June 15, 2017

Radioactive contamination at Plutonium Fuel Research Facility (PFRF) in Oarai Research and Development Center (Follow-up 4)

Japan Atomic Energy Agency

Below is the situation after the press release issued on June 13 of the radioactive contamination at Plutonium Fuel Research Facility (PFRF) occurred on June 6 (Tue), 2017. (Added information is underlined.)

1. Main measures taken by JAEA so far

During inspection work of storage container containing nuclear fuel materials(*), the resin bag filled with the container containing nuclear fuel material in the storage container was broken, and radioactive contamination of 5 workers was confirmed. As a result of body contamination check, 24 Bq (α ray) at a maximum in nasal cavity was confirmed. (June 6 press release)(**)

Because 2.2×10^4 Bq (Pu-239) was confirmed at most by lung monitor measurement of the 5 workers at Nuclear Fuel Cycle Engineering Laboratories, the workers were sent to the National Institute of Radiological Sciences (NIRS), the National Institutes for Quantum and Radiological Science and Technology (QST), re-decontamination of body surface, lung monitor, etc. was carried out.

On the other hand, survey about the contamination situation inside Room No. 108 of PFRF set as an entry restricted area was conducted. (June 6 press release)

JAEA gave a detailed description of the accident at the Secretariat of the Nuclear Regulation Authority. (June 12 press release)

Yesterday (June 14), the images of the SD card in the digital camera with which the worker took photos of the work situation were checked (Attachment 1)

* In this storage container, Pu oxide, U oxide, etc. that were used in test, etc. for developing fuels for a fast reactor are stored. It is confirmed that, in terms of metal weight of all the amount of stored nuclear fuel materials, Pu and U account for 26.9 percent and 73.1 percent respectively, and included components and elements other than oxide are now under investigation. If total amount of nuclear materials becomes clear, values that cannot be open to public for the reason of protecting nuclear materials regarding proportion, etc. can be calculated. Therefore we will refrain from releasing

information on current situation from the perspective of nuclear nonproliferation. We will explain the situation within a possible range when we can decide whether or not to be able to clear by investigation into the cause, etc.

**We confirmed 2 μ Sv, 3 μ Sv, and 60 μ Sv (1/20,5000 ～ 1/800 of 50 mSv, the annual exposure limit of a radiation worker) were confirmed as read values of the pocket dosimeters of the three of the five workers.

2. Situation of workers exposed to radiation

The 5 workers (one in 50's, two in 40's, one in 30's one in 20's: five in total) left NIRS today (June 13 press release).

(1) Health condition: No abnormality. The five workers are being healed following the instruction of the industrial doctor. They will follow the diagnosis of the industrial doctor and doctors of NIRS.

(2) The five workers were divided into three groups and interview with them was conducted headed by the Director General and Deputy Director General for about an hour. (June 13 press release)

Another interview with the workers will be held for the investigation into causes.

To the press: We would appreciated it if you would refrain from interviewing with the workers in order to prevent a strain on them

3. Situation of the spot

(1) Situation of the hood

The storage container with a lid covered is set still in the hood, being monitored continuously by TV camera.

(2) Contamination situation inside Room No. 108, etc.

- On June 7, measurement was conducted at 14 spots, and at a maximum 55 Bq/cm^2 (α ray) and 3.1 Bq/cm^2 (β (ϒ)ray) were measured. (June 9 press release)
- Currently, means to collect dispersed materials, decontaminate the room of the accident and move forward with investigation is being examined.

(3) Radiation Monitors, etc.

- There is no change in the indicated value of Pu dust monitor in Room No. 108, the indication of radioactive material density in the air is staying within the normal range.
- There is no change in indication with low values of the ventilation dust monitor and area monitor compared with before the incident. (Attachment 2)

4. Following action

Situation and measures taken will be reported to the NRA by June 19.

