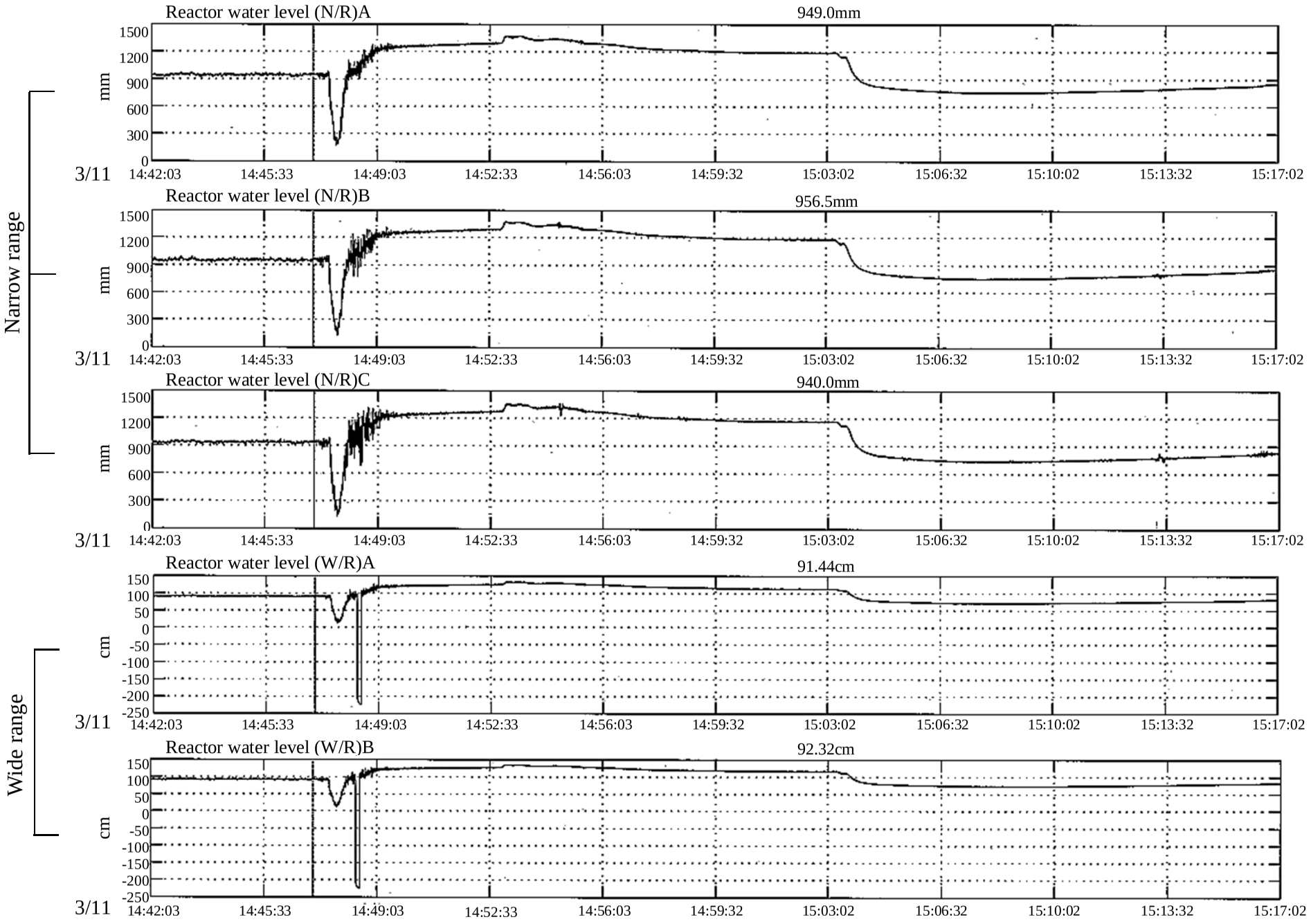
Unit 1: Reactor Water Level

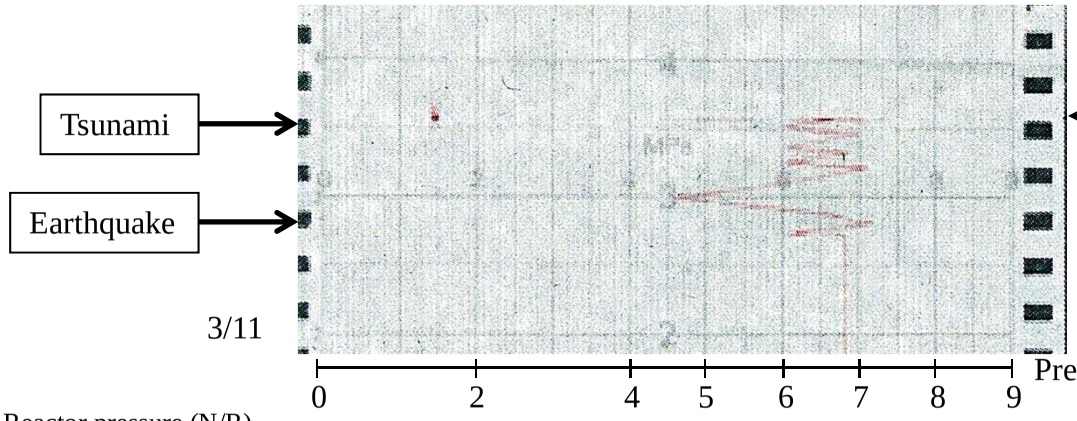


〔0mm（Narrow range・Wide range）= TAF + 3,430（Fuel range）〕

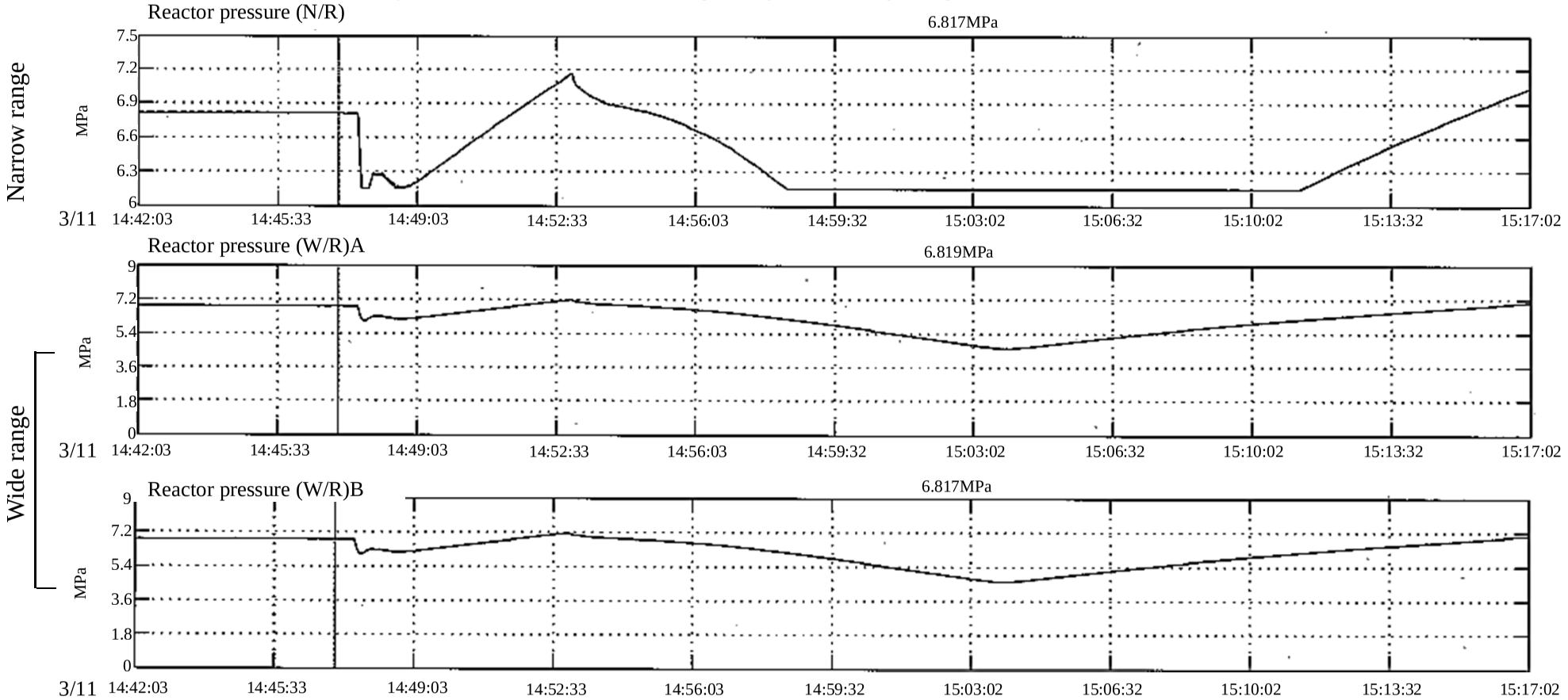
Compiled from the “Transient Analysis Recording System”(May 2011) by TEPCO

Attachment II-1-1-1

Unit 1 Reactor Pressure



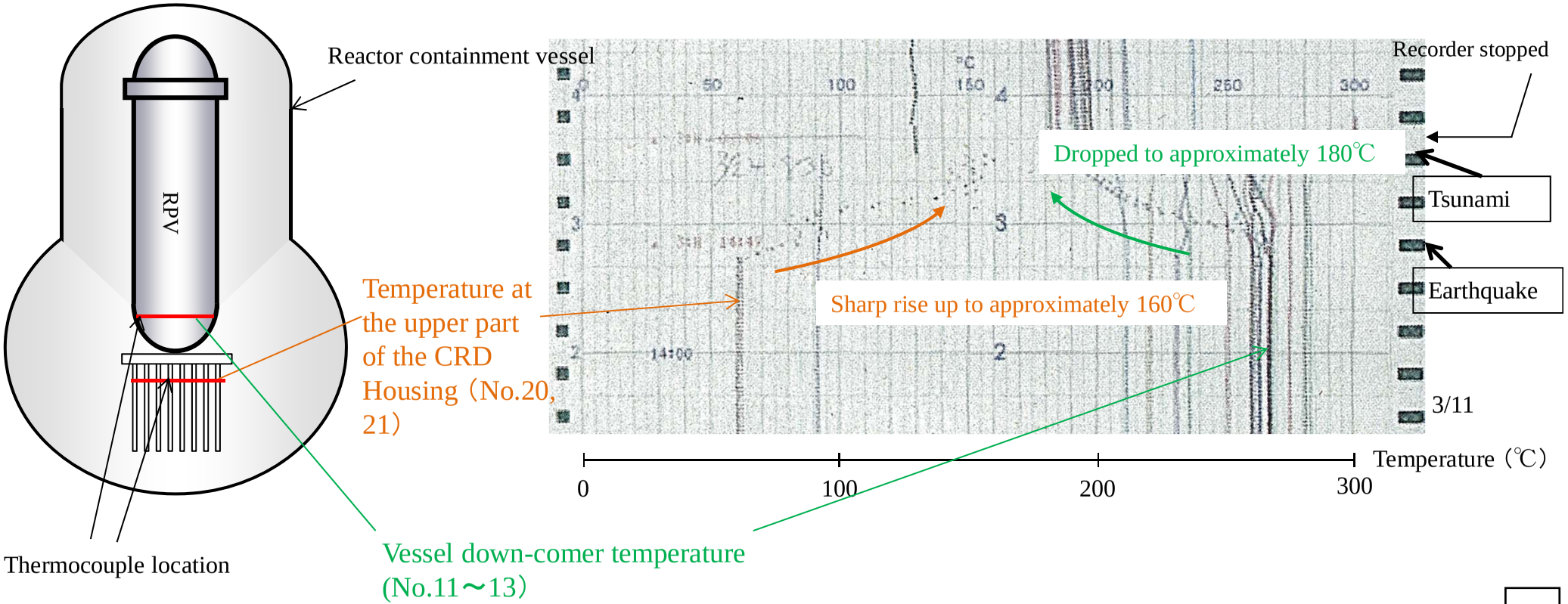
Compiled from the “Recorder Chart” (May 2011) by TEPCO



Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Attachment Ⅱ-1-1-2

Unit 1 Reactor Pressure Vessel (RPV) Temperature



Explanatory notes

TR-263-104

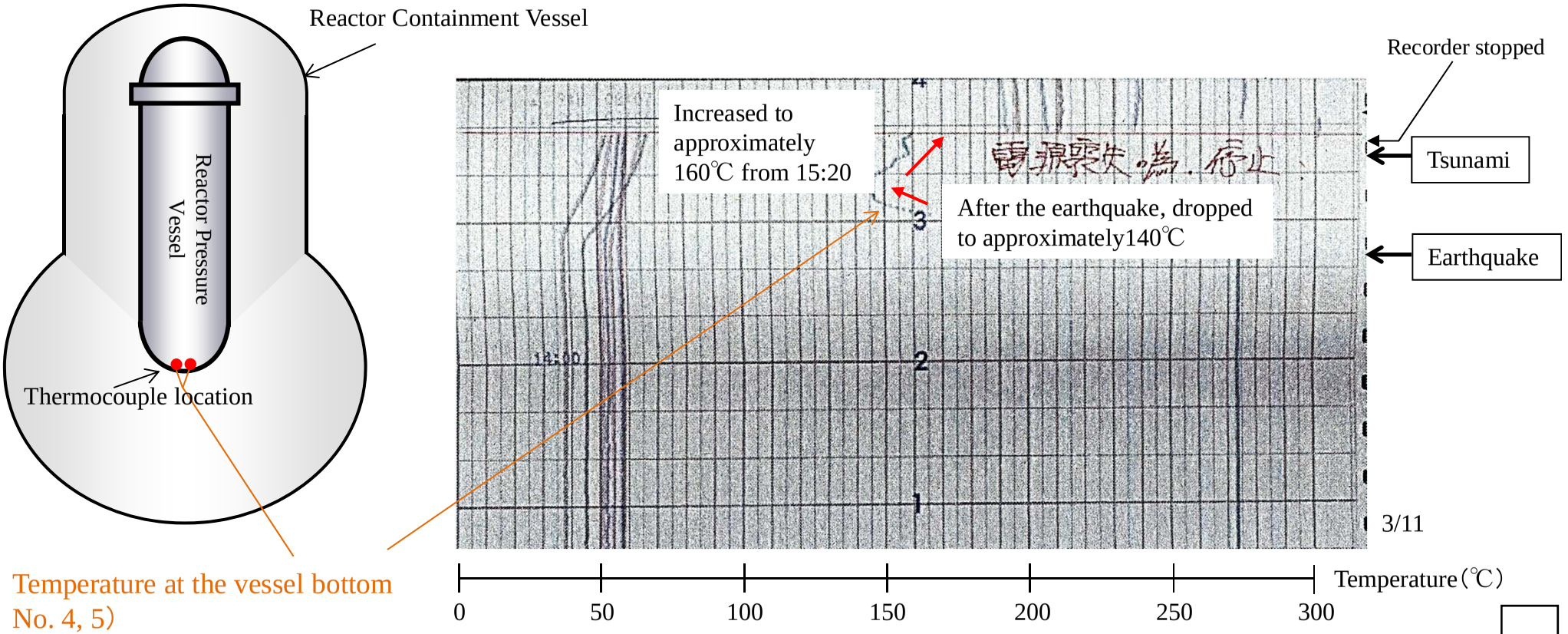
NO	Color	Dot	Name of Measurement		NO	Color	Dot	Name of Measurement	
1		●	vessel flange	263-69A1	13		+	vessel downcomer	263-69G3
2		●	vessel steam	263-69B1	14		+	vessel above skirt joint	263-69H1
3		●	vessel below water level	263-69C1	15		+	vessel above skirt joint	263-69H3
4		●	vessel below water level	263-69C3	16		+	vessel skirt near joint	263-69K1
5		●	feedwater nozzle N4B-end	263-69D1	17		+	vessel bottom head	263-69L1
6		●	feedwater nozzle N4B-inboard	263-69D2	18		+	vessel bottom head	263-69L2
7		○	feedwater nozzle N4C-end	263-69E1	19		Y	vessel skirt at mtg flange	263-69M1
8		○	feedwater nozzle N4C-inboard	263-69E2	20		Y	top control rod drive housing	263-69N1
9		○	vessel core	263-69F1	21		Y	top control rod drive housing	263-69N3
10		○	vessel core	263-69F3	22		Y	vessel head adjac to flange	263-66A1
11		○	vessel downcomer	263-69G1	23		Y	vessel head flange	263-66B1
12		○	vessel downcomer	263-69G2	24		Y	vessel stud	263-67A1

An indication fault was found with the thermocouple for the vessel down-comer (No.11) when the reactor was reactivated after the periodic inspection in 2001. The cable was removed then from the recorder for that thermocouple.
At that time, the recorders for No.11 and No.12 thermocouples were connected to each other with another cable. Because the thermocouple for No.11 was left unchanged to a new one, the same data had been kept recorded as the data of No.11 and that of No. 12 thereafter until March 11, 2011.

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Attachment Ⅱ-1-1-3

Unit 1 Temperatures at the Vessel Bottom



Temperature at the vessel bottom
No. 4, 5）

Explanatory notes

TR-260-20

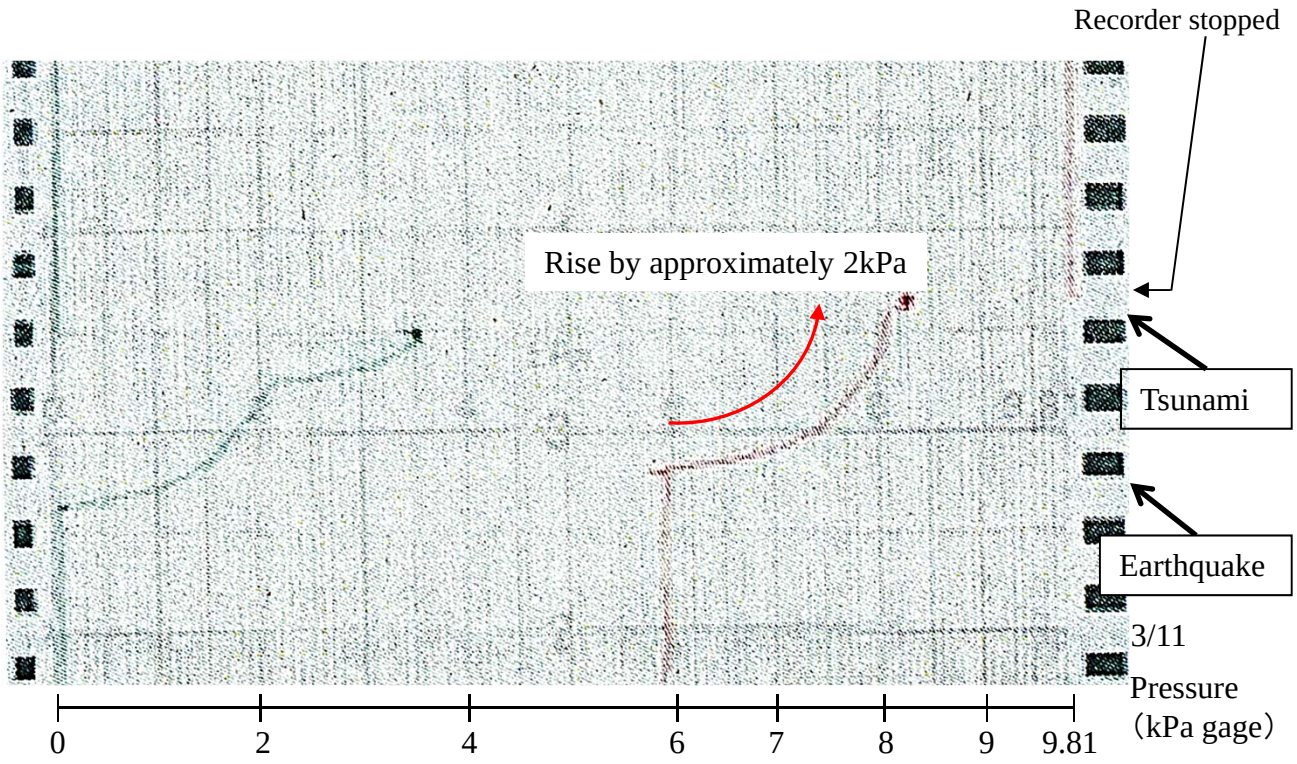
NO	Color	Dot	Name of Measurement	NO	Color	Dot	Name of Measurement
1		●	TE261-13A VALVE203-4A	7		○	TE261-14B VALVE203-3B
2		●	TE261-13C VALVE203-4C	8		○	TE261-14C VALVE203-3C
3		●	TE261-13B VALVE203-4B	9		○	TE261-14D VALVE203-3D
4		●	TE263-69P VESSEL BOTTOM	10		○	
5		●	TE263-69P VESSEL BOTTOM	11		○	
6		●	TE261-14A VALVE203-3A	12		○	

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Attachment Ⅱ-1-1-4

Attachment II-1-1-5

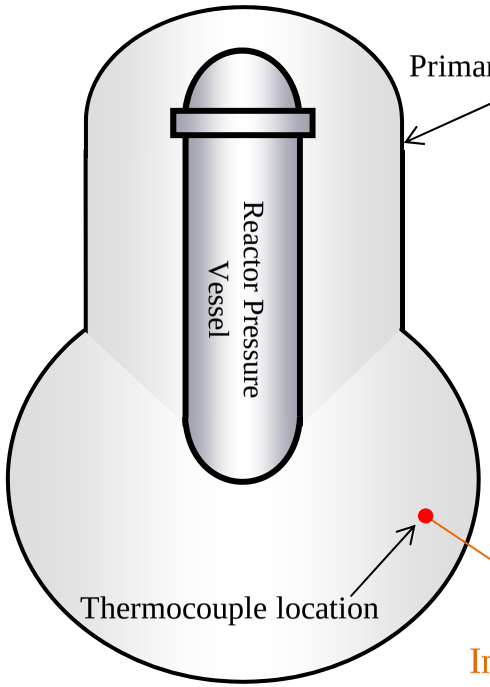
Unit 1 D/W Pressure



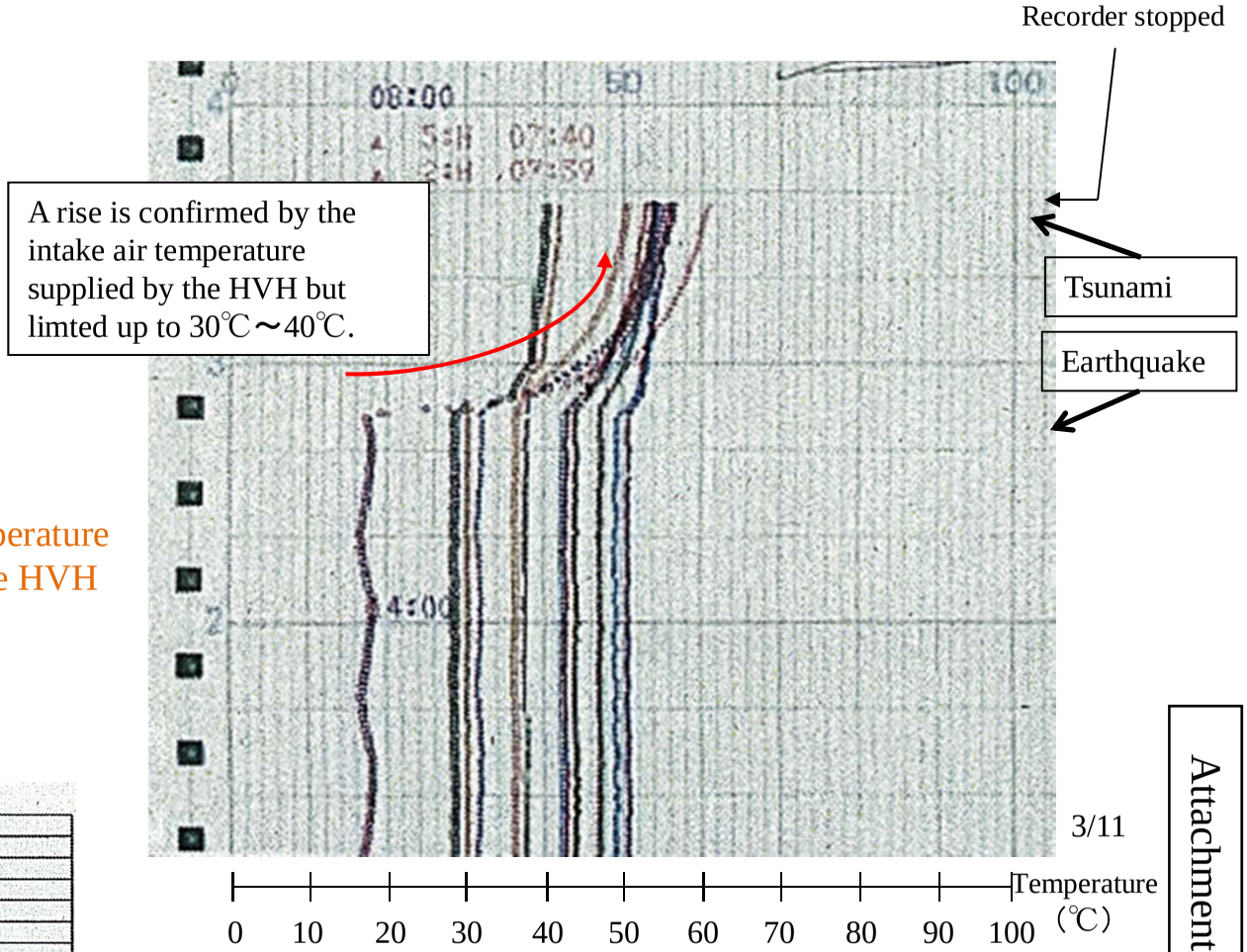
（Red）D/W Pressure

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Unit 1 Temperatures around D/W HVH



Intake air temperature supplied by the HVH (No.6-No.10)



Explanatory note

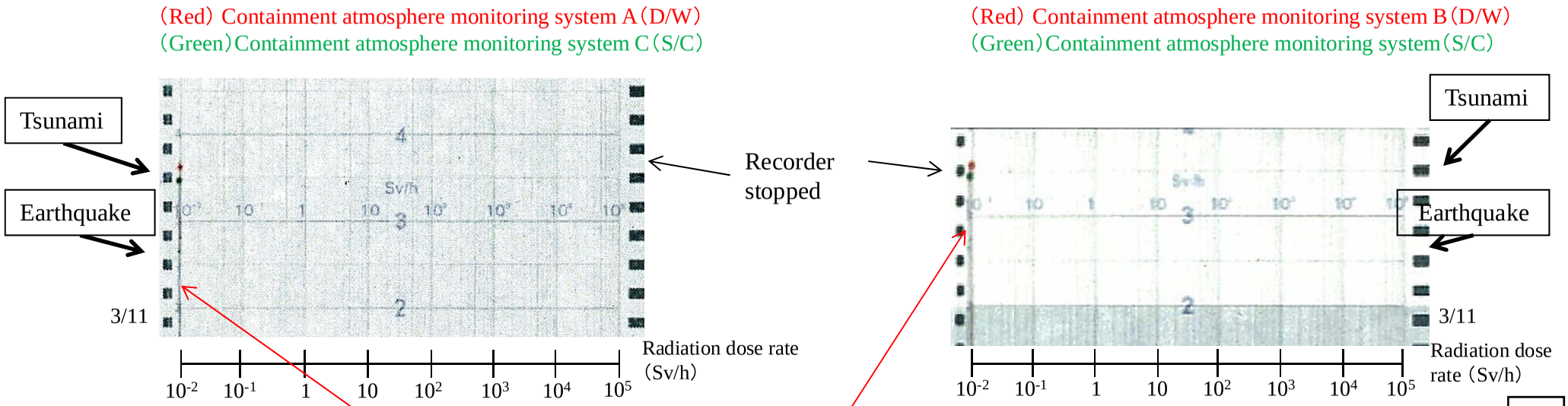
TR-1602-5

No.	Color	Dot	Name of Measurement
1		●	RETURN AIR DUCT HVH-12A
2		●	RETURN AIR DUCT HVH-12B
3		●	RETURN AIR DUCT HVH-12C
4		●	RETURN AIR DUCT HVH-12D
5		●	RETURN AIR DUCT HVH-12E
6		●	SUPPLY AIR DUCT HVH-12A
7		●	SUPPLY AIR DUCT HVH-12B
8		○	SUPPLY AIR DUCT HVH-12C
9		○	SUPPLY AIR DUCT HVH-12D
10		○	SUPPLY AIR DUCT HVH-12E
11		○	EQ AROUND CIRCUM RPV BELLOWS TE-1625L
12		○	EQ AROUND CIRCUM RPV BELLOWS TE-1625M
13		+	EQ AROUND CIRCUM RPV BELLOWS TE-1625N
14		+	EQ AROUND CIRCUM RPV BELLOWS TE-1625P
15		+	EQ AROUND CIRCUM RPV BELLOWS TE-1625R
16		+	
17		+	
18		+	
19		+	
20		Y	
21		Y	
22		Y	
23		Y	
24		Y	

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Attachment II-1-1-6

Unit 1 Containment Atmosphere Monitoring System

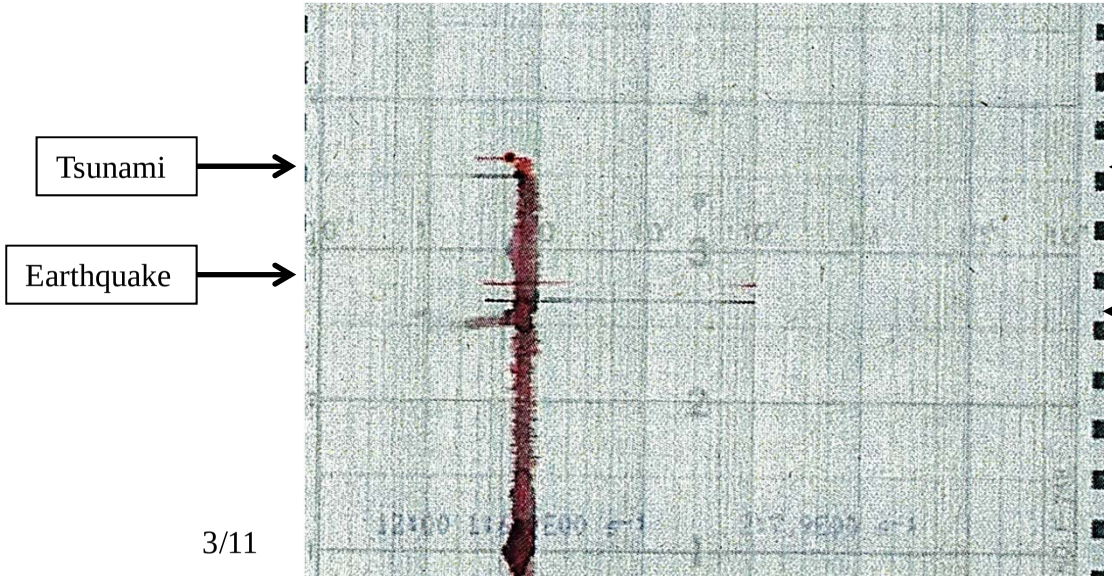


Both indicate the lower limit values

Compiled from the "Recorder Chart" (May 2011) by TEPCO

Attachment Ⅱ-1-1-7

Unit 1 Radiation Monitor of Stack



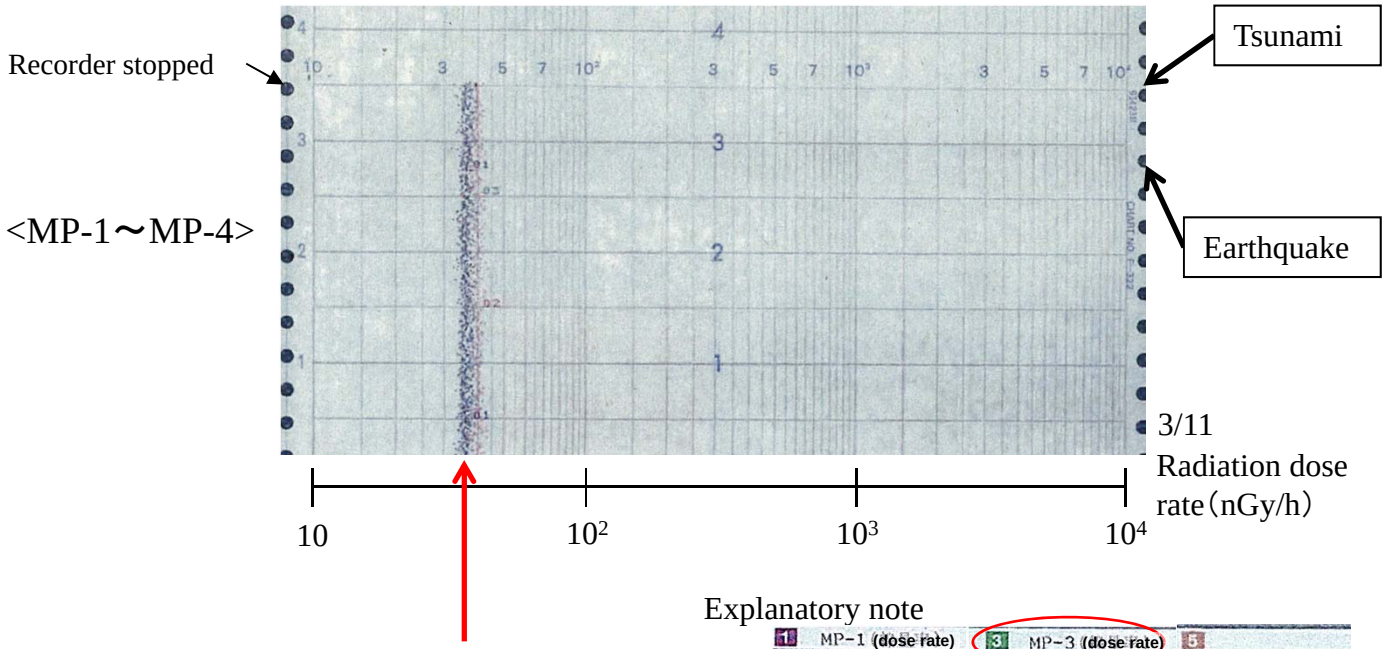
(Green) Radiation monitor of exhaust stack A
(Red) Radiation monitor of exhaust stack B

Compiled from the "Recorder Chart" (May 2011) by TEPCO

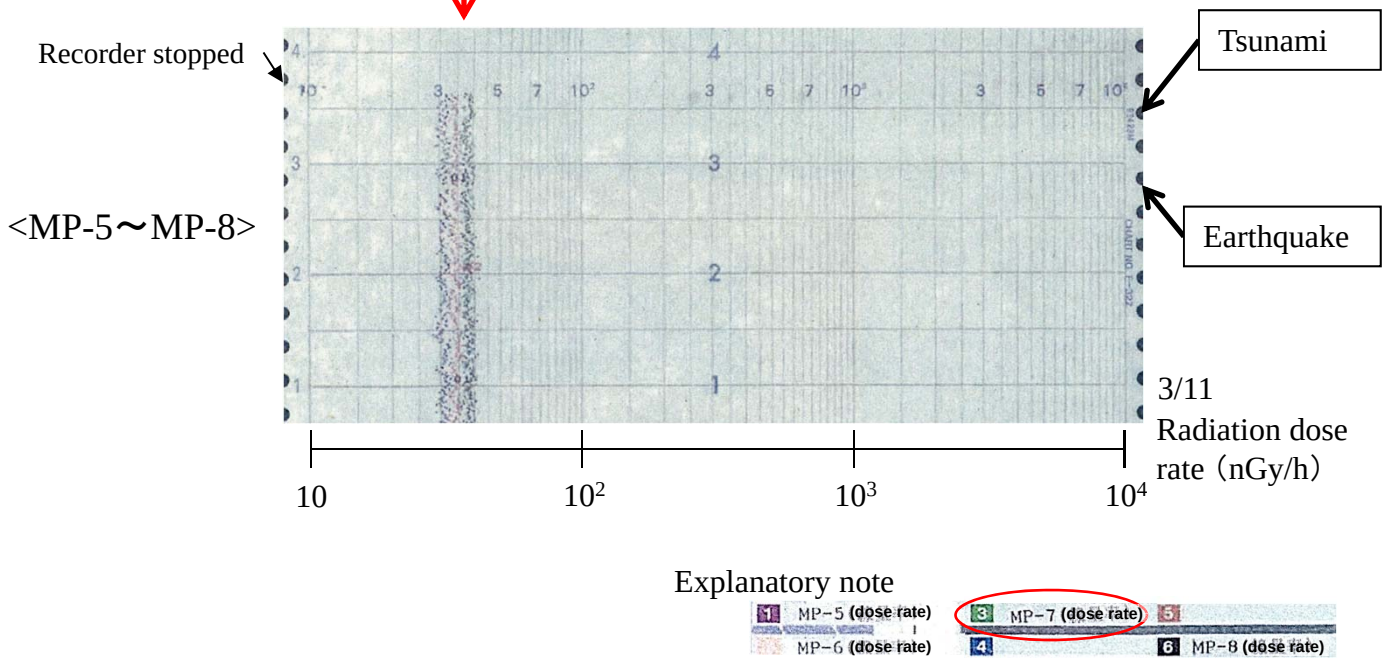
Attachment II -1-1-8

Attachment II-1-1-9

Radiation Dose Rates at Monitoring Posts（MP）



Fluctuating around 40 nGy/h



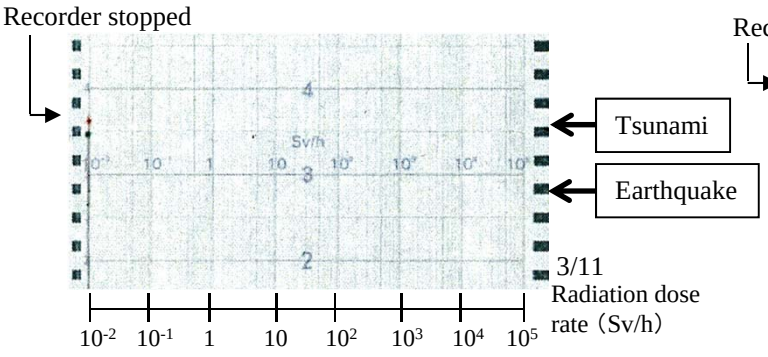
Compiled from the “Recorder chart” (May 2011) by TEPCO

Radiation Dose Rates at
Unit 1-3 Containment Atmosphere Monitoring System (CAMS)

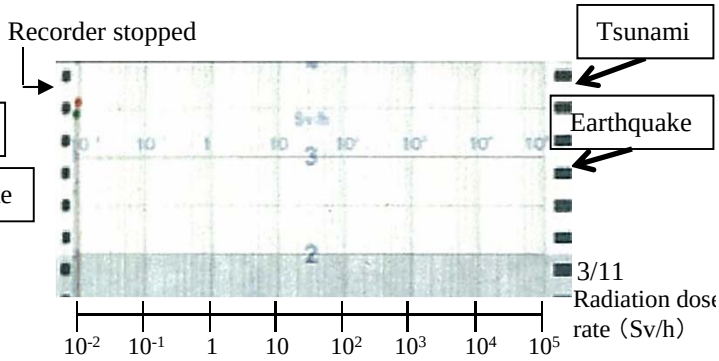
No significant increase observed in the radiation dose rate.

<Unit 1>

(Red) Containment Atmosphere Monitoring System A (D/W)
(Green) Containment Atmosphere Monitoring System C (S/C)

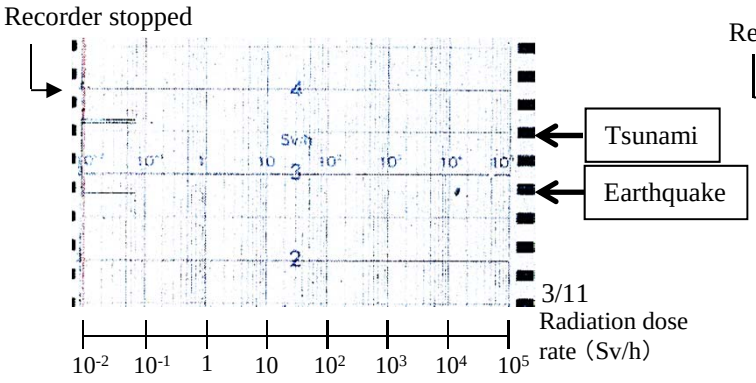


(Red) Containment Atmosphere Monitoring System B (D/W)
(Green) Containment Atmosphere Monitoring System D (S/C)

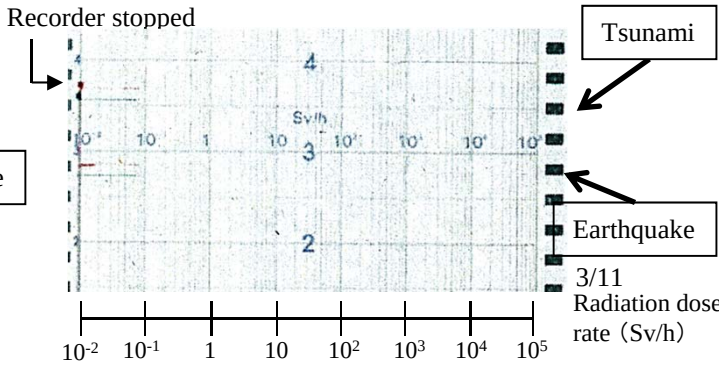


<Unit 2>

(Red) Containment Atmosphere Monitoring System A (D/W)
(Green) Containment Atmosphere Monitoring System C (S/C)

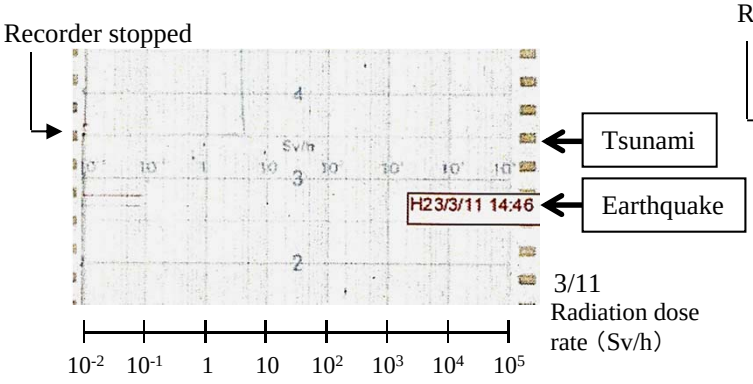


(Red) Containment Atmosphere Monitoring System B (D/W)
(Green) Containment Atmosphere Monitoring System D (S/C)

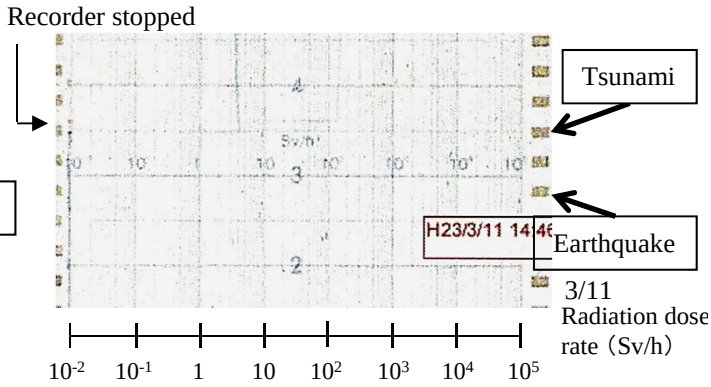


<Unit 3>

(Red) Containment Atmosphere Monitoring System A (D/W)
(Green) Containment Atmosphere Monitoring System C (S/C)



(Red) Containment Atmosphere Monitoring System B (D/W)
(Green) Containment Atmosphere Monitoring System D (S/C)

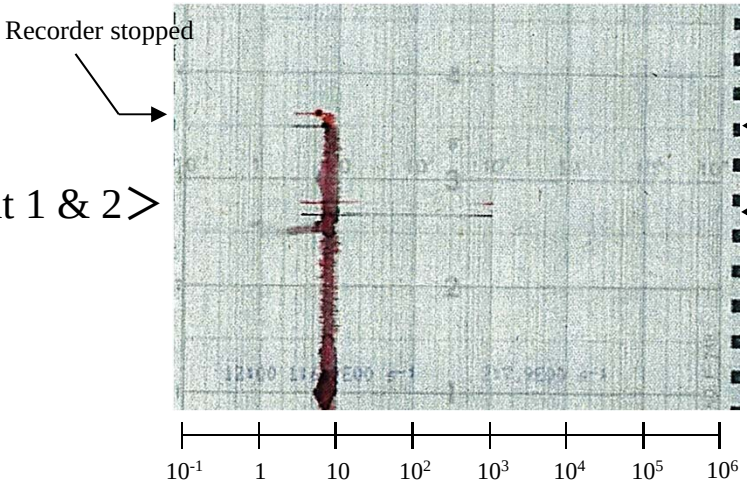


Compiled from the "Recorder Chart" (May 2011) by TEPCO

Radiation Dose Rates at Unit 1-6 Main Exhaust Stack

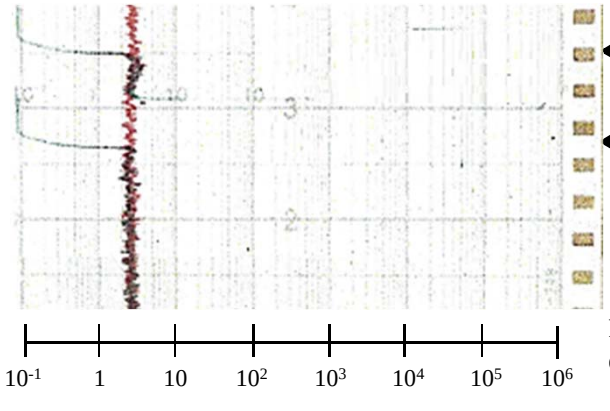
No significant increase observed in the radiation dose.

<Unit 1 & 2>



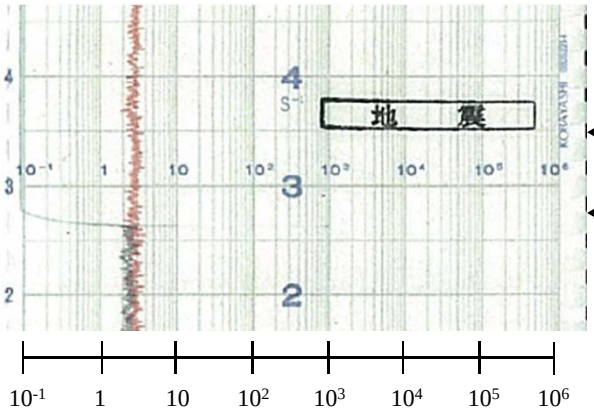
（Green）Radiation monitor of main exhaust stack A
（Red）Radiation monitor of main exhaust stack B

<Unit 3 & 4>



（Green）Radiation monitor of main exhaust stack (scintillation) A
（Red）Radiation monitor of main exhaust stack (scintillation) B

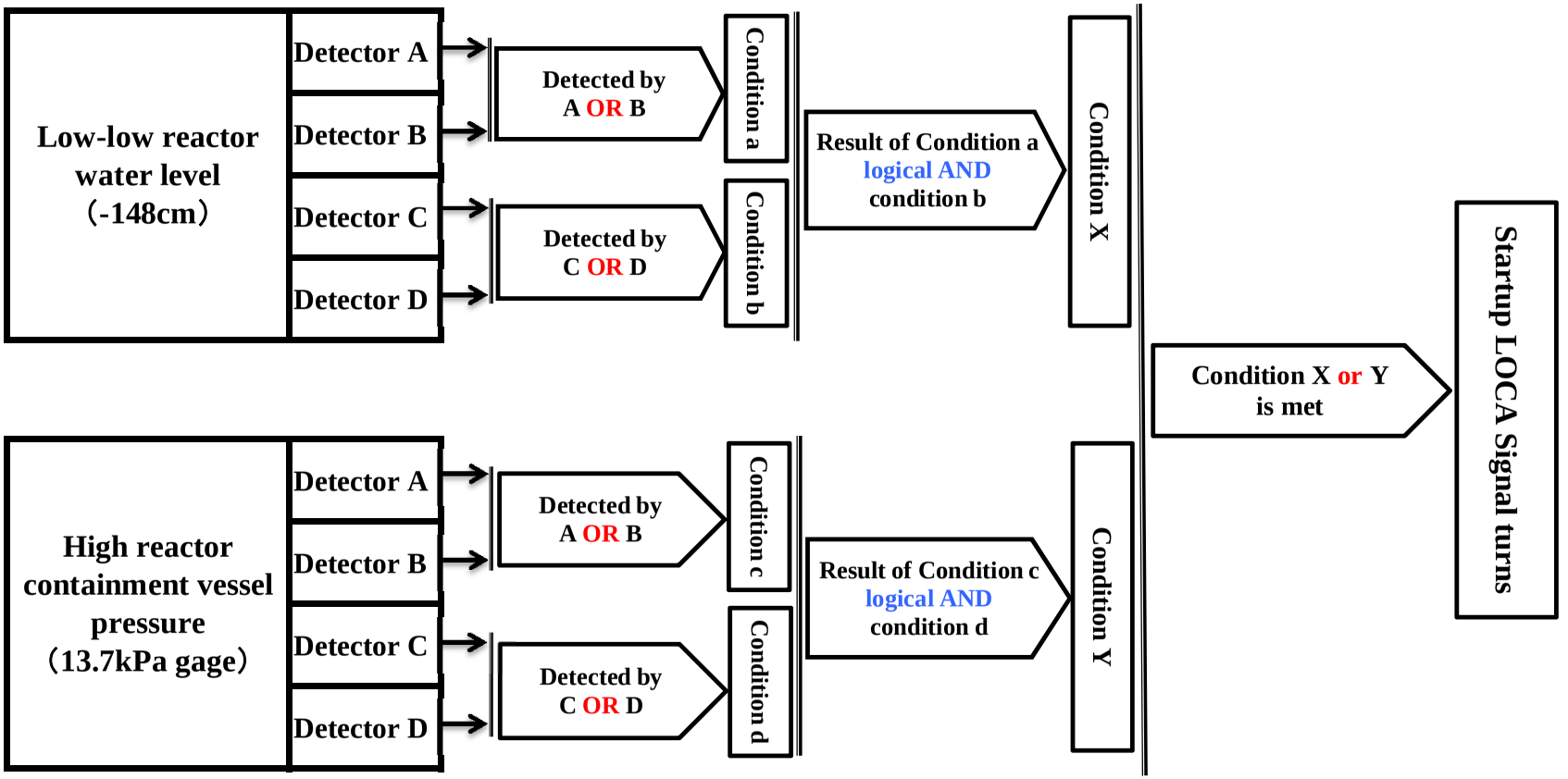
<Unit 5 & 6>



（Green）Radiation monitor of main exhaust stack (scintillation) A
（Red）Radiation monitor of main exhaust stack (scintillation) B

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Logic Flow of the Startup LOCA Signal Actuation



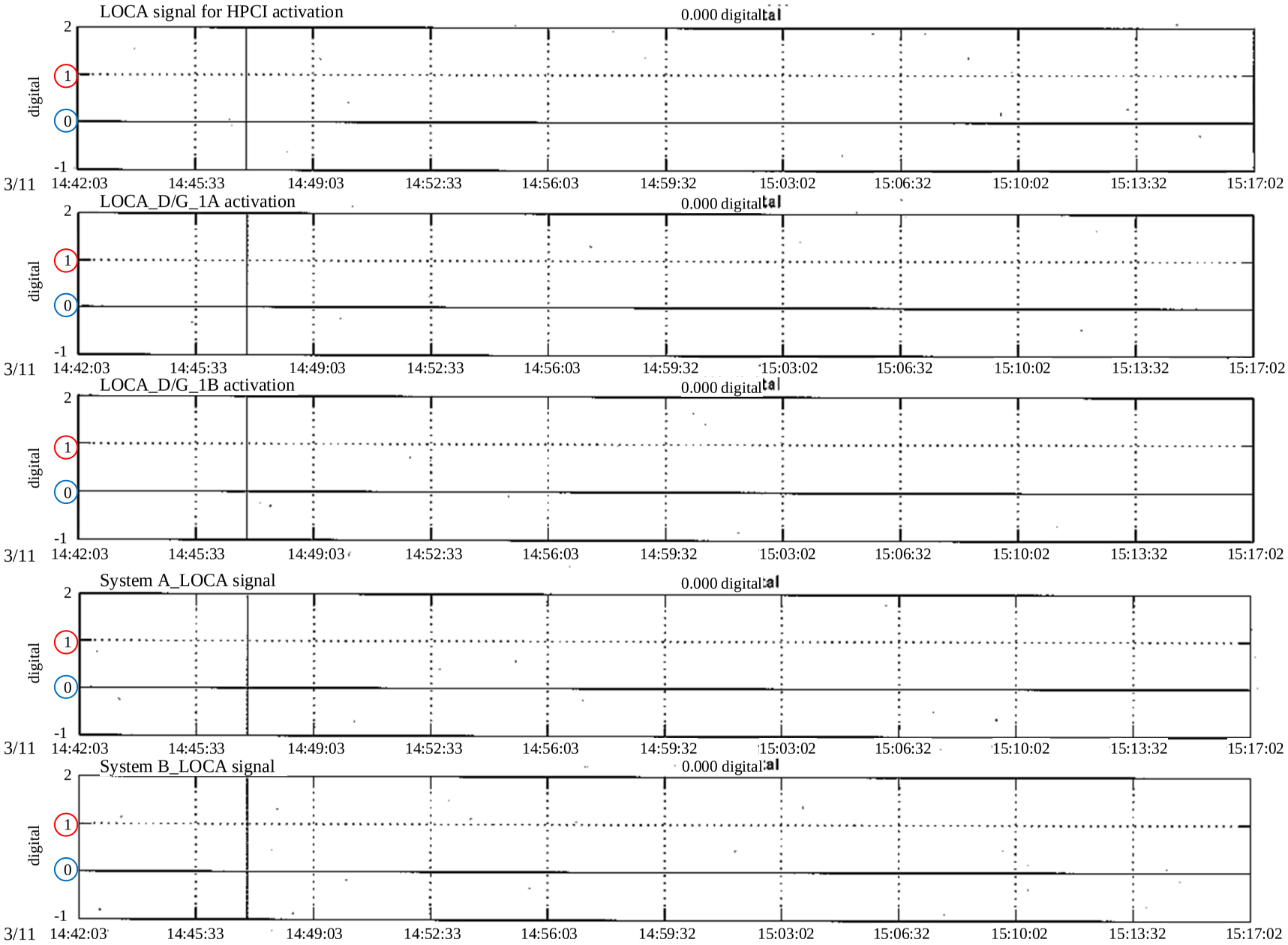
Note 1: The startup LOCA signal here means the signal for activating the High Pressure Coolant Injection System (HPCI), Core Spray System (CS) and emergency DGs.

