temporary distribution board
(1F, Incinerator workshop bldg.)



[Before stopping the pump]



[After stopping the pump]

No.2 Discharge pump of Incinerator workshop bldg. (Incinerator bldg.) (MI-A)
No.3 Discharge pump of Process main bldg. (Workshop bldg.) (MI-B)

Label with description to each switch on the images is given for easy grasping of the situation , but the actual switches in the boards were handled with number controls only.

【Reference 2】

Investigation results of buildings, subdrain water levels, and subdrain water quality

● **Water levels in the buildings**

Date	Incinerator [OP.mm]	Workshop [OP.mm]	Subdrain No.125 [OP.mm]
4/14 22:00	4376	4250	8395
4/15 2:00	4376	4250	8398
4/15 6:00	4376	4250	8394
4/15 10:00	4376	4250	8395
4/15 14:00	4376	4250	8409
4/15 18:00	4376	4250	8411
4/15 22:00	4376	4250	8398
4/16 2:00	4377	4250	8397
4/16 6:00	4377	4250	8390

● **No.125 Subdrain water quality**

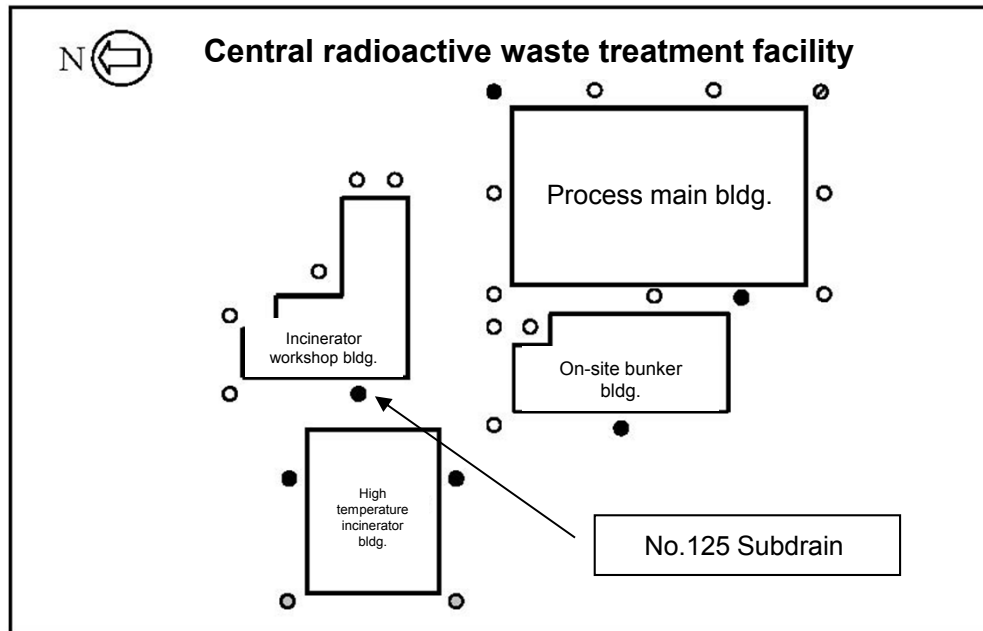
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- 4:00** Grossβ : 1.1×10^{-1} Bq/cm³
- 8:00** Grossβ : 1.2×10^{-1} Bq/cm³
- 12:00** Grossβ : 1.5×10^{-1} Bq/cm³
- 16:00** Grossβ : 1.3×10^{-1} Bq/cm³
- 20:00** Grossβ : 1.2×10^{-1} Bq/cm³

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- 0:15** Grossβ : 9.8×10^{-2} Bq/cm³
- 4:00** Grossβ : 9.5×10^{-2} Bq/cm³
- 8:00** Grossβ : 1.0×10^{-1} Bq/cm³

* Data on tritium is under analysis for each case.



Estimated amount of accumulated water in the Incinerator workshop building (1st basement)

- Estimated amount of accumulated water

Total: approx. 203 m³ (= [1] + [2])

[1] Incinerator equipment bldg.: approx. 165 m³ (approx. 918 m² × 18 cm*)

[2] Workshop & machinery equipment bldg.: approx. 38 m³ (approx. 759 m² × 5 cm*)

*: Value taken through the detailed measurement on Apr. 13.

(Incinerator equipment bldg.: 8:30 PM, Apr 13

Workshop & machinery equipment bldg.: 9:20 PM, Apr 13)

- No change in the water level (depth) was found through the measurement conducted on Apr. 14

Incinerator equipment bldg.: 2:35 AM/ 0:15 PM, Apr 14

Workshop & machinery equipment bldg.: 2:50 AM/ 0:15PM, Apr. 14

- Water quality analysis results of accumulated water in the Incinerator workshop building

(taken on Apr. 15)

[1] Incinerator equipment bldg.

Cs134: 5.4×10^3 Bq/cm³

Cs137: 1.4×10^4 Bq/cm³

Grossβ: 5.0×10^4 Bq/cm³

Chlorine: 400 ppm

[2] Workshop equipment bldg.

Cs134: 8.6×10^1 Bq/cm³

Cs137: 2.3×10^2 Bq/cm³

Grossβ: 2.5×10^3 Bq/cm³

Chlorine: 1200 ppm