5. JAEA received documents from the following municipalities.

① Ibaraki prefecture: “Radioactive contamination and exposure accident of workers at ”Plutonium Fuel Research Facility” in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 8)

② Oarai town: “Emergency requests concerning the accidental incident occurred in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 8)

③ Mito city: “Emergency requests concerning the accidental incident occurred in Oarai Research and Development Center” (June 8)

④ Hokota city: “Emergency requests concerning the radioactive contamination and exposure accident of workers at Plutonium Fuel Research Facility in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)

⑤ Ibaraki town: “Emergency requests concerning the accident occurred in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)

⑥ Hokota city council: “Requests” (June 9)

⑦ Oarai town council: “Emergency requests concerning the radioactive contamination and exposure accident of workers at Plutonium Fuel Research Facility in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)

⑧ Omitama city: “Emergency requests concerning the radioactive contamination and exposure accident of workers at Plutonium Fuel Research Facility in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)

⑨ Ibaraki town council: “Requests concerning the accident occurred in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 13)

6. About the work causing the accident (Position in the operational safety programs, etc.)

Attachment 3

7. Events up to setting up the on-site command post on chronological order

Attachment 4

Attachment 1

Photos taken with the digital camera withdrawn from the scene

The inspection of storage containers started in February, 2017. Inspection of 31 containers had been inspected with no abnormality such as contamination, etc. before this incident occurred. A digital camera brought in the room for recording the work recorded inspection situation of the storage container. As a result of checking collected data, 5 images taken on June 6 were confirmed.

On June 6, inspection work of storage containers were carried out. The storage container 1010 in which resin bags ruptured is the fifth one, it was confirmed recording times coincide with what discharged workers told. (Attachment 1 of June 13 press release)

<Chronology of withdrawal>

June 14 (Wed)

14:01 Staff entered the scene.

14:37 SD card was brought out from the controlled area.

14:46 SD card was sent to the on-site Response Headquarters.

14:50 SD card was received in the on-site Response Headquarters.

15:25 Check images recorded in SD card was started.

15:29 Check images was completed.

- The safety inspector was a witness to a process of drawing out the SD card and checking images.
- The digital camera in the greenhouse have not been decontaminated, the SD card was drawn out.

<Collected data>

Photo images taken from May 2, 2011 to June 6, 2017 were recorded in SD card. There were 5 images taken on June 6.

<Detail of 5 images>

① Photo 1 (Tool Box Meeting (TMB) board, before the work) taken at 8:54 (No relation with the work)