Note 2: When the "Low-low reactor water level" or "High reactor containment vessel pressure"is detected, the detection circuit, relay circuit and logic circuit become electified in that order, and if the condition X or Y is achieved then necessary power for the activation of each equipment will be supplied.

Compiled from the “Recorder Chart” (May 2011) by TEPCO

LOCA Signal Situation in Unit 1

LOCA signal was not sent out from any systems.



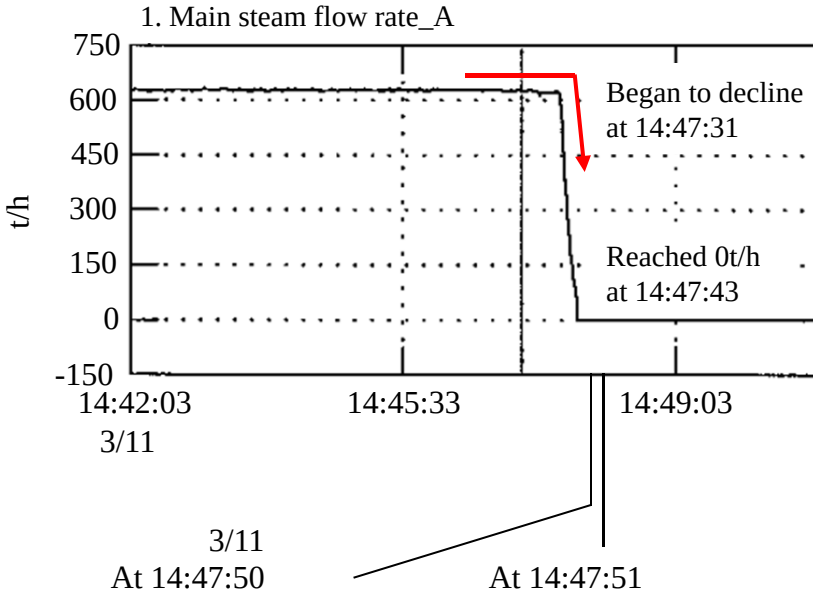
Signalling

No signalling

Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Attachment II-1-1-11

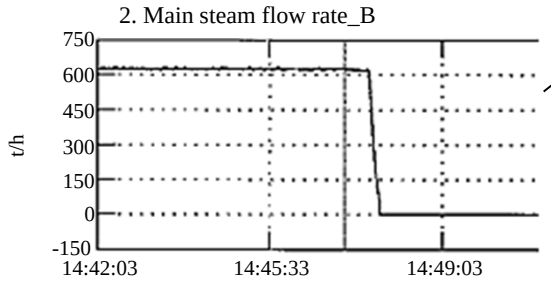
Unit 1 Main Steam Flow and APRM Output

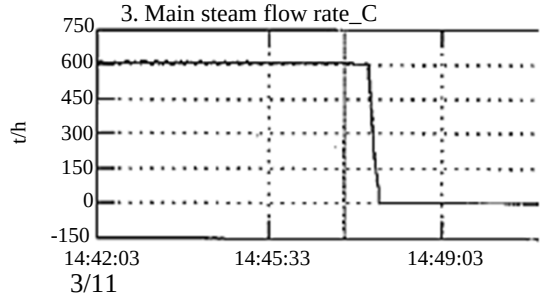


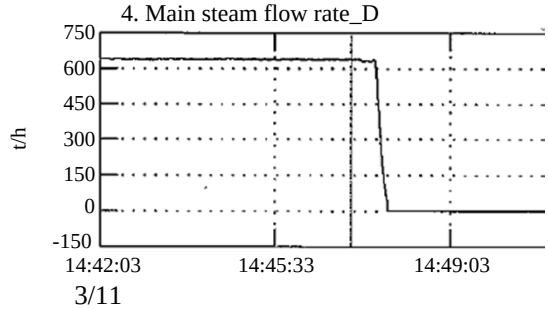
3/11 At 14:47:50 “High main steam line flow” with A and C systems.

3/11 At 14:47:51 “High main steam line flow’ with B and D systems.

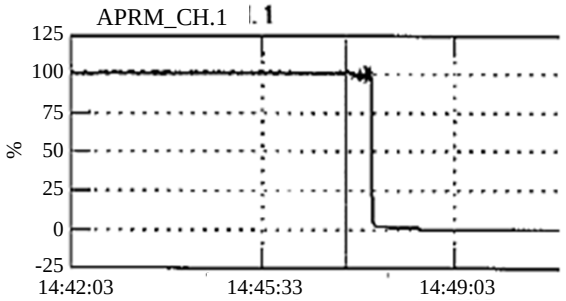
（Based on the alarm typer at Unit 1)

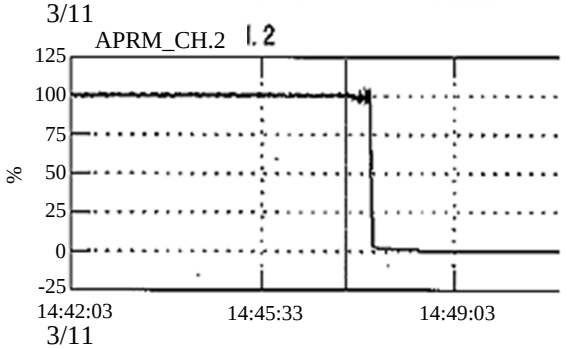


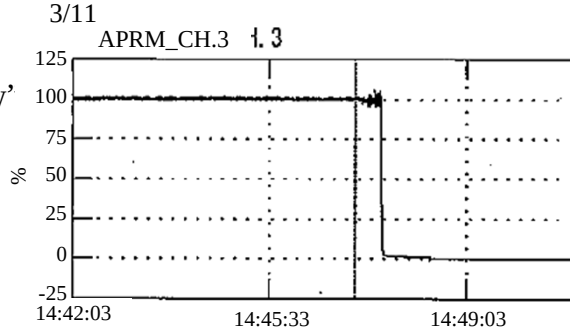


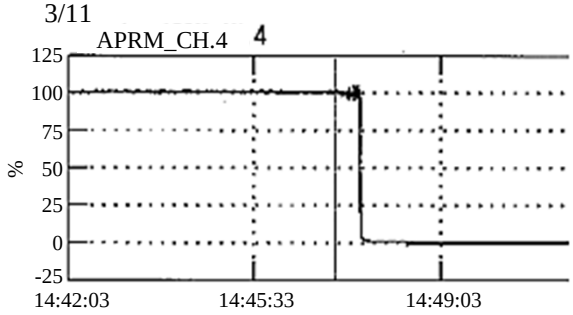


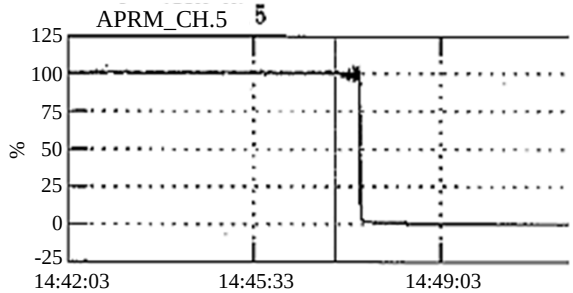
The behavior of the decline of the main steam flow rate and the decline in the APRM output correlate to each other.

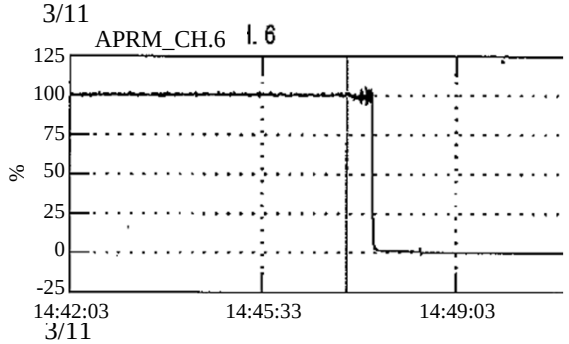








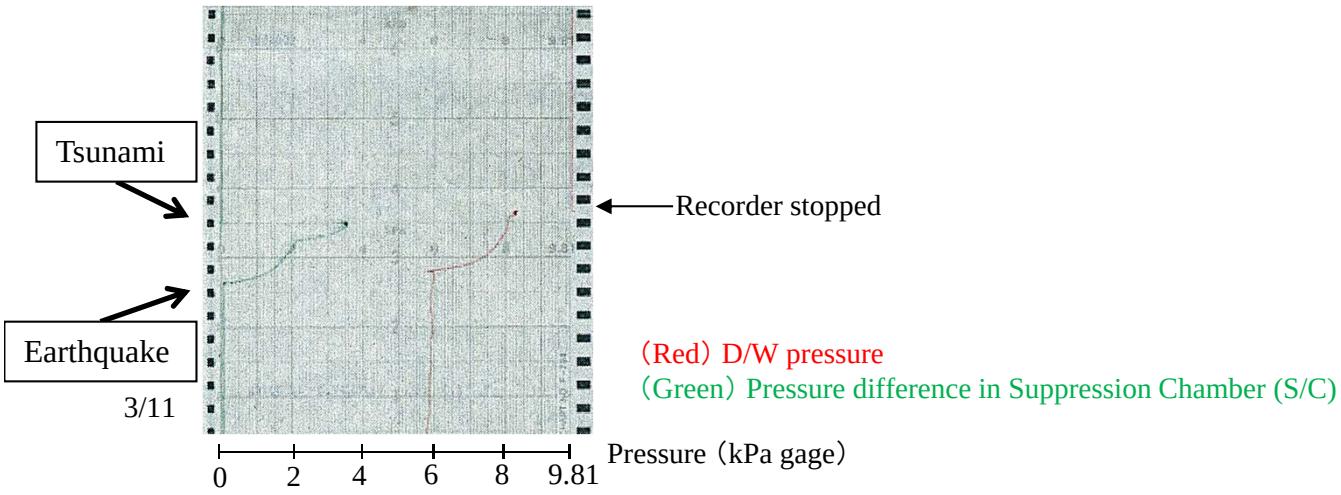




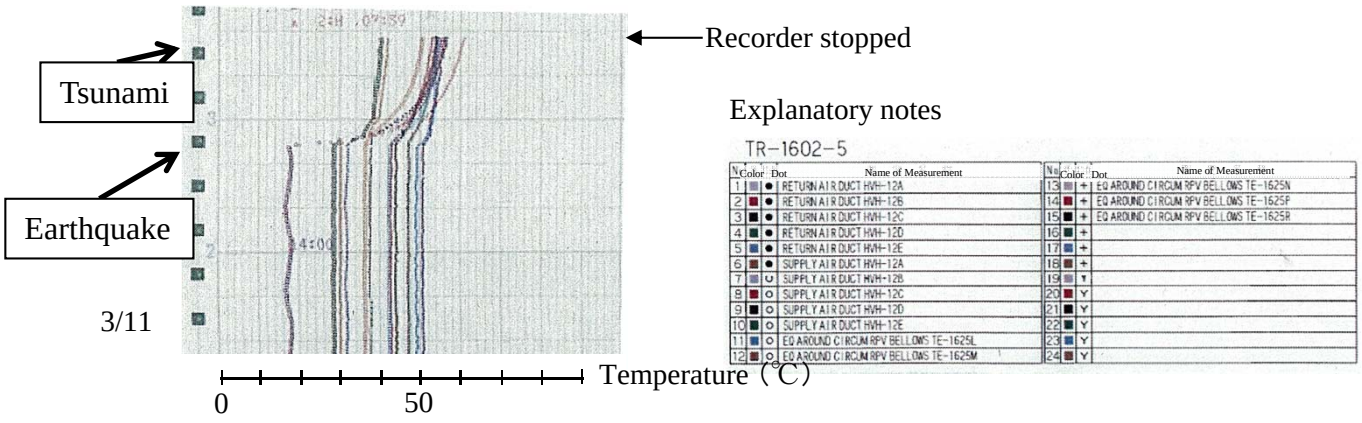
Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Unit 1 D/W Pressure, D/W Temperature, S/C Pressure and S/C Water Temperature

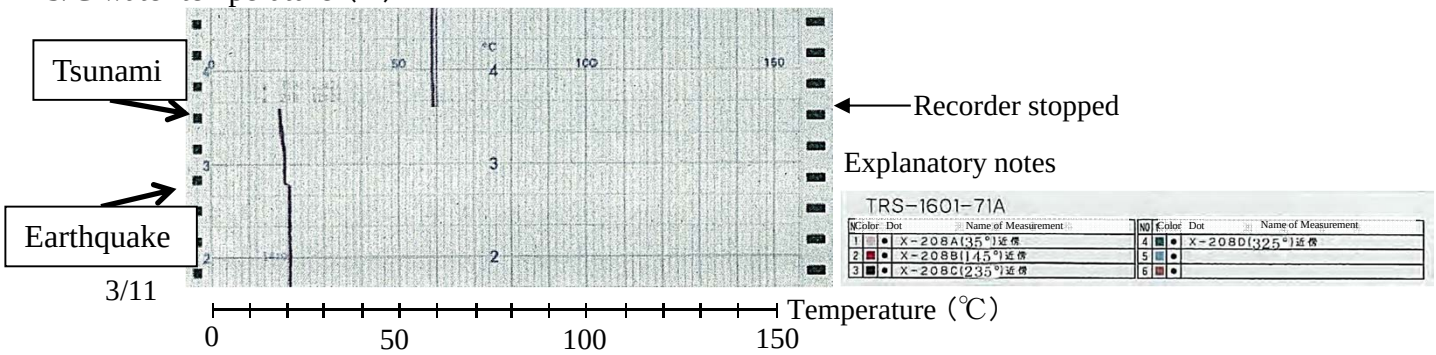
D/W pressure・S/C pressure（pressure difference with D/W pressure）



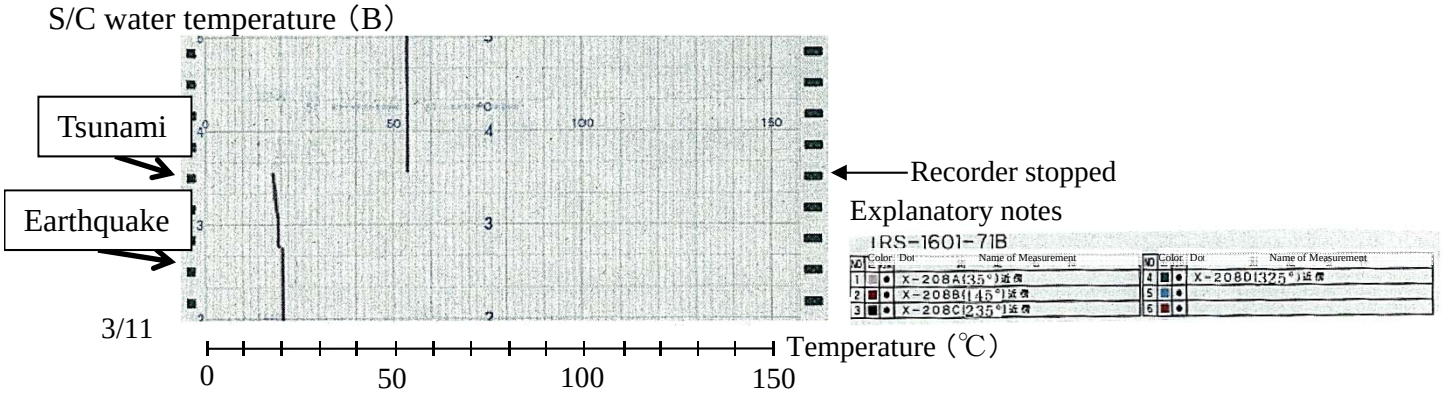
D/W temperature



S/C water temperature（A）



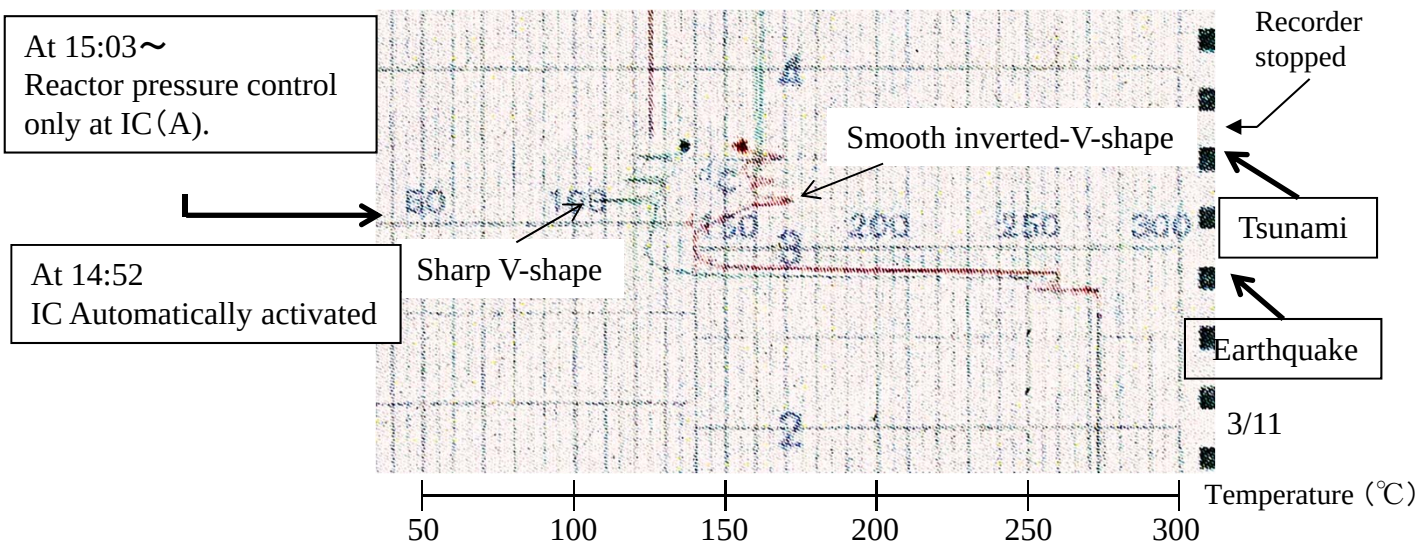
S/C water temperature（B）



Compiled from the “Recorder Chart” (May 2011) by TEPCO

Unit 1 PLR Pump (A)(B) Inlet Temperature

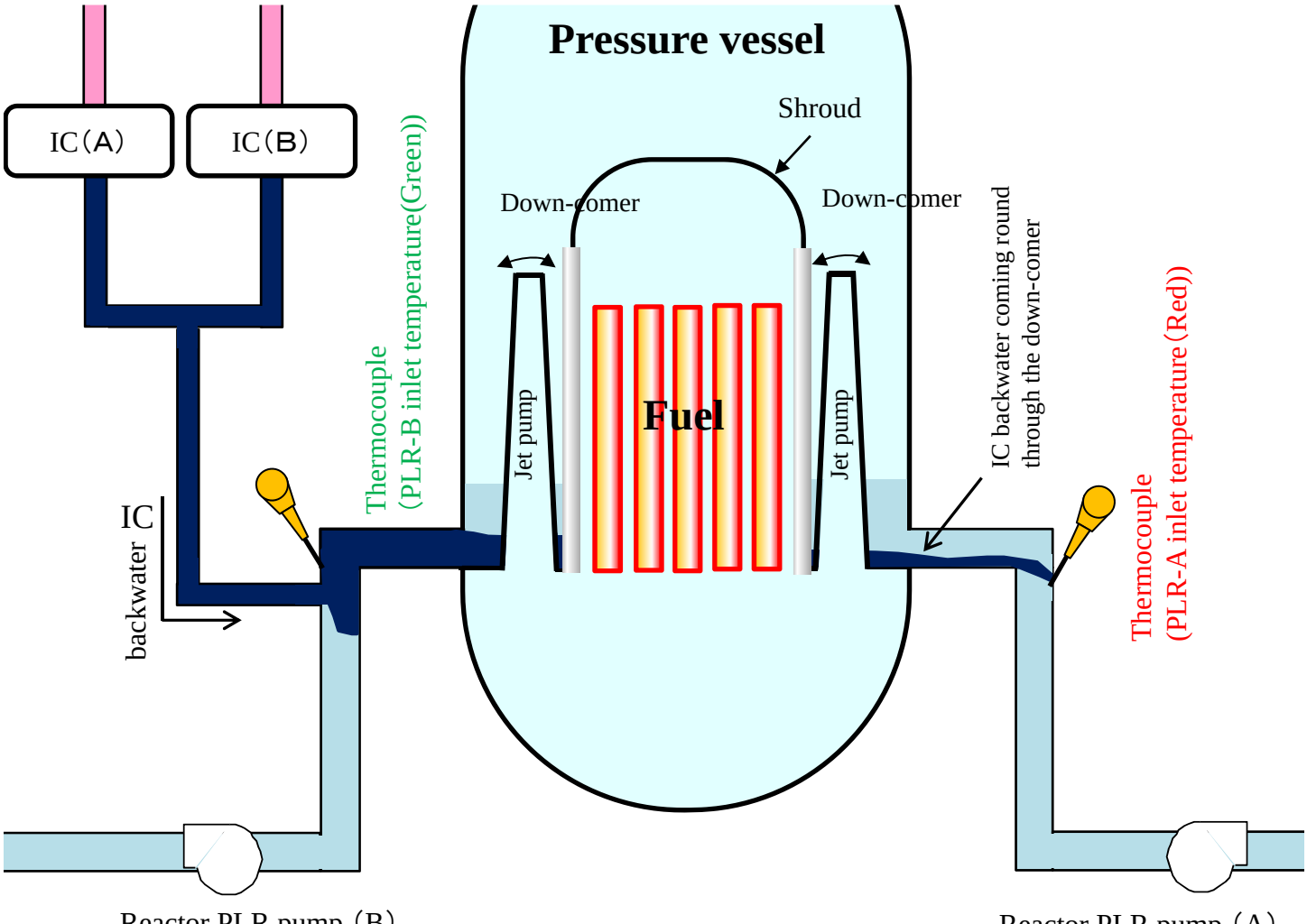
Attachment Ⅱ-1-1-13



（Green）PLR pump（B） inlet temperature　　（Red）PLR pump（A） inlet temperature

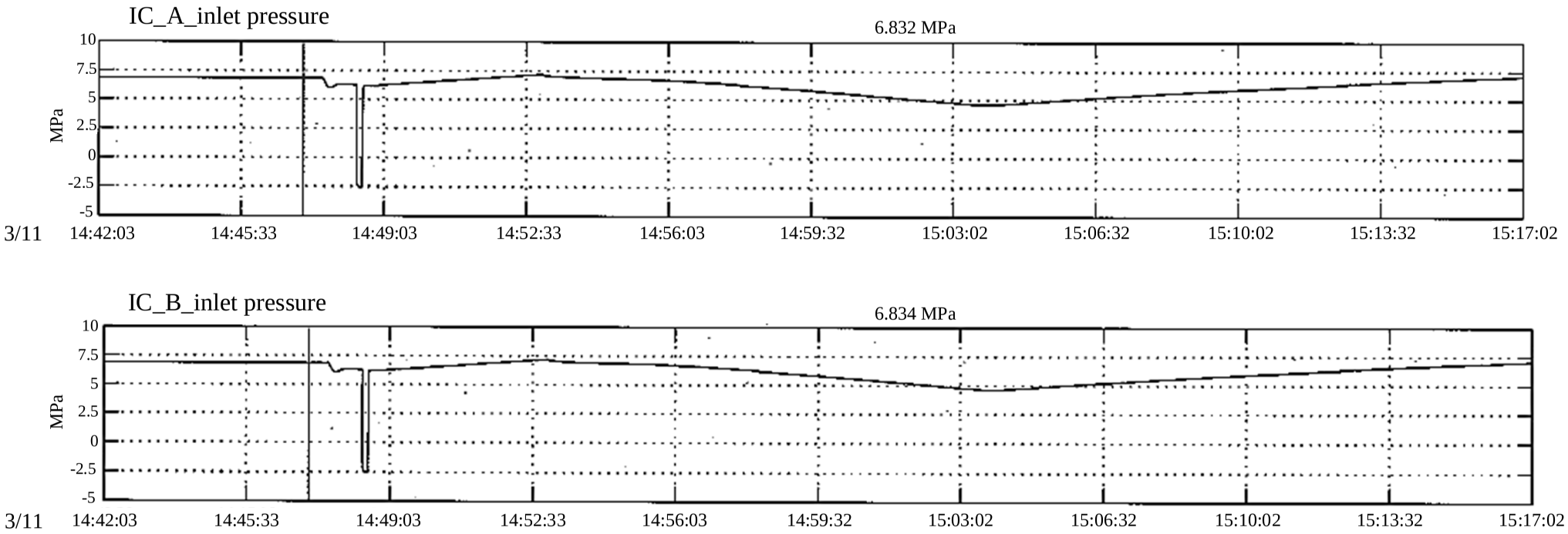
※In an actual condition, two lines on the recorder chart indicating the temperatures at the same time are programmed to be recorded with a slight gap from each other to avoid the pointers clashing against one another, whilst the time difference on the chart above has been adjusted by deleting the gap.

Compiled from the “Recorder Chart” (May 2011) by TEPCO



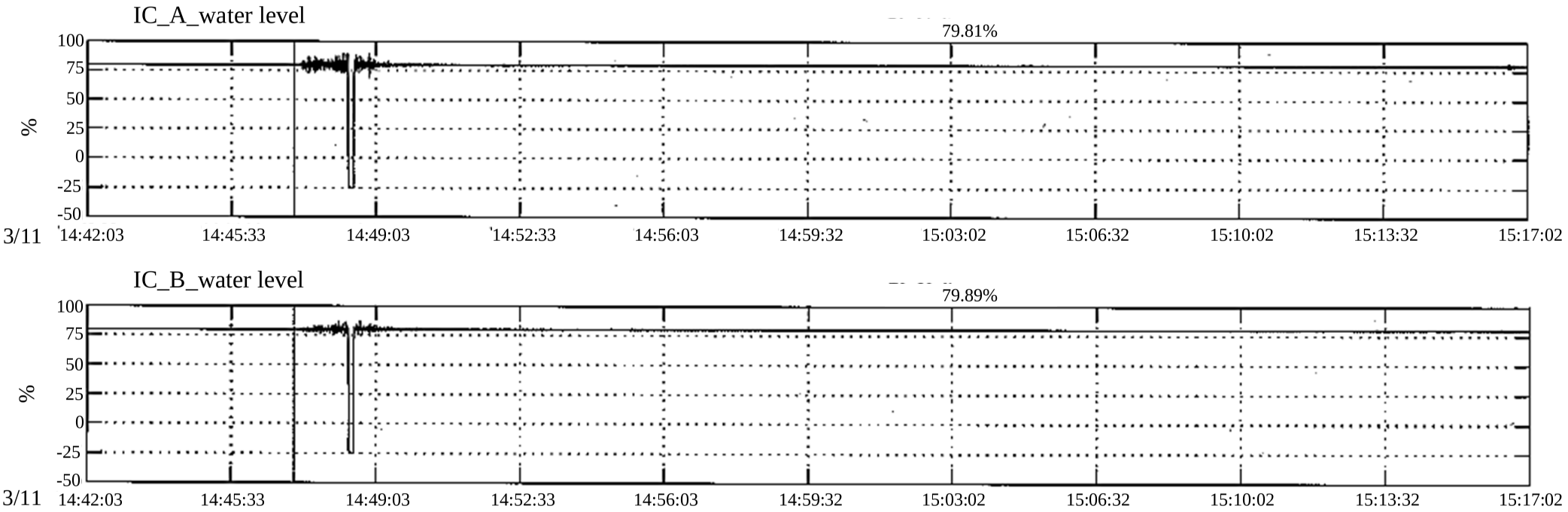
（The condition of the connection of the IC back piping and PLP piping is based on construction approval documents, photographs and other other materials.)

Unit 1 Inlet Pressure of the Isolation Condenser (IC) Tank



Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

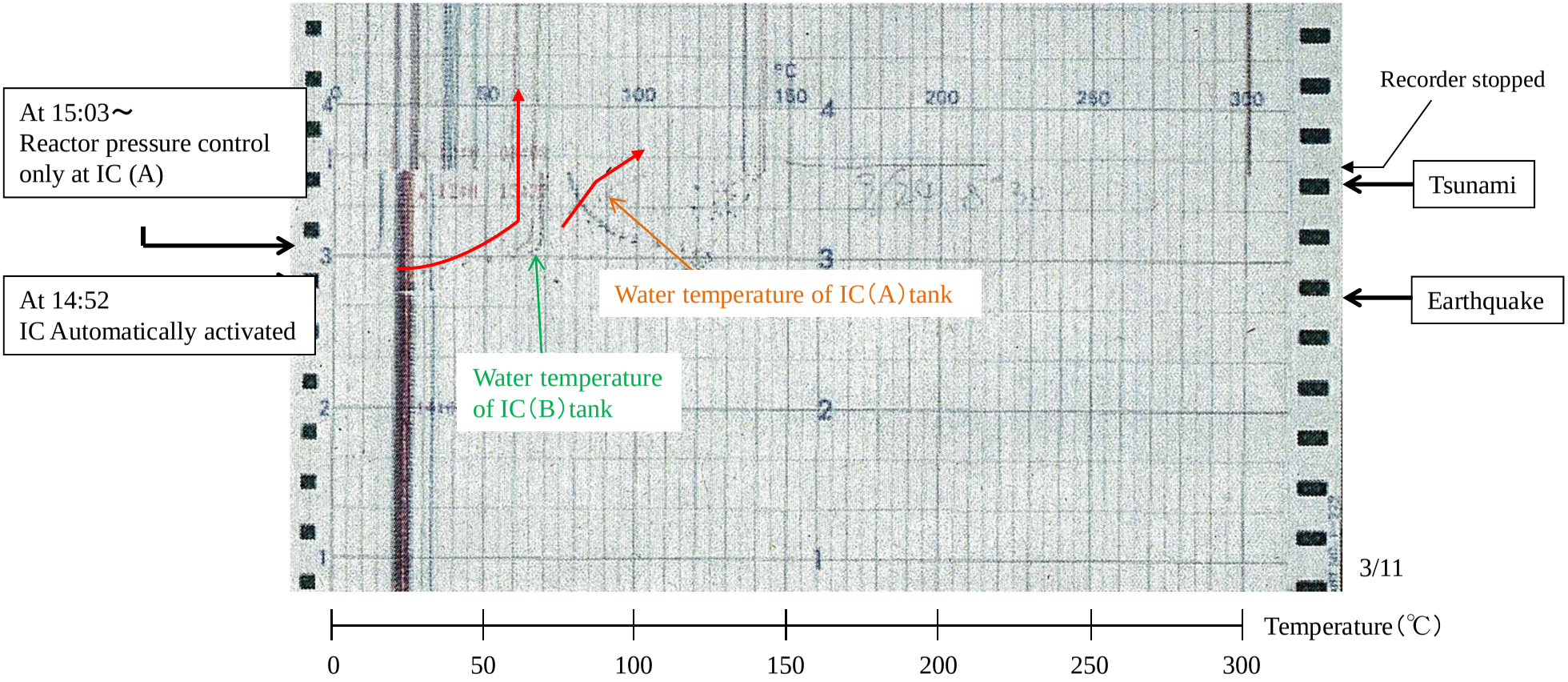
Unit 1 Water Level of the Isolation Condenser (IC) Tank



Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Attachment II-1-1-15

Unit 1 Water Temperature of Isolation Condenser (IC) Tank



The temperature of the water within the IC tank of both channels A and B is rising due to the heat exchange with steam flowing in the IC pipe.

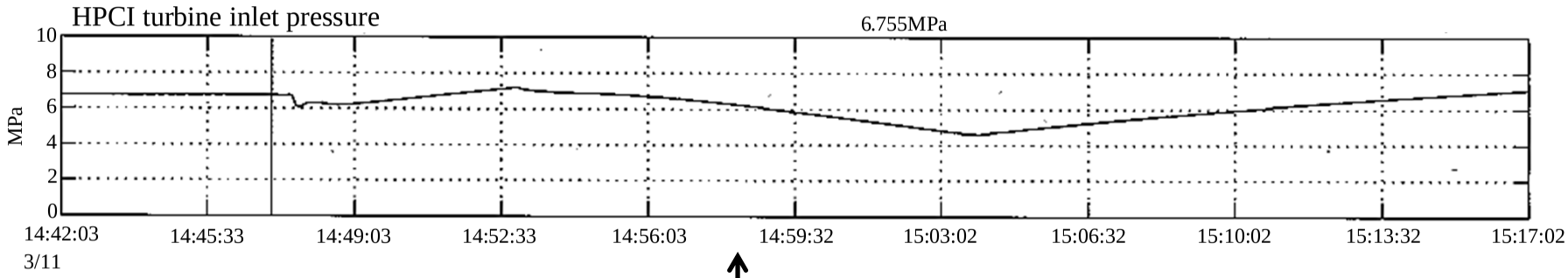
Explanatory notes

TR-1040-6

NO	Color	Dot	Name of Measurement		NO	Color	Dot	Name of Measurement	
1		●	FUEL POOL TEMP (UPPER)	TE-1904-100A	13		+	ISOLATION CONDENSER"A"OUTLET	TE-1342A
2		●	FUEL POOL TEMP (UNDER)	TE-1904-100B	14		+	ISOLATION CONDENSER"A"OUTLET	TE-1342C
3		●			15		+	ISOLATION CONDENSER"B"SHELL	TE-1343B
4		●			16		+	ISOLATION CONDENSER"B"OUTLET	TE-1342B
5		●	SHC"A"PUMP DISCHARGE	TE1042A	17		+	ISOLATION CONDENSER"B"OUTLET	TE-1342B
6		●	SHC"B"PUMP DISCHARGE	TE1042B	18		+	FUEL POOL COOLING Hx OUTLET	TE-1931-100A
7		○	SHC"A"Hx OUTLET	TE1042C	19		Y	FUEL POOL COOLING INLET TO PUMP"A"B"	TE-1931-123
8		○	SHC"B"Hx OUTLET	TE1042D	20		Y	FUEL POOL COOLING Hx OUTLET	TE-1931-100B
9		○	RCW OUTLET Hx"A"	TE1042E	21		Y		
10		○	RCW OUTLET Hx"B"	TE1042F	22		Y	CONT SPRAY SYS."A"Hx OUTLET	
11		○			23		Y	CONT SPRAY SYS."B"Hx OUTLET	
12		○	ISOLATION CONDENSER"A"SHELL	TE-13434	24		Y		

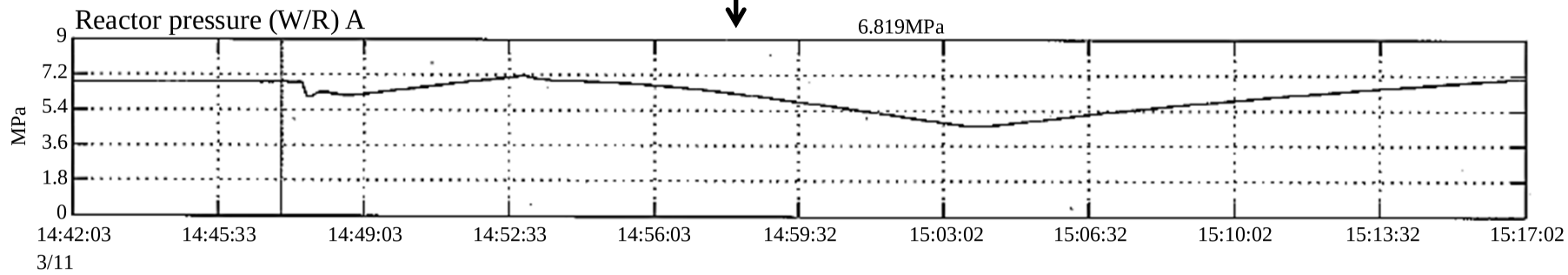
Compiled from the “Recorder Chart” (May 2011) by TEPCO

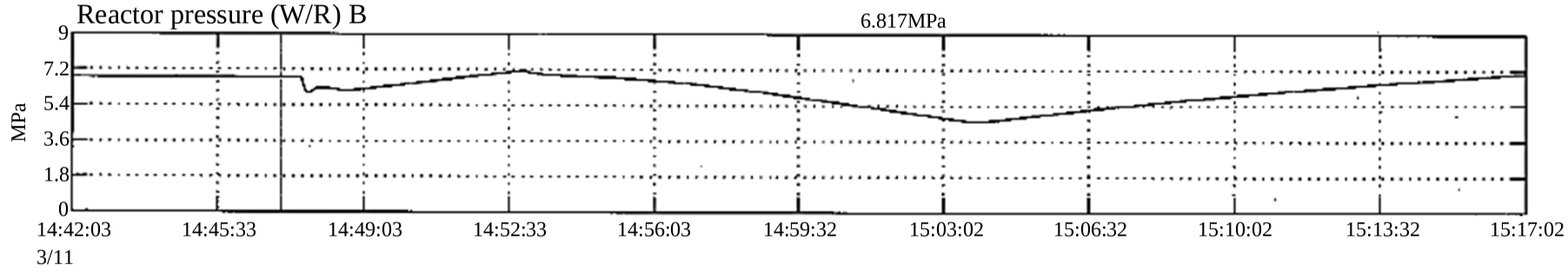
Unit 1 HPCI Turbine Inlet Pressure



Almost the same transition

Wide range



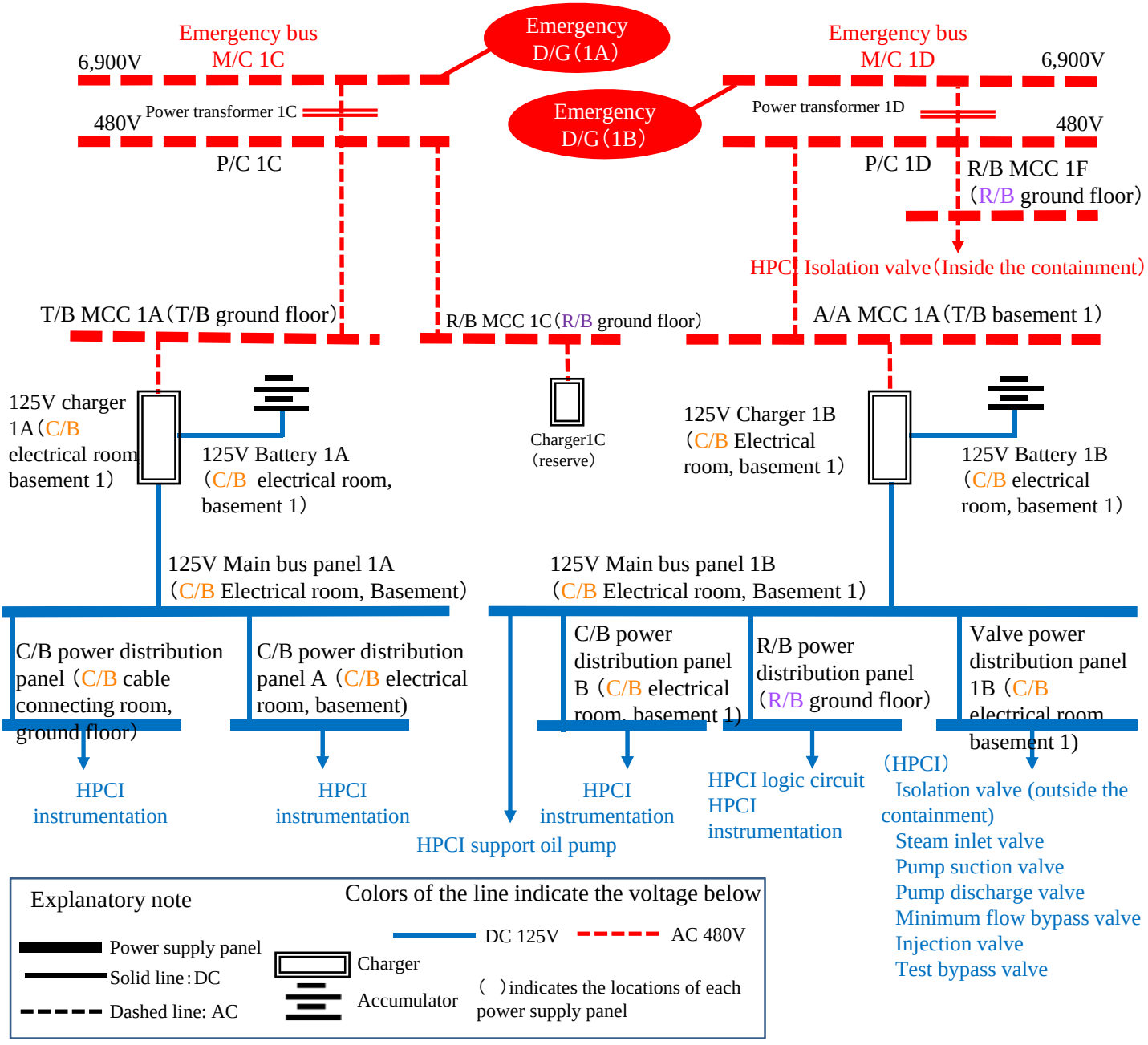


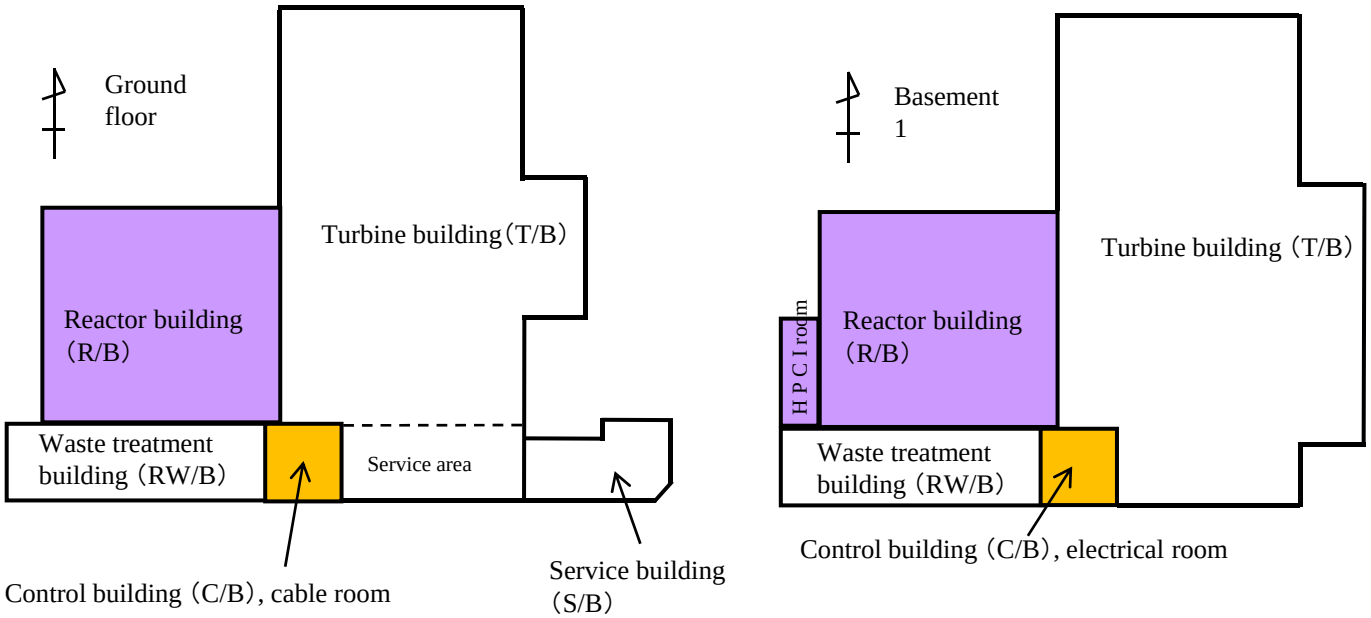
Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Attachment II-1-1-17

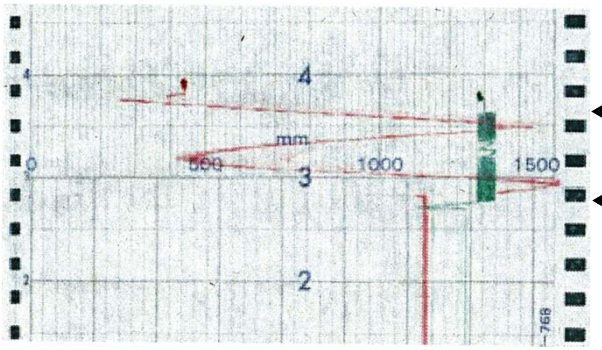
Unit 1 Overview of the Power Supply Regarding HPCI

Attachment II-1-1-18

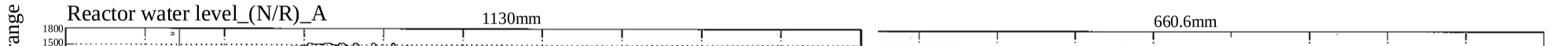


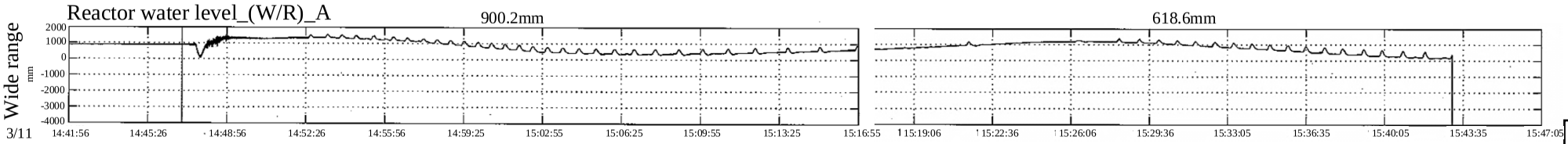


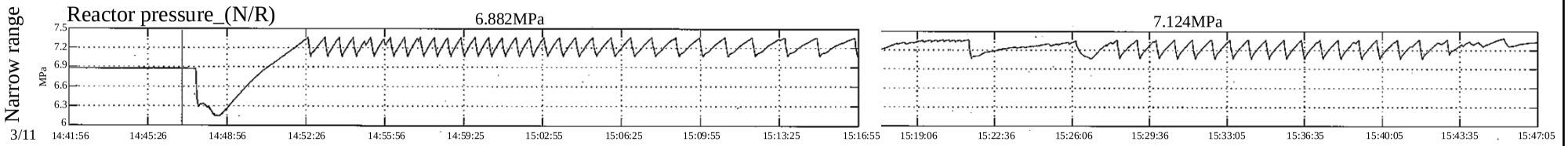
Unit 2: Reactor Water Level and Pressure