② Photo 2 (Storage container 1007) taken at 10:59

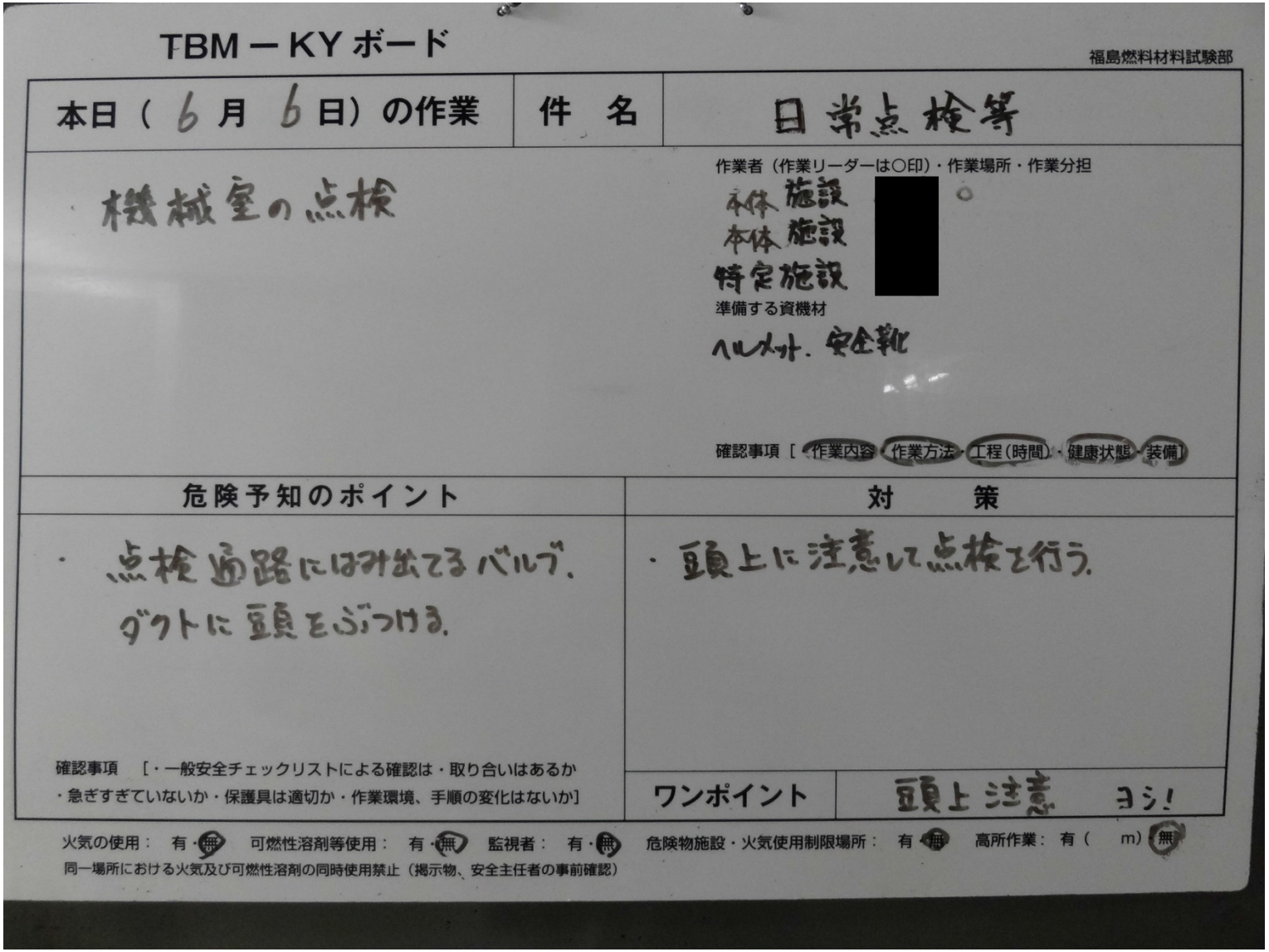
③ Photo 3 (Storage container 1007) taken at 11:00

④ Photo 4 (Storage container 1008) taken at 11:13

⑤ Photo 5 (Storage container 1010) taken at 12:55 (Storage container after the incident occurred.)

- Taken times were recorded by setting of the digital camera. (Confirmation of consistency with the real time have not been implemented.)