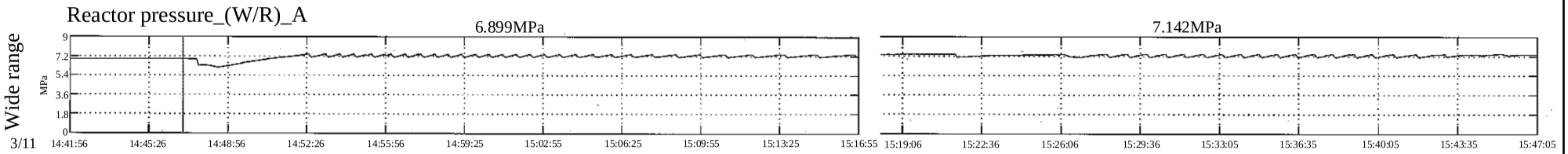


Compiled from the “Recorder Chart” (May 2011) by TEPCO





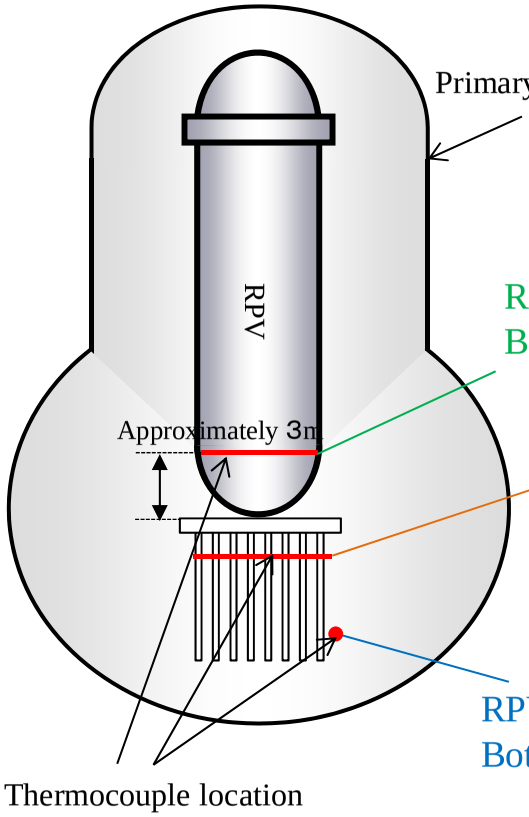




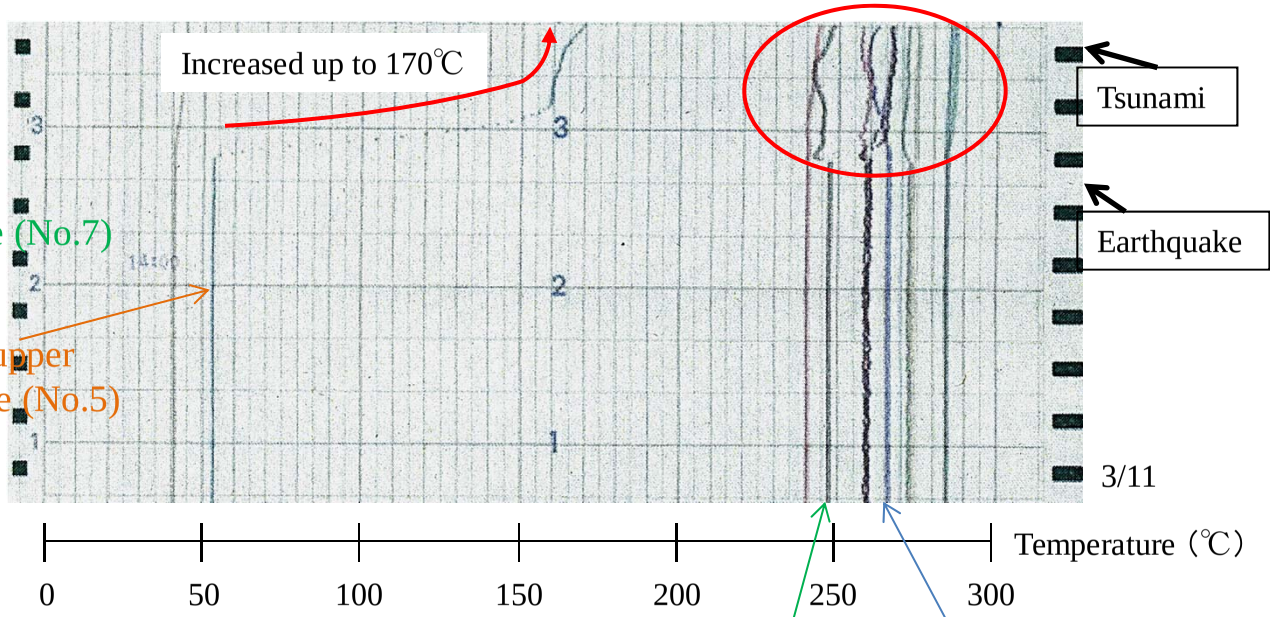
〔0mm（Narrow range and wide range）＝TAF＋4,170mm（Fuel range）〕

Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Unit 2 Reactor Pressure Vessel (RPV) Temperature



In each case, no significant decrease in the temperature observed



RPV Bottom temperature (No.7)

RPV Bottom-Drain Temperature (No.9)

Explanation note

TR-2-3-89

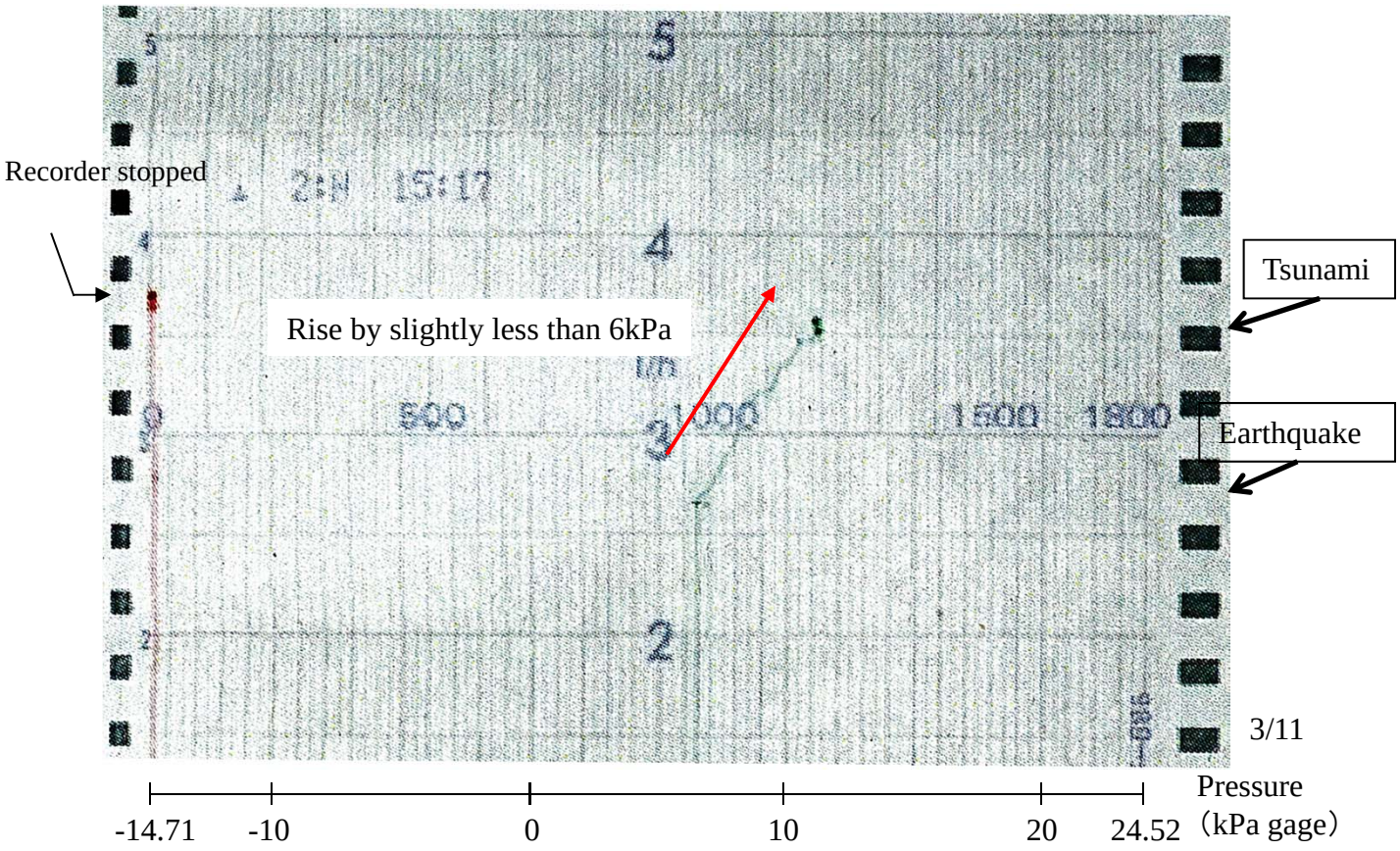
No	Color	Dot	Name of Measurement
1			Feedwater nozzle N-4B temperature
2			Feedwater nozzle N-4B temperature
3			Feedwater nozzle N-4D temperature
4			Feedwater nozzle N-4D temperature
5			CRD Housing upper part temperature
6			CRD Housing lower part temperature
7			RPV Bottom head upper part temperature
8			RPV Support skirt upper part temperature
9			RPV Drain pipe temperature
10			RPV Head flange ambient temperature
11			RPV Head flange temperature
12			RPV Body flange temperature

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Attachment II-1-1-20

Attachment II-1-1-21

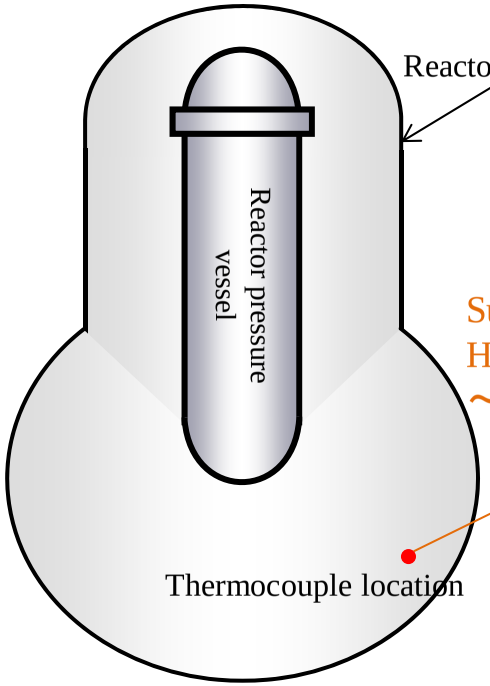
Unit 2 Reactor Containment Vessel Nitrogen Gas Pressure



(Green) Reactor containment vessel nitrogen gas pressure

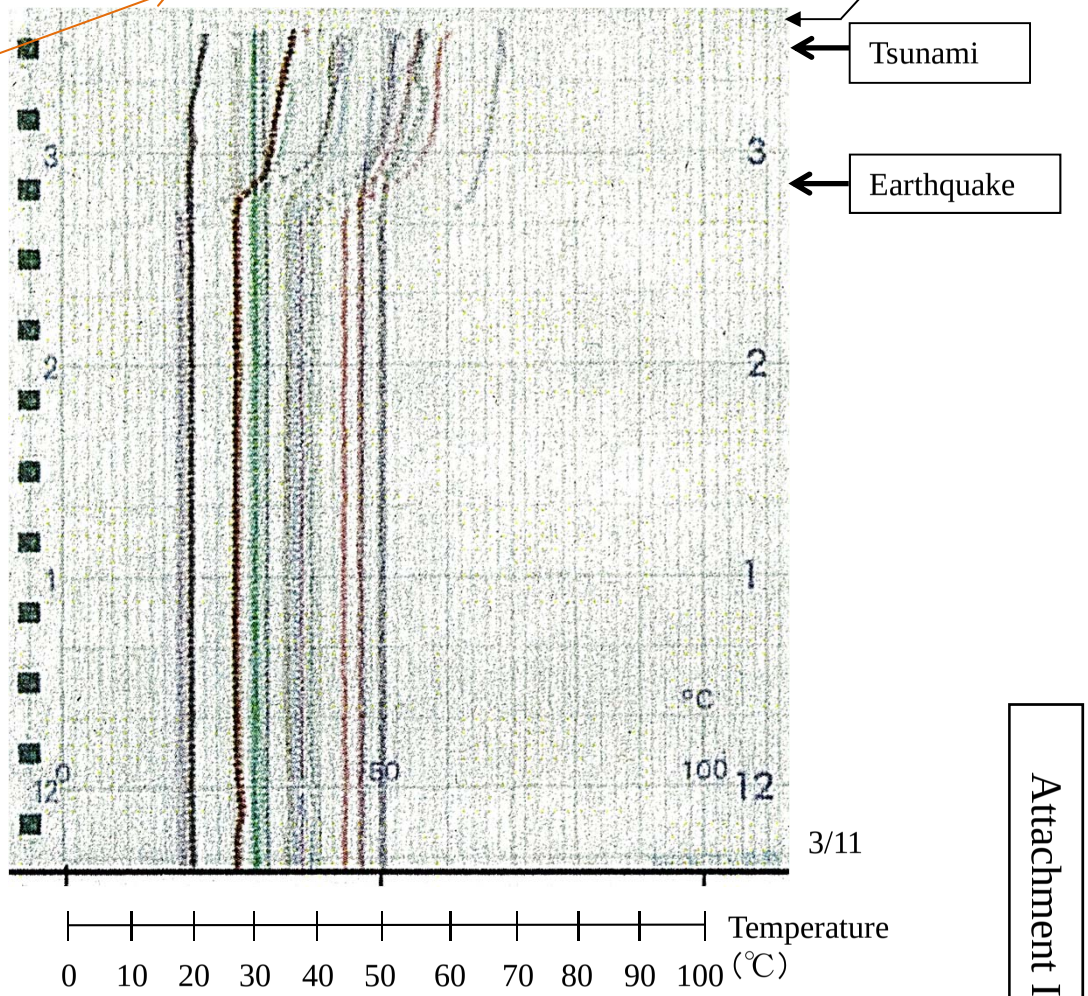
Compiled from the "Recorder Chart" (May 2011) by TEPCO

Unit 2 Drywell (D/W) Cooler HVH Temperature



Supply air D/W cooler HVH temperature(No.6～No.10)

A rise is observed in the supply air D/W cooler HVH temperature.



Explanatory note

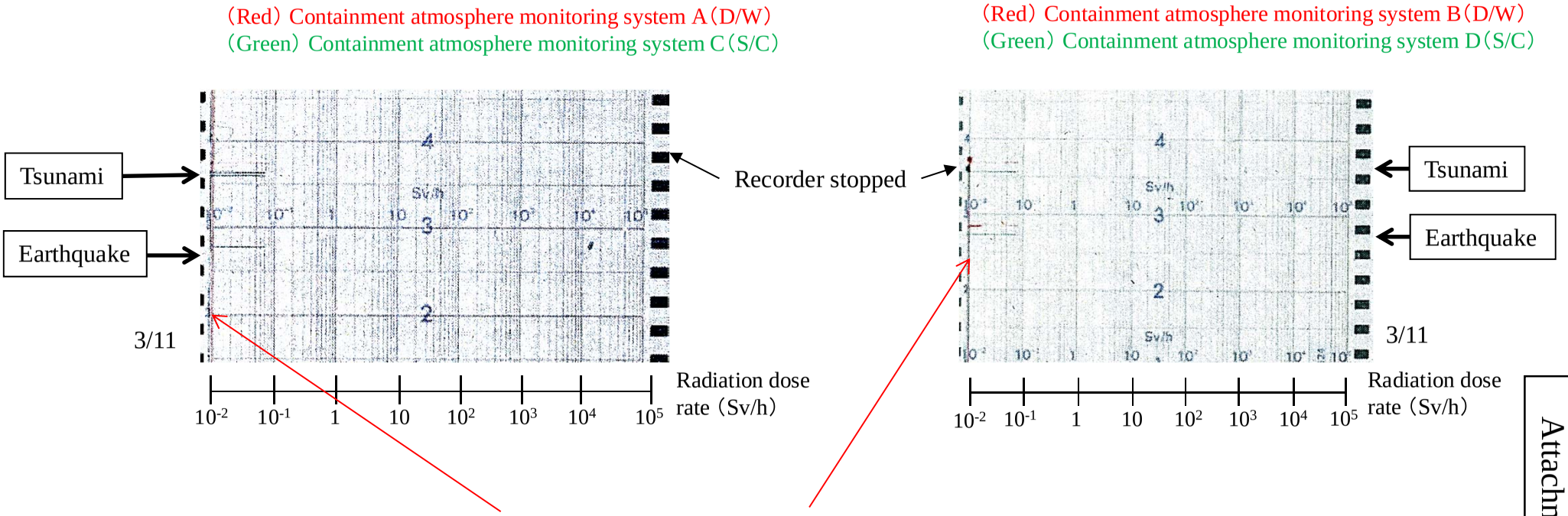
TRS-16-115 測定個所 Object of Measurement

			Object of Measurement	設定値 set point
○	1		Return air D/W cooler HVH-16A	66.0℃
●	2		Return air D/W cooler HVH-16B	66.0℃
O	3		Return air D/W cooler HVH-16C	66.0℃
O	4		Return air D/W cooler HVH-16D	66.0℃
+	5		Return air D/W cooler HVH-16E	66.0℃
+	6		Supply air D/W cooler HVH-16A	66.0℃
Y	7		Supply air D/W cooler HVH-16B	66.0℃
Y	8		Supply air D/W cooler HVH-16C	66.0℃
●	9		Supply air D/W cooler HVH-16D	66.0℃
●	10		Supply air D/W cooler HVH-16E	66.0℃
○	11		RPV bellows seal area	66.0℃
O	12		RPV bellows seal area	66.0℃
+	13		RPV bellows seal area	66.0℃
+	14		RPV bellows seal area	66.0℃
Y	15		RPV bellows seal area	66.0℃
Y	16		S/C gas temperature	65.5℃
●	17		S/C gas temperature	65.5℃
●	18		S/C gas temperature	65.5℃
○	19		S/C gas temperature	65.5℃
O	20		Reserve	
+	21		Electric penetration temperature	
+	22		Electric penetration temperature	
Y	23		Electric penetration temperature	
Y	24		Electric penetration temperature	

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Attachment II-1-1-22

Unit 2 Containment Atmosphere Monitoring System

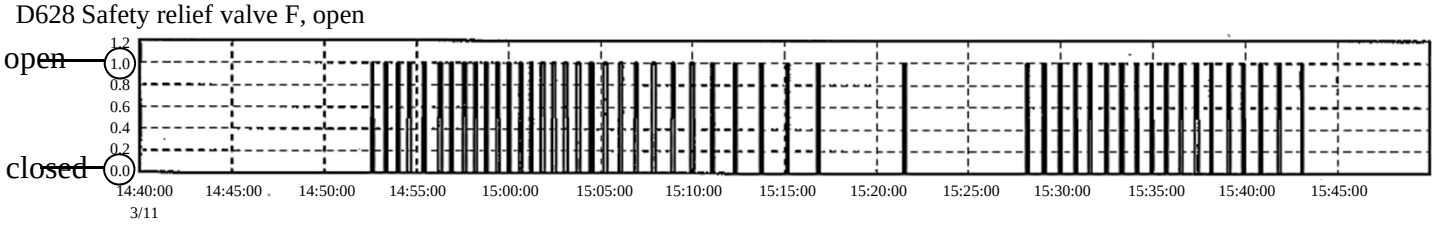


Compiled from the "Recorder Chart" (May 2011) by TEPCO

Attachment II-1-1-23

Unit 2 Operation of SRV

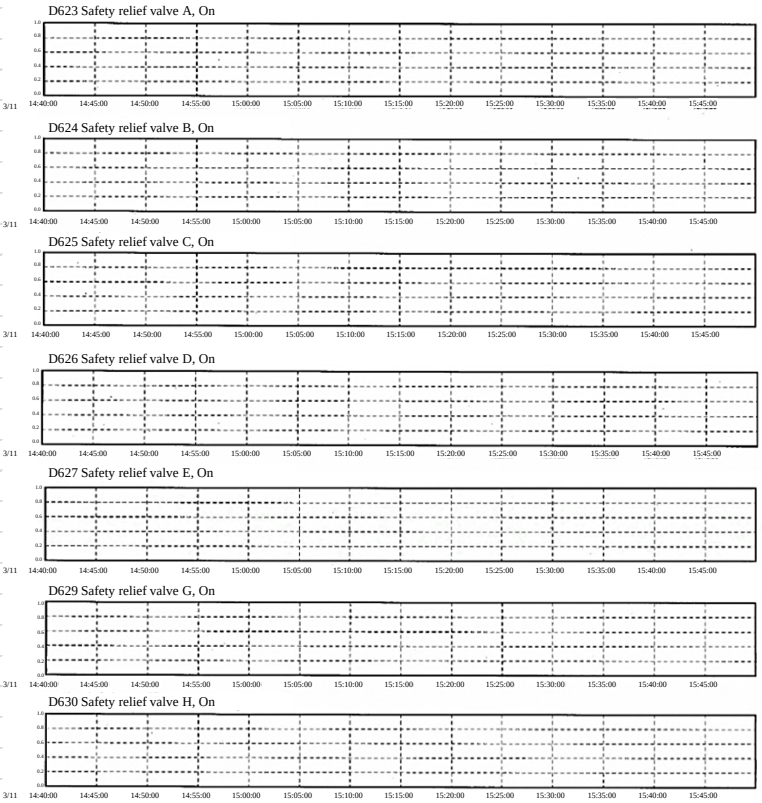
Attachment II-1-1-24



Opening-closing record of the safety relief valve F

No.	3/11 Time	SRV F Open	No.	3/11 Time	SRV Open
1	14:52:33	ON	26	15:11:02	ON
	14:52:40	OFF		15:11:11	OFF
2	14:53:18	ON	27	15:12:15	ON
	14:53:25	OFF		15:12:23	OFF
3	14:53:56	ON	28	15:13:41	ON
	14:54:04	OFF		15:13:49	OFF
4	14:54:33	ON	29	15:15:07	ON
	14:54:42	OFF		15:15:14	OFF
5	14:55:20	ON	30	15:16:47	ON
	14:55:29	OFF		15:16:54	OFF
6	14:56:12	ON	31	15:21:27	ON
	14:56:22	OFF		15:21:35	OFF
7	14:56:50	ON	32	15:28:08	ON
	14:56:59	OFF		15:28:16	OFF
8	14:57:32	ON	33	15:29:03	ON
	14:57:41	OFF		15:29:11	OFF
9	14:58:08	ON	34	15:29:55	ON
	14:58:17	OFF		15:30:03	OFF
10	14:58:44	ON	35	15:30:44	ON
	14:58:53	OFF		15:30:53	OFF
11	14:59:20	ON	36	15:31:33	ON
	14:59:29	OFF		15:31:42	OFF
12	14:59:57	ON	37	15:32:26	ON
	15:00:06	OFF		15:32:35	OFF
13	15:00:34	ON	38	15:33:15	ON
	15:00:43	OFF		15:33:24	OFF
14	15:01:10	ON	39	15:34:04	ON
	15:01:19	OFF		15:34:13	OFF
15	15:01:46	ON	40	15:34:53	ON
	15:01:56	OFF		15:35:01	OFF
16	15:02:22	ON	41	15:35:41	ON
	15:02:33	OFF		15:35:49	OFF
17	15:03:01	ON	42	15:36:28	ON
	15:03:11	OFF		15:36:37	OFF
18	15:03:42	ON	43	15:37:19	ON
	15:03:52	OFF		15:37:28	OFF
19	15:04:25	ON	44	15:38:07	ON
	15:04:35	OFF		15:38:15	OFF
20	15:05:10	ON	45	15:39:03	ON
	15:05:21	OFF		15:39:12	OFF
21	15:06:00	ON	46	15:39:52	ON
	15:06:10	OFF		15:40:00	OFF
22	15:06:52	ON	47	15:40:48	ON
	15:07:02	OFF		15:40:56	OFF
23	15:07:48	ON	48	15:41:47	ON
	15:07:58	OFF		15:41:56	OFF
24	15:08:51	ON	49	15:43:02	ON
	15:09:01	OFF		15:43:07	OFF
25	15:09:54	ON			
	15:10:04	OFF			

※There is no record of the valves A-E, valve G and valve H among the SRV



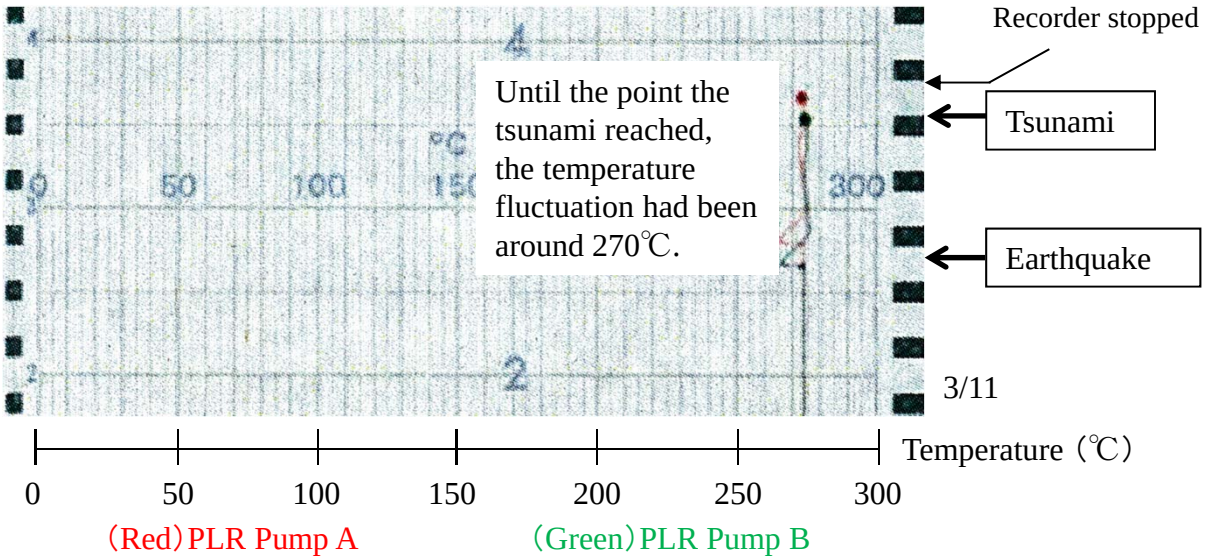
Compiled from the "Historical Data in the Process Computer System" (May 2011) by TEPCO

Between 14:52:33 and 15:43:07, the SRV (valve F) was repeatedly opened and closed for 49 times in total (counted based on the alarm typer record of Unit 2).

(Based on the data of the Unit 2 alarm typer and the alarm printer of the historical data in the process computer system

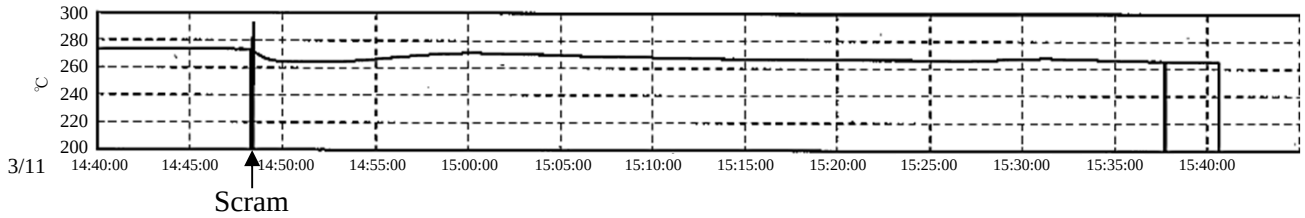
Attachment II-1-1-25

Unit 2 PLR Pump Inlet Temperature

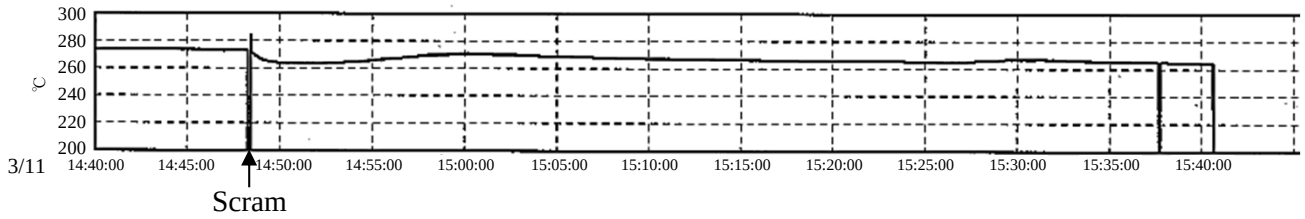


Compiled from the “Recorder Chart” (May 2011) by TEPCO

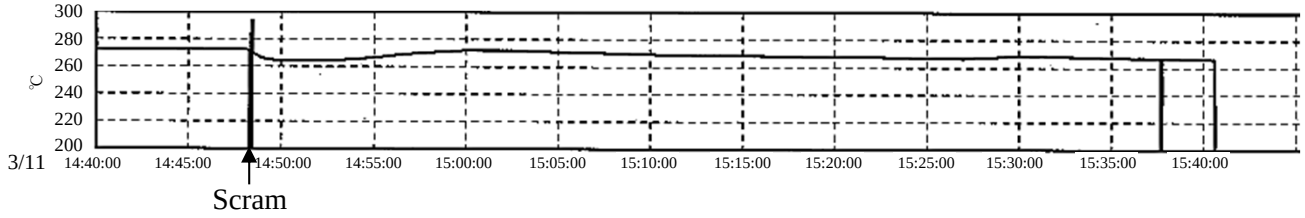
C020 Recirculation pump inlet temperature A1



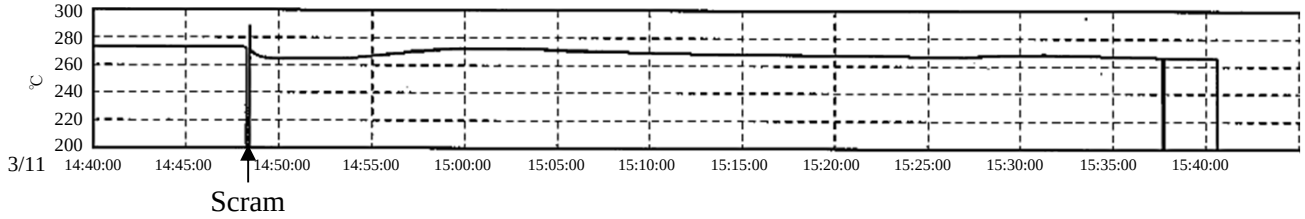
C021 Recirculation pump inlet temperature A2



C022 Recirculation pump inlet temperature B1

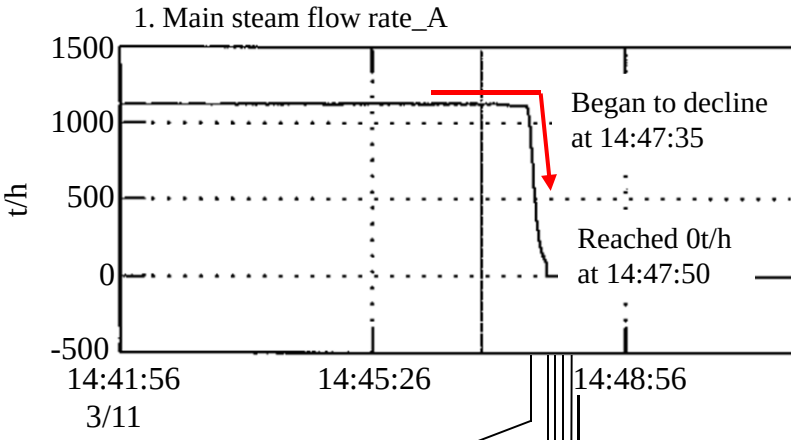


C023 Recirculation pump inlet temperature B2



Compiled from the “Historical Data in the Process Computer System” (May 2011) by TEPCO

Unit 2 Main Steam Flow Rate and APRM Output



3/11

14:47:33 Reactor automatic scram（B）
14:47:34 Reactor automatic scram（A）

14:48:23 Main steam flow, high（A･C）
14:48:23 Main steam pressure, low（A･C）

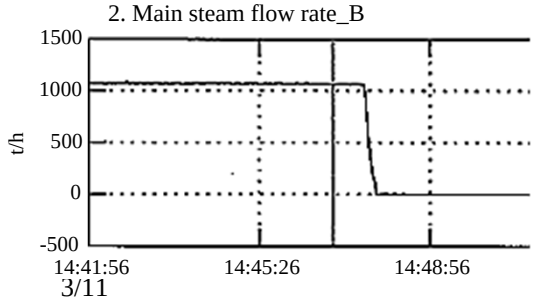
14:48:24 Main steam isolation valve, Isolation signal

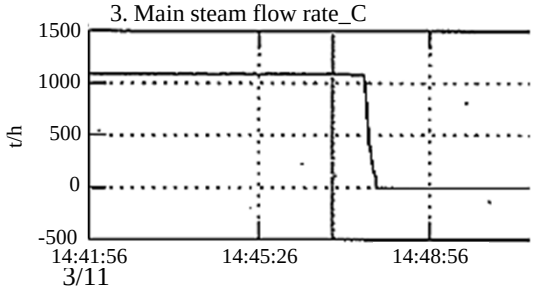
14:48:28 Main steam flow, high（B･D）
14:48:28 Main steam pressure, low（B･D）

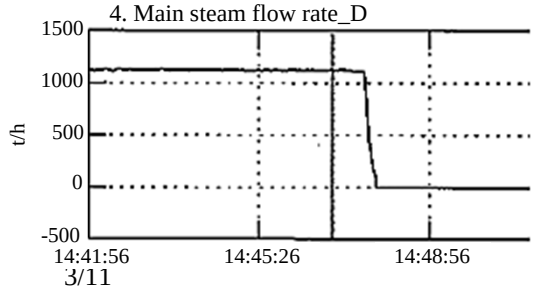
14:48:29
Main steam isolation valve, close ON
（Closure began）
14:48:32
Main steam isolation valve, open OFF
（Completely closed）

14:48:29
Main steam isolation valve
Isolation signal

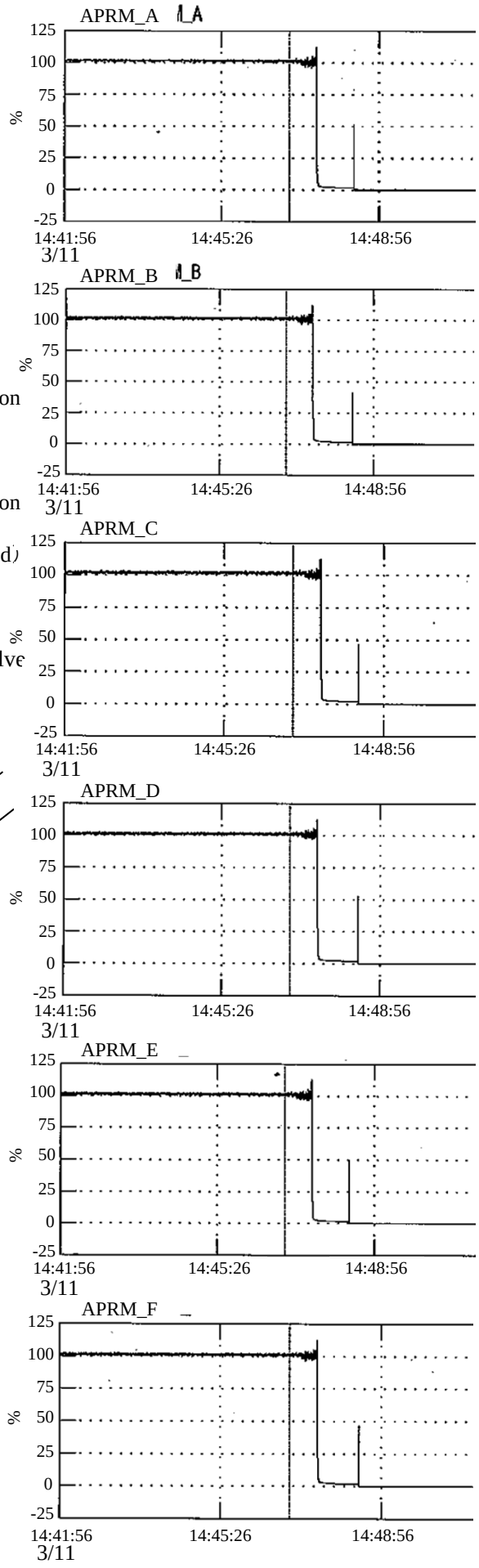
（Based on the Unit 2 alarm typer record）







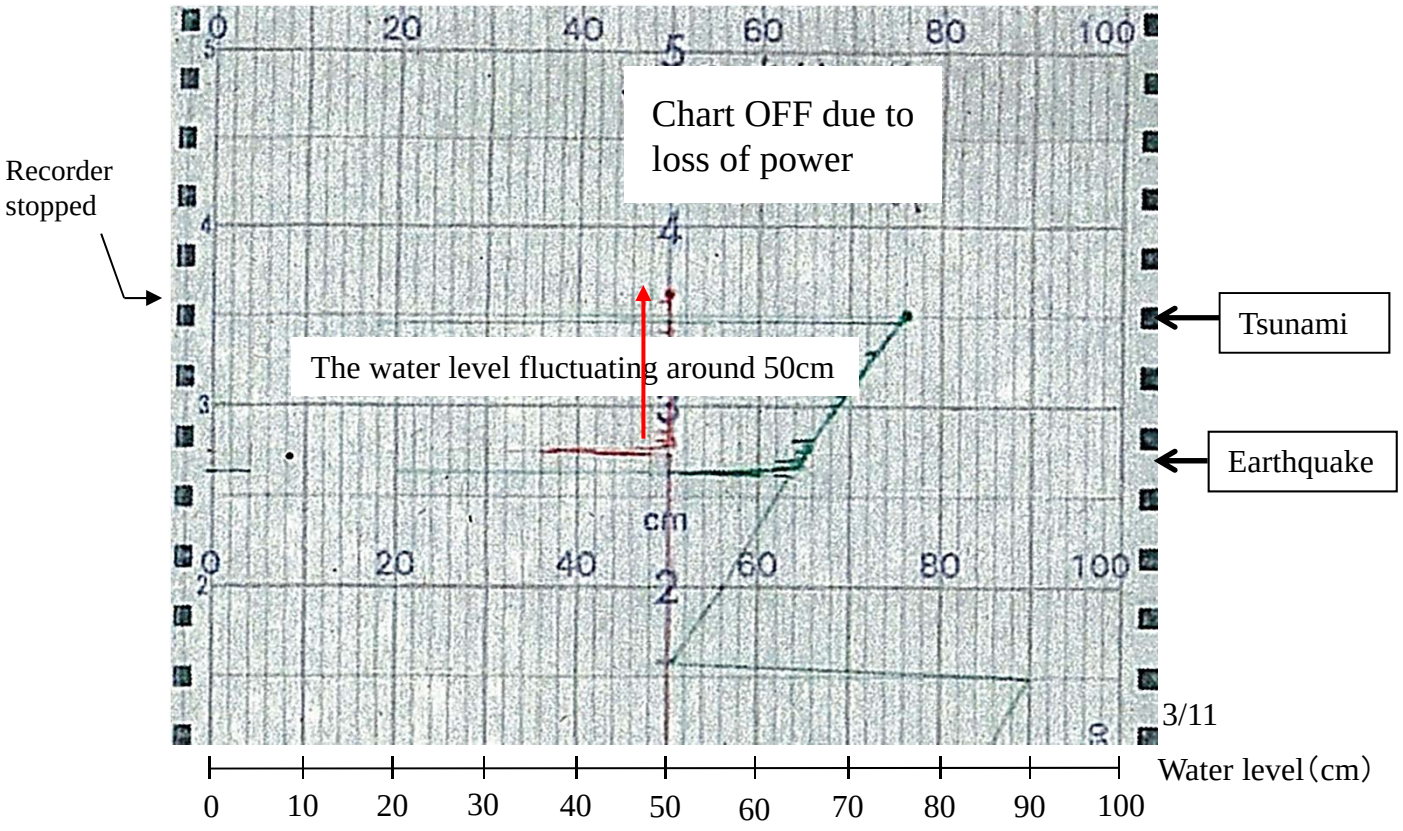
The decline of the main steam flow and the decline in the APRM output correlate to each other.



Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Attachment II-1-1-27

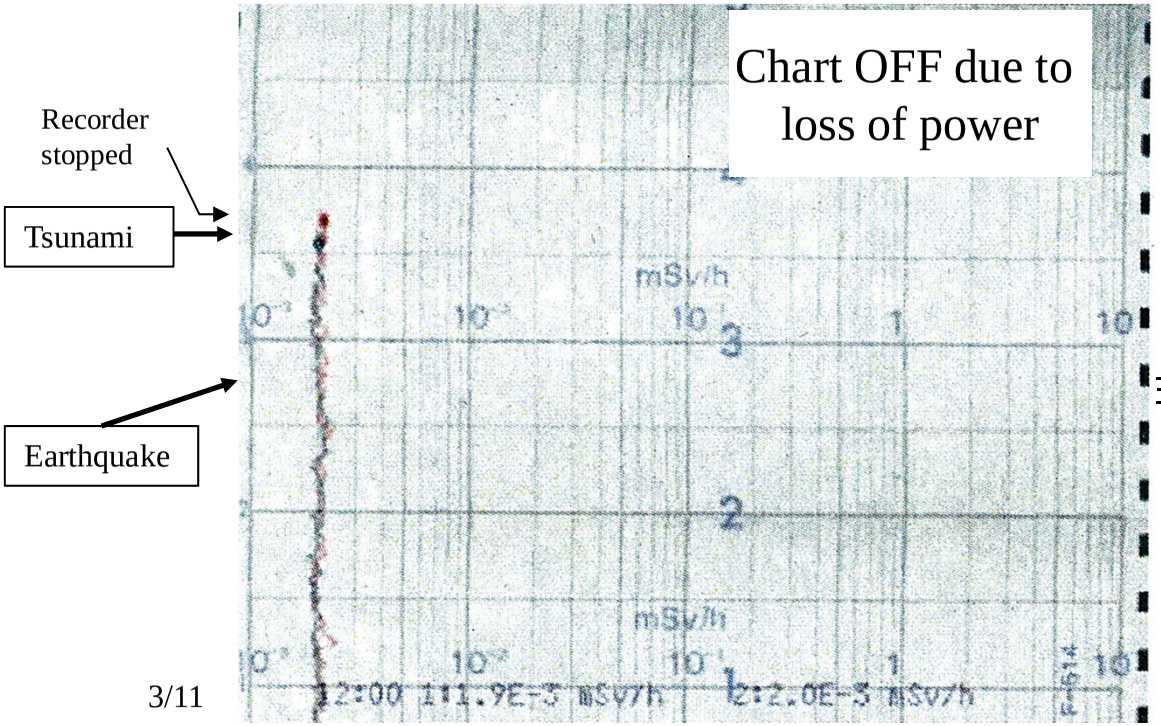
Unit 2 Water Level of the Floor Drain Sump in D/W



（Red）Water level of the floor drain sump in D/W

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Unit 2 Standby Gas Treatment System (SGTS) Exhaust Radiation Monitor



(Green) SGTS exhaust radiation monitor A
(Red) SGTS exhaust radiation monitor B

14:48:22 **SGTS A Activated**

Emergency diesel generator activated

14:48:14 **SGTS A stopped**

Off-site power lost

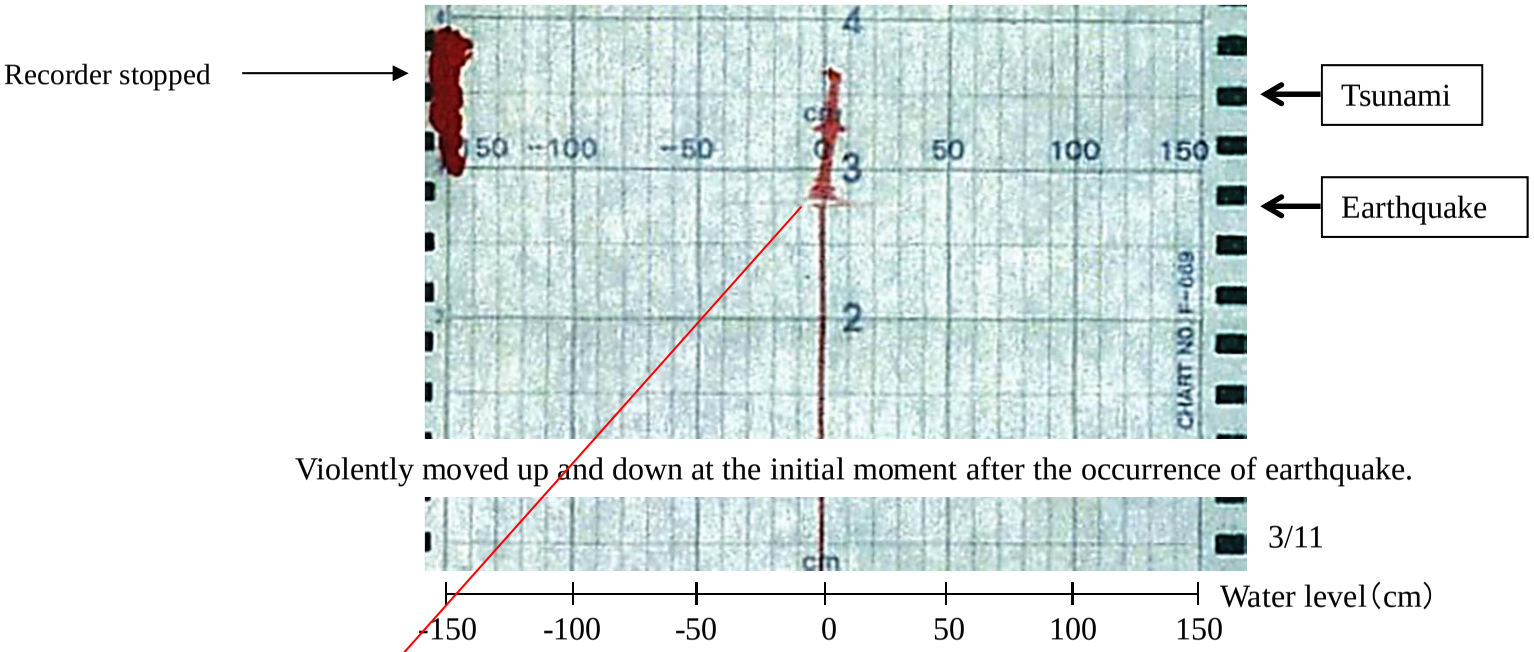
14:47:43 **SGTS A Activated**

Time

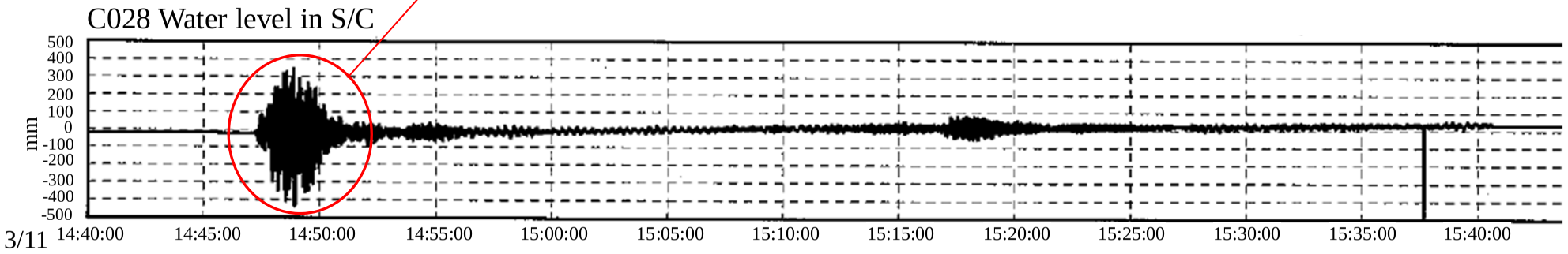
(Based on the Unit 2 alarm typer record and historical data in the process computer system)

Compiled from the "Recorder Chart" (May 2011) by TEPCO

Unit 2 S/C Water Level



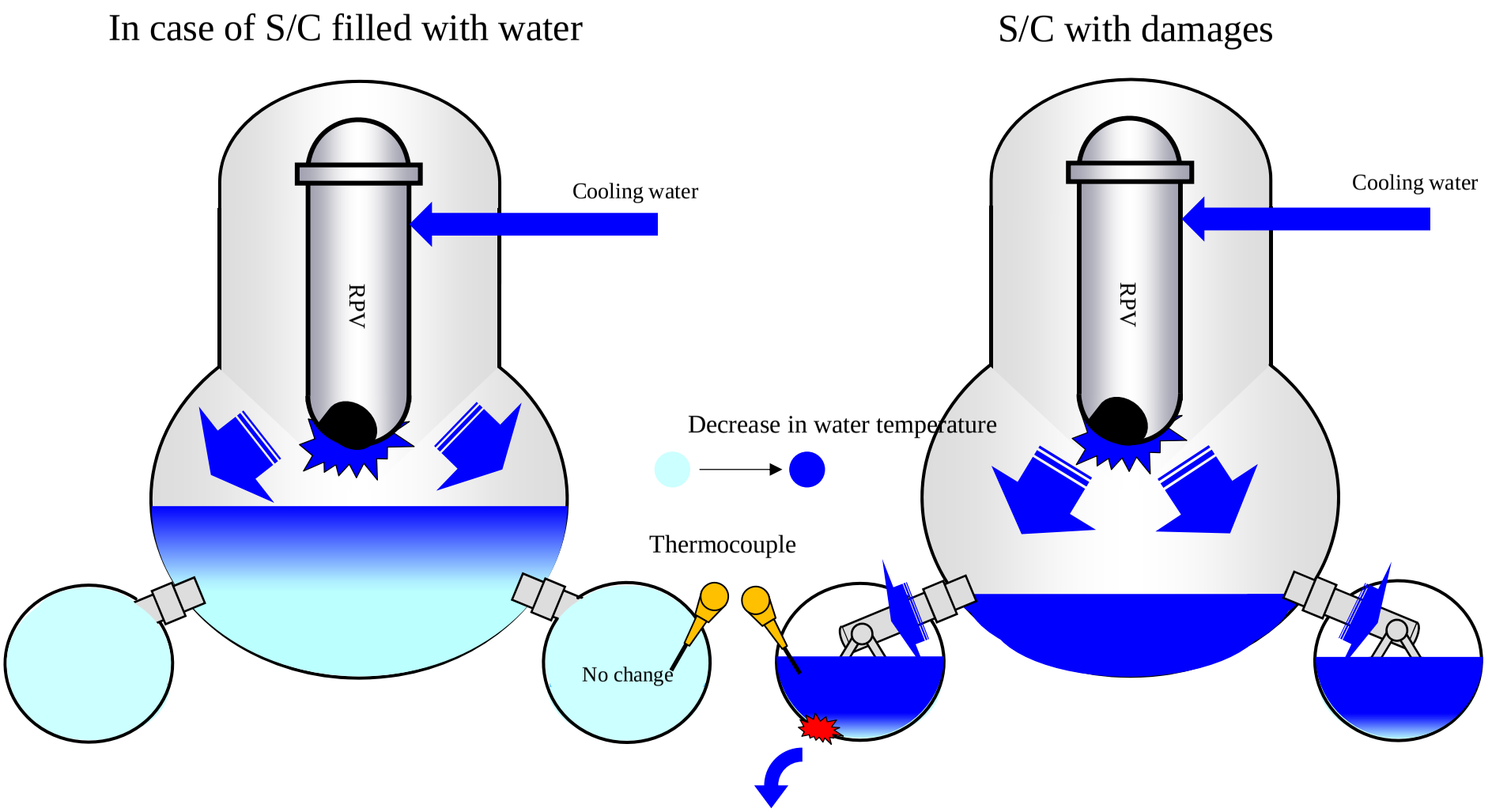
Compiled from the "Recorder Chart" (May 2011) by TEPCO



Compiled from the "Historical Data in the Process Computer System" (May 2011) by TEPCO

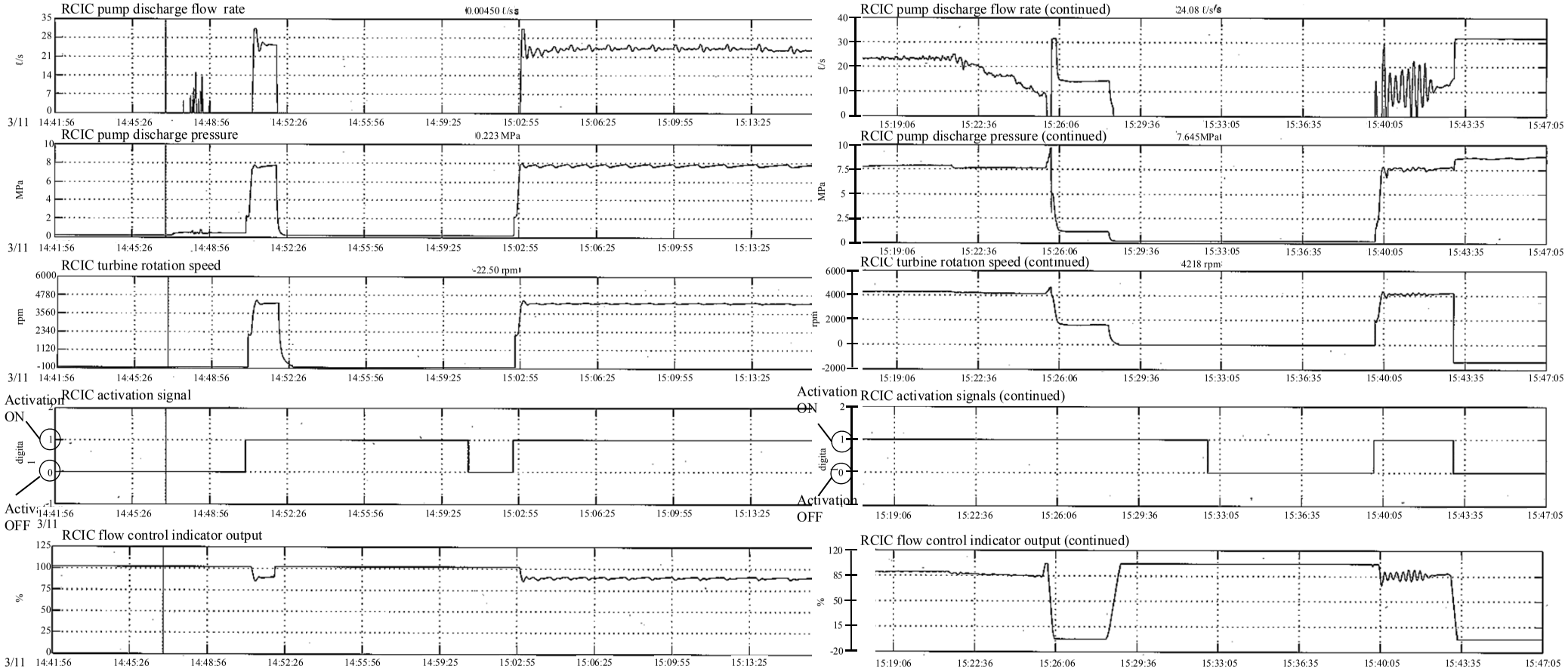
Attachment II-1-1-29

Unit 2 Decrease in Water Temperature in S/C due to Cooling Water



Attachment II-1-1-30

Unit 2 RCIC Pump Discharge Flow Rate etc.