Photo 1


TBM－KY ボード

福島燃料材料試験部

本日（6月6日）の作業	件名	日常点検等

機械室の点検

作業者（作業リーダーは○印）・作業場所・作業分担

本体施設 [redacted] ○

本体施設

特定施設

準備する資機材

ヘルメット．安全靴

確認事項［作業内容・作業方法・工程（時間）・健康状態・装備］

危険予知のポイント	対策
・点検通路にはみ出てるバルブ．ダクトに頭をぶつける．	・頭上に注意して点検を行う．

確認事項　［・一般安全チェックリストによる確認は・取り合いはあるか ・急ぎすぎていないか・保護具は適切か・作業環境、手順の変化はないか］

ワンポイント　頭上注意　ヨシ！

火気の使用：　有・無　可燃性溶剤等使用：　有・無　監視者：　有・無　危険物施設・火気使用制限場所：　有・無　高所作業：　有（　m）・無

同一場所における火気及び可燃性溶剤の同時使用禁止（掲示物、安全主任者の事前確認）

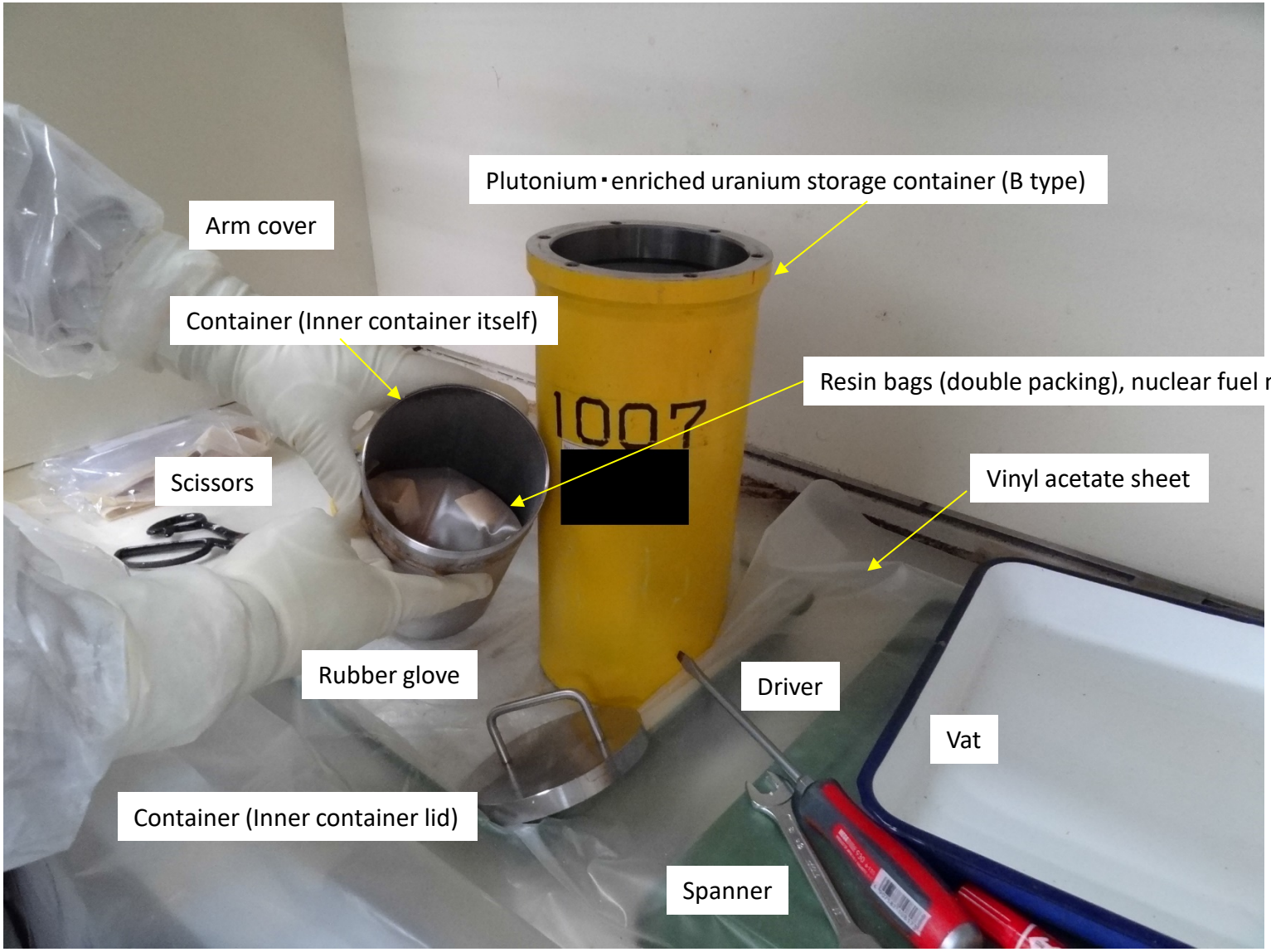
TBM (Tool Box Meeting) Board in the Machine Room (in Radiation Cold Environment)

No relation to this radiation work

Photo 2

There is an inner Container in storage container.

Spanner and driver used to open the storage container.