At 14:50:33
RCIC turbine activated

At 14:50:34
RCIC activation signal actuated

RCIC in operation

At 14:51:56
High reactor water level

RCIC stopped

At 15:02:40
RCIC turbine activated

At 15:02:41
RCIC activation signal actuated

RCIC in operation

At 15:25:34
RCIC injection valve "Closure"

At around 15:26
Switched the line to return water to CST

At 15:28:14
High reactor water level

RCIC stopped

At around 15:39
RCIC manually activated (quick start)

RCICin operation

Compiled from the "Transient Analysis Recording System" (May 2011) by TEPCO

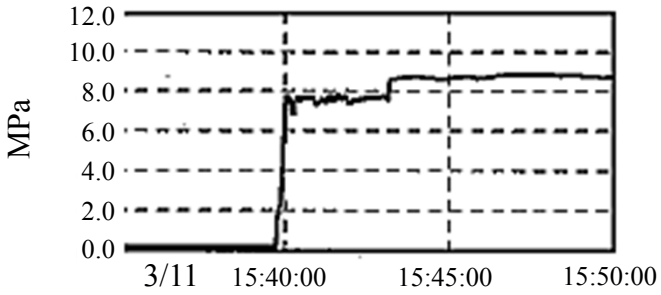
(Compiled from the records of "Alarm Typer" (May 2011), "Process Computer System Alarm Printer" (May 2011) and "Shift Operator's Logbook" (May 2011) by TEPCO

Attachment II-1-1-31

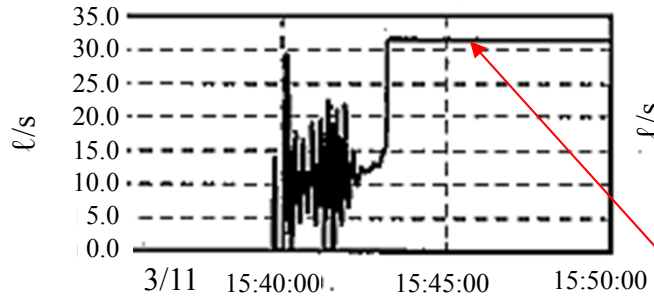
Unit 2 RCIC Pump Discharge Pressure etc.

Attachment II-1-1-32

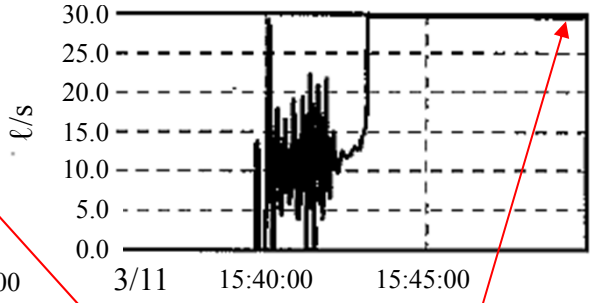
P750 RCIC pump discharge pressure



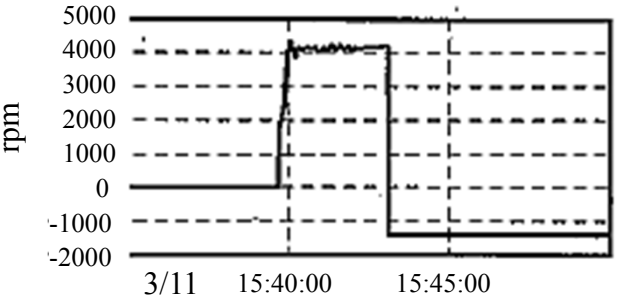
P751 RCIC pump discharge flow rate



B024 RCIC system flow

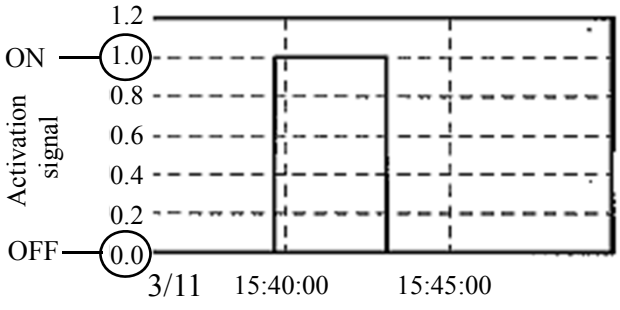


P752 RCIC turbine rotation speed

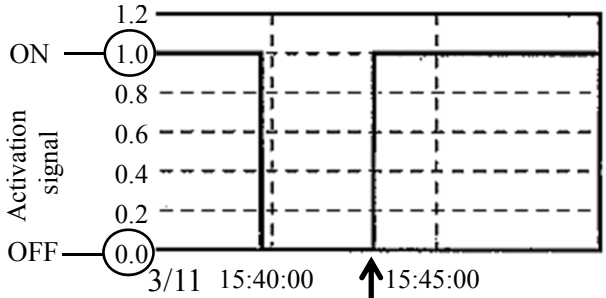


It is estimated that the RCIC continued to be in operation while unable to control flow rate.

R705 RCIC activation signal



D648 RCIC turbine activation



At 15:43:07
RCIC turbine activation signal OFF

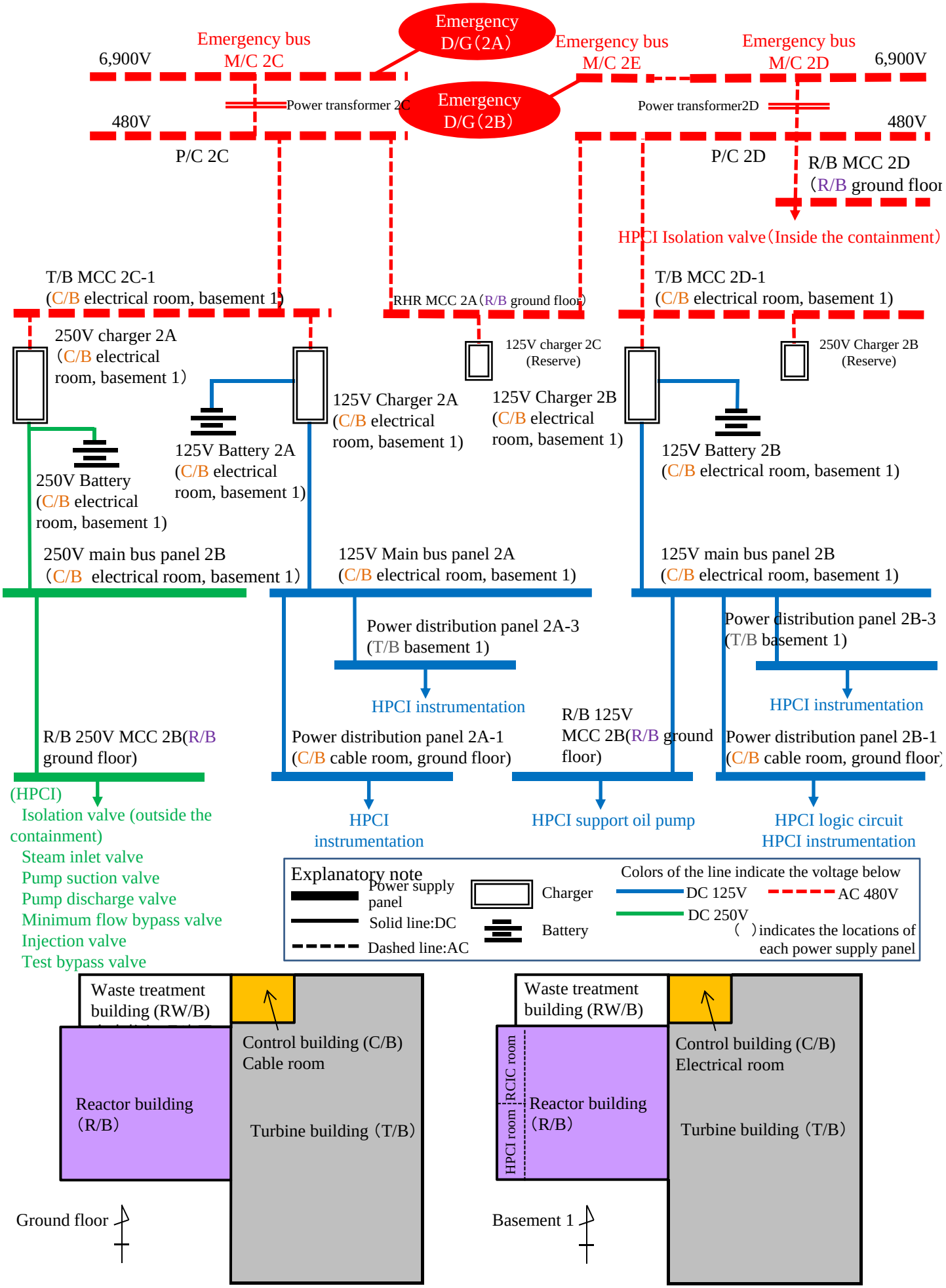
15:43:08
RCIC activation signal stopped

(Based on the Unit 2 alarm typer)

Compiled from the "Historical Data in the Process Computer System" (May 2011) by TEPCO

Unit 2 Overview of the Power Supply Regarding HPCI

Attachment II-1-1-33

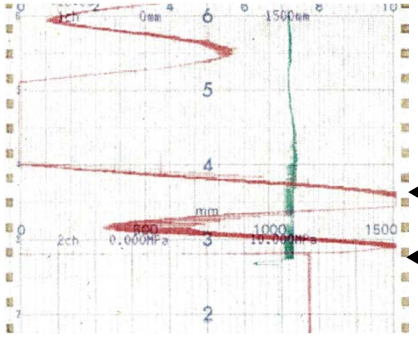


Unit 3 Reactor Water Level

(Red) Reactor water level (narrow range)

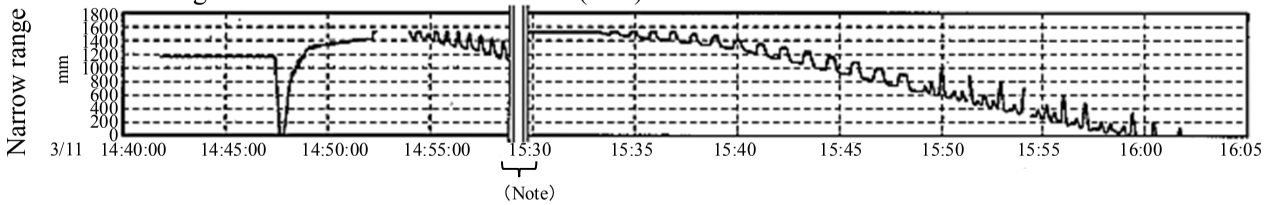
At 15:25:02
High reactor water level → RCIC stopped

(Based on Unit 3 alarm typer record)



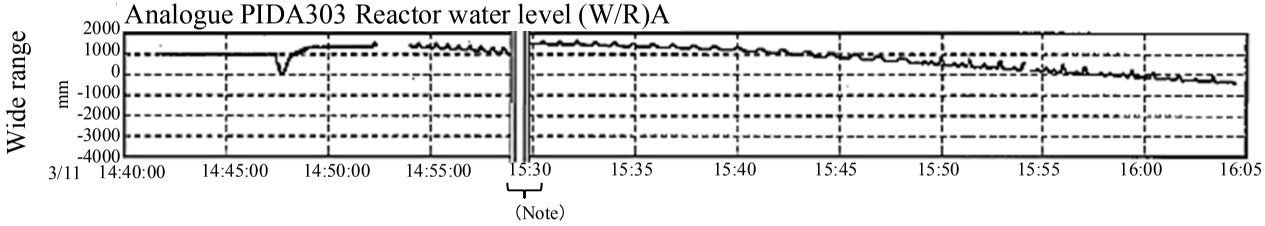
Compiled from the "Recorder Chart" (May 2011) by TEPCO

Analogue PIDA300 Reactor water level (N/R)A

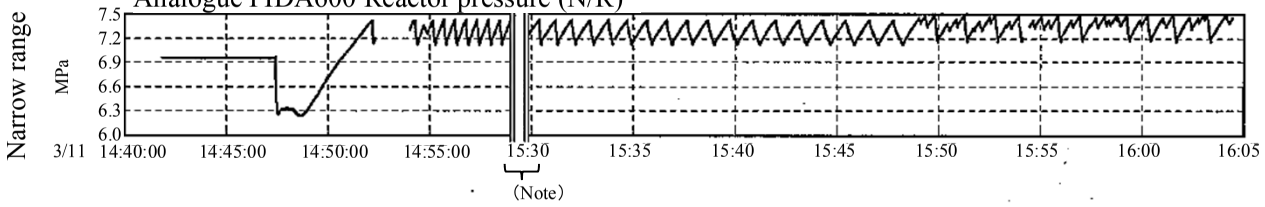


(0mm(Narrow range・Wide range)
＝TAF＋4,170mm(Fuel range))

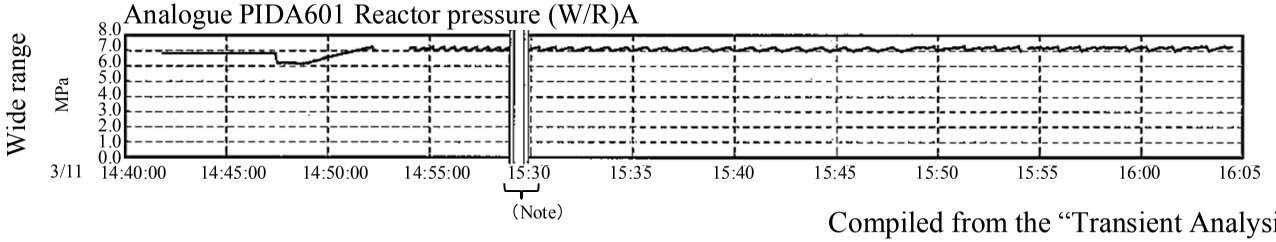
Analogue PIDA303 Reactor water level (W/R)A



Analogue PIDA600 Reactor pressure (N/R)



Analogue PIDA601 Reactor pressure (W/R)A

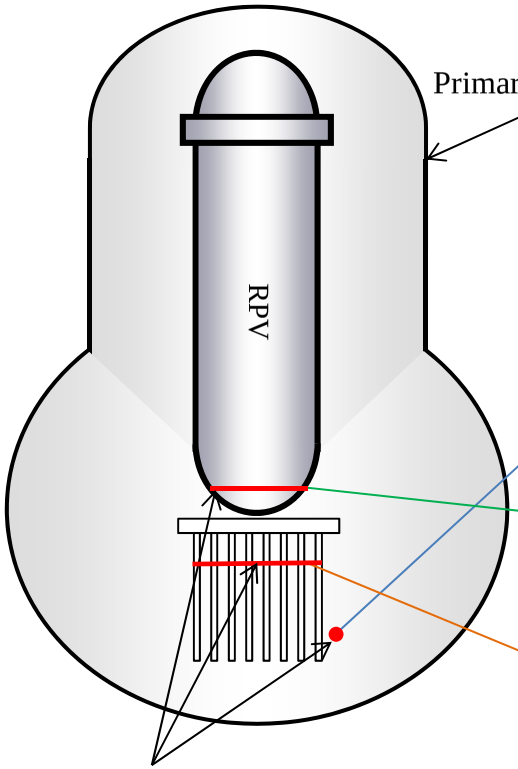


(Note)
Regarding the data recorded by the Unit 3 Transient Analysis Recording System, TEPCO announced that data was interrupted for approximately 30 minutes from14:59 on March 11, 2011, as a result of cross-checking against the record of other charts, and thus, the times for the data thereafter are estimated.

Compiled from the "Transient Analysis Recording System" (May 2011) by TEPCO

Attachment II-1-1-34

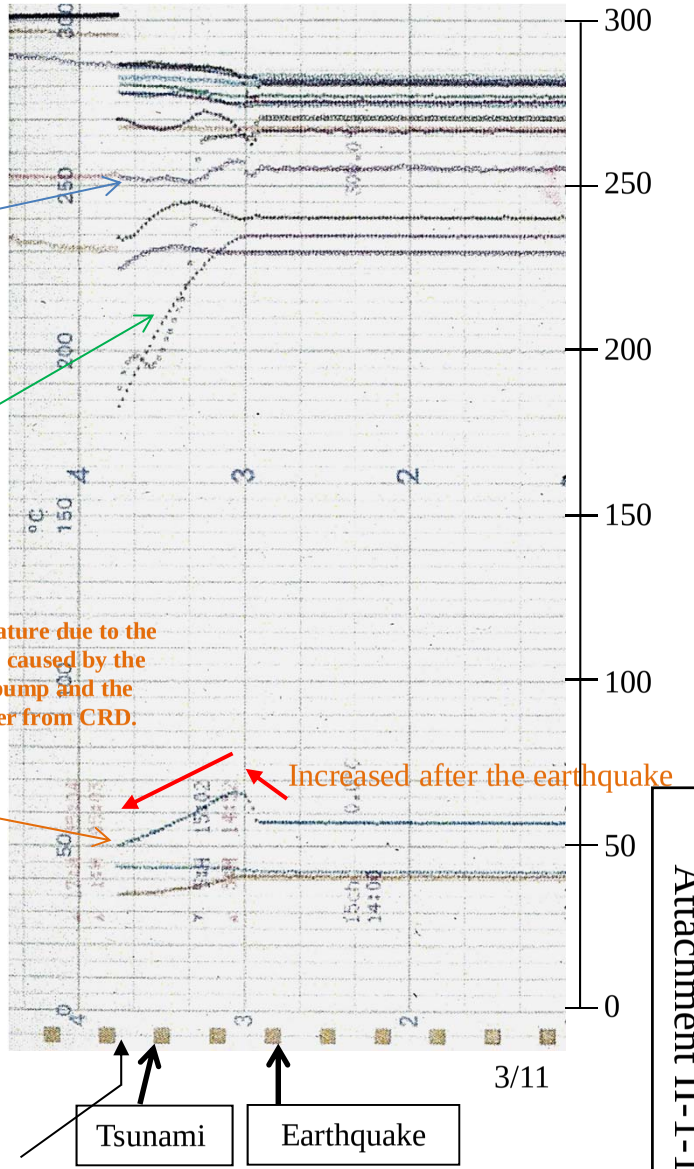
Unit 3 Reactor Pressure Vessel (RPV) Temperature



RPV Drain temperature (No.9)

RPV Bottom head temperature (No.13)

CRD Housing upper part Temperature (No.5)



Explanatory note

TRS-2-3-89

No	Color Dot	Name of Measurement
1	■ ●	RPV Feedwater nozzle N4B
2	■ ●	RPV Feedwater nozzle N4B
3	■ ●	RPV Feedwater nozzle N4D
4	■ ●	RPV Feedwater nozzle N4D
5	■ ●	CRD Housing upper part
6	■ ●	CRD Housing lower part
7	■ ○	RPV Bottom head upper part
8	■ ○	RPV Support skirt upper part
9	■ ○	RPV Drain
10	■ ○	RPV Head
11	■ ○	RPV Head flange
12	■ ○	RPV Body flange

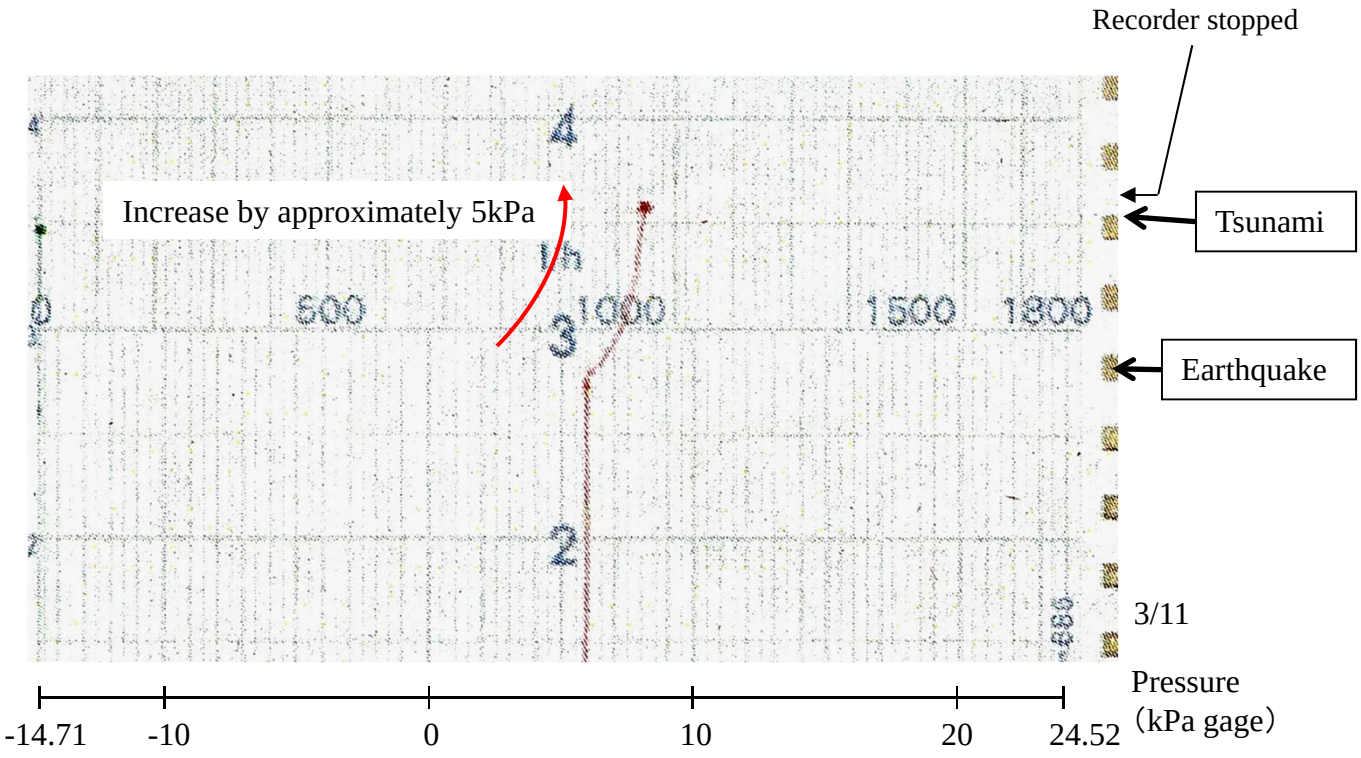
No	Color Dot	Name of Measurement
13	■ +	RPV lower part head temperature
14	■ +	RPV wall in the vicinity of flange
15	■ +	The bottom part of RPV situated above the vessel support skirt
16	■ +	The wall of RPV under the feedwater nozzle
17	■ +	The bottom of the supporting skirt of flange
18	■ +	
19	■ Y	
20	■ Y	
21	■ Y	
22	■ Y	
23	■ Y	
24	■ Y	

※There is a possibility that the time on the recorder chart was about 7 minutes ahead of the actual time.

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Attachment II-1-1-36

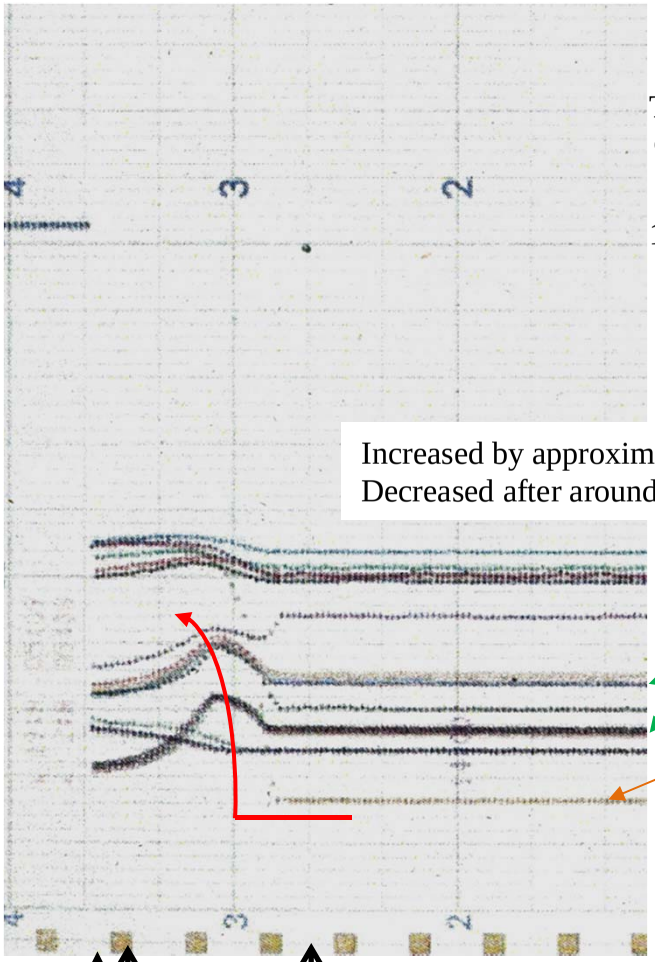
Unit 3 Reactor Containment Vessel Nitrogen Gas Pressure

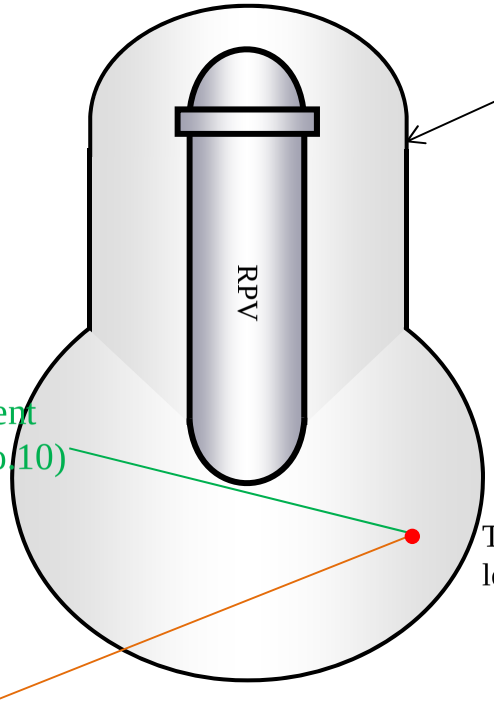


(Red) Reactor containment vessel nitrogen gas pressure

Compiled from the "Recorder Chart" (May 2011) by TEPCO

Unit 3 Air Temperature Supplied by D/W HVH





Air temperature supplied by containment vessel air conditioning unit (No.7～No.10)

Air temperature supplied by containment vessel air conditioning unit（No.6）

Explanatory note

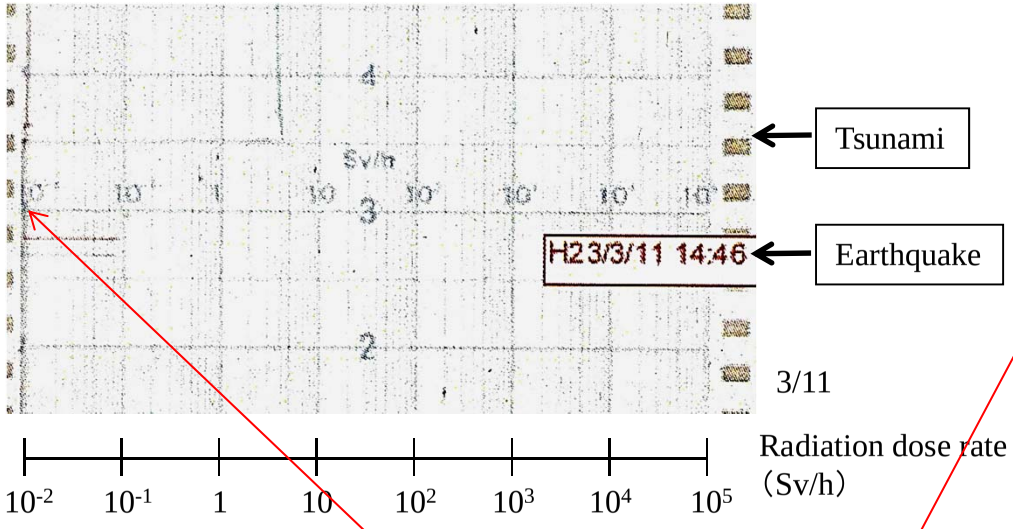
TRS-16-115 Store No. Unit 3

No.	Color Dot	Input Instruments No.	Input Instruments Measurement Point	Switch Set Point	No.	Color Dot	Input Instruments No.	Input Instruments Measurement Point	Switch Set Point
1	●	TE-16-114A	Return air temperature to D/W HVH	65.6℃	13	+	TE-16-114N	Temperature of the reactor bellows seal	65.6℃
2	●	TE-16-114B	Return air temperature to D/W HVH	65.6℃	14	+	TE-16-114P	Temperature of the reactor bellows seal	65.6℃
3	●	TE-16-114C	Return air temperature to D/W HVH	65.6℃	15	+	TE-16-114R	Temperature of the reactor bellows seal	65.6℃
4	●	TE-16-114D	Return air temperature to D/W HVH	65.6℃	16	+	TE-16-114T	S/C gas temperature	65.6℃
5	●	TE-16-114E	Return air temperature to D/W HVH	65.6℃	17	+	TE-16-114U	S/C gas temperature	65.6℃
6	●	TE-16-114F	Air temperature supplied by D/W HVH	65.6℃	18	+	TE-16-114V	S/C gas temperature	65.6℃
7	○	TE-16-114G	Air temperature supplied by D/W HVH	65.6℃	19	Y	TE-16-114W	S/C gas temperature	65.6℃
8	○	TE-16-114H	Air temperature supplied by D/W HVH	65.6℃	20	Y			
9	○	TE-16-114J	Air temperature supplied by D/W HVH	65.6℃	21	Y			
10	○	TE-16-114K	Air temperature supplied by D/W HVH	65.6℃	22	Y			
11	○	TE-16-114L	Temperature of the reactor bellows seal	65.6℃	23	Y			
12	○	TE-16-114M	Temperature of the reactor bellows seal	65.6℃	24	Y			

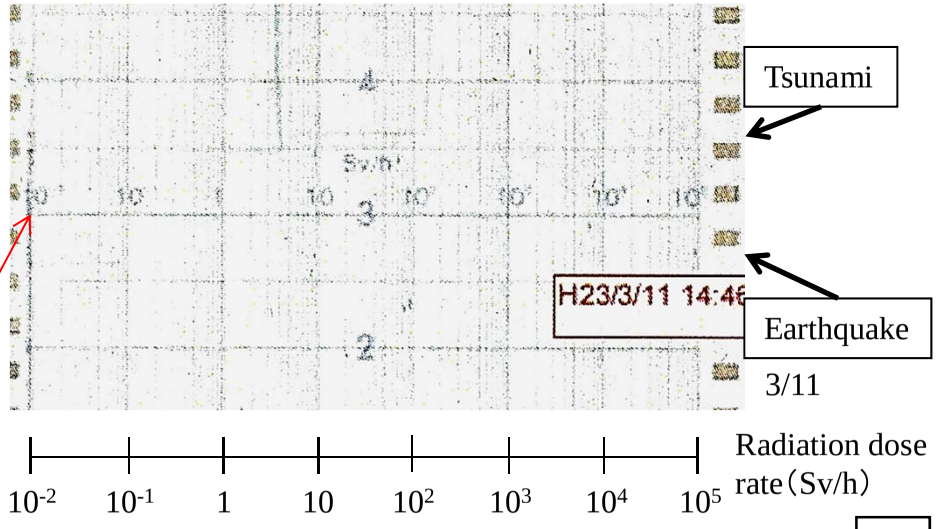
Compiled from the “Recorder Chart” (May 2011) by TEPCO

Unit 3 Containment Atmosphere Monitoring System

（Red）Containment atmosphere monitoring system A（D/W）
（Green）Containment atmosphere monitoring system C（S/C）



（Red）Containment atmosphere monitoring system B（D/W）
（Green）Containment atmosphere monitoring system D（S/C）



Both indicate lower limit values

Compiled from the “Recorder Chart” (May 2011) by TEPCO

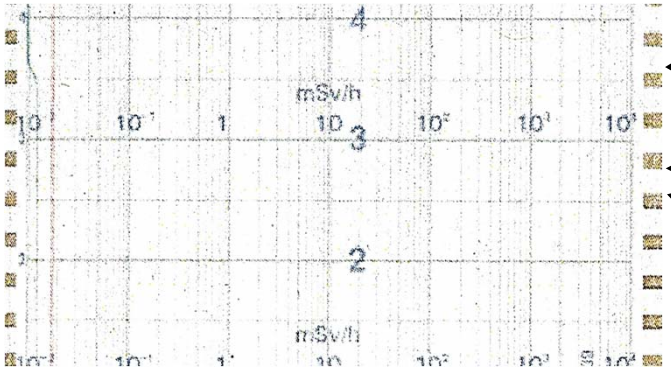
Attachment II-1-1-38

Unit 3 Main Stack Radiation Monitor

（Based on the Unit 3 alarm typer）

On March 11 at 14:47, SGTS was activated

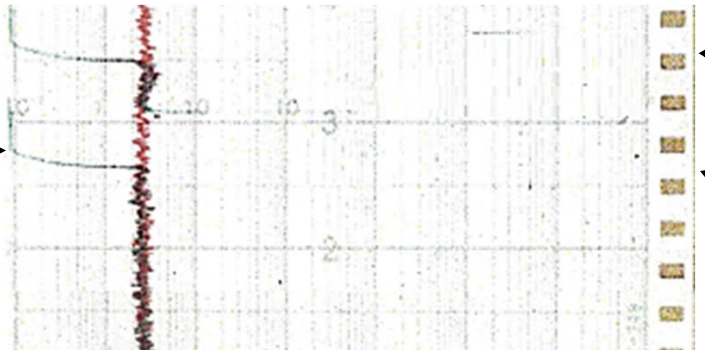
(Red) Main stack radiation monitor (Ionization chamber)



Tsunami

Earthquake

(Red) Main stack radiation monitor (Scintillation type)A
(Green) Main stack radiation monitor (Scintillation type)B



Tsunami

Earthquake

10^{-2} 10^{-1} 1 10 10^{2} 10^{3} 10^{4}

Radiation dose rate（mSv/h）

10^{-1} 1 10 10^{2} 10^{3} 10^{4} 10^{5} 10^{6}

Radiation dose rate (cps)

Compiled from the “Recorder Chart” (May 2011) by TEPCO

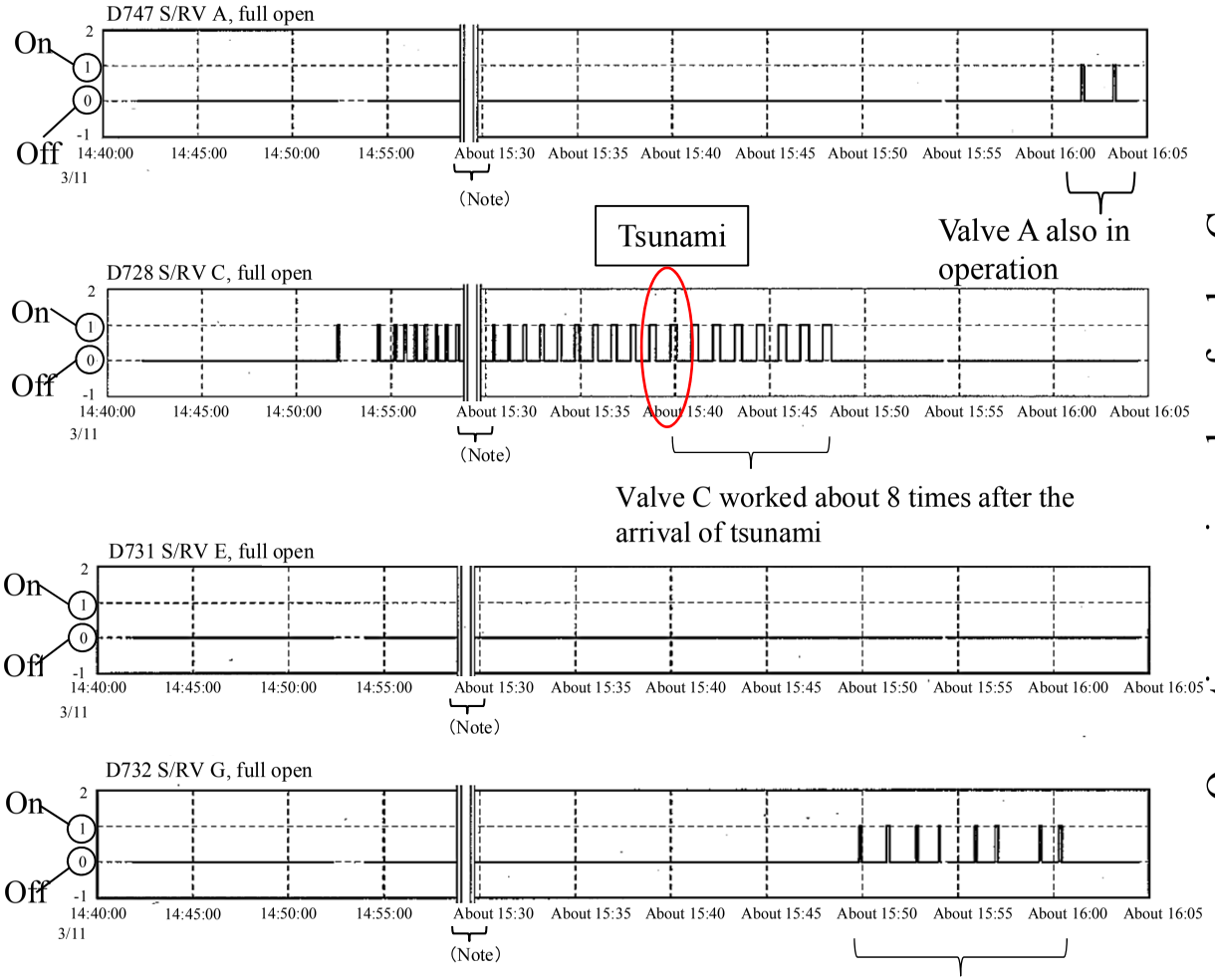
Attachment II-1-1-39

Opening-closing record of the safety relief valve C

No.	3/11 Time	SRV C open	No.	3/11 Time	SRV C open
1	14:51:50	On	28	15:07:58	On
	14:51:55	Off		15:08:05	Off
2	14:52:29	On	29	15:08:39	On
	14:52:35	Off		15:08:46	Off
3	14:53:03	On	30	15:09:55	On
	14:53:11	Off		15:10:03	Off
4	14:53:56	On	31	15:11:09	On
	14:54:04	Off		15:11:16	Off
5	14:54:48	On	32	15:12:01	On
	14:54:56	Off		15:12:07	Off
6	14:55:21	On	33	15:13:32	On
	14:55:29	Off		15:13:39	Off
7	14:55:53	On	34	15:14:43	On
	14:56:01	Off		15:14:49	Off
8	14:56:26	On	35	15:15:54	On
	14:56:34	Off		15:16:00	Off
9	14:57:00	On	36	15:17:17	On
	14:57:07	Off		15:17:22	Off
10	14:57:33	On	37	15:19:01	On
	14:57:41	Off		15:19:06	Off
11	14:58:06	On	38	15:25:58	On
	14:58:14	Off		15:26:03	Off
12	14:58:39	On	39	15:27:19	On
	14:58:47	Off		15:27:24	Off
13	14:59:13	On	40	15:28:17	On
	14:59:21	Off		15:28:23	Off
14	14:59:47	On	41	15:30:02	On
	14:59:55	Off		15:30:09	Off
15	15:00:21	On	42	15:30:51	On
	15:00:29	Off		15:30:58	Off
16	15:00:56	On	43	15:31:39	On
	15:01:04	Off		15:31:50	Off
17	15:01:30	On	44	15:32:32	On
	15:01:38	Off		15:32:45	Off
18	15:02:04	On	45	15:33:27	On
	15:02:12	Off		15:33:40	Off
19	15:02:39	On	46	15:34:23	On
	15:02:46	Off		15:34:37	Off
20	15:03:12	On	47	15:35:21	On
	15:03:20	Off		15:35:36	Off
21	15:03:46	On	48	15:36:19	On
	15:03:54	Off		15:36:36	Off
22	15:04:21	On	49	15:37:20	On
	15:04:29	Off		15:37:36	Off
23	15:04:56	On	50	15:38:20	On
	15:05:03	Off		15:38:40	Off
24	15:05:30	On	51	15:39:26	On
	15:05:38	Off		15:39:46	Off
25	15:06:06	On	52	15:40:33	On
	15:06:14	Off		15:40:54	Off
26	15:06:42	On	53	15:41:39	On
	15:06:50	Off		15:42:02	Off
27	15:07:19	On	54	15:42:48	On
	15:07:26	Off		15:43:12	Off

（Based on the Unit 3 alarm typer）

Unit 3 Operation of SRV



Operation seen in order of valve C → valve G → valve A

Compiled from the "Transient Analysis Recording System" (May 2012) by TEPCO

- Between 14:41:50 and 15:43:12, the SRV (Valve C) was repeatedly opened and closed 54 times in total (based on the Unit 3 alarm typer record).
- The transient analysis recording system data is missing for approximately 30 minutes from14:59 and the records regarding the operations of SRV before and after this time period correspond with the records on the alarm typer.
- The data of the contact point D, which includes the operation record of SRV, on the alarm typer contains only up to 15:43:45, and there is no record of the operation of valves G and A that started the opening-closing operation after 15:50.

（※With the Unit 3 transient analysis recording system data, only the operations of valves A, C, E and G among the SRV are recorded）

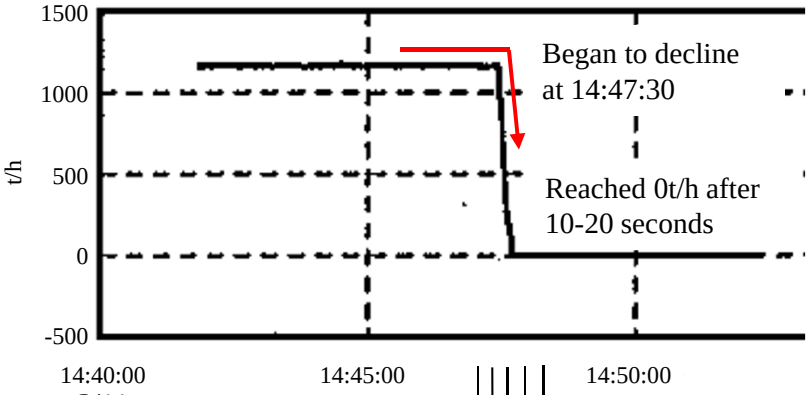
(Note)
Regarding the data recorded by the Unit 3 Transient Analysis Recording System, TEPCO announced that data was interrupted for approximately 30 minutes from14:59 on March 11, 2011, as a result of cross-checking against the record of other charts, and thus, the times for the data thereafter are estimated.

Attachment II-1-1-40

Unit 2 Main Steam Flow Rate and APRM Output

Attachment II-1-1-41

Analogue PIDA309 Main steam flow rate A

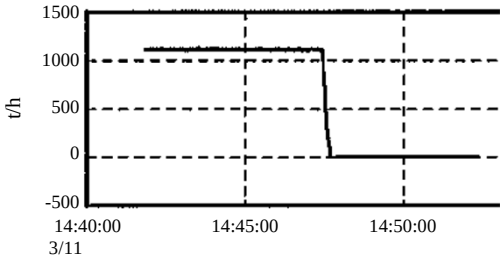


3/11
14:47:00 Earthquake trip（C）
Reactor automatic scram（A）
14:47:04 Earthquake trip（D）
Reactor automatic scram（B）
14:47:58
Main steam isolation valve, Isolation signal
Main steam flow rate, high（A･C）
Main steam pressure, low（A）
Main steam line leak detection, high（A･C）

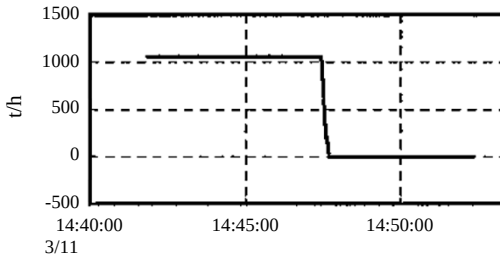
14:48 Main steam isolation valve, open OFF（completely closed）
14:48:11
Main steam flow rate, high（B･D）
Main steam pressure, low（B）
Main steam line leak detection, high（B･D）

（Based on the Unit 3 alarm typer）

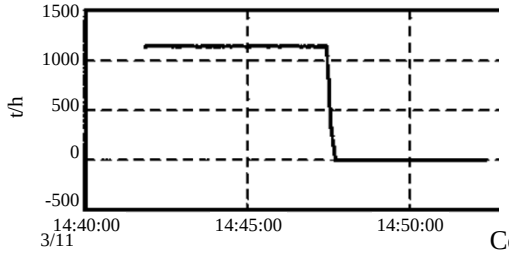
Analogue PIDA310 Main steam flow rate B



Analogue PIDA311 Main steam flow rate C

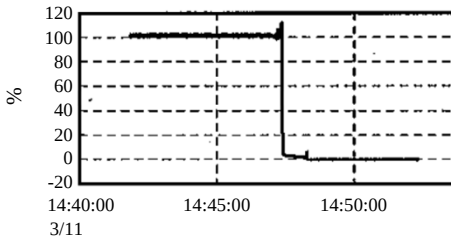


Analogue PIDA312 Main steam flow rate D

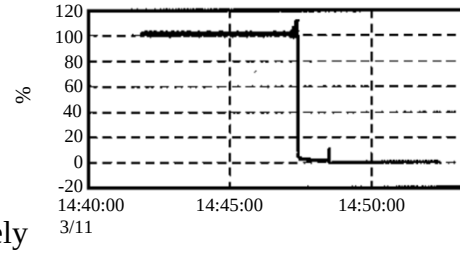


The decline of the main steam flow rate and the decline in the APRM output correlate to each other.

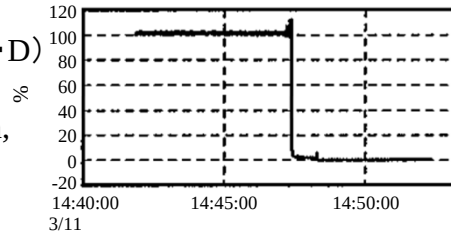
Analogue PIDA000 APRM-A



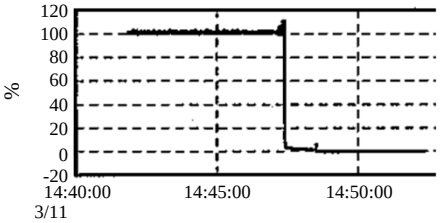
Analogue PIDA001 APRM-B



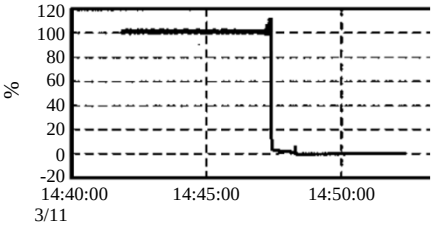
Analogue PIDA002 APRM-C



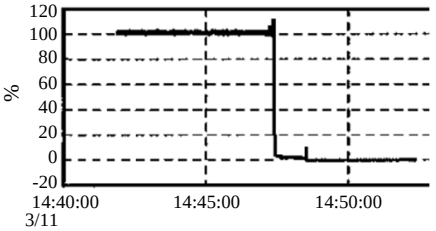
Analogue PIDA003 APRM-D



Analogue PIDA004 APRM-E

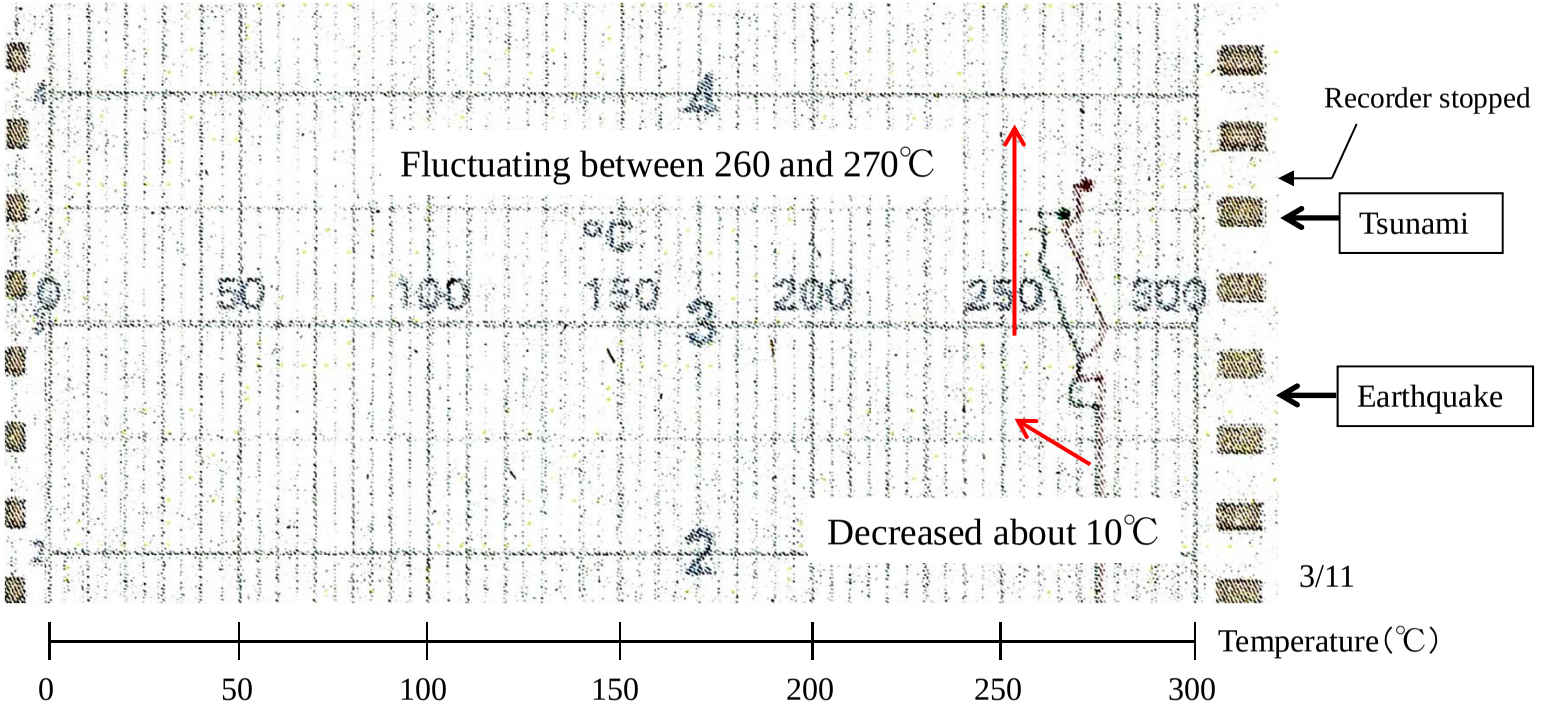


Analogue PIDA005 APRM-F



Compiled from the “Transient Analysis Recording System” (May 2011) by TEPCO

Unit 3 PLR Pump Inlet Temperature



(Red) PLR pump A inlet temperature
(Green) PLR pump B inlet temperature

Compiled from the "Recorder Chart" (May 2011) by TEPCO

Attachment II-1-1-42

Unit 3 Alarm Typer

At 14:59

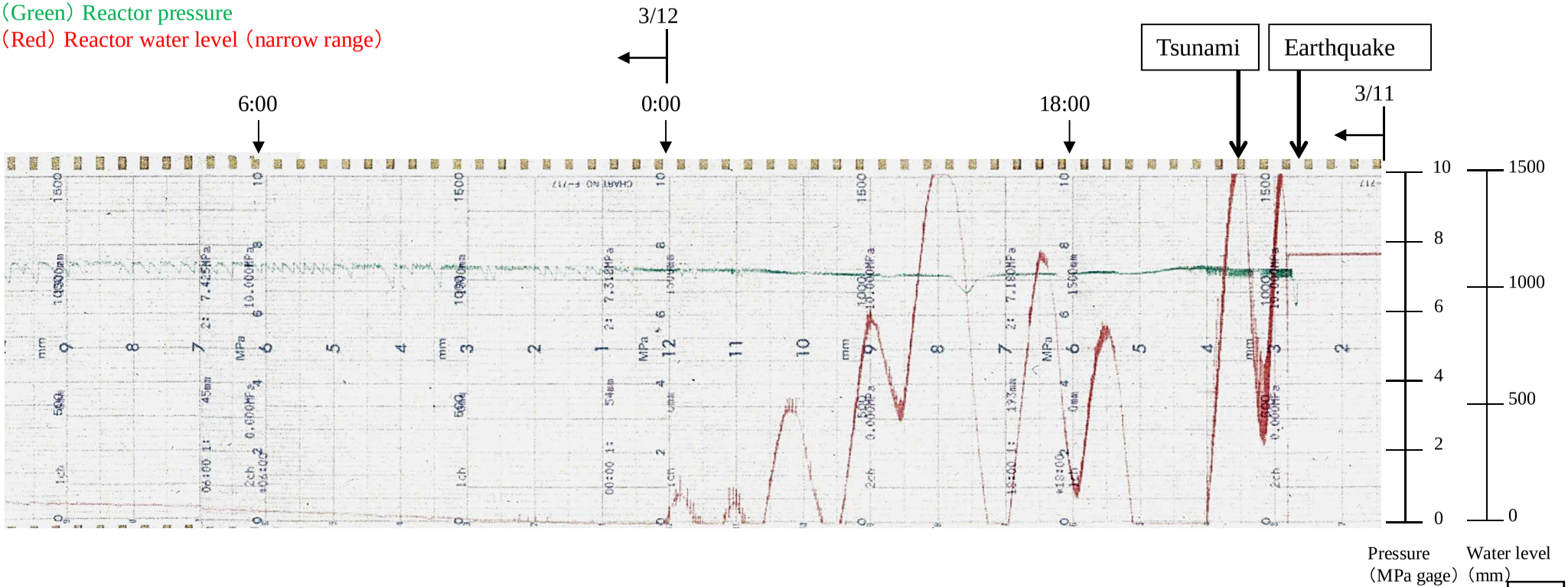
The water level change rate for the D/W floor drain sump shows the value, far exceeding its upper limit.

Compiled from the "Alarm Typer" (May 2011) TEPCO

Attachment II-1-1-43

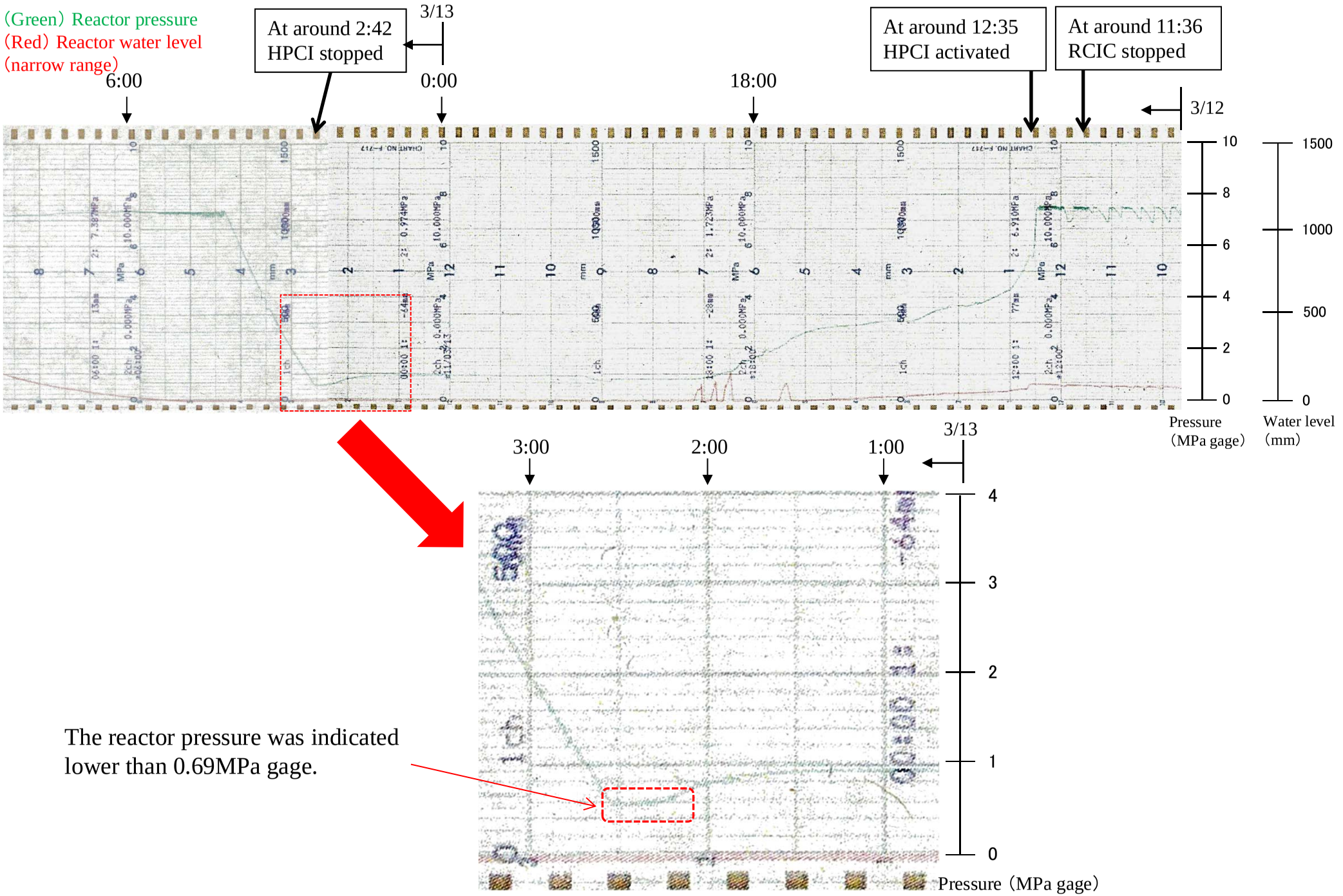
Unit 3 Reactor Water Level and Reactor Pressure

（Green）Reactor pressure
（Red）Reactor water level（narrow range）



Compiled from the “Recorder Chart” (May 2011) by TEPCO

Attachment II-1-1-44



The reactor pressure was indicated lower than 0.69MPa gage.

Compiled from the "Recorder Chart" (May 2011) by TEPCO

Unit 3 Shift Operators' Logbook

Attachment II-1-1-45

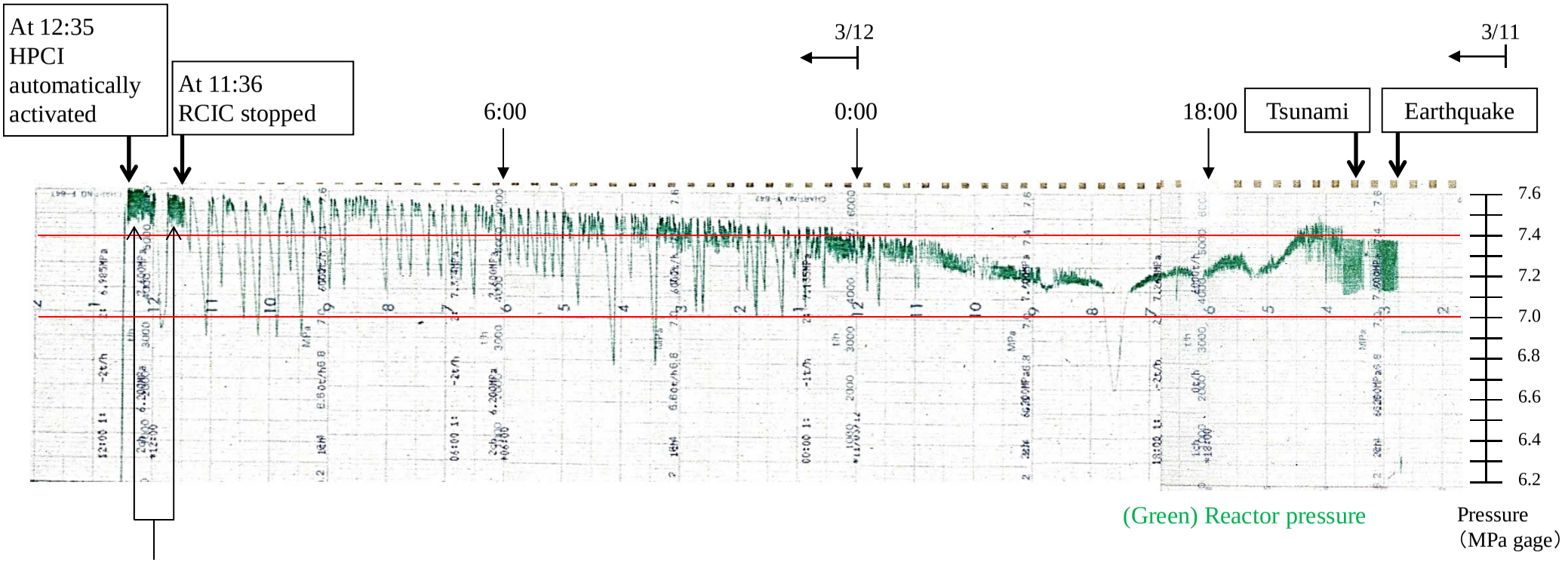
Saturday, March 12, 2011

1/

Operation/Event Occurrence time	Contents
20:27	AM panel, D/W pressure, S/C pressure, S/C water level indicator. No power.
20:36	No power for the reactor water level indicator. Final data - wide range Channel A: 1,350mm, fuel range Channel A : +400mm
20:57	Water supply controller A - power "OFF"
	PLR controller A – power "OFF"
	ECCS recorder – power "OFF"
21:30	Site PI indication: D/W pressure 170kPa
3/13	
1:45	D/D FP, diesel oil supply, 70 ↑ 110L. Suction pressure: 0MPa. Discharge: 0.42MPa
2:42	HPCI stopped. Reactor pressure: 0.58MPa
2:45	SRV did not open. Reactor pressure: 0.8MPa
2:55	SRV did not open. Reactor pressure: 1.3MPa
3:05	D/D FP, the fire pump injected into reactor. MO-10-27B. 15% open. There seemed a flowing sound at 7%.
	Suction pressure: 0 ↑ 0. 14MPa. Discharge: 0.4 ↑ 0.61MPa
3:35	HPCI FIC display light turned off.
3:37	RCIC Vac pump did not become activated.
3:39	HPCI AOP stopped.
3:51	R × water level indicator (W). Indicator's power ON. -3600mmR
	R × water level indicator (fuel range). Indicator's power ON. -1600mm. Reactor pressure: 5MPa. A possibility of TAF
4:04	R × water level indicator (fuel range). -1600mm. Reactor pressure: 5.6MPa.
4:06	HPCI condensed water pump - power OFF.
4:52	D/W vent valve, AO-205, temporary power outlet ON. Valve opening confirmed locally as fully closed. Cylinder pressure: 0
5:08	S/C spray began. MO-10-25B closed.
5:08	RCIC manually activated/Stop valve closed. RCIC stop valve reset – did not work.
5:10	Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. Complete loss of water supply.
5:16	DTr pump - Megger test finished. No water exposure. Confirmation of usability.

Compiled from the "Shift Operators' Logbook" (May 2011) by TEPCO

Unit 3 Reactor Pressure



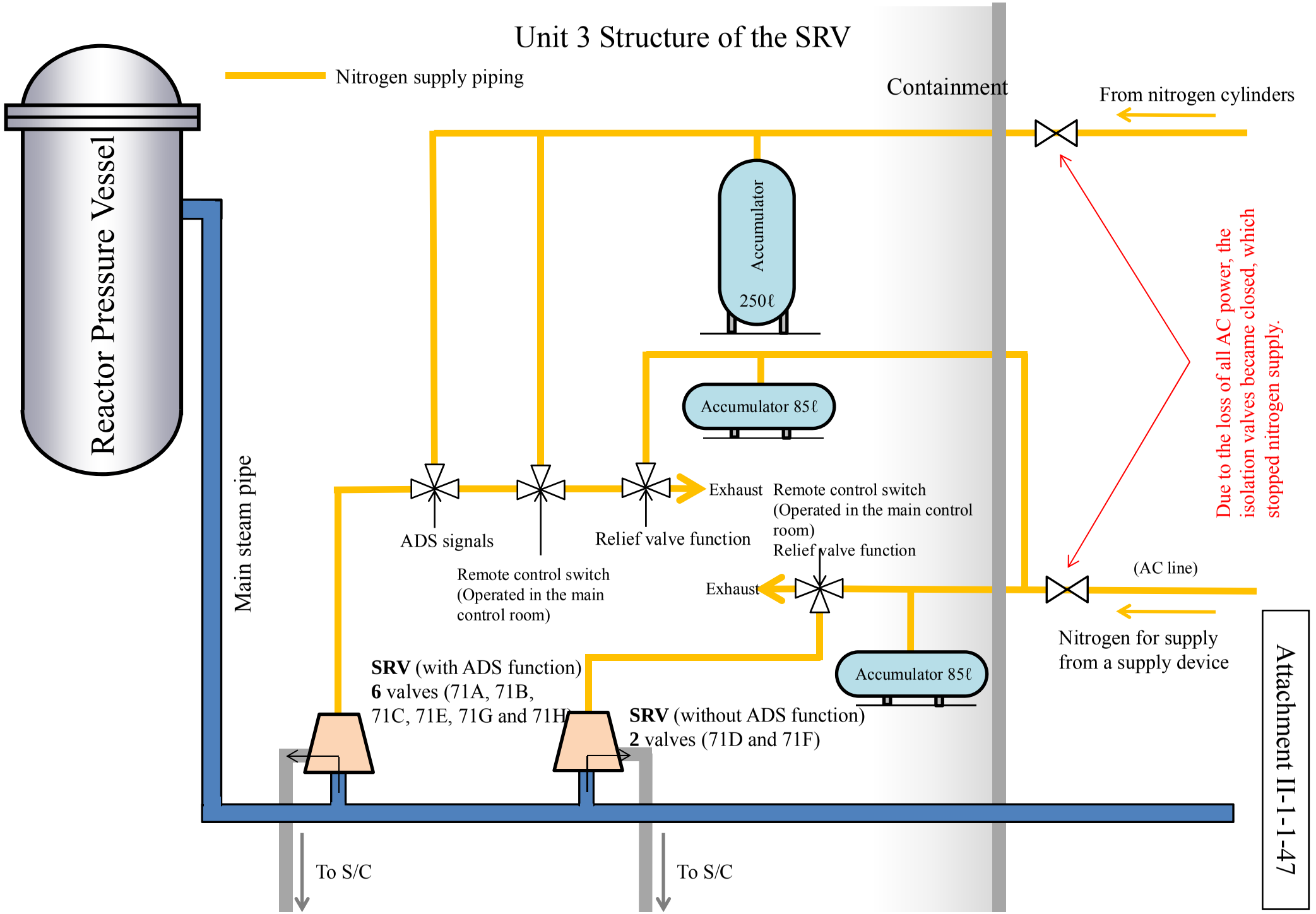
Reactor pressure increased before it reached the resetting value of the safety relief valve function of the SR valve.

The reactor pressure shows nearly 65 times of rise and fall (when the pressure indicates around 7.4MPa gage, drops sharply with a V-shape to nearly 7.0MPa gage and then rises again), which was influenced by the SRV opening-closing operation by the safety relief functions.

※In order to make the chart clearer, a red supplementary line for each 7.4MPa gage and 7.0MPa gage has been made.

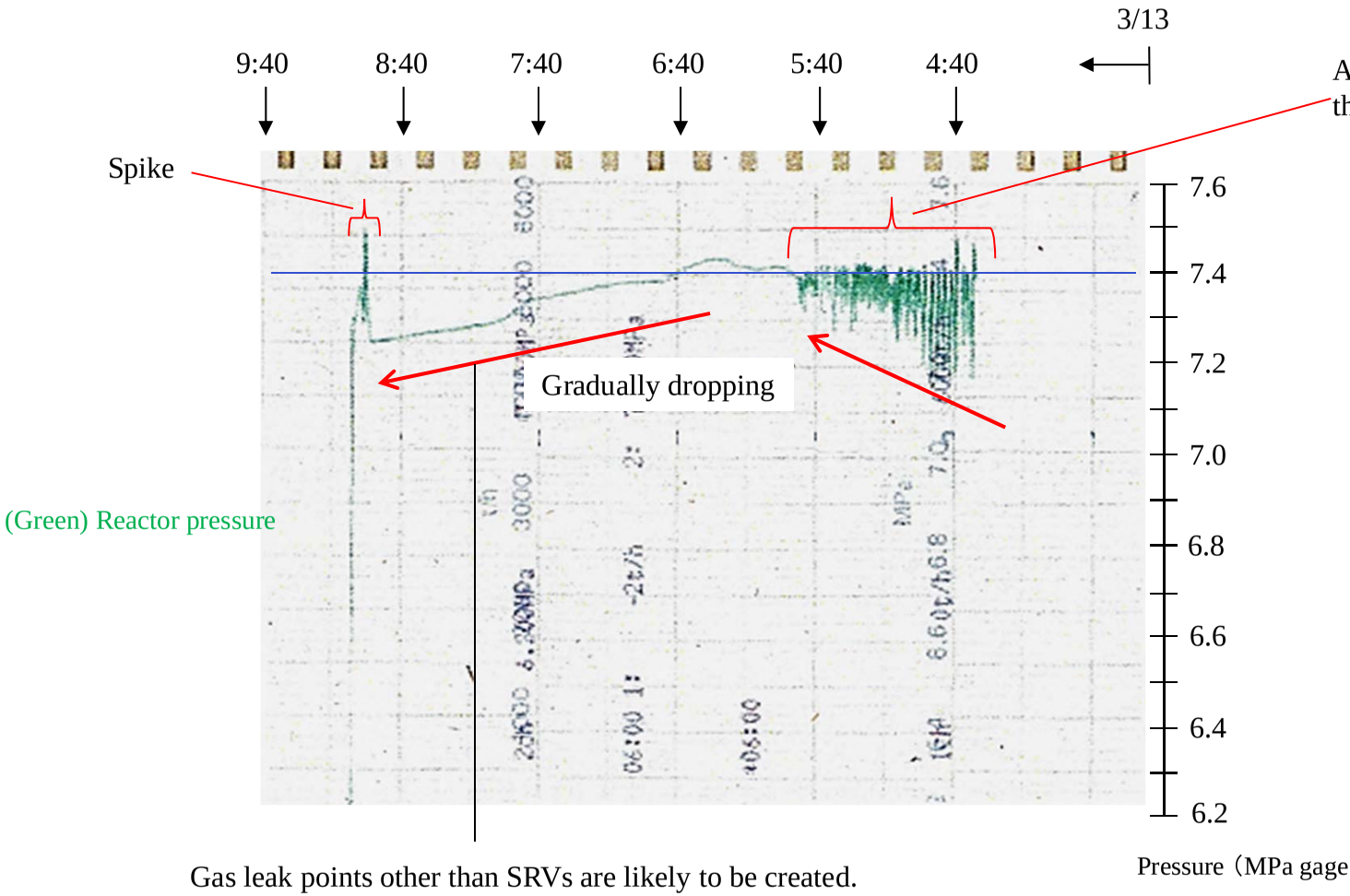
Compiled from the “Recorder Chart” (May 2011) by TEPCO

Unit 3 Structure of the SRV



Attachment II-1-47

Unit 3 Reactor Pressure

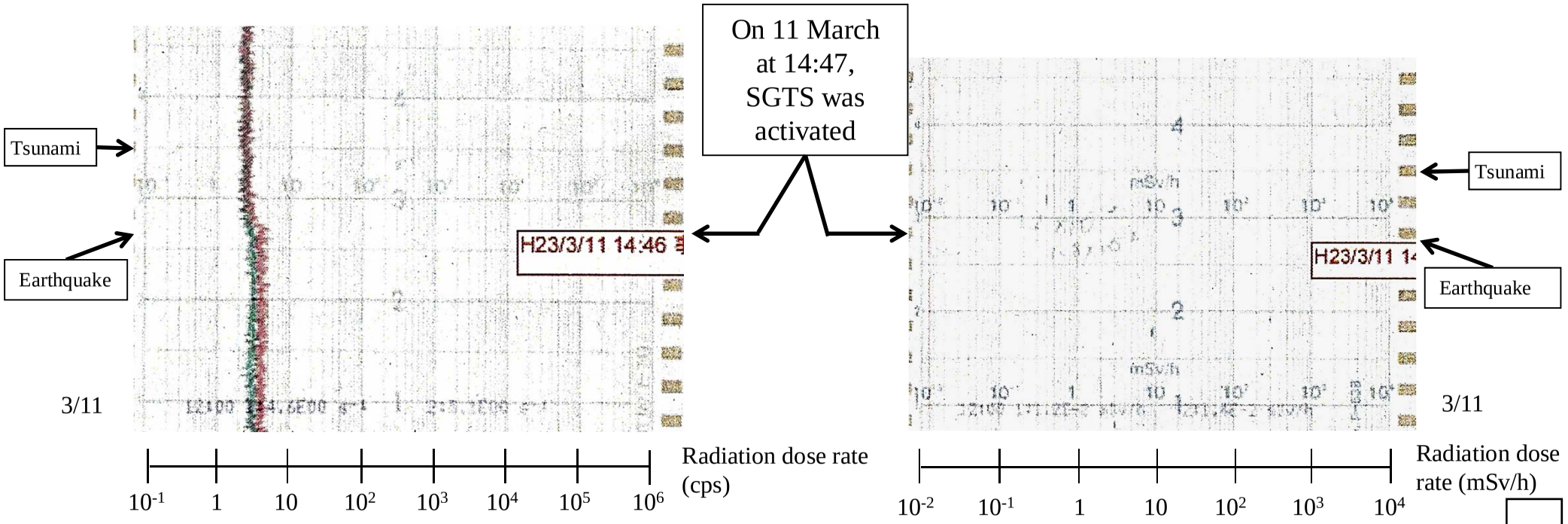


※In order to make the chart clearly visible, actual times have been shown on the chart and a new line has been added to the line of 7.4MPa gage.

Compiled from the “Recorder Chart” (May 2011) by TEPCO

Unit 3 Standby Gas Treatment System (SGTS) Radiation Monitor

(Based on the Unit 3 alarm typer)



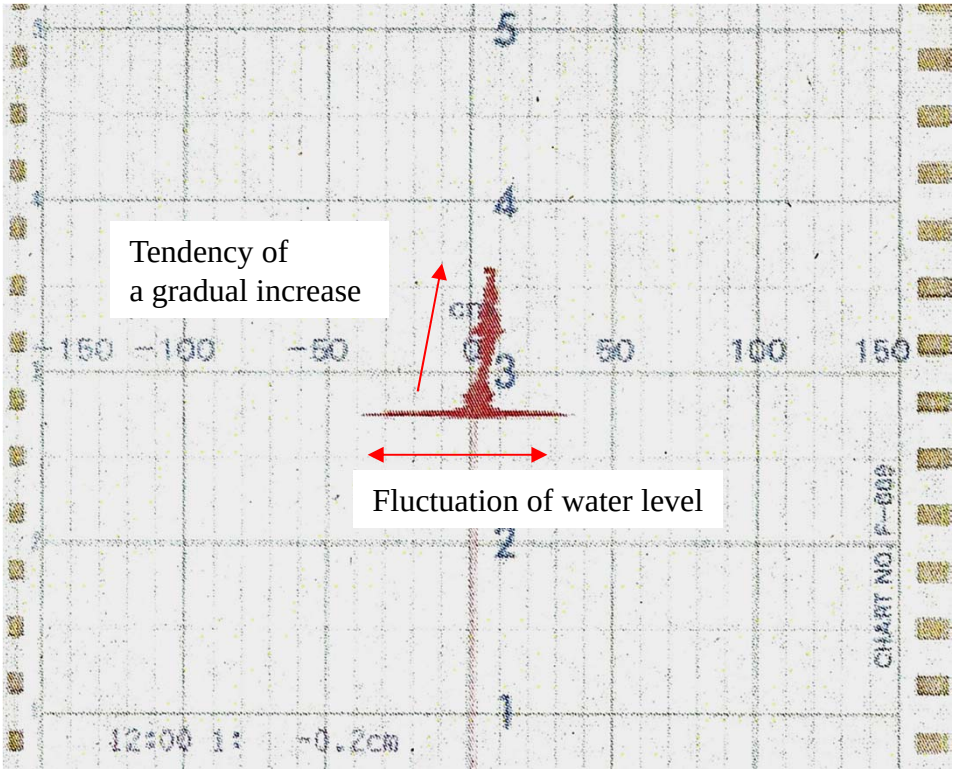
(Red) SGTS radiation monitor A (scintillation-type)
(Green) SGTS radiation monitor B (scintillation-type)

(Red) SGTS radiation monitor A (Ionization chamber type)
(Green) SGTS radiation monitor (Ionization chamber type)

Compiled from the "Recorder Chart" (May 2011) by TEPCO

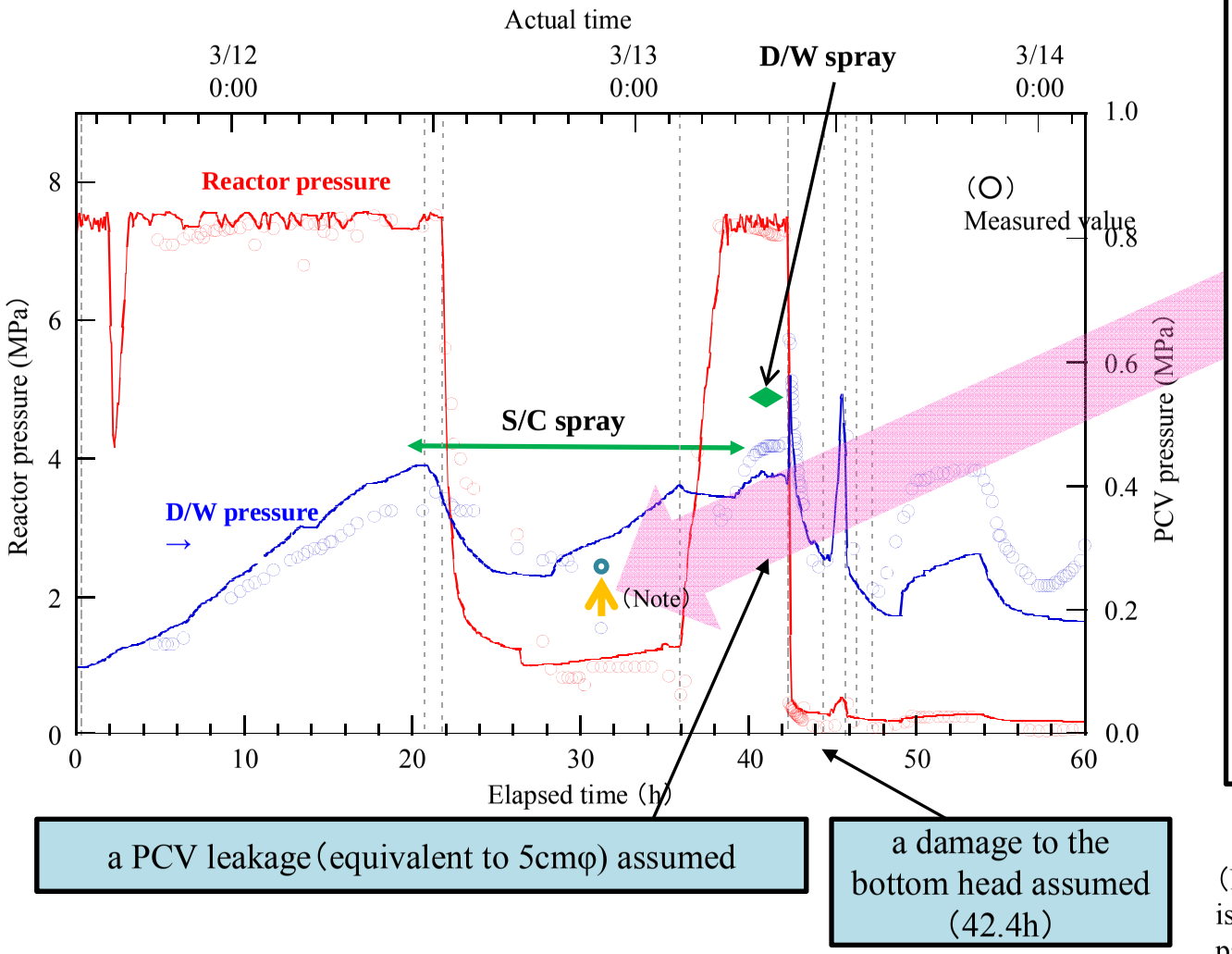
Attachment II-1-1-50

Unit 3 S/C Water Level



Compiled from the “Recorder Chart” (May 2011) by TEPCO

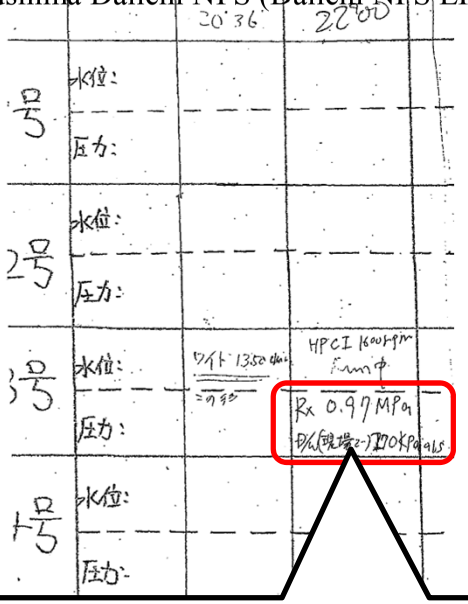
Unit 3 Analysis Results of the Reactor Pressure and D/W Pressure



a PCV leakage (equivalent to 5cmφ) assumed

a damage to the bottom head assumed (42.4h)

Excerpt from a memo by the Operation team at the Emergency Response Center at the Fukushima Daiichi NPS (Daiichi NPS ERC)

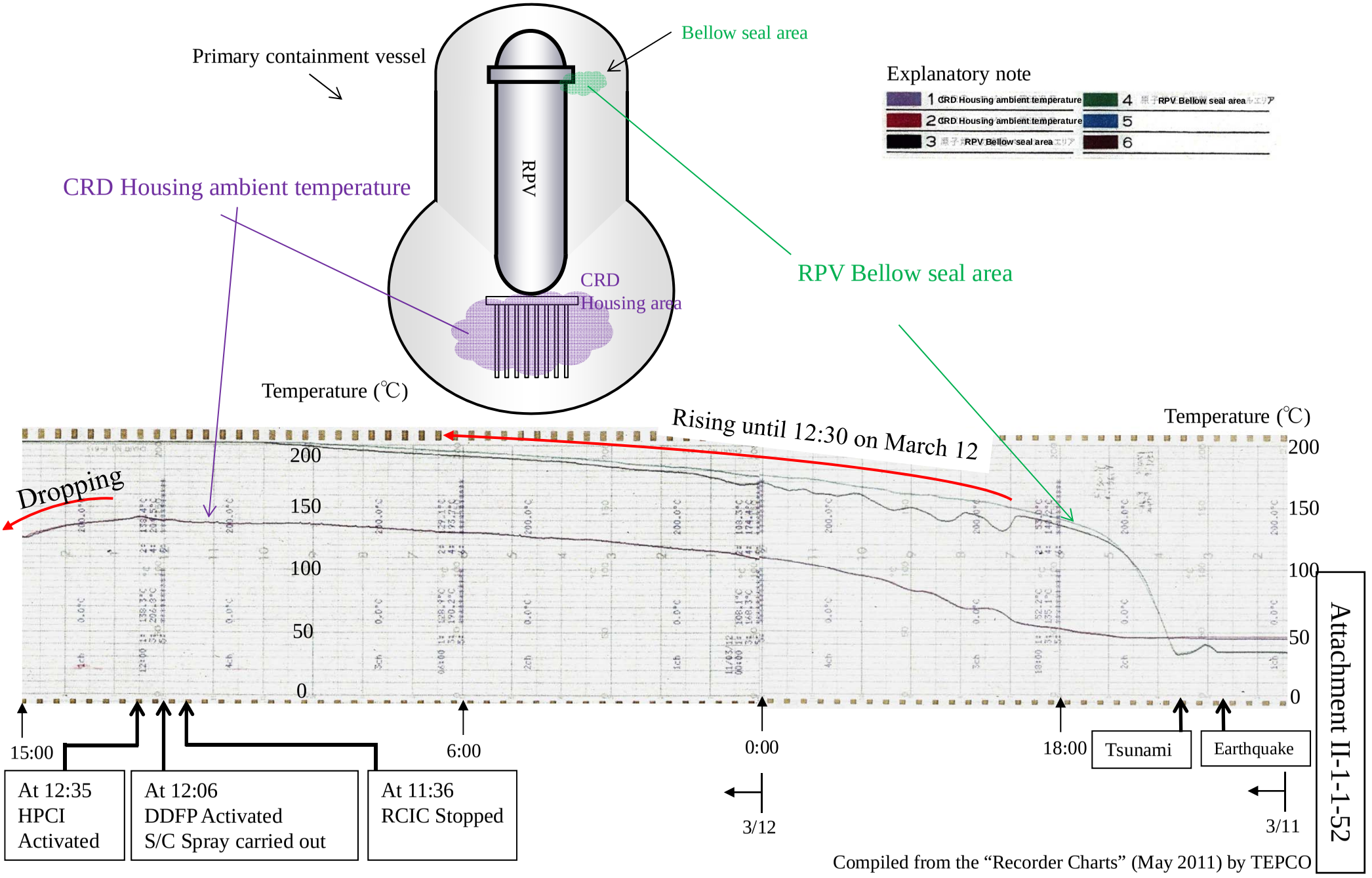


Rx0.97MPa
D/W (at the site) 270kPa abs

Compiled from the "Investigation on the influence of the thermal stratification of the retained water in suppression chamber on the reactor containment vessel pressure" (Materials 3 from the 7th Hearing Session regarding technical findings for the TEPCO Fukushima Daiichi Nuclear Power Station accident) (February 1, 2012) by JENES

(Note) D/W pressure at 22:00 on March 12, 2011, is recorded as "0.1700MPa abs" on the Unit 3 plant parameters, whereas in the memo by the Operation team at the Daiichi NPS ERC it is written as "270kPa abs D/W (at the site)".

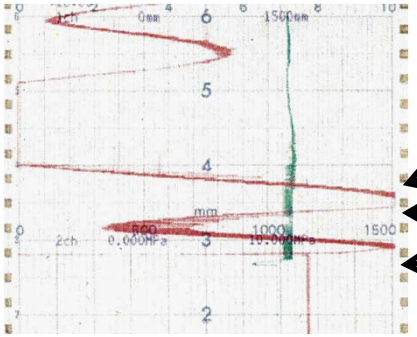
Unit 3 Containment Vessel Temperature



Compiled from the "Recorder Charts" (May 2011) by TEPCO

Attachment II-1-1-52

Unit 3 Reactor Water Level and RCIC Operation



(Red) Reactor water level (narrow range)

Tsunami

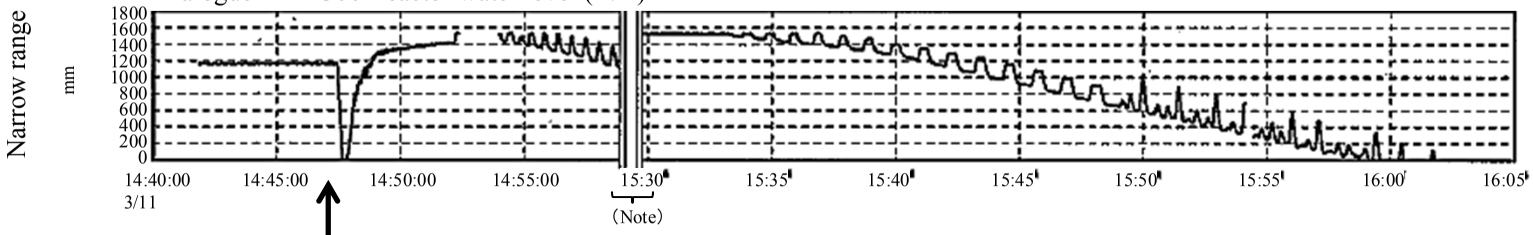
15:25:02
High reactor water level → RCIC stopped

Earthquake

(Based on Unit 3 alarm typer)

Compiled from the "Recorder Chart" (May 2011) by TEPCO

Analogue PIDA300 Reactor water level (N/R)A

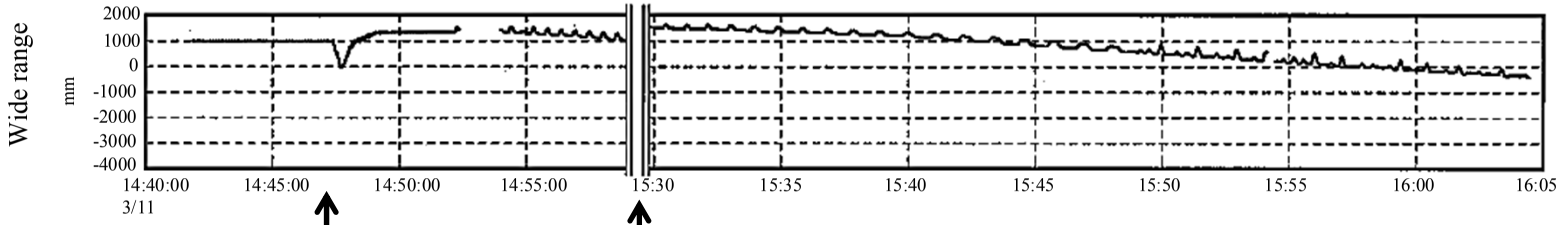


Earthquake

(Note)

0mm (narrow range)
＝TAF＋4,170mm (fuel range)

Analogue PIDA303 Reactor water level (W/R)A



Earthquake

At 15:05:39
RCIC turbine activated

At 15:06
RCIC injection valve "Open"
RCIC system flow rate 25.2 ℓ/s

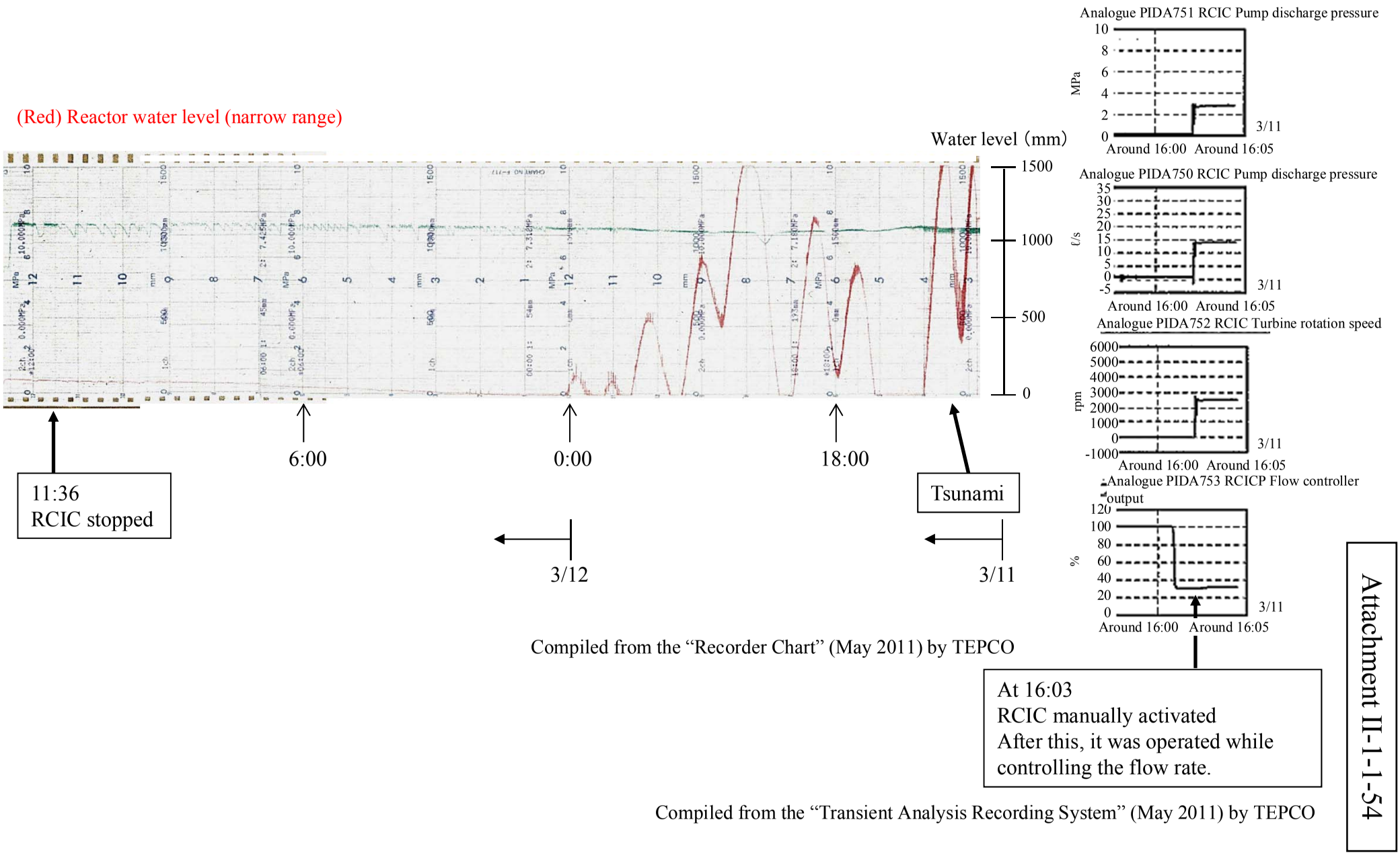
(Based on the Unit 3 alarm typer)

(Note) Regarding the data recorded by the Unit 3 Transient Analysis Recording System, TEPCO announced that data was interrupted for approximately 30 minutes from14:59 on March 11, 2011, as a result of cross-checking against the record of other charts, and thus, the times for the data thereafter are estimated.

Compiled from the "Transient Analysis Recording System" (May 2011) by TEPCO

Attachment II-1-1-53

Unit 3 Reactor Water Level, RCIC Pump Discharge Pressure etc.



Compiled from the "Recorder Chart" (May 2011) by TEPCO

Compiled from the "Transient Analysis Recording System" (May 2011) by TEPCO

Response at the Unit 1 and the transition of indicated values shown by instrumentation devices

12th at 15:36
hydrogen gas explosion
occurred at R/B

Water injection

12th at 4:00 — 12th at 14:53

Alternative water injection

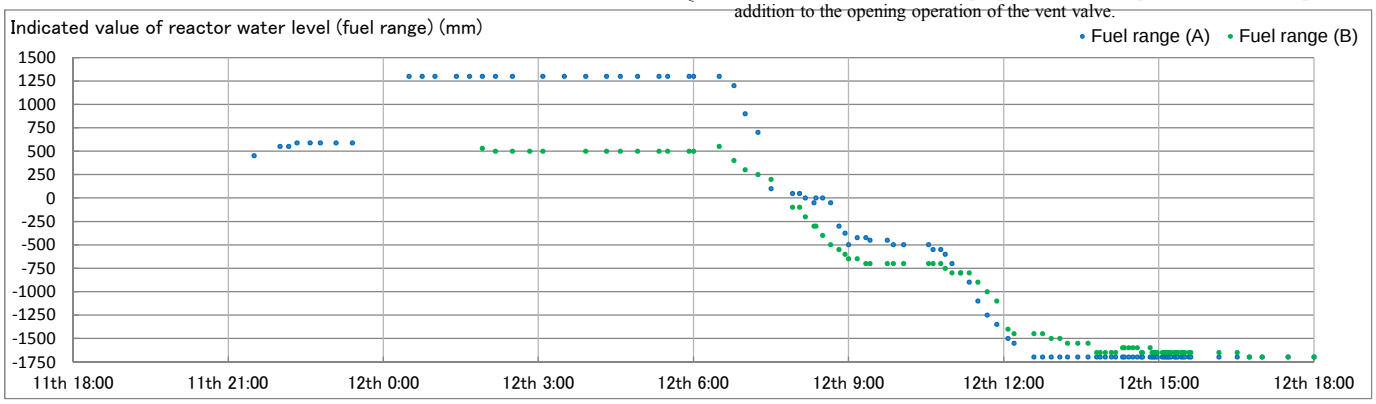
This suggests the possibility that there was a water injection line configured and a fire pump was in operation to inject water. It does not necessarily mean that water was actually injected into the nuclear reactor.