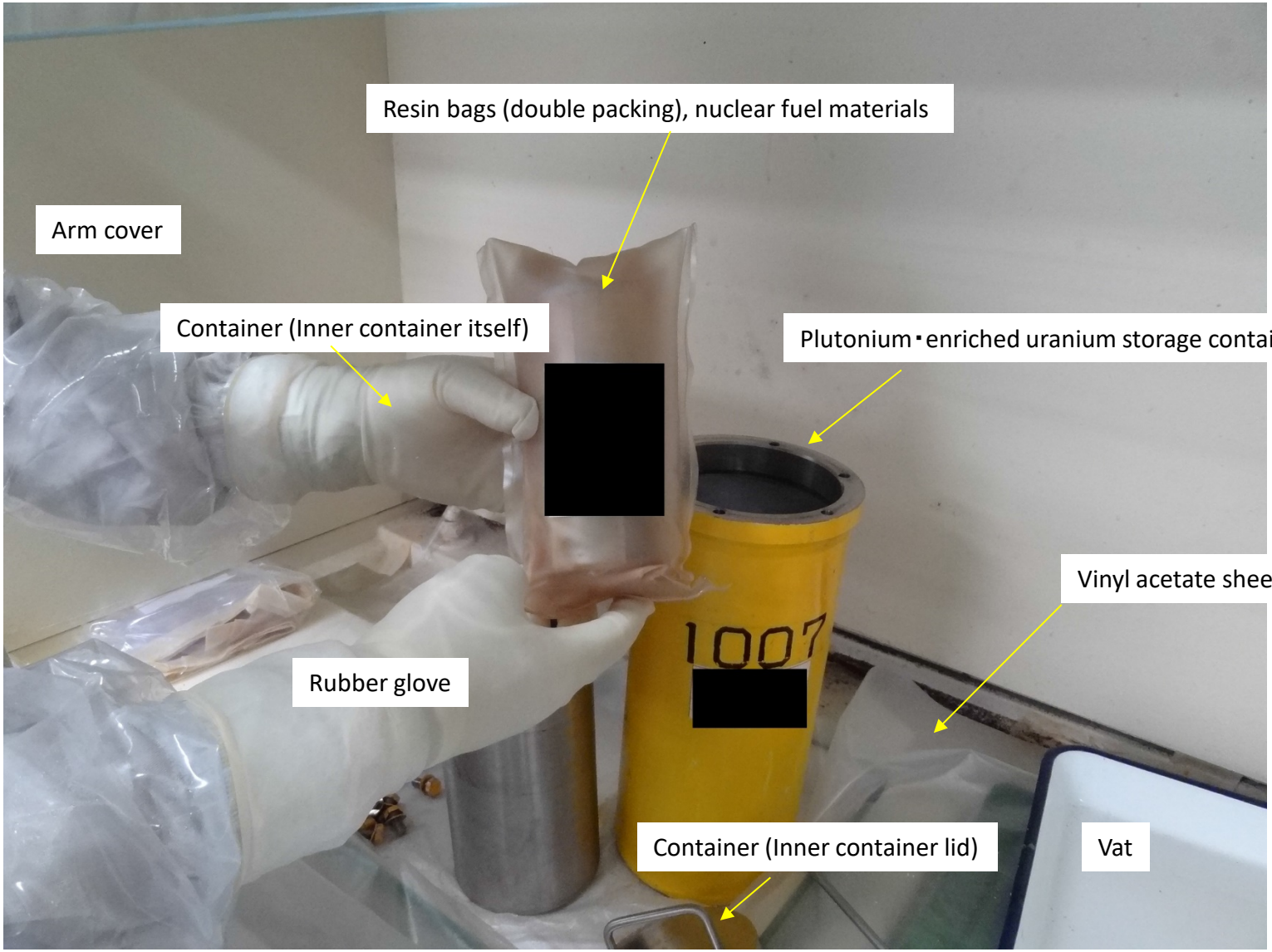


The vat and scissors were not used for this work.

Instead of using a bat, the inner floor of the hood is cured with the vinyl acetate sheet.

There is an inner Container in storage container.

Spanner and driver used to open the storage container.