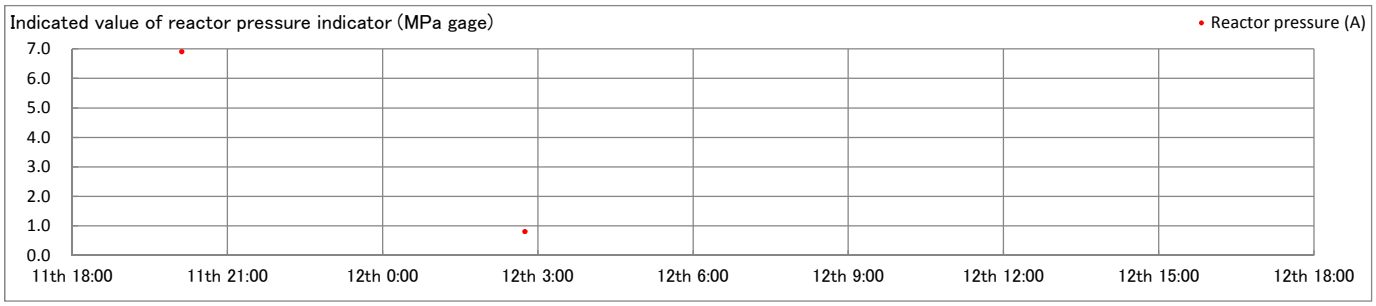
Manual operation to open the SRV

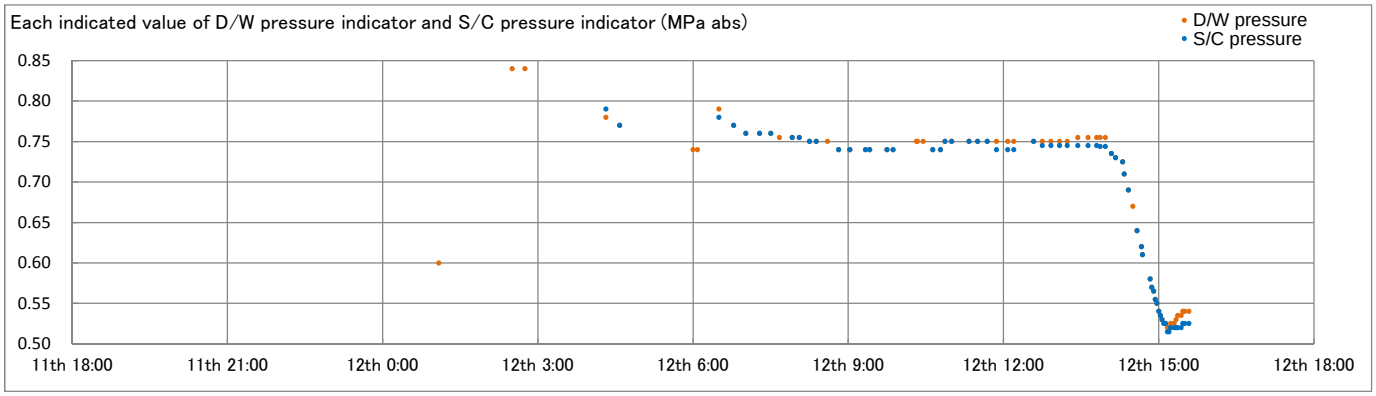
Manual operation to open the reactor containment vessel vent value

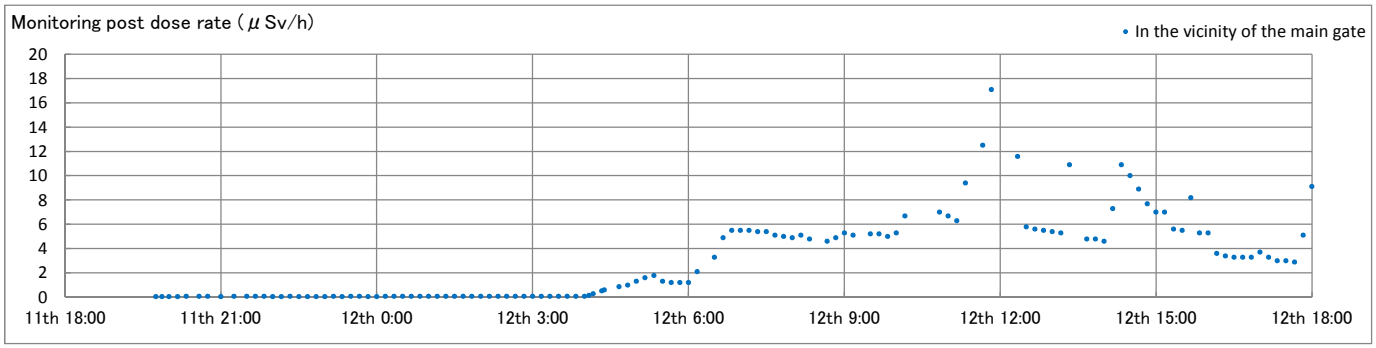
12th at 14:00

This suggests a possibility of the operation to open the valve required for the reactor containment vessel vent. For the implementation of the reactor containment vessel vent, however, the valve has to be kept open and also the rupture disc has to be ruptured, in addition to the opening operation of the vent valve.









※The following radiation dose rates have also been measured in the vicinity of the main gate
On 12 March: 10:20, 180.2; 10:30, 385.5; 10:40, 162.9; 11:30, 35.8; 12:00, 23.2; 2:10, 48.2 (unit:μSv/h)

Compiled from the "Plant Related Parameters" (May 2011) etc. by TEPCO

Response at the Unit 2 and the transition of indicated values shown by instrumentation devices

Water injection

14th at 12:30
RCIC stopped

Whilst this suggests a possibility that the RCIC was in operation, it does not necessarily mean that the RCIC was functioning normally and water was being injected into the

14th
at 19:57

Alternative water injection

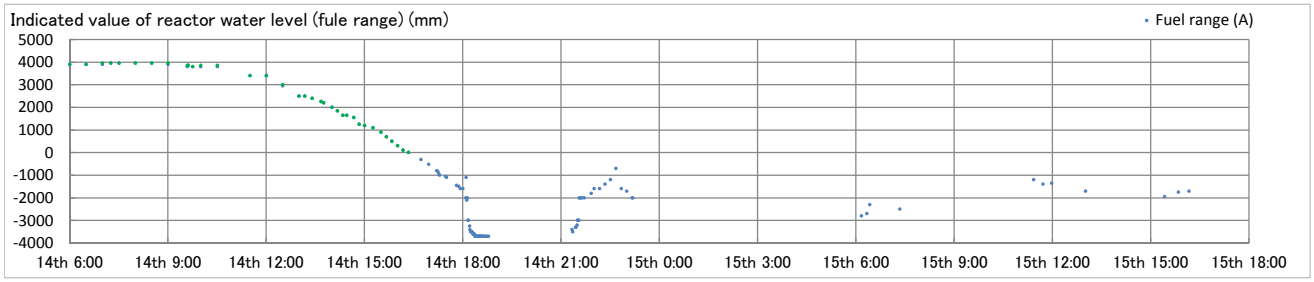
This suggests the possibility that there was a water injection line configured and a fire pump was in operation to inject water. It does not necessarily mean that water was actually injected into the nuclear reactor.

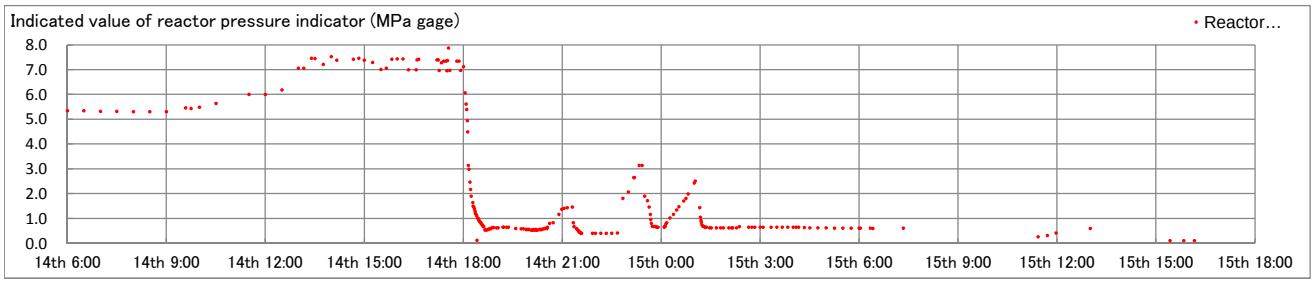
Manual operation to open the SRV

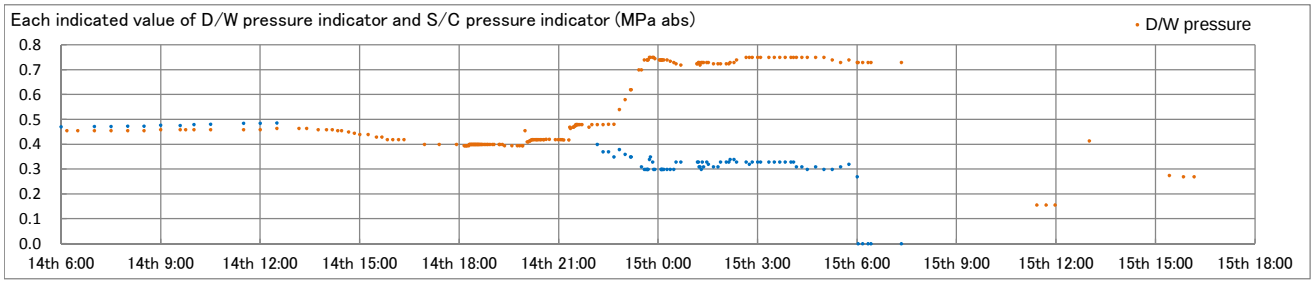
14th
at 16:34

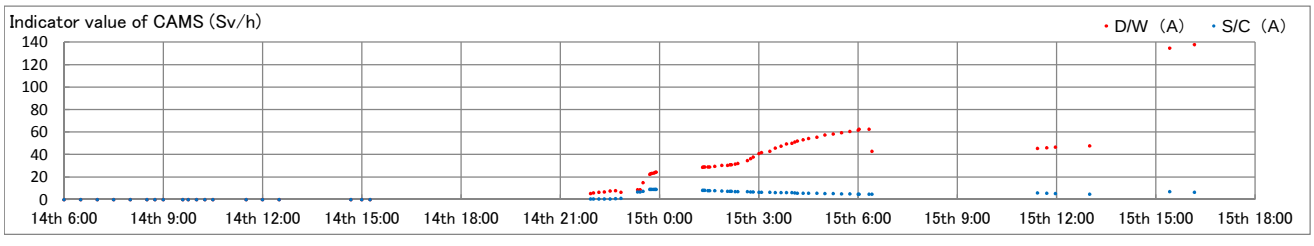
This suggests a possibility that the operation to open the SRV were conducted. However, even if the operation to open the SRV was conducted, it is not clear as to whether the valve was kept open.

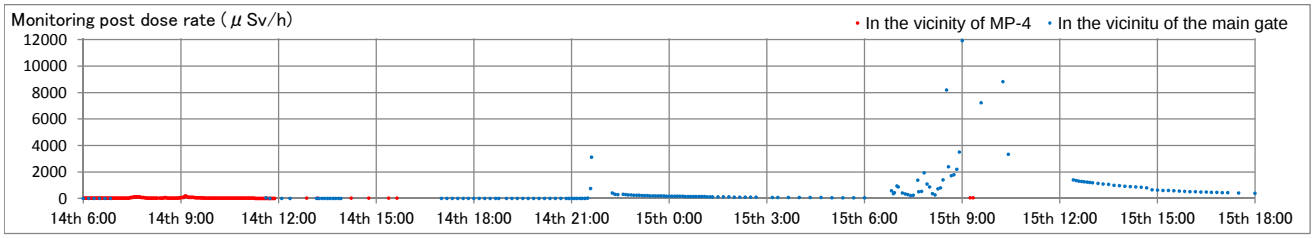
Manual operation to open the reactor containment vessel vent











Compiled from the "Plant Related Parameters" (May 2011) etc. by TEPCO

Response at the Unit 3 and the transition of indicated values shown by instrumentation devices

14th at 11:01
Hydrogen gas explosion occurred at R/B

Water injection

13th at 2:42
HPCI stopped

Whilst this suggests a possibility that the HPCI was in operation, it does not necessarily mean that the HPCI was functioning normally and water was being injected into the nuclear reactor.

13th at 9:10 — Alternative water injection
13th at 12:20 — Alternative water injection
13th at 13:10 — Alternative water injection
14th at 1:10 — Alternative water injection
14th at 3:20 — Alternative water injection
14th at 16:30 — Alternative water injection
14th at 20:36 — Alternative water injection

This suggests the possibility that there was a water injection line configured and a fire pump was in operation to inject water. It does not necessarily mean that water was actually injected into the nuclear reactor.

Manual operation to open the SRV

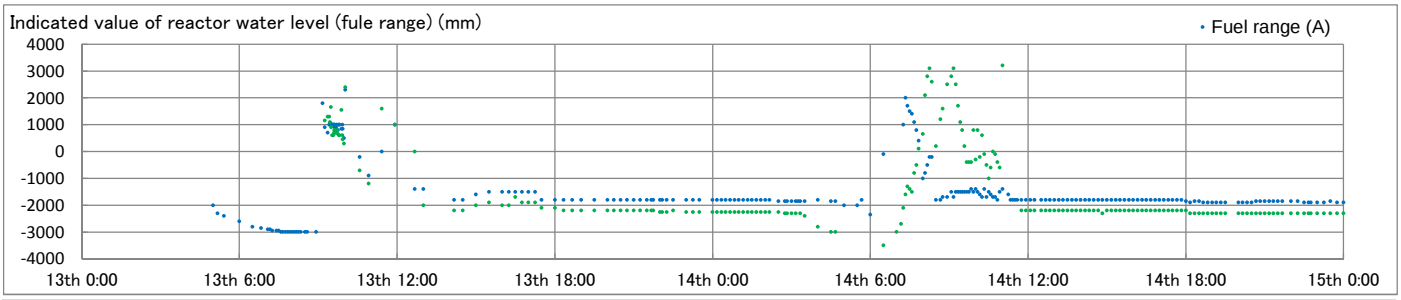
13th at 9:50

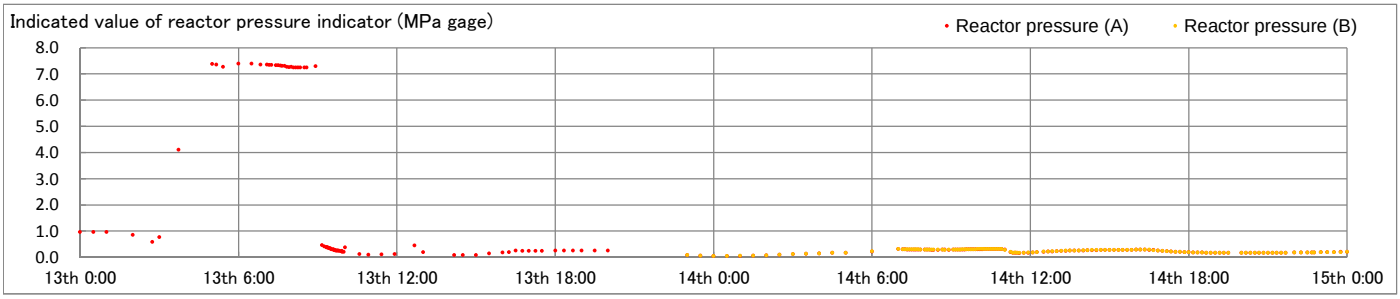
This suggests a possibility that the operation to open the SRV were conducted. However, even if the operation to opent the SRV was conducted, it is not clear as to whether the valve was kept open.

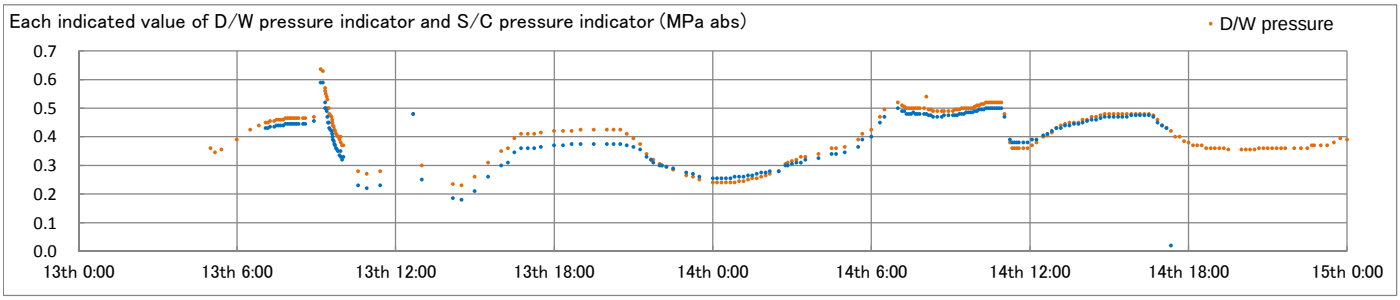
Manual operation to open the reactor containment vessel vent

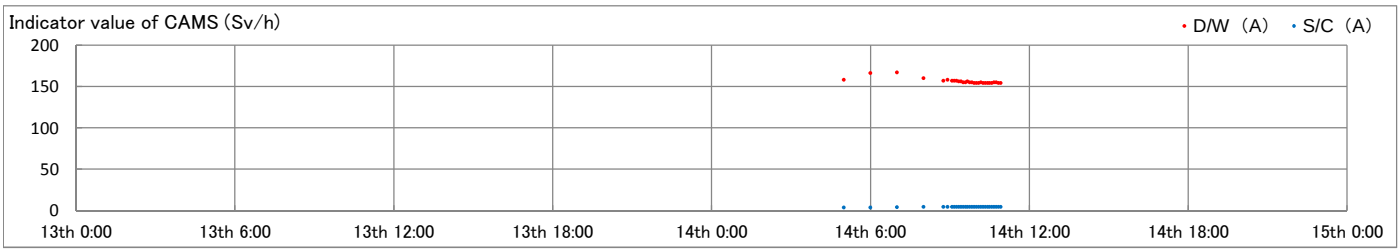
13th at 8:41
13th at 11:17
13th at 12:30
14th at 3:40
14th at 6:10

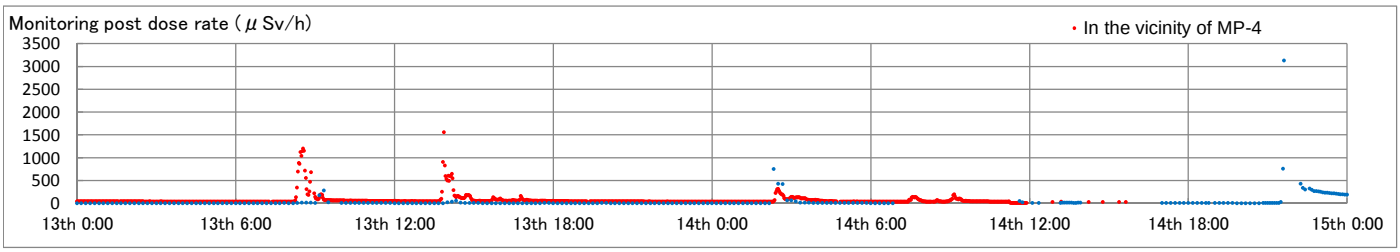
This suggests a possibility of the operation to open the valve required for the reactor containment vessel vent. For the implementation of the reactor containment vessel vent, however, the valve has to be kept open and also the rupture disc has to be ruptured, in addition to the opening operation of the vent









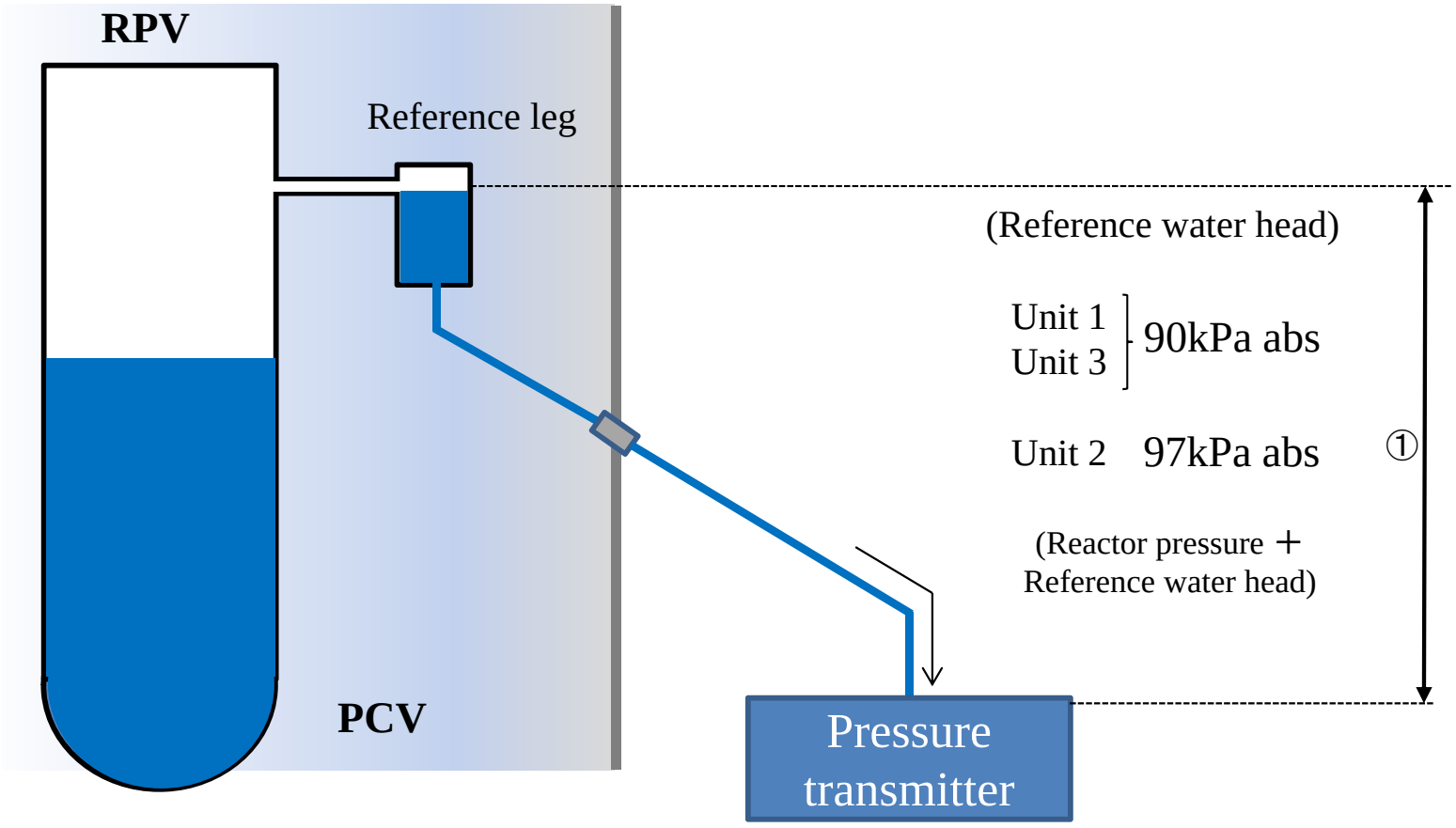


Compiled from the "Plant Related Parameters" (May 2011) etc. by TEPCO

Attachment II-1-2

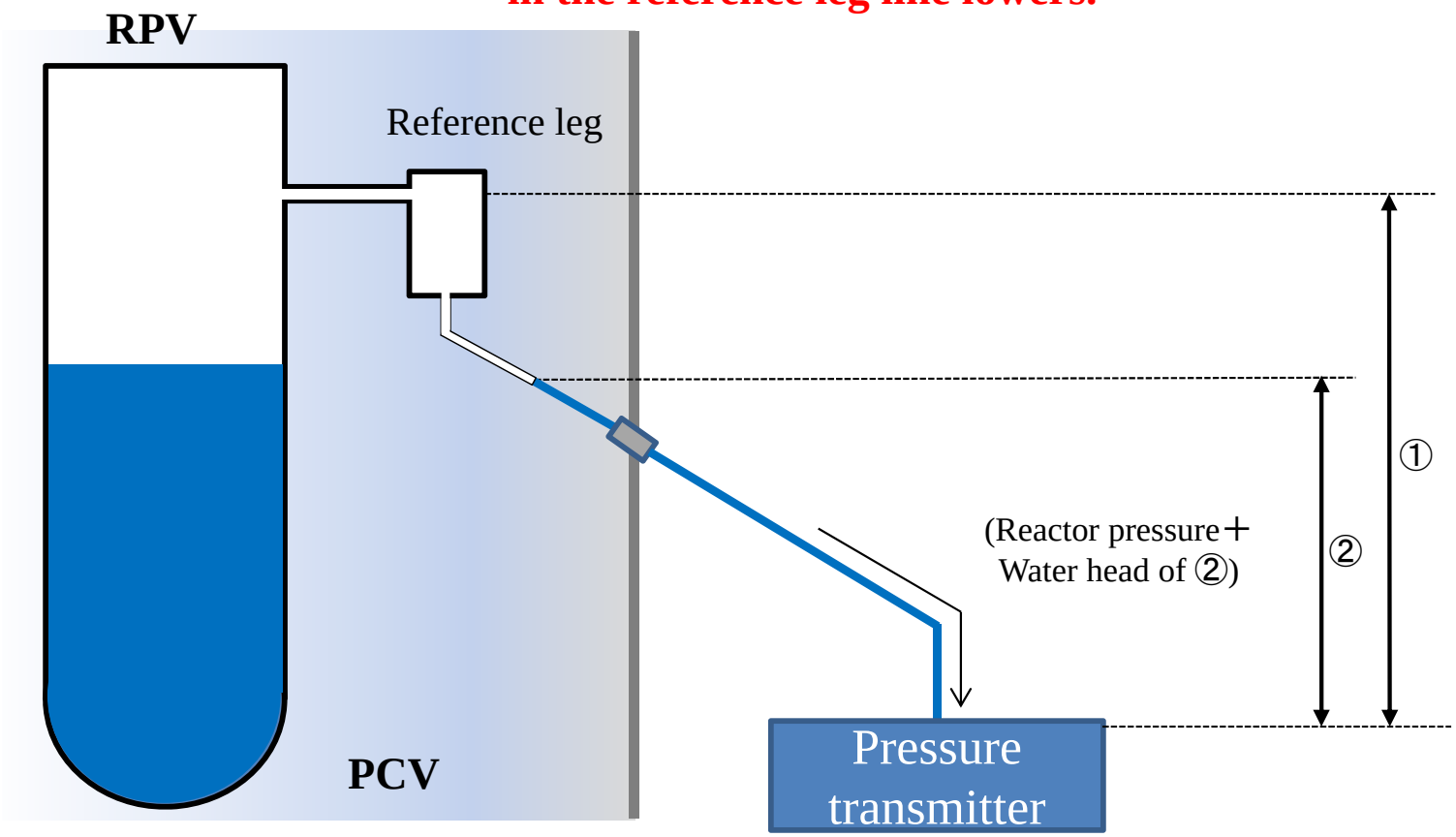
Errors with Reactor Pressure Indicator

Normal condition



(Reactor pressure＋Reference water head)－Reference water head
＝ Indicated value ＝ Reactor pressure

In the case where the water level in the reference leg or in the reference leg line lowers.

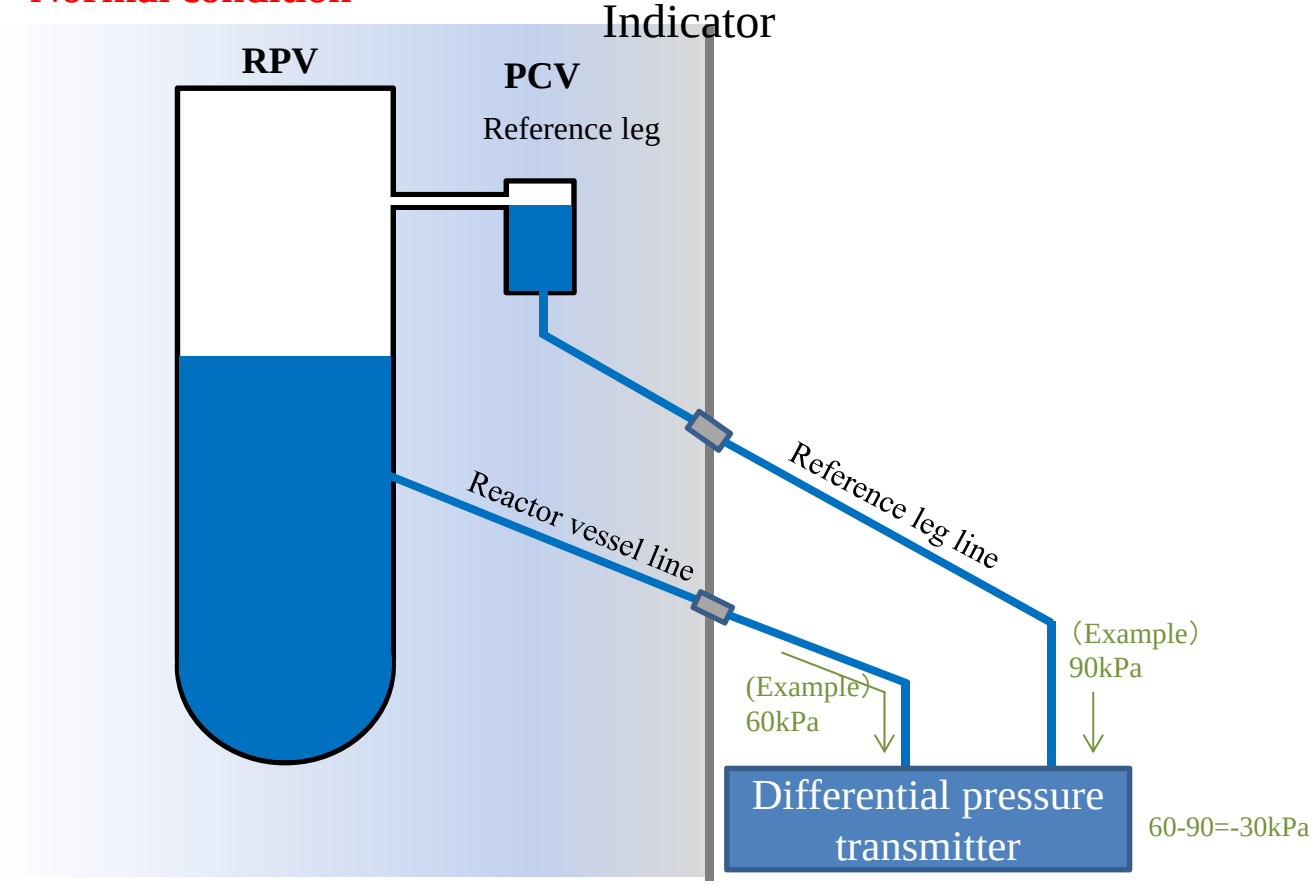


(Reactor pressure ＋ Water head of ②)－ ①
＝ Indicated value ＜ Reactor pressure

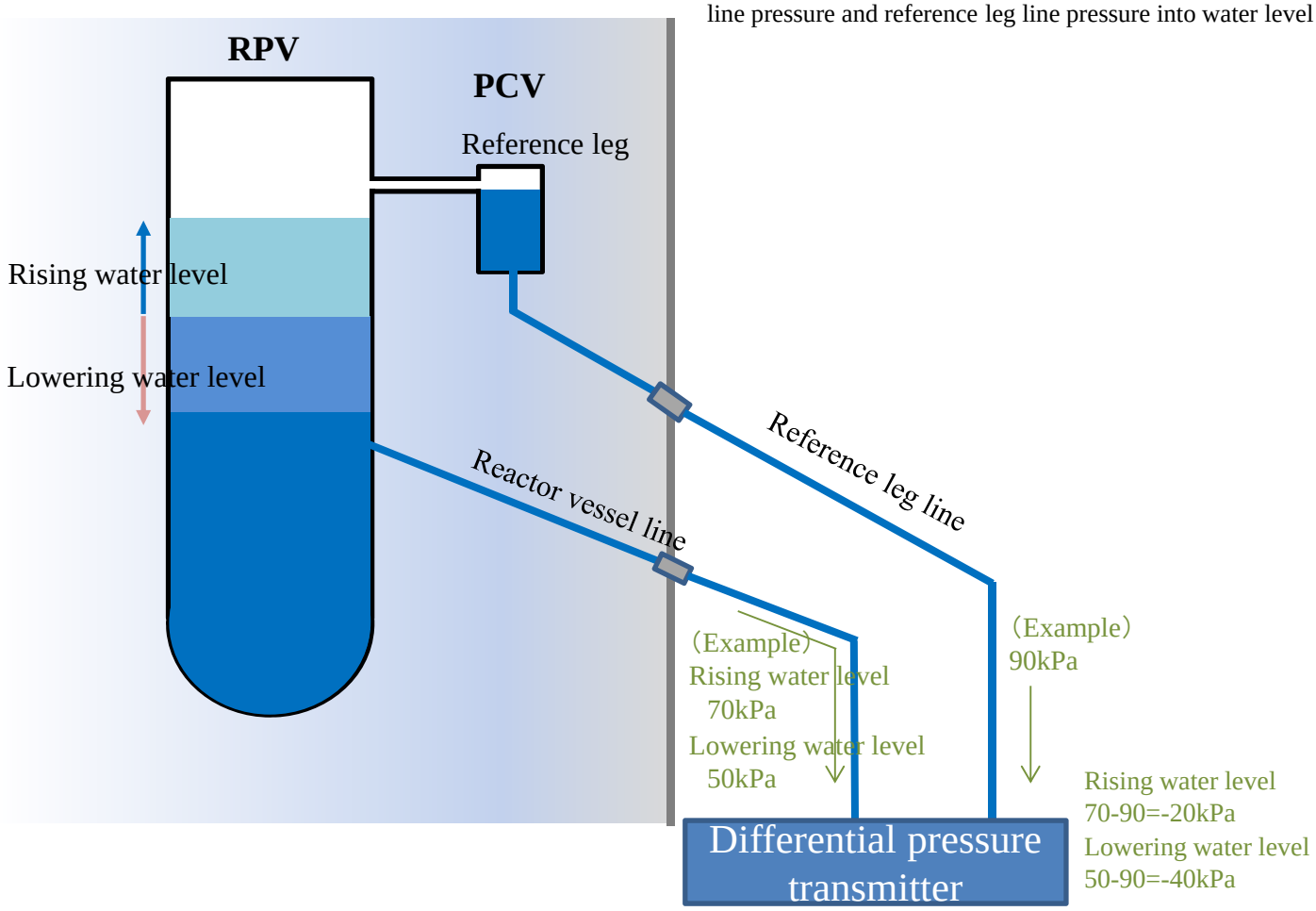
Attachment II-1-3

Errors with Reactor Water Level Indicator

Normal condition



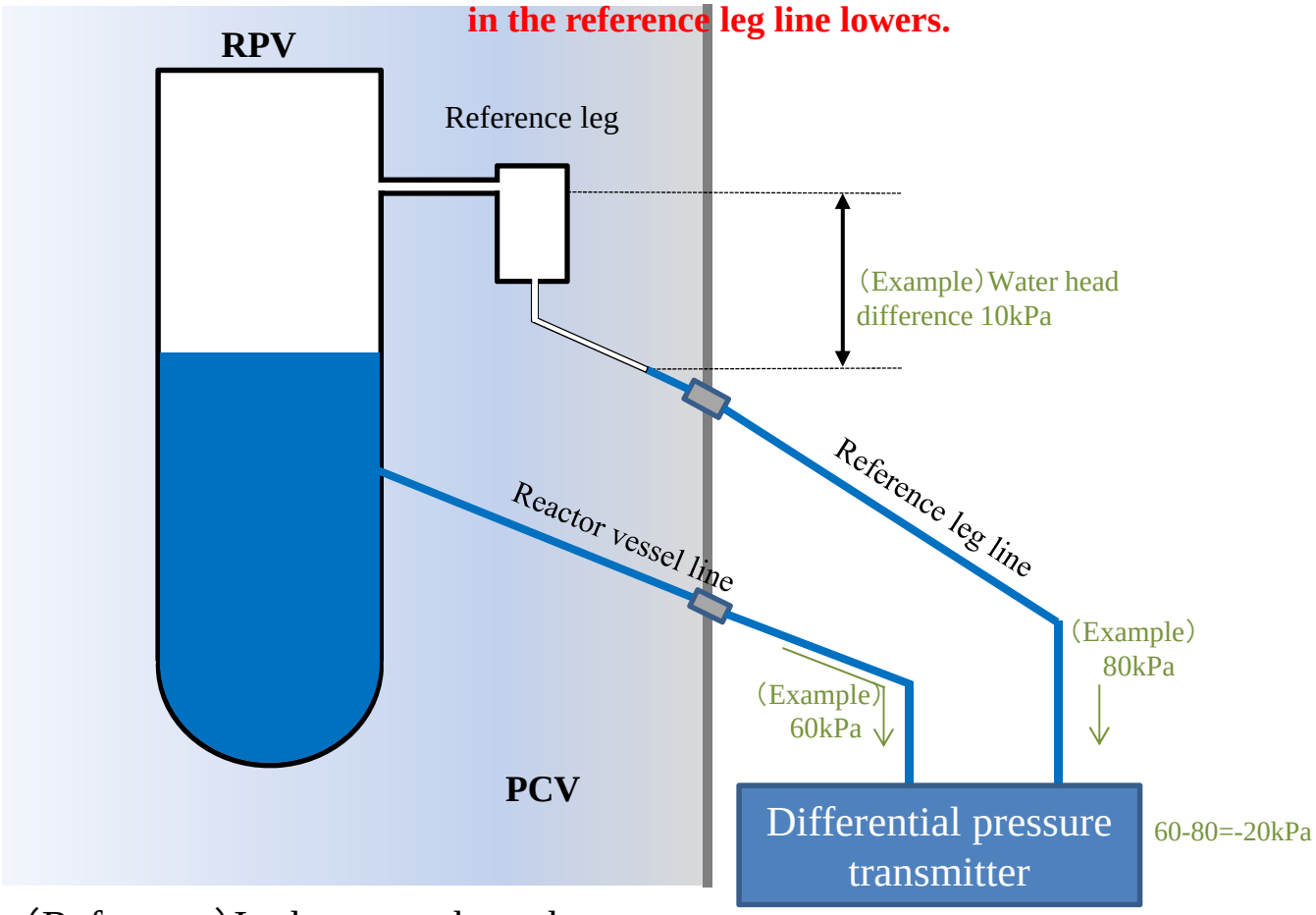
Converts the differential pressure between the reactor vessel line pressure and reference leg line pressure into water level



Converts the differential pressure between the reactor vessel line pressure and reference leg line pressure into water level

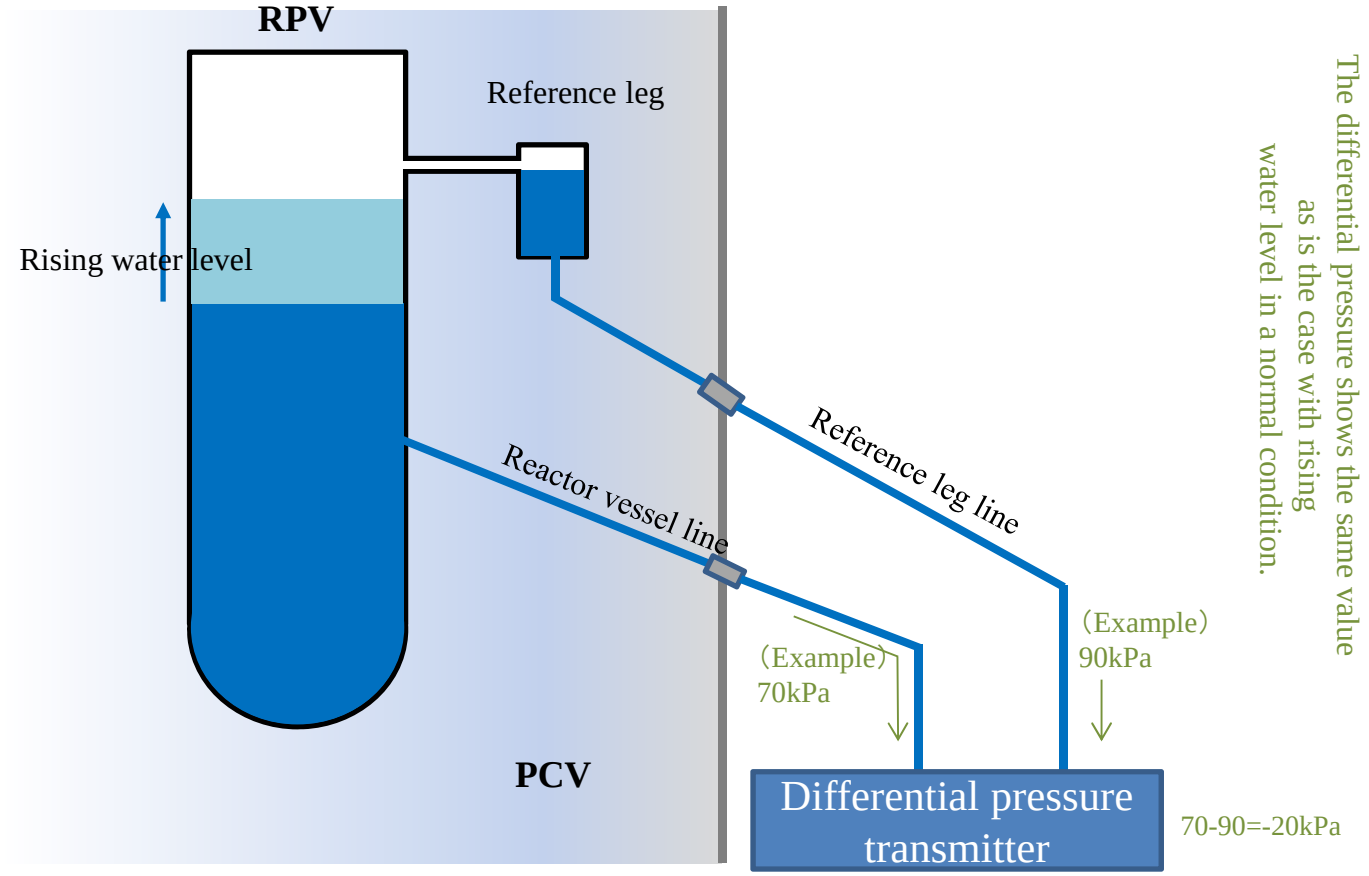
※Each of the reactor vessel line pressure and reference leg line pressure is in absolute pressure.

①In the case where the reference water head or the water level in the reference leg line lowers.



Converts the differential pressure between the reactor vessel line pressure and reference leg line pressure into water level

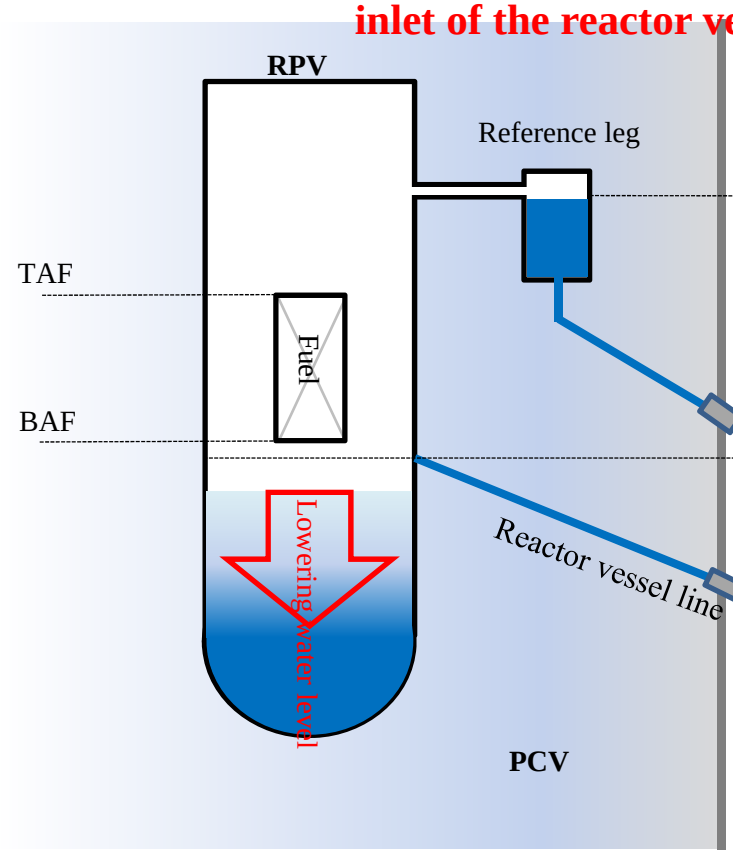
(Reference) In the case where the water level rises in a normal condition



Converts the differential pressure between the reactor vessel line pressure and reference leg line pressure into water level

※Each of the reactor vessel line pressure and reference leg line pressure is in absolute pressure.

② In the case where the reactor water level falls below the inlet of the reactor vessel line



The rise and fall of reactor water level does not influence the water pressure on the differential pressure transmitter through the reactor vessel line.

⇩

The differential pressure transmitter measures only the water head difference between the water levels within both lines.

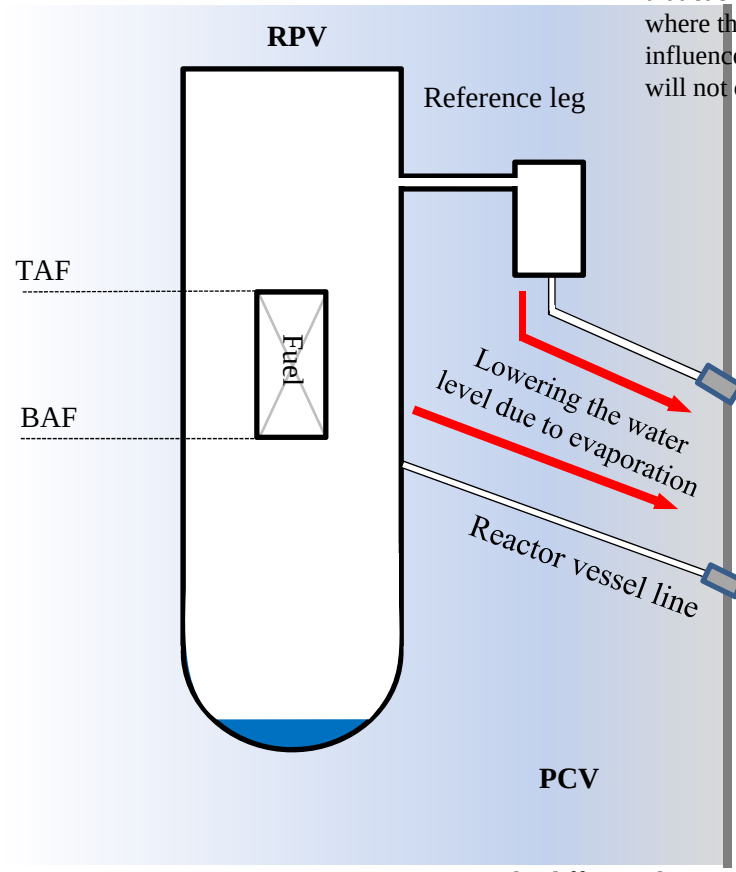
⇩

Such water head difference is converted into reactor water level, resulting in erroneous indications.

Converts the differential pressure between the reactor vessel line pressure and reference leg line pressure into water level

③ When ① and ② occur simultaneously

As the water levels in the reactor vessel line and reference leg line fall so that each water surface becomes closer to the outer wall of the PCV, where the temperature is relatively low and the inside of the lines is less influenced by the RPV internal conditions; evaporation inside the lines will not continue.



⇩

The water levels within both lines hardly change and accordingly so does the water head difference.

⇩

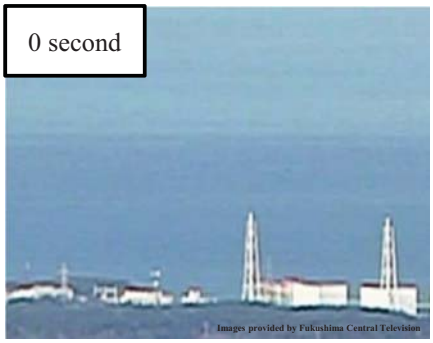
The reactor water level indication stays flat for hours.

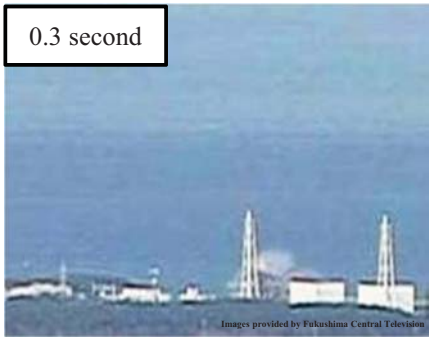
Converts the differential pressure between the reactor vessel line pressure and reference leg line pressure into water level

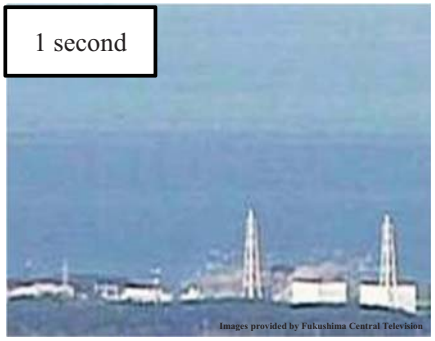
Attachment Ⅱ-2-1

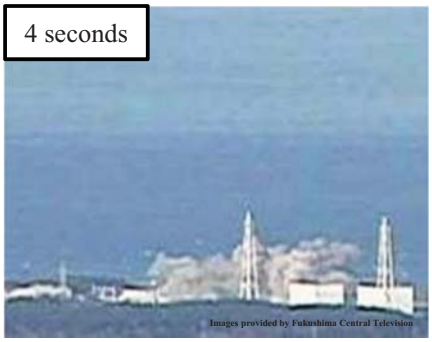
Unit 1 and Unit 3 Hydrogen Explosion Images

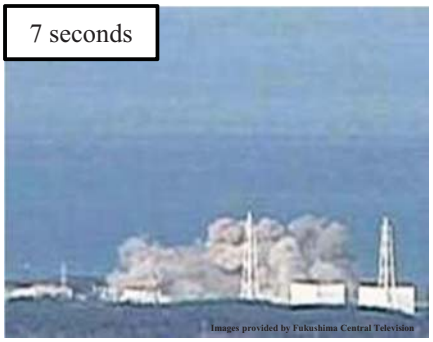
【Unit 1】

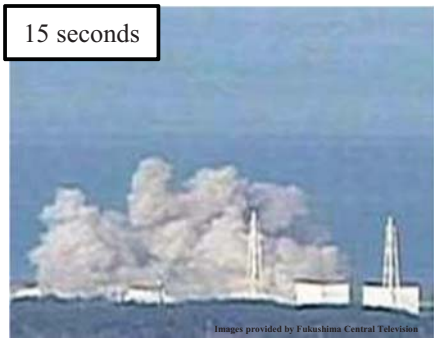




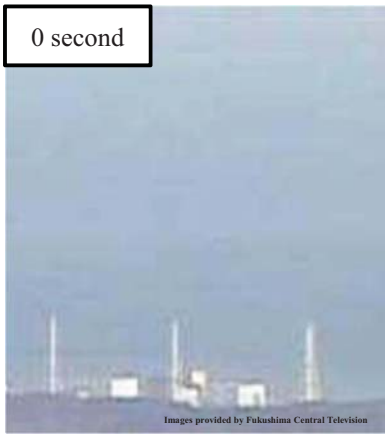


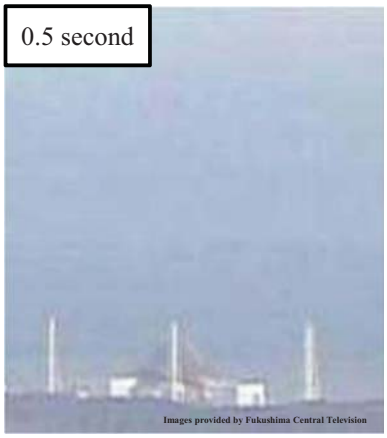


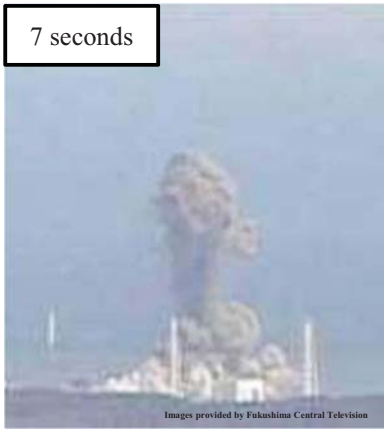


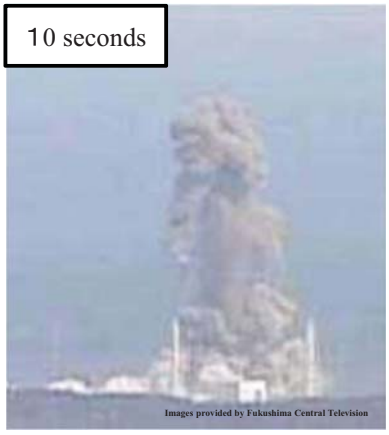


【Unit 3】



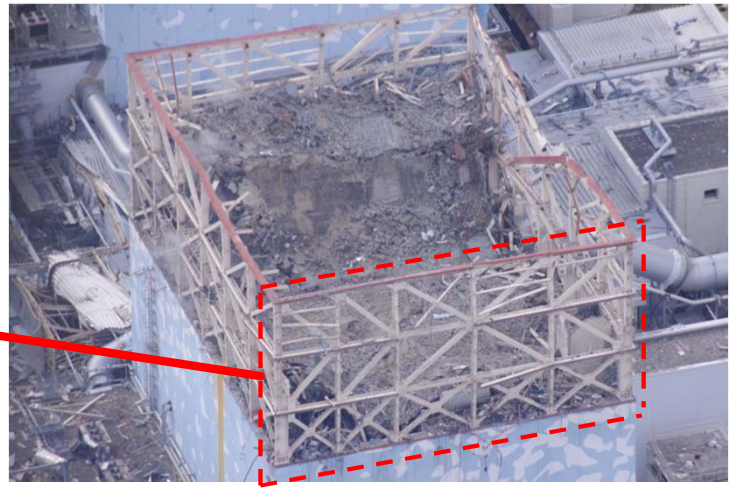






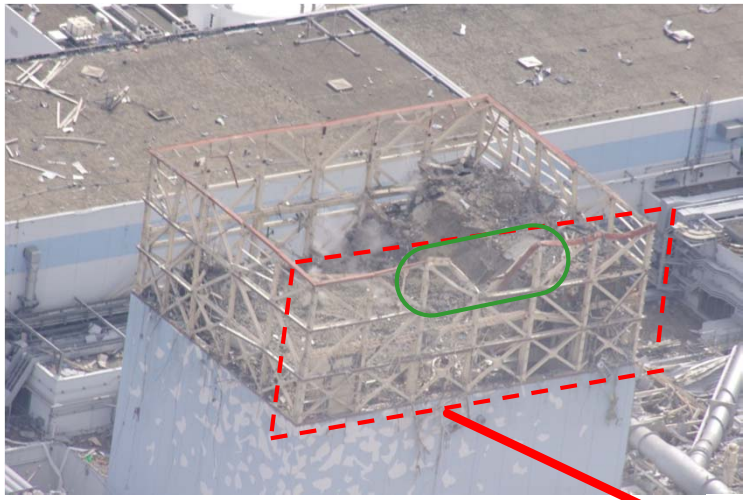
Damaged Condition of Unit 1 R/B 5th Floor

【North wall】

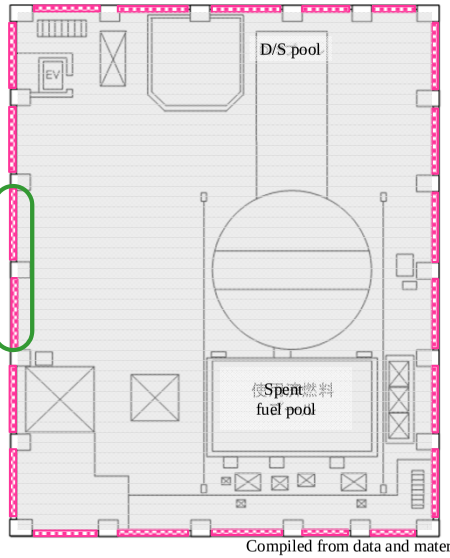


Photographed by the Ministry of Defense, March 27, 2011

【West wall】

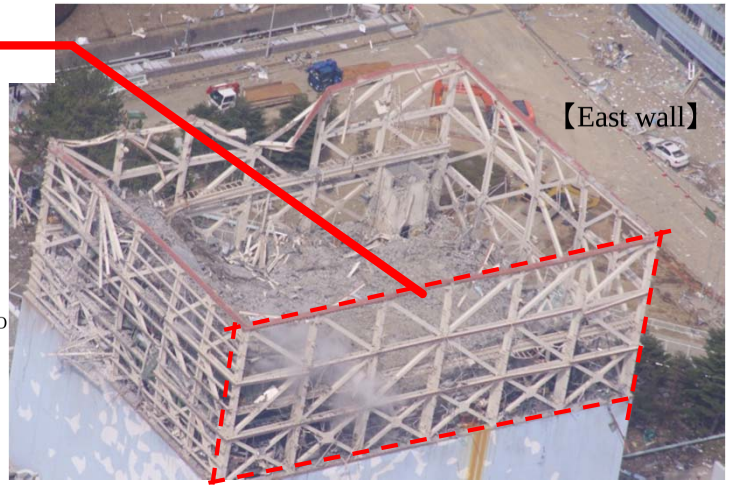


Photographed by the Ministry of Defense, March 27, 2011



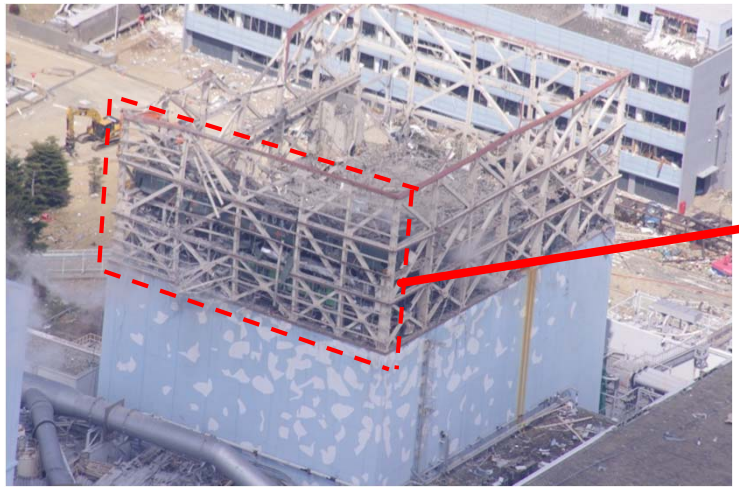
Compiled from data and materials by TEPCO

【East wall】



Photographed by the Ministry of Defense, March 27, 2011

【South wall】



Photographed by the Ministry of Defense, March 27, 2011

Explanatory note

: Complete collapse

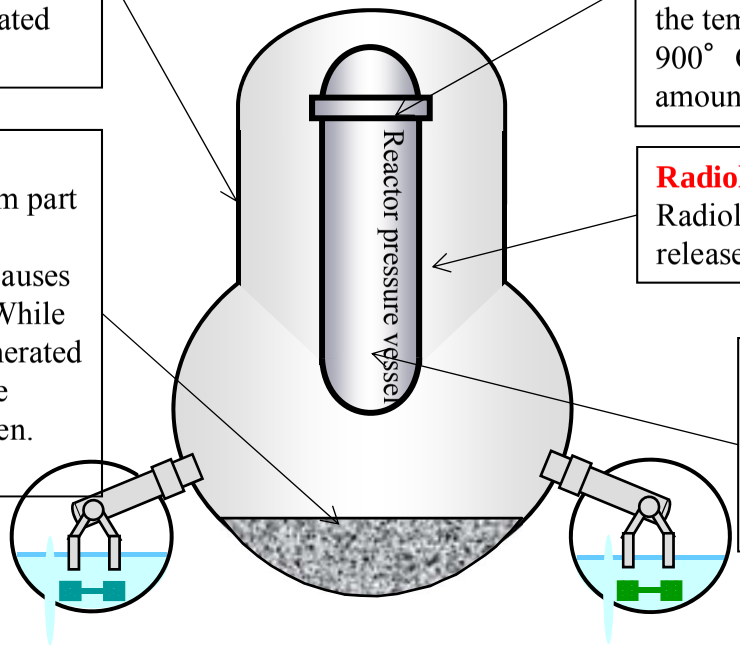
: Ceiling collapse

Attachment II -2-2

Main Causes of Hydrogen Generation inside the R/B

Zinc oxidation reaction
When zinc, which is used for painting the inside wall of the containment vessel, is left in a condition with a high temperature for a long period of time, hydrogen is generated by oxidation of zinc.

Core concrete reaction
When molten fuel perforates the bottom part of the pressure vessel and falls to the pedestal of the containment vessel, it causes pyrolysis of the concrete of the floor. While the pyrolysis is occurring, steam is generated and causes oxidation with metals in the molten fuel, which generates hydrogen.



Zirconium-water reaction
If the core is exposed and the temperature of fuel cladding rises, zirconium in the fuel cladding reacts with water and generates hydrogen. When the temperature of the fuel cladding exceeds 900° C, the reaction rate increases and a larger amount of hydrogen is generated.

Radiolysis of water
Radiolysis of water proceeds by radiation released from the core and generates hydrogen.

Boron carbide oxidation reaction
When boron carbide (B_4C), which is contained in the control rod, reacts with water and is oxidized to generate hydrogen.

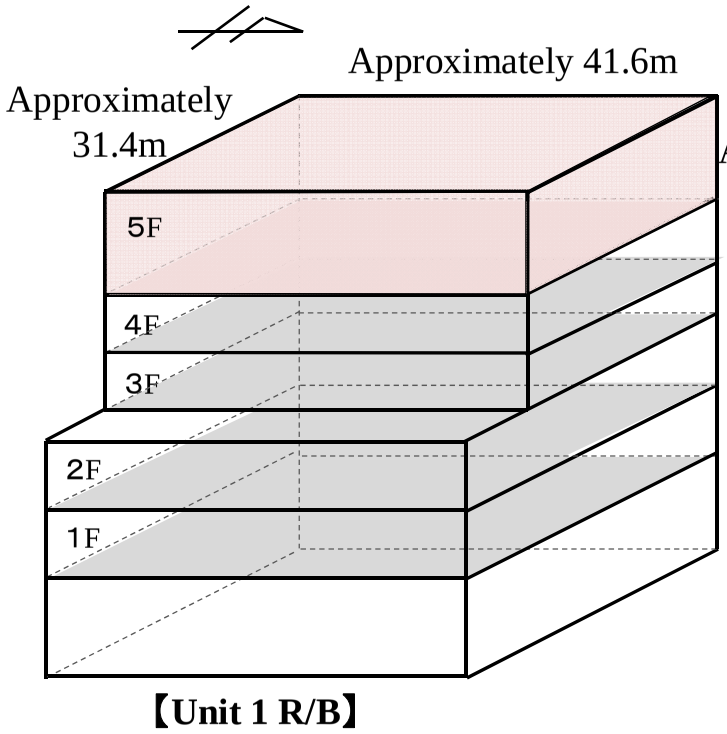
Hydrogen derived from other than the core

Hydrogen at spent fuel pool
○Radiolysis of water
→Immediately recombined to water if the water temperature at the pool is low.
○Zirconium-water reaction
→No reaction as long as pool water is secured.

Hydrogen for CAMS calibration
Hydrogen for CAMS calibration is set up in the R/B of each unit. However, the amount of the hydrogen is small.

Battery electrolyte
Battery is set up in the R/B of each unit. When being charged, the battery generates hydrogen as a result of battery electrolyte reaction; but during responses to the accident, no evidence was found that it had been charged.

Amount of Hydrogen Generated at Unit 1



【Unit 1 R/B】

Volume of the 5th Floor, Unit 1 R/B
Approx. 31.4m × approx. 41.6m × approx. 15.9m
＝20,769㎥（Approximately 21,000㎥）

Amount of hydrogen required to cause an explosion at the 5th floor of Unit 1 R/B
Approximately 21,000㎥ × 0.183[Note1] × 0.08109[Note 2]
＝Approximately 311.6kg

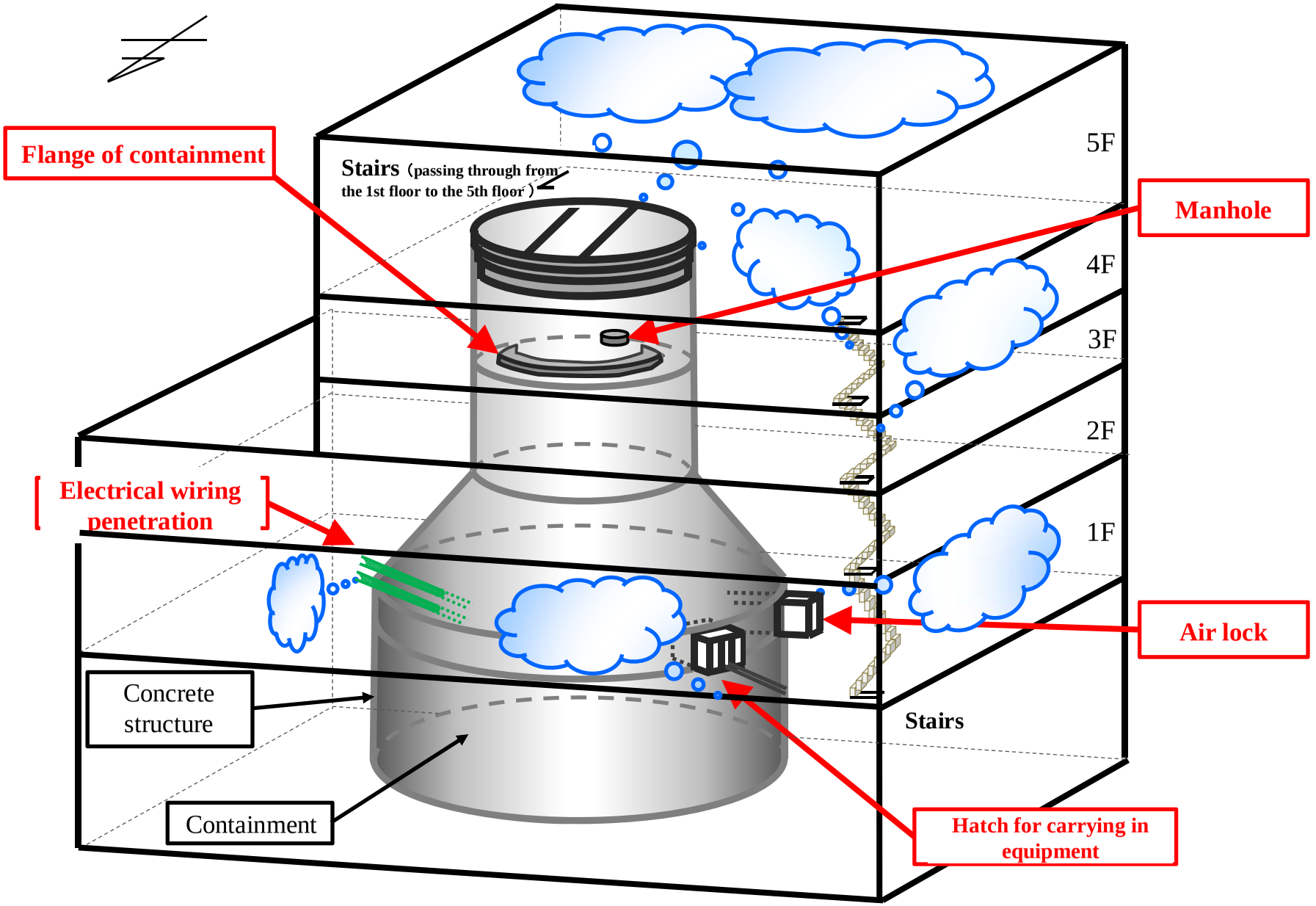
The amount of hydrogen assumed to be generated at Unit 1
＜Results of the MAAP analysis＞
Nearly 900kg of hydrogen was generated by 6:00 on March 12.
＜Results of MELCOR analysis＞
Nearly 900kg of hydrogen was generated by 14:30 on March 12.

Even taking into account the amount of hydrogen released to the air through the containment vent, it still makes sense that the amount of hydrogen generated inside the Unit 1 R/B was sufficient to cause the explosion.

Note 1: The lower limit of the mixing ratio of hydrogen that could cause an explosion is set relatively high as 18.3%
Note 2: It is hypothesized that the temperature inside the R/B is 30℃ and the atmospheric pressure, and the hydrogen density in this case is set as 0.08109kg㎥.

Attachment II-2-4

Possible Locations of Hydrogen Leakage from Containment



Damaged Condition of Unit 2 R/B 5th Floor

Photographed by DigitalGlobe, provided by TEPCO, March 16, 2011

(South)

(East)

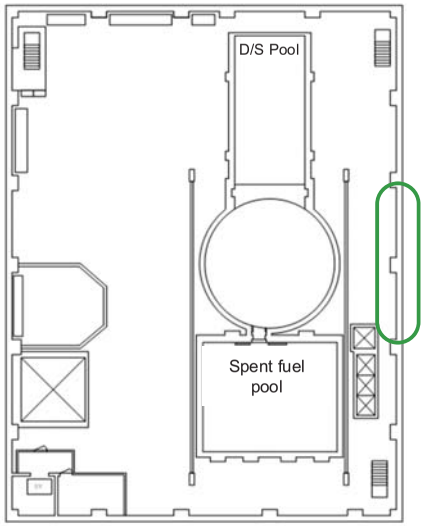
(West)

(North)

Photographed by the Ministry of Defense, March 27, 2011

Blowout panel dropped

(North)



(West)

(East)

Compiled from data and materials by TEPCO

(South)

【East wall】

Photographed by the Ministry of Defense, March 27, 2011

【Opening part of the blowout panel】

Photographed by TEPCO, September 23, 2011

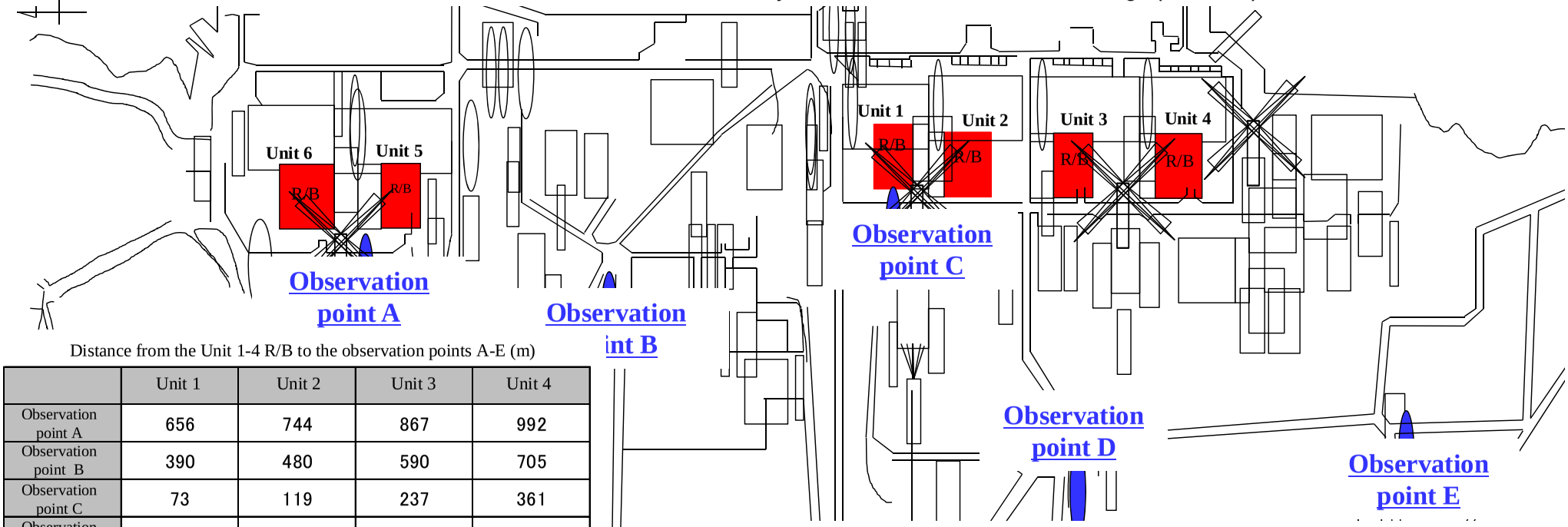
Attachment II-2-6

Locations of Seismic Observation Recorders within the Fukushima Dai-ichi Nuclear Power Station

Maximum acceleration recorded by the seismic observation recorder at the occurrence of the explosion at Unit 1, Unit 3 and Unit 4 R/B (Gal)

	Unit 1 Explosion March 12 at 15:36			Unit 3 Explosion March 14 at 11:01			Unit 4 Explosion March 15 at 6:12		
	South-north direction	East-west direction	Vertical direction	South-north direction	East-west direction	Vertical direction	South-north direction	East-west direction	Vertical direction
Observation point A	81	52	120	14	15	21	2	2	2
Observation point B	284	129	138	45	18	28	4	3	3
Observation point C	2,320※	2,392※	1,956	115	158	490	11	9	6
Observation point D	102	91	231	36	51	173	6	7	11
Observation point E	39	22	26	26	24	30	5	5	11

※This value is only for information as it was out of range (2,000Gal) of the sensor. 値。

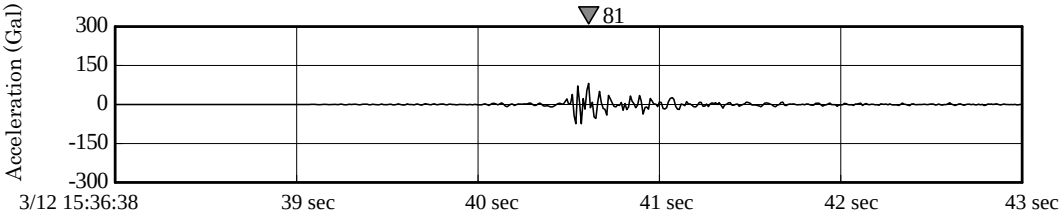


Distance from the Unit 1-4 R/B to the observation points A-E (m)

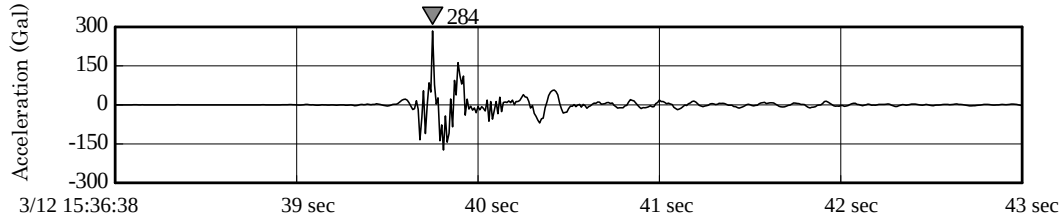
	Unit 1	Unit 2	Unit 3	Unit 4
Observation point A	656	744	867	992
Observation point B	390	480	590	705
Observation point C	73	119	237	361
Observation point D	422	345	351	374
Observation point E	684	599	496	407

Compiled from the “Fukushima Nuclear Accidents Investigation Report (Interim)” (December 2011) by TEPCO

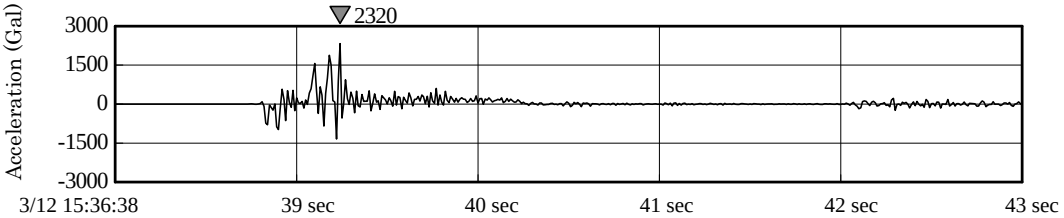
【Observation point A】



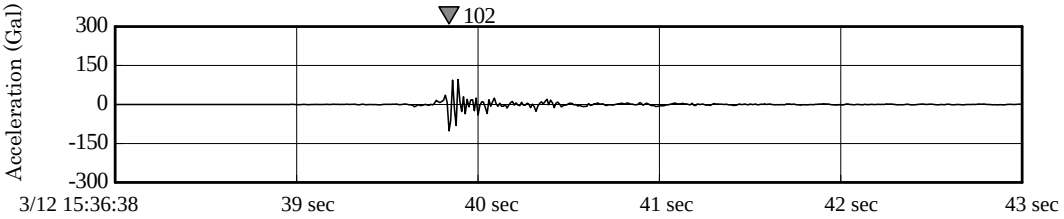
【Observation point B】



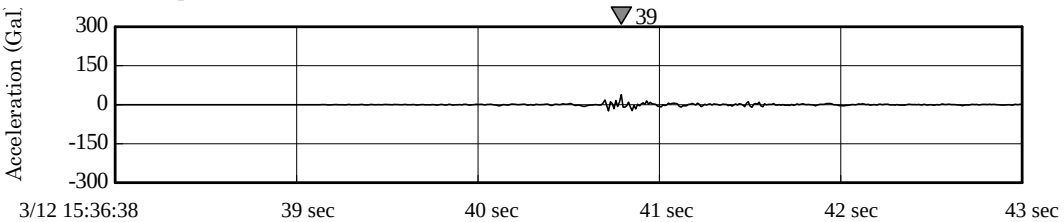
【Observation point C】 ※This value is only for information as it was out of range (2,000Gal) of the sensor.



【Observation point D】



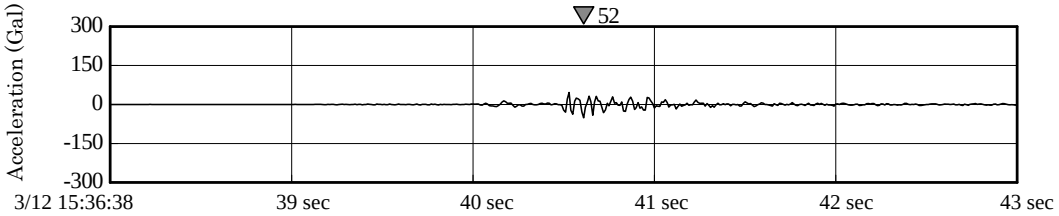
【Observation point E】



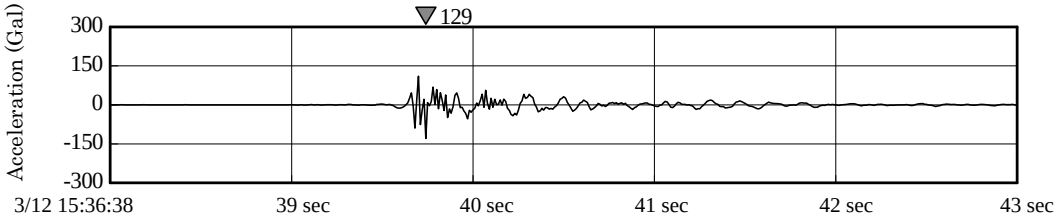
Accelerogram at the Unit 1 explosion (South-north direction)

Compiled from the data and materials created by TEPCO

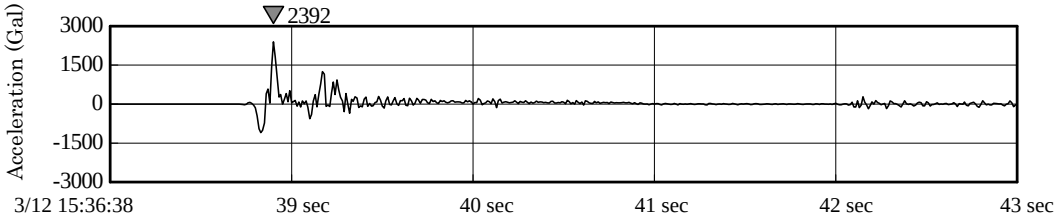
【Observation point A】



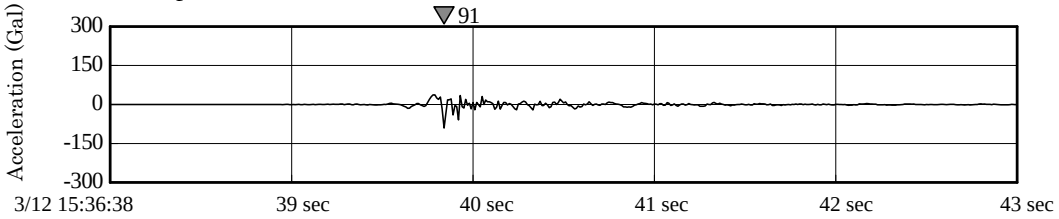
【Observation point B】



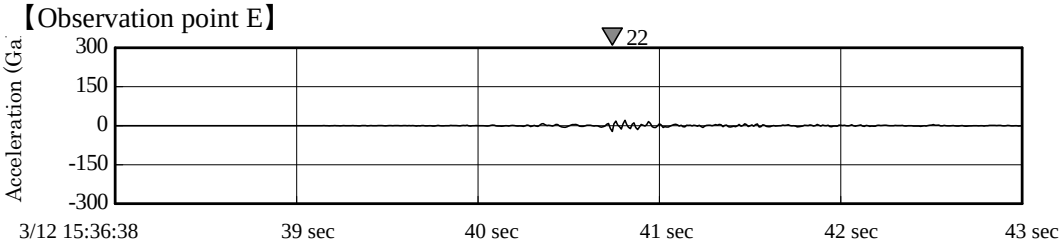
【Observation point C】 ※This value is only for information as it was out of range (2,000Gal) of the sensor.



【Observation point D】



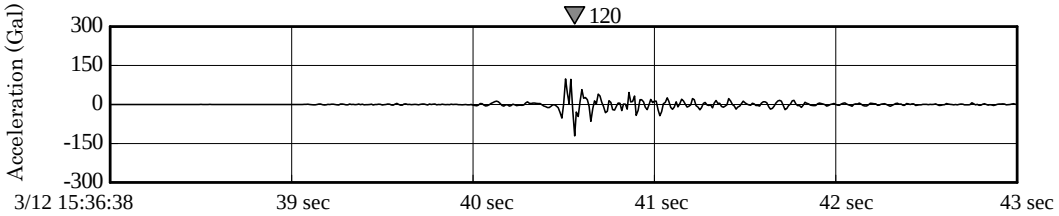
【Observation point E】



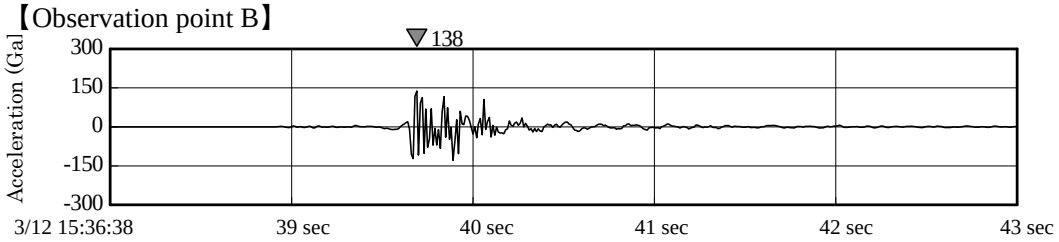
Accelerogram at the Unit 1 explosion (East-west direction)

Compiled from the data and materials created by TEPCO

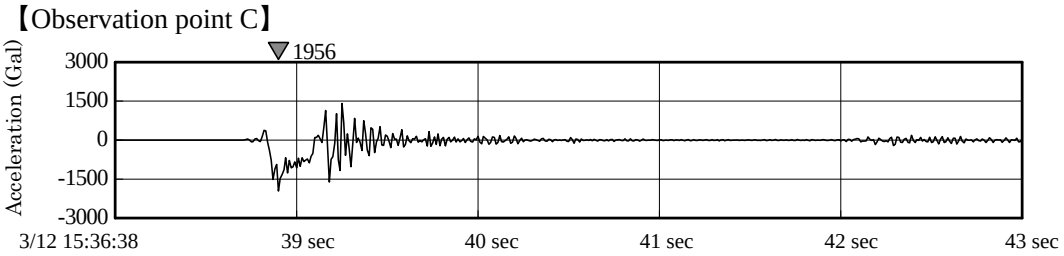
【Observation point A】



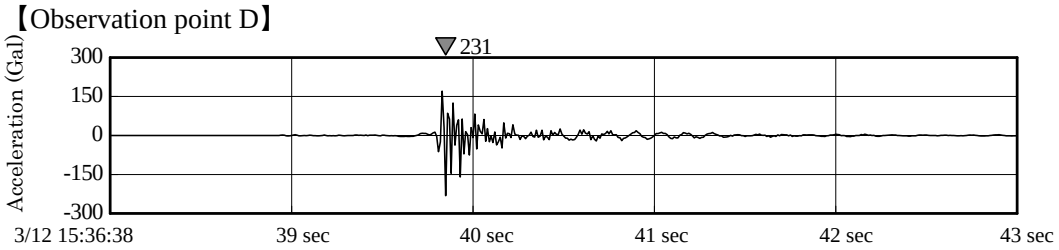
【Observation point B】



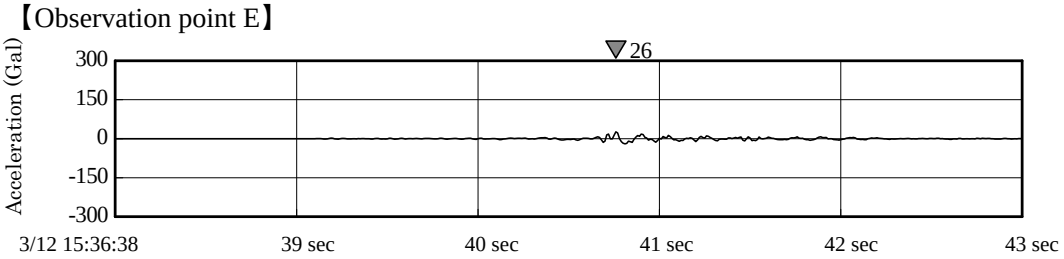
【Observation point C】



【Observation point D】



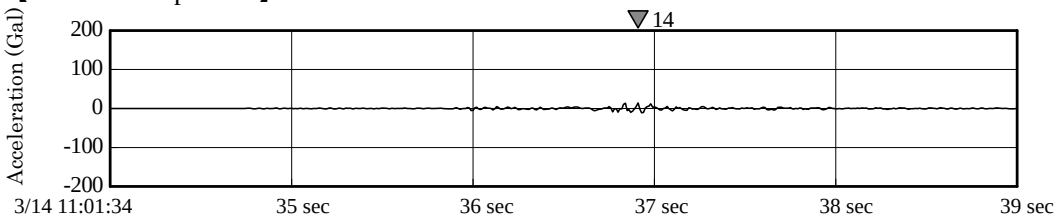
【Observation point E】



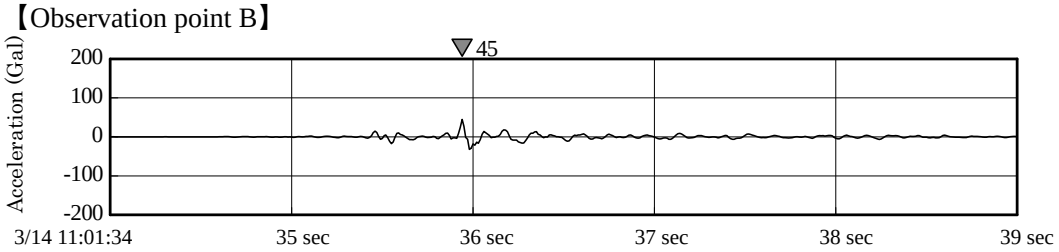
Accelerogram at the Unit 1 explosion (Vertical direction)

Compiled from the data and materials created by TEPCO

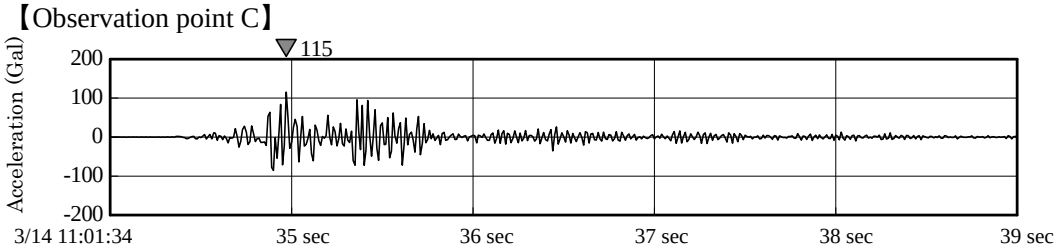
【Observation point A】



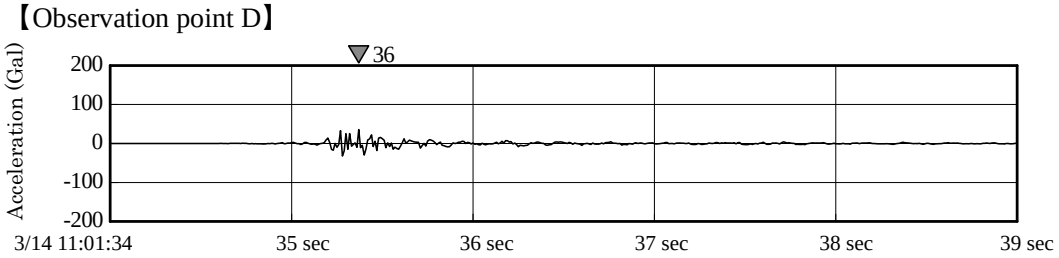
【Observation point B】



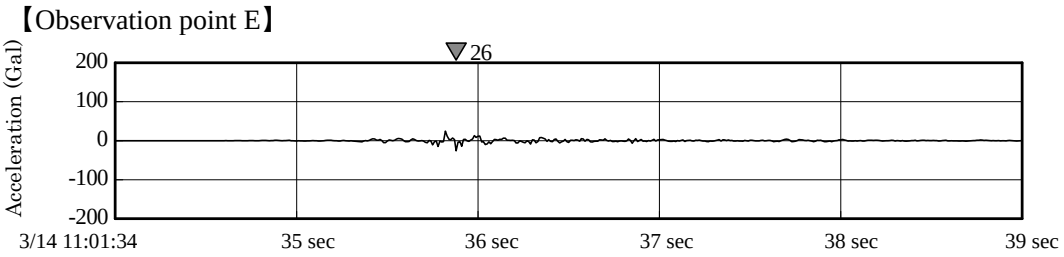
【Observation point C】



【Observation point D】



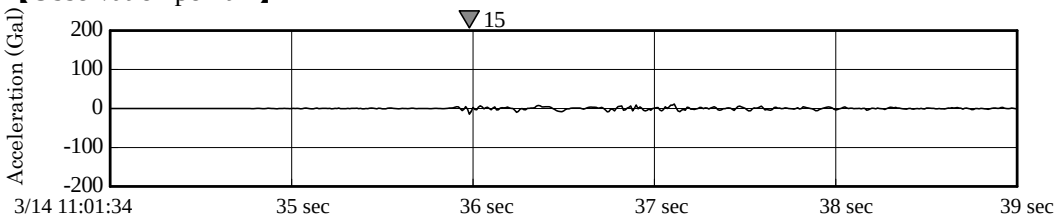
【Observation point E】



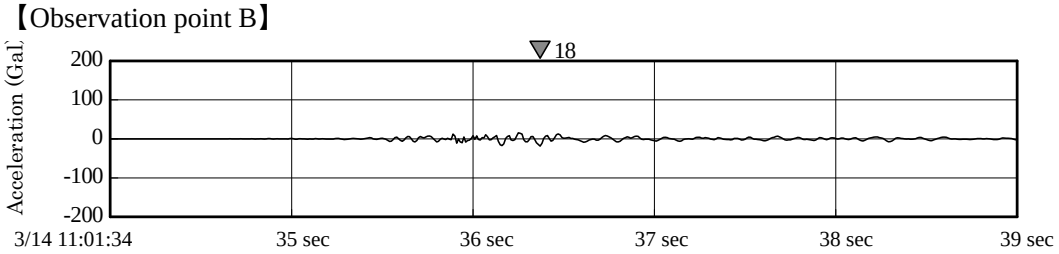
Accelerogram at the Unit 3 explosion (South-north direction)

Compiled from the data and materials created by TEPCO

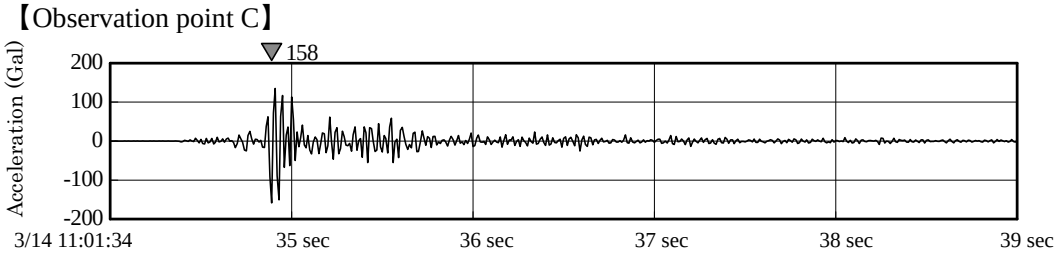
【Observation point A】



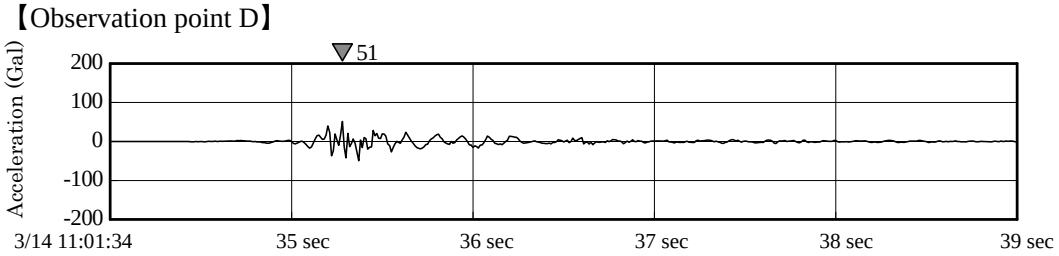
【Observation point B】



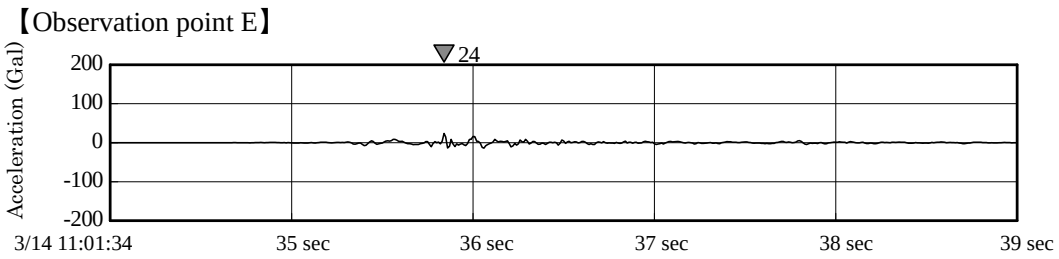
【Observation point C】



【Observation point D】



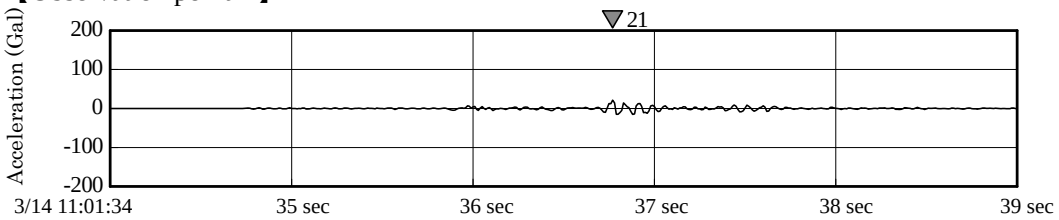
【Observation point E】



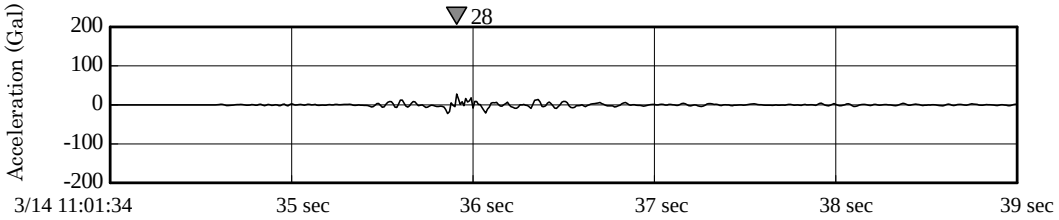
Accelerogram at the Unit 3 explosion (East-west direction)

Compiled from the data and materials created by TEPCO

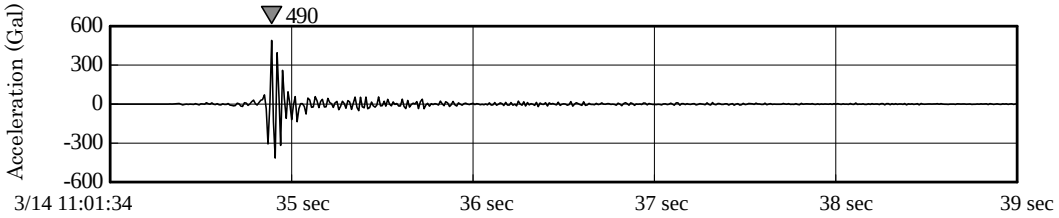
【Observation point A】



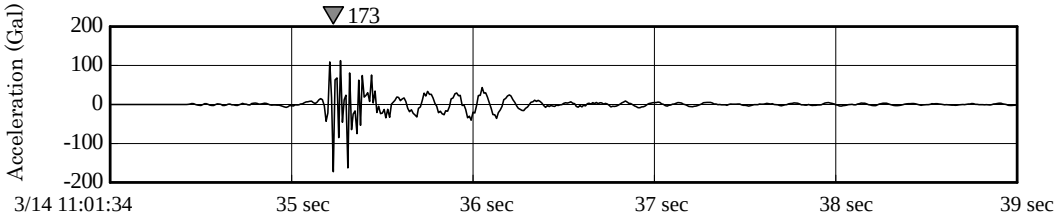
【Observation point B】



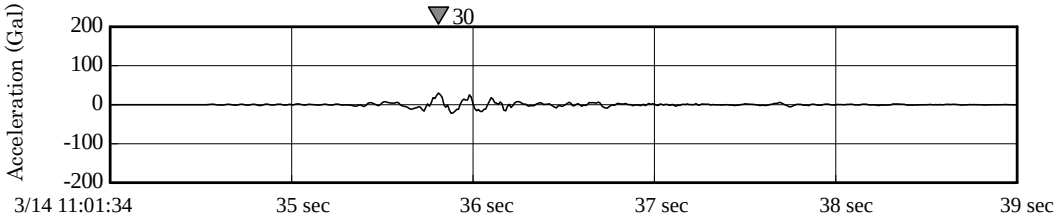
【Observation point C】



【Observation point D】



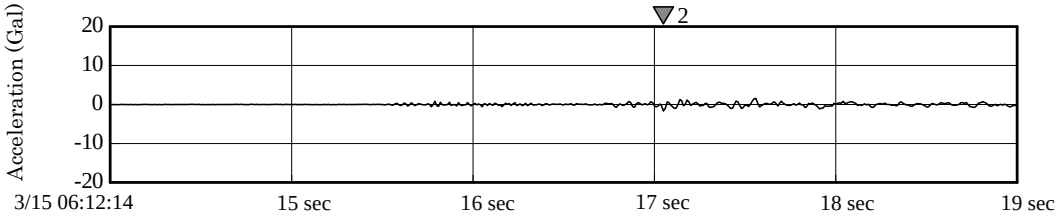
【Observation point E】



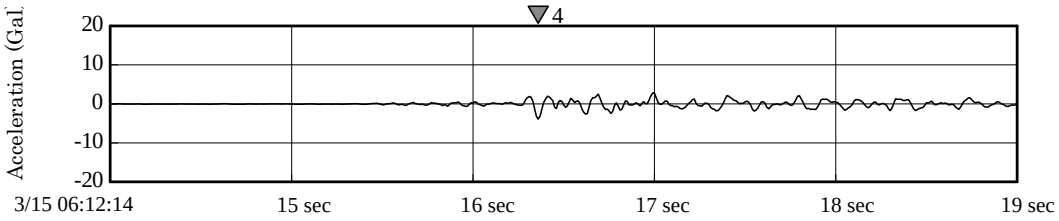
Accelerogram at the Unit 3 explosion (Vertical direction)

Compiled from the data and materials created by TEPCO

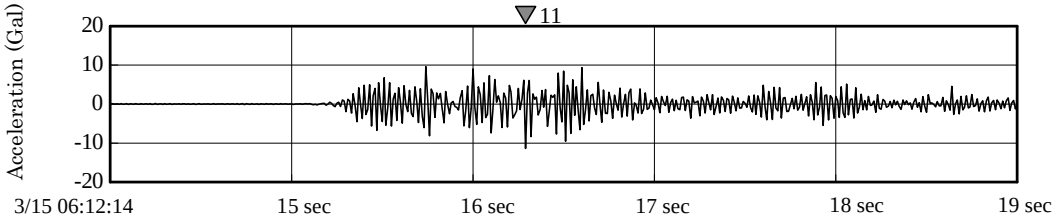
【Observation point A】



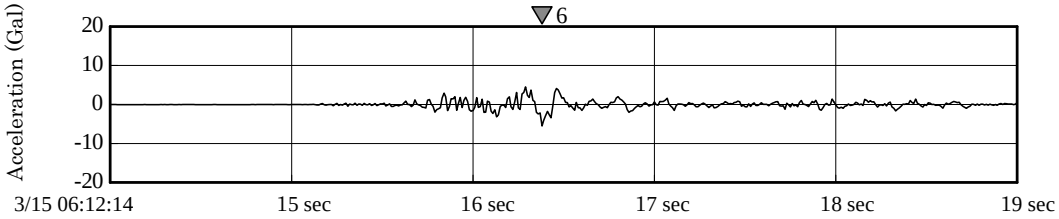
【Observation point B】



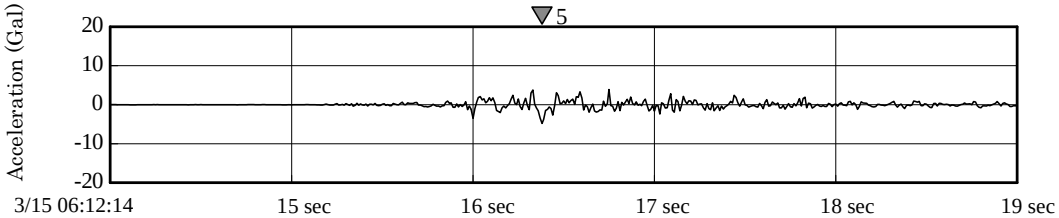
【Observation point C】



【Observation point D】



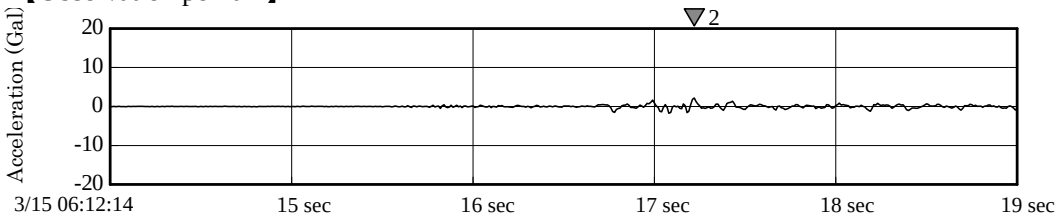
【Observation point E】



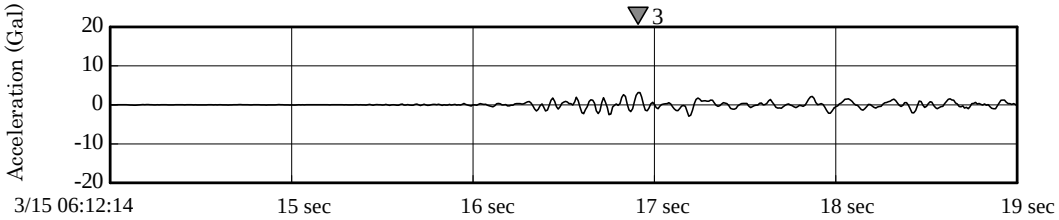
Accelerogram at the Unit 4 explosion (South-north direction)

Compiled from the data and materials created by TEPCO

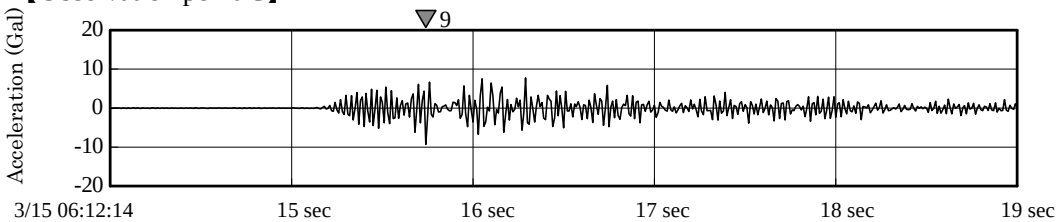
【Observation point A】



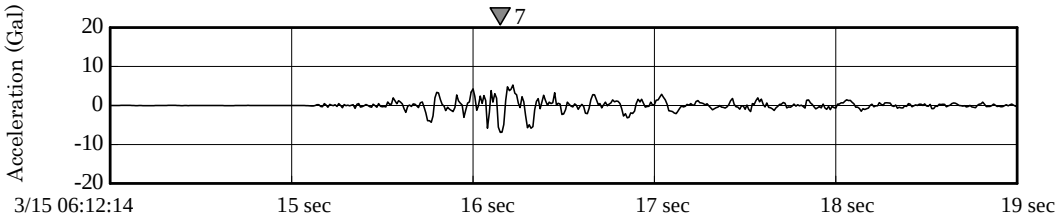
【Observation point B】



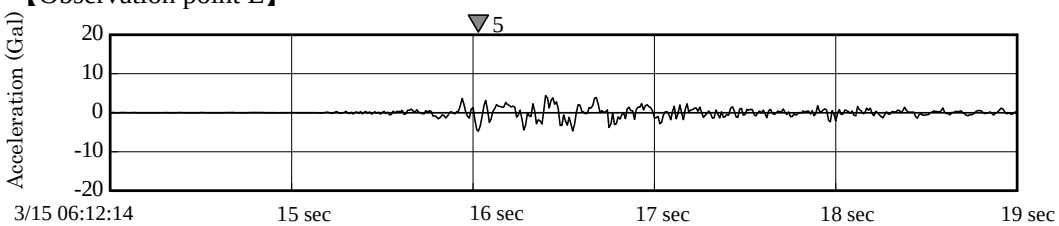
【Observation point C】



【Observation point D】



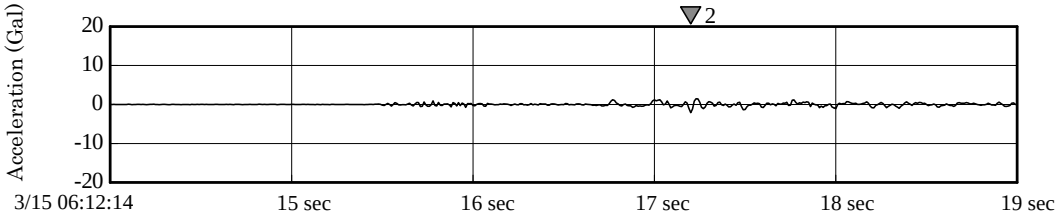
【Observation point E】



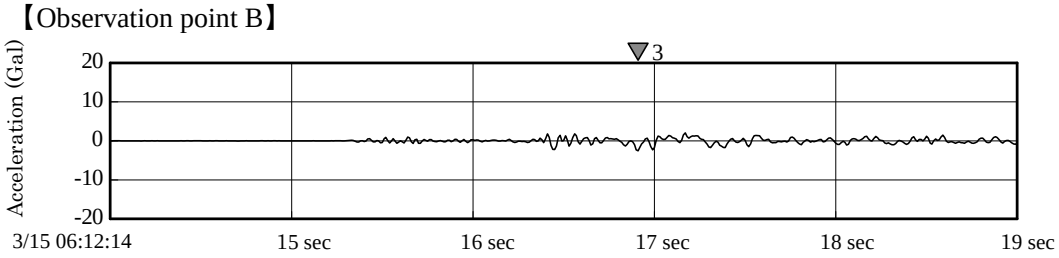
Accelerogram at the Unit 4 explosion (East-west direction)

Compiled from the data and materials created by TEPCO

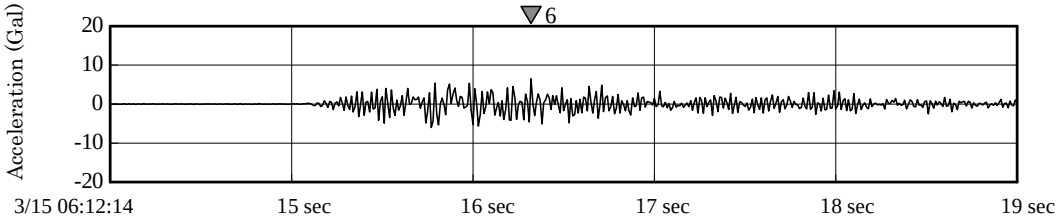
【Observation point A】



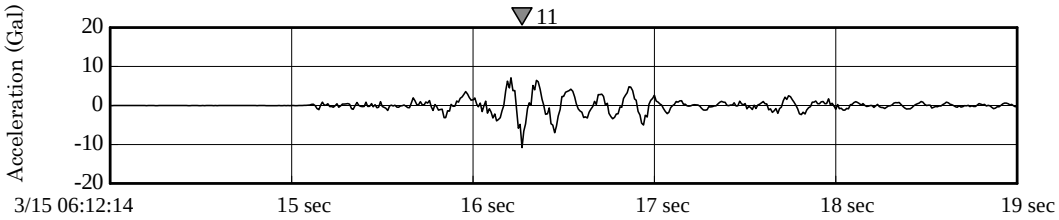
【Observation point B】



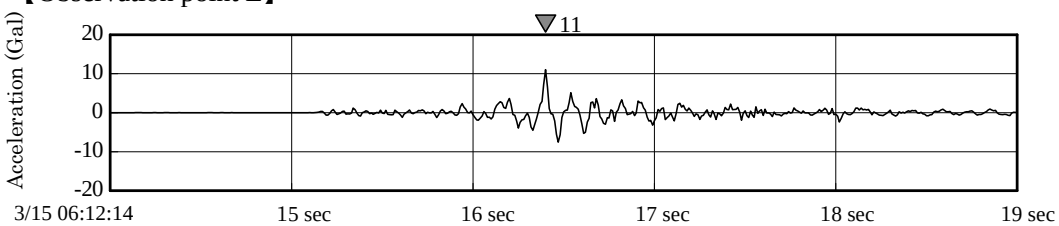
【Observation point C】



【Observation point D】



【Observation point E】



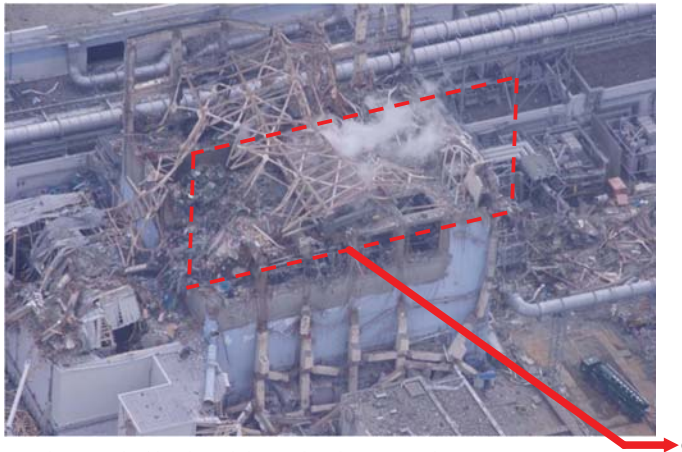
Accelerogram at the Unit 4 explosion (Vertical direction)

Compiled from the data and materials created by TEPCO

Damaged Condition of Unit 3 R/B

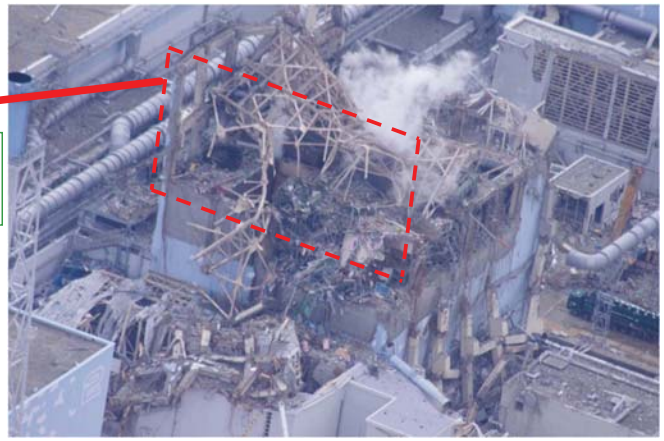
【5th Floor】

【West wall】

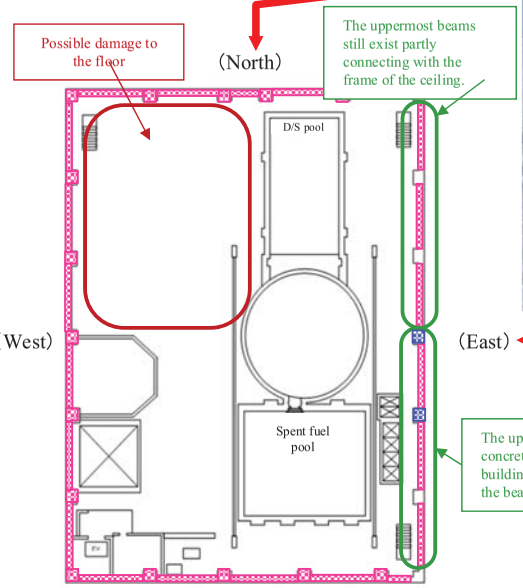


Photographed by the Ministry of Defense, March 27, 2011

【North wall】

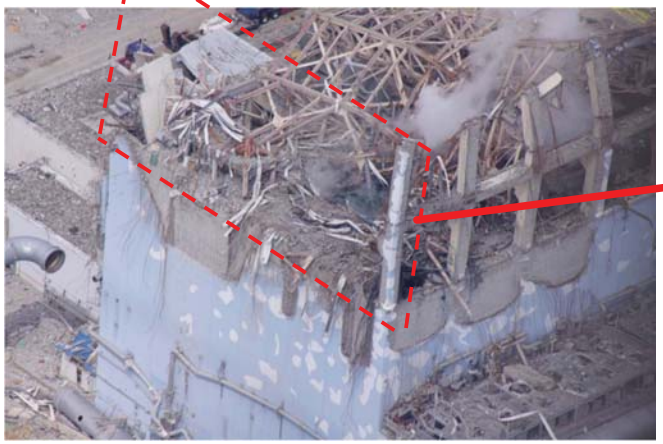


Photographed by the Ministry of Defense, March 27, 2011



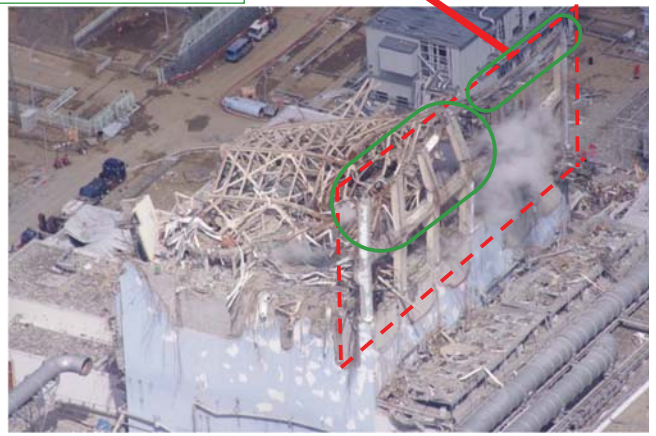
Compiled from data and materials by TEPCO

【South wall】



Photographed by the Ministry of Defense, March 27, 2011

【East wall】



Photographed by the Ministry of Defense, March 27, 2011

Explanatory notes

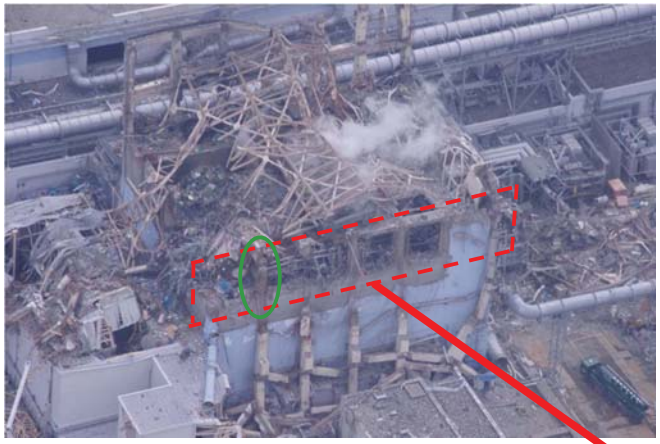
: Complete collapse

: Partly collapse

Attachment II -2-8

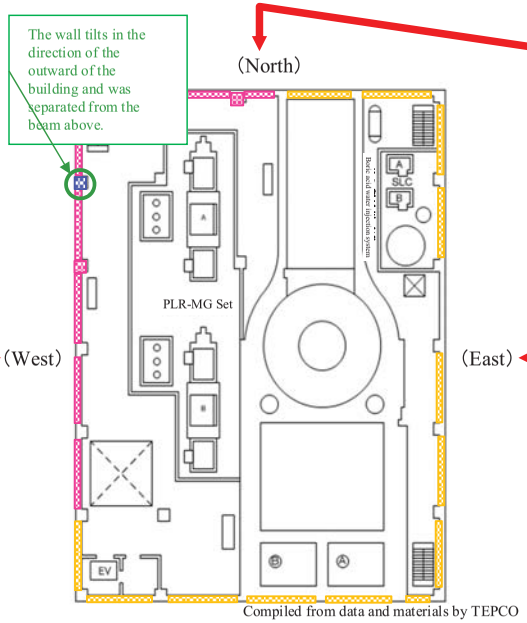
Damaged Condition of Unit 3 R/B

【West wall】



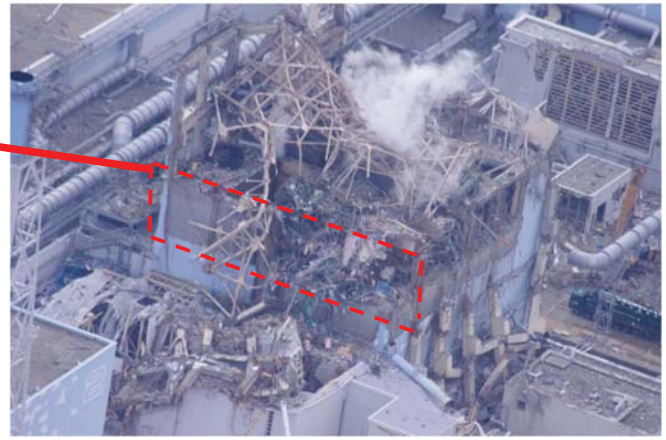
Photographed by the Ministry of Defense, March 27, 2011

【4th Floor】



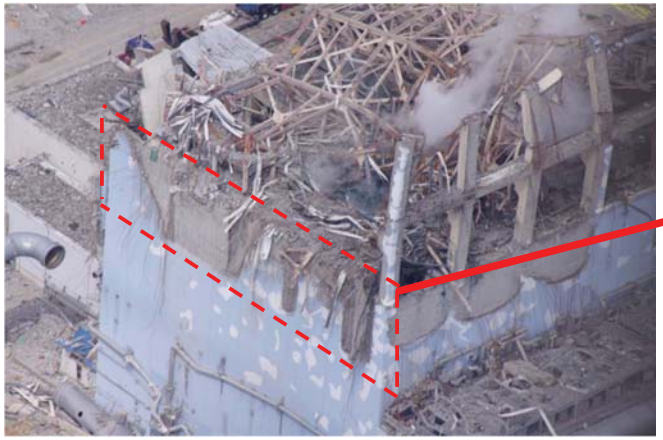
Compiled from data and materials by TEPCO

【North wall】



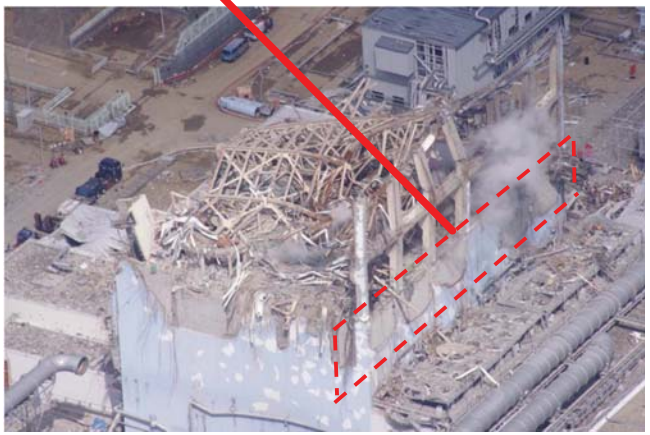
Photographed by the Ministry of Defense, March 27, 2011

【South wall】



Photographed by the Ministry of Defense, March 27, 2011

【East wall】



Photographed by the Ministry of Defense, March 27, 2011

Explanatory notes

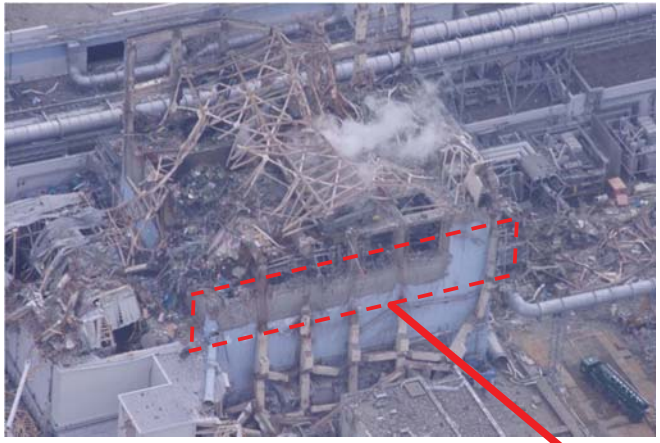
: Complete collapse

: Partly collapse

: Surface damage

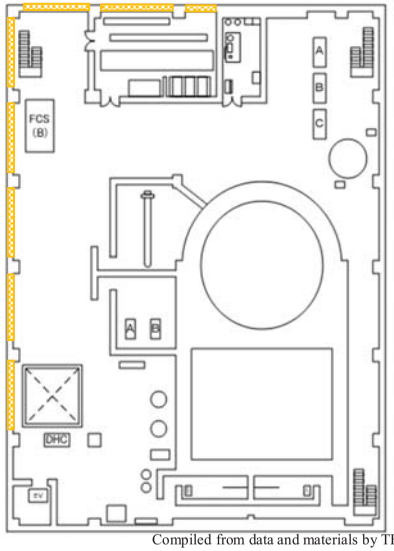
Damaged Condition of Unit 3 R/B

【West wall】



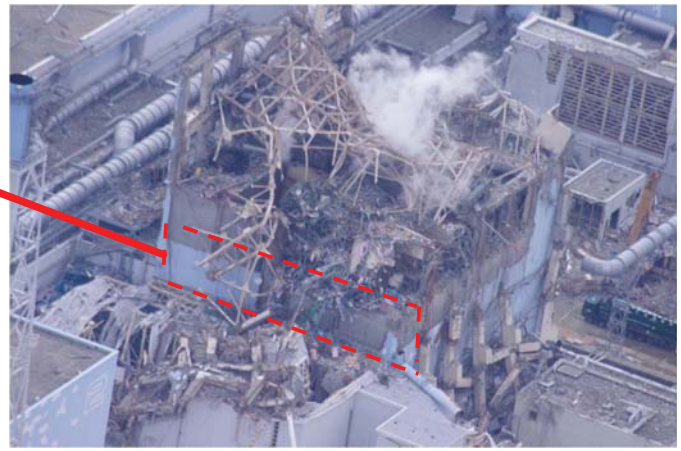
Photographed by the Ministry of Defense, March 27, 2011

【3rd Floor】



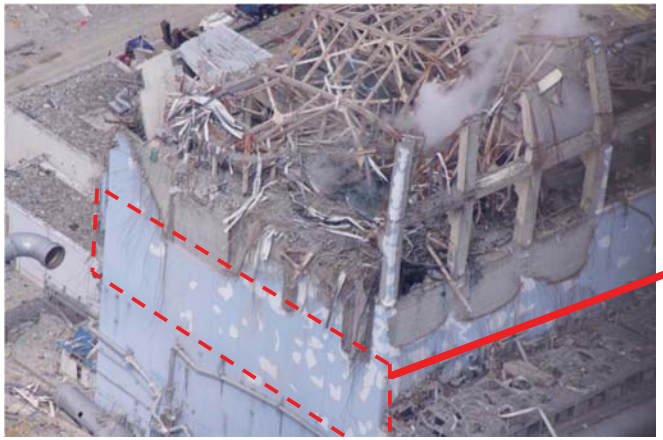
Compiled from data and materials by TEPCO

【North wall】



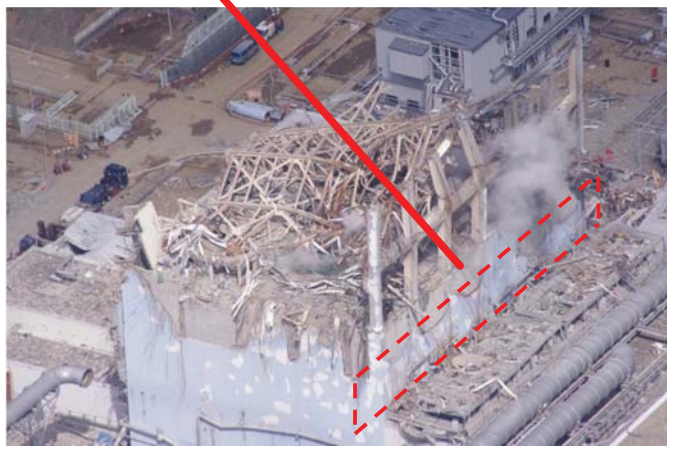
Photographed by the Ministry of Defense, March 27, 2011

【South wall】



Photographed by the Ministry of Defense, March 27, 2011

【East wall】

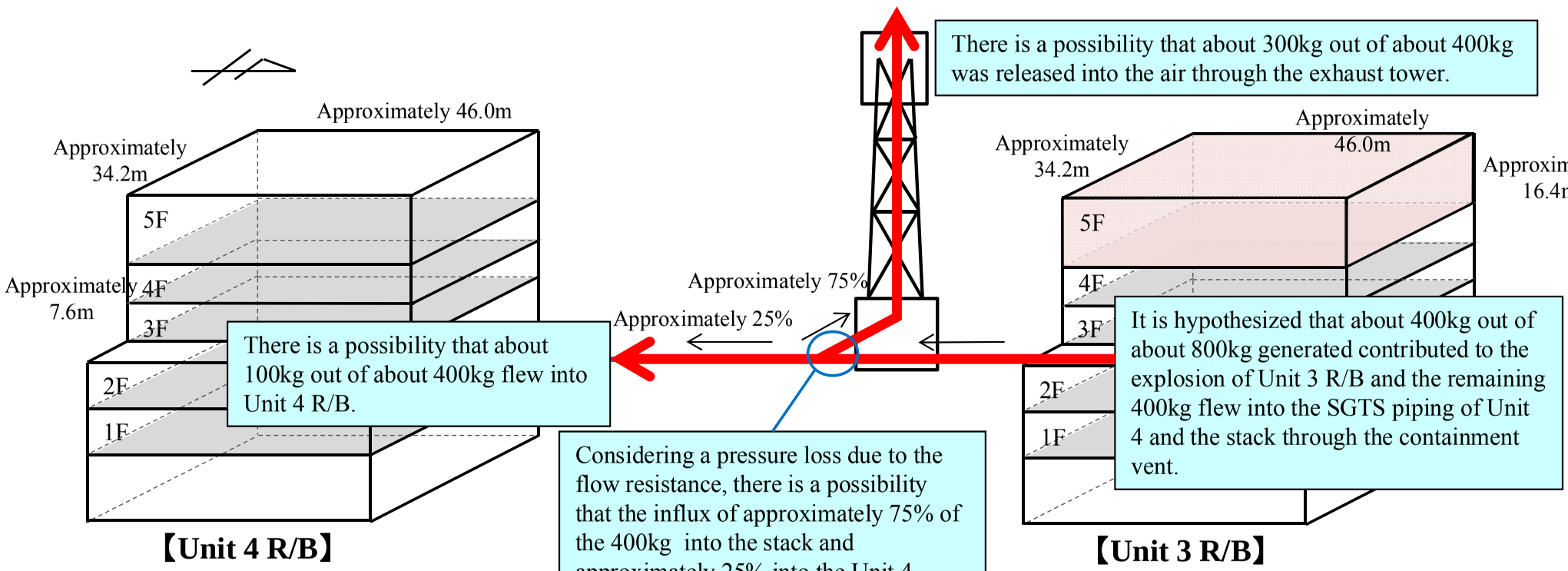


Photographed by the Ministry of Defense, March 27, 2011

Explanatory notes

: Surface damage

Amount of Hydrogen Generated in Unit 3 and Unit 4



Capacity of the 4th floor, Unit 4 R/B (West)
Approx. 15.4m × approx. 46.0m × approx. 7.6m
＝5,383㎥（Approximately 5,000㎥）
Amount of hydrogen required to cause an explosion at the 4th floor of Unit 4 R/B (West)
Approx. 5,000㎥ × 0.183[Note 1] × 0.08109[Note 2]
＝Approximately 74.2kg

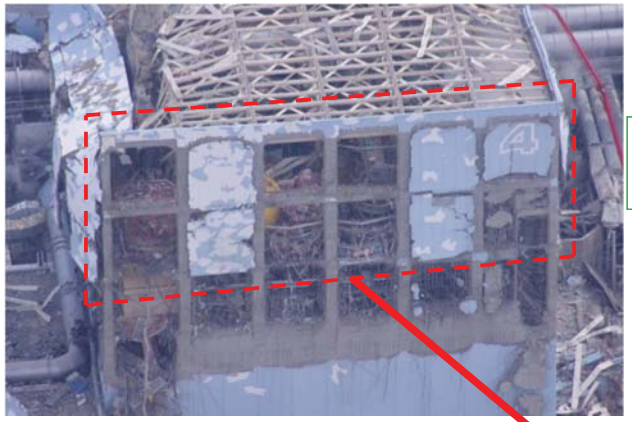
Capacity of the 5th floor, Unit 3 R/B
Approx. 34.2m × approx. 46.0m × approx. 16.4m
＝25,800㎥（Approximately 25,000㎥）
Amount of hydrogen required to cause an explosion at the 5th floor of Unit 3 R/B
Approx. 25,000㎥ × 0.183[Note 1] × 0.08109[Note 2]
＝Approximately 371.0kg

The amount of hydrogen assumed to be generated at Unit 3
＜Results of MAAP analysis＞
Over 600kg of hydrogen was generated by just after 12:00 on March 13.
Furthermore, nearly 800kg of hydrogen in total was generated by midnight on March 15.
＜Results of MELCOR analysis (operator's analysis 2)＞
About 700kg of hydrogen was generated by 12:00 on March 13, and thereafter another 250kg was generated by midnight on March 15.
→It is hypothesized that at least the estimated amount of approximately 800kg of hydrogen was generated in Unit 3.

Note 1: The lower limit of the mixing ratio of hydrogen that could cause an explosion is set relatively high as 18.3%
Note 2: It is hypothesized that the temperature inside each R/B is 30℃ and the atmospheric pressure, and the hydrogen density in this case is set as 0.08109kg㎥.

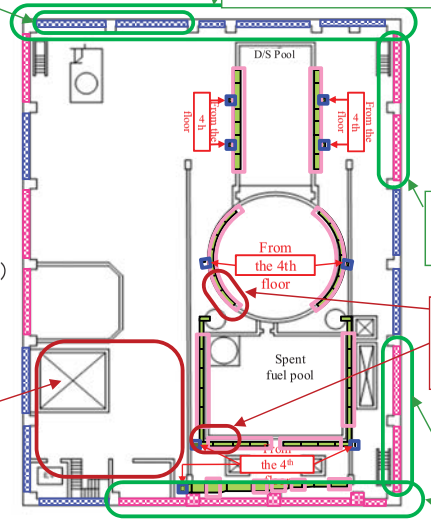
Damaged Condition of Unit 4 R/B

【West wall】

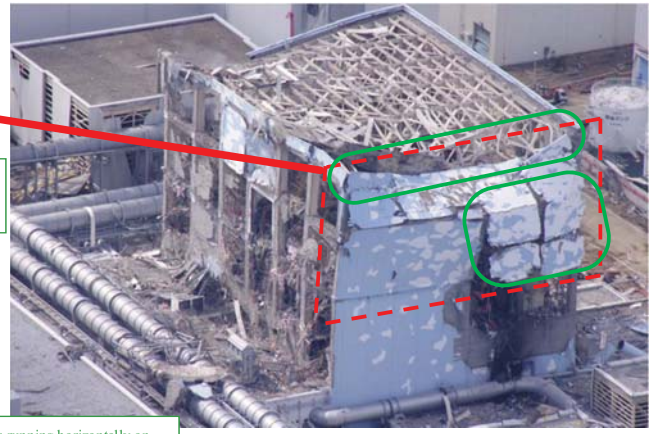


Photographed by the Ministry of Defense, March 27, 2011

【5th Floor】

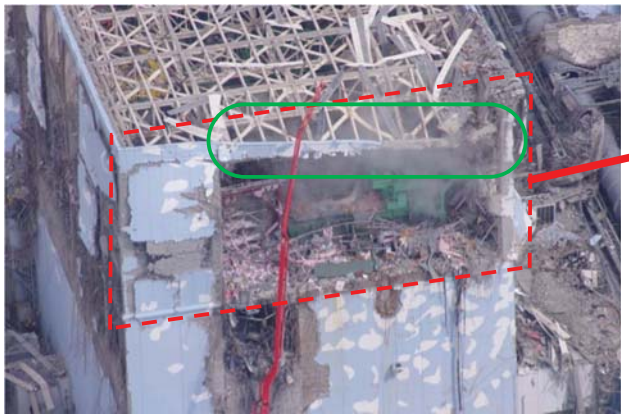


【North wall】



Photographed by the Ministry of Defense, March 27, 2011

【South wall】



Photographed by the Ministry of Defense, March 27, 2011

【East wall】

Photographed by the Ministry of Defense, March 27, 2011

Compiled from data and materials by TEPCO

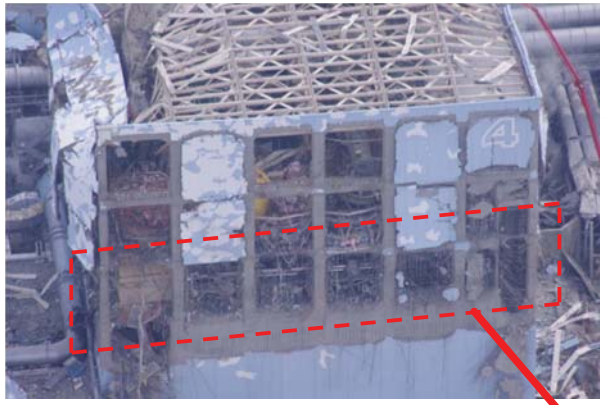
Explanatory notes

- : Complete collapse
- : Partly collapse
- : Exhaust duct
- : Exhaust port
- : Connection points to the lower floor

Damaged Condition of Unit 4 R/B

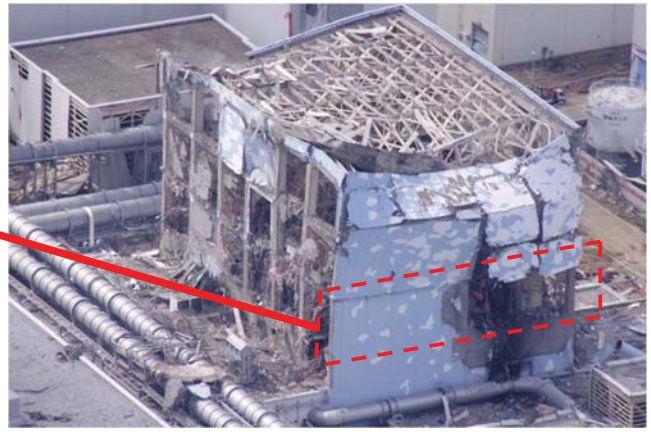
【4th Floor】

【West wall】

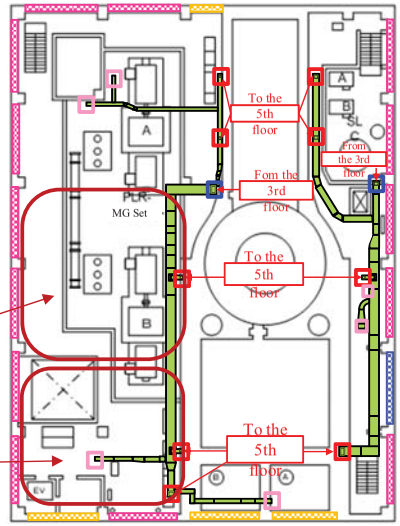


Photographed by the Ministry of Defense, March 27, 2011

【North wall】



Photographed by the Ministry of Defense, March 27, 2011

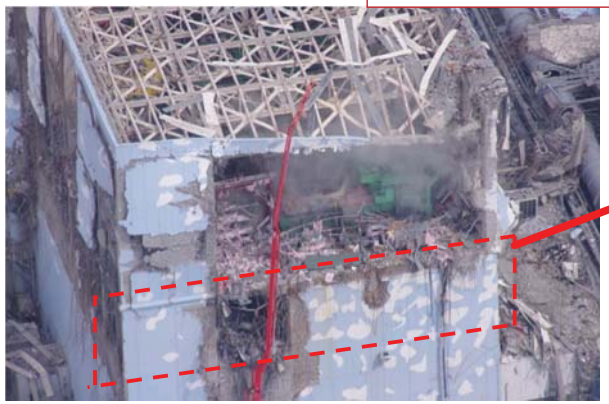


The floor surface right below the severely damaged floor on the 5th floor was distorted downward and a number of debris, which was assumed to be the wreckage of exhaust duct, were found.

Exhaust duct was smashed to the level that no original shape was visible, and the floor of the 4th floor was sinking towards the 3rd floor due to the explosion.

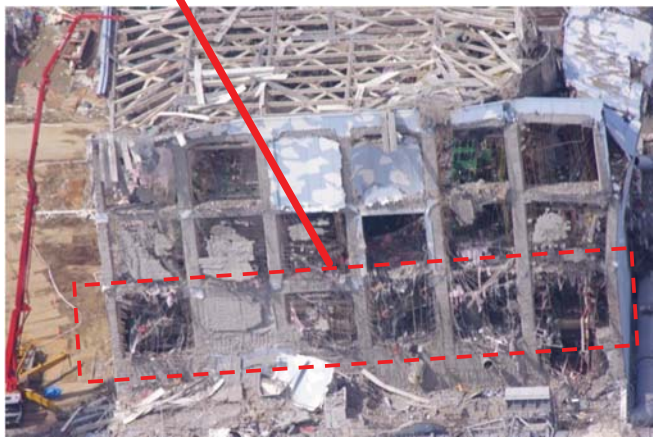
Compiled from data and materials by TEPCO

【South wall】



Photographed by the Ministry of Defense, March 27, 2011

【East wall】



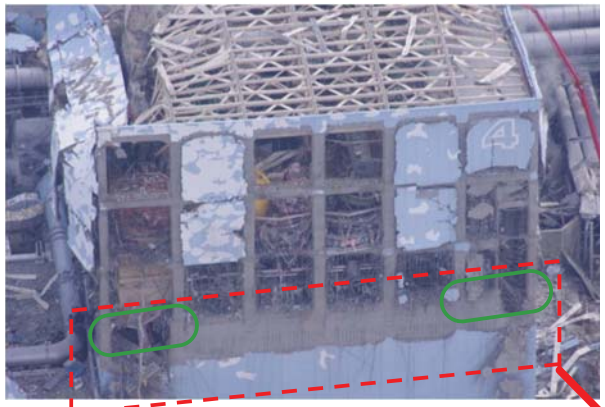
Photographed by the Ministry of Defense, March 27, 2011

Explanatory notes

- : Complete collapse
- : Partly collapse
- : Surface damage
- : Exhaust duct
- : Exhaust port
- : Connection points to the lower floor
- : Connection points to the upper floor

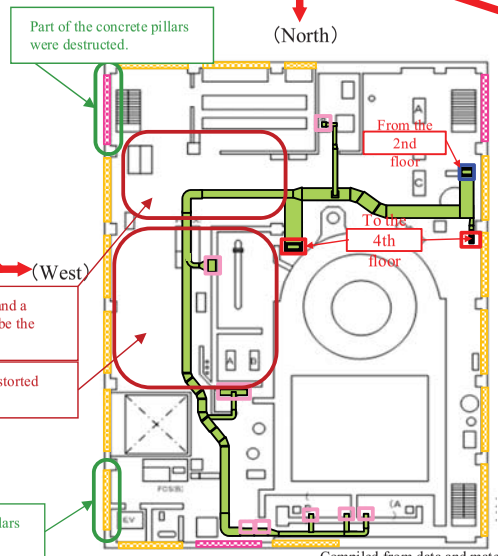
Damaged Condition of Unit 4 R/B

【West wall】



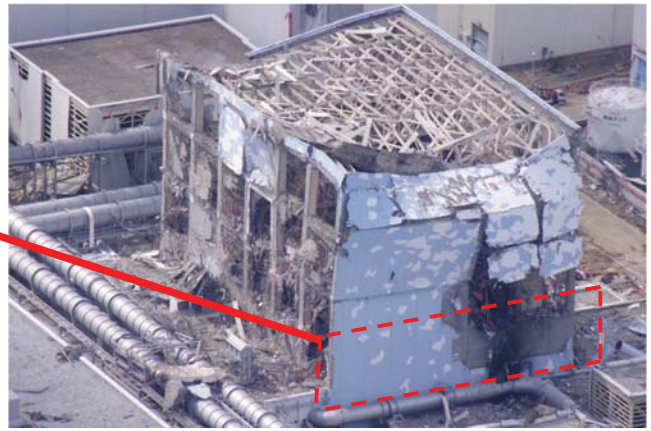
Photographed by the Ministry of Defense, March 27, 2011

【3rd Floor】



Compiled from data and materials by TEPCO

【North wall】

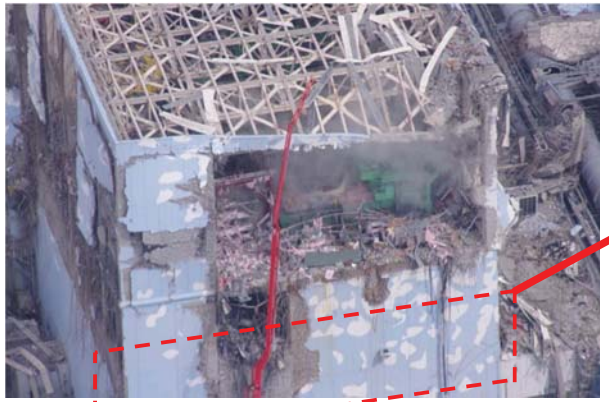


Photographed by the Ministry of Defense, March 27, 2011

【East wall】

Photographed by the Ministry of Defense, March 27, 2011

【South wall】



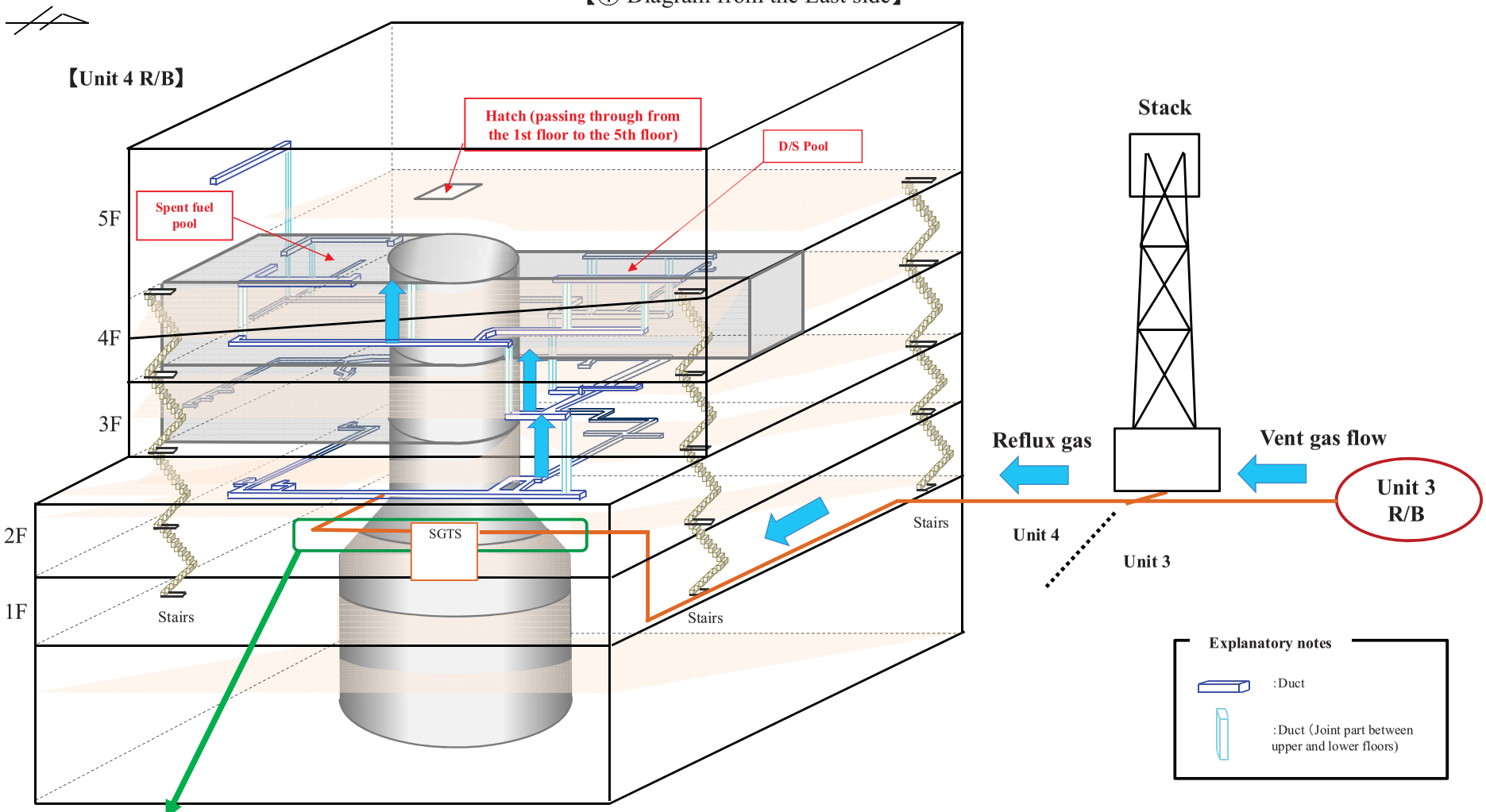
Photographed by the Ministry of Defense, March 27, 2011

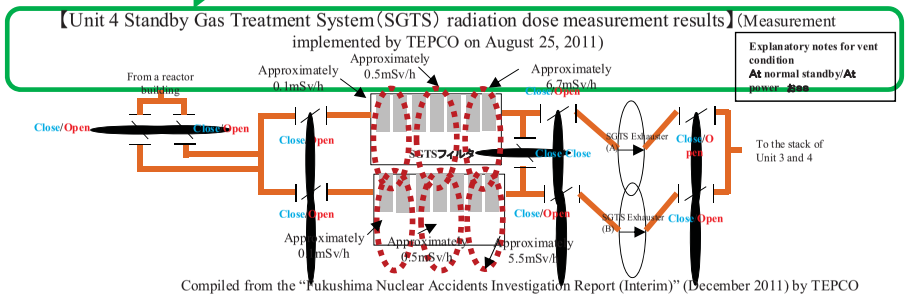
Explanatory notes

- : Complete collapse
- : Surface damage
- : Exhaust duct
- : Exhaust port
- : Connection points to the lower floor
- : Connection points to the upper floor

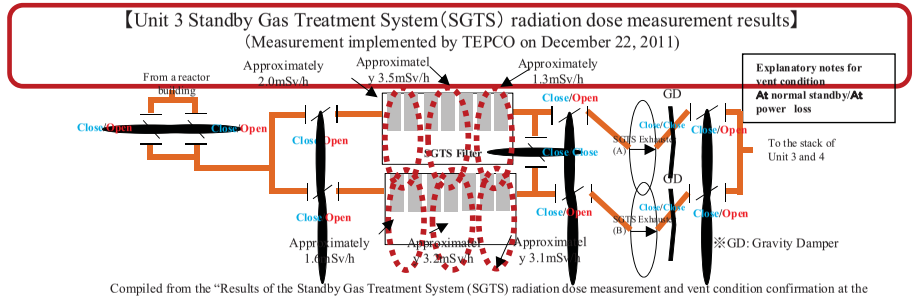
Possible Inflow Pass of Hydrogen from Unit 3 to Unit 4

【① Diagram from the East side】





Compiled from the "Fukushima Nuclear Accidents Investigation Report (Interim)" (December 2011) by TEPCO



Compiled from the "Results of the Standby Gas Treatment System (SGTS) radiation dose measurement and vent condition confirmation at the

Possible Inflow Pass of Hydrogen from Unit 3 to Unit 4

【② Diagram from the West side】