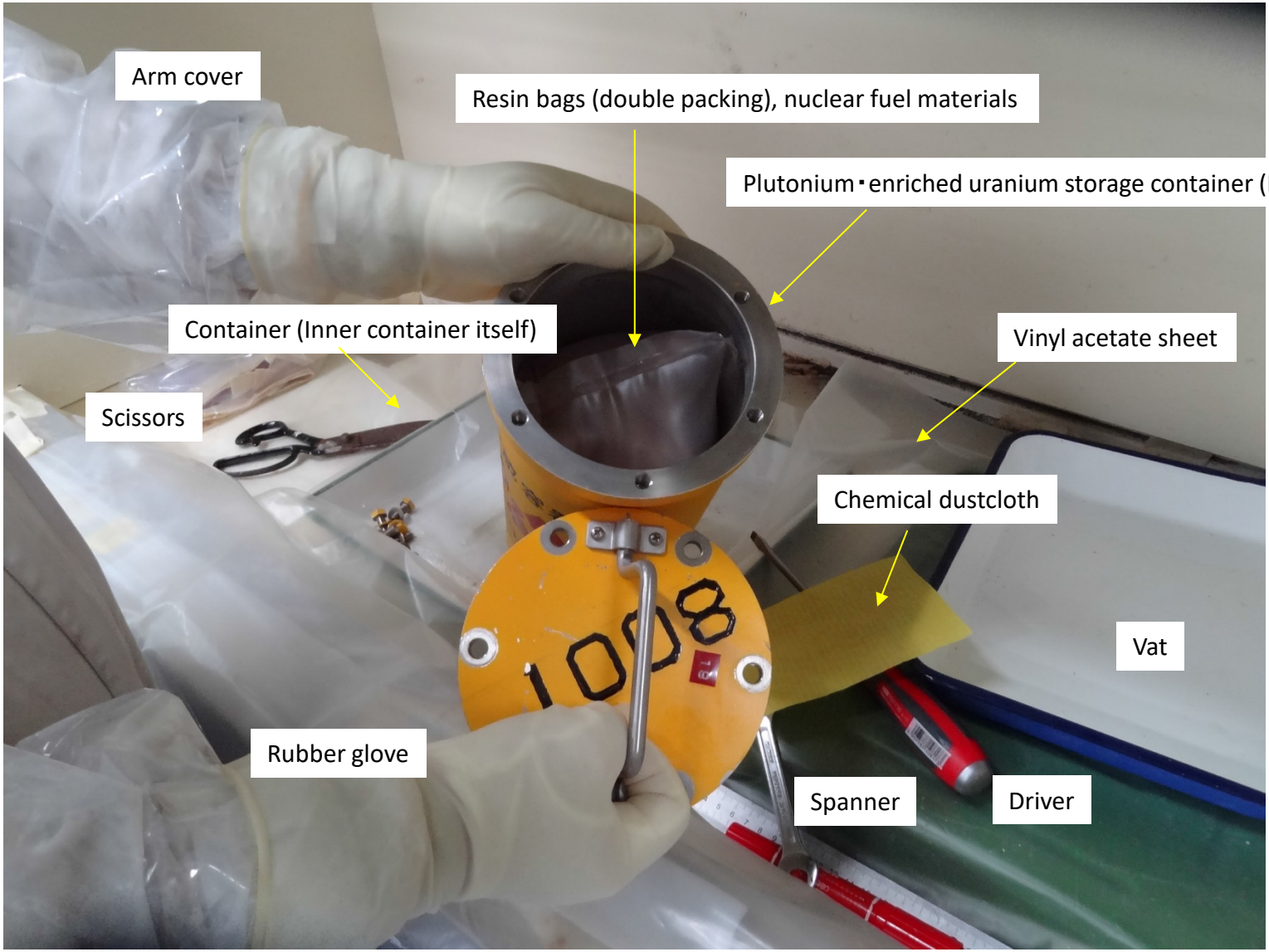


The vat and scissors were not used for this work.

Instead of using a bat, the inner floor of the hood is cured with the vinyl acetate sheet.

There is an inner Container in storage container.

Spanner and driver used to open the storage container.



The vat and scissors were not used for this work.

Instead of using a bat, the inner floor of the hood is cured with the vinyl acetate sheet.

There is an inner Container in storage container.

Spanner and driver used to open the storage container.

The vat and scissors were not used for this work.

Instead of using a bat, the inner floor of the hood is cured with the vinyl acetate sheet.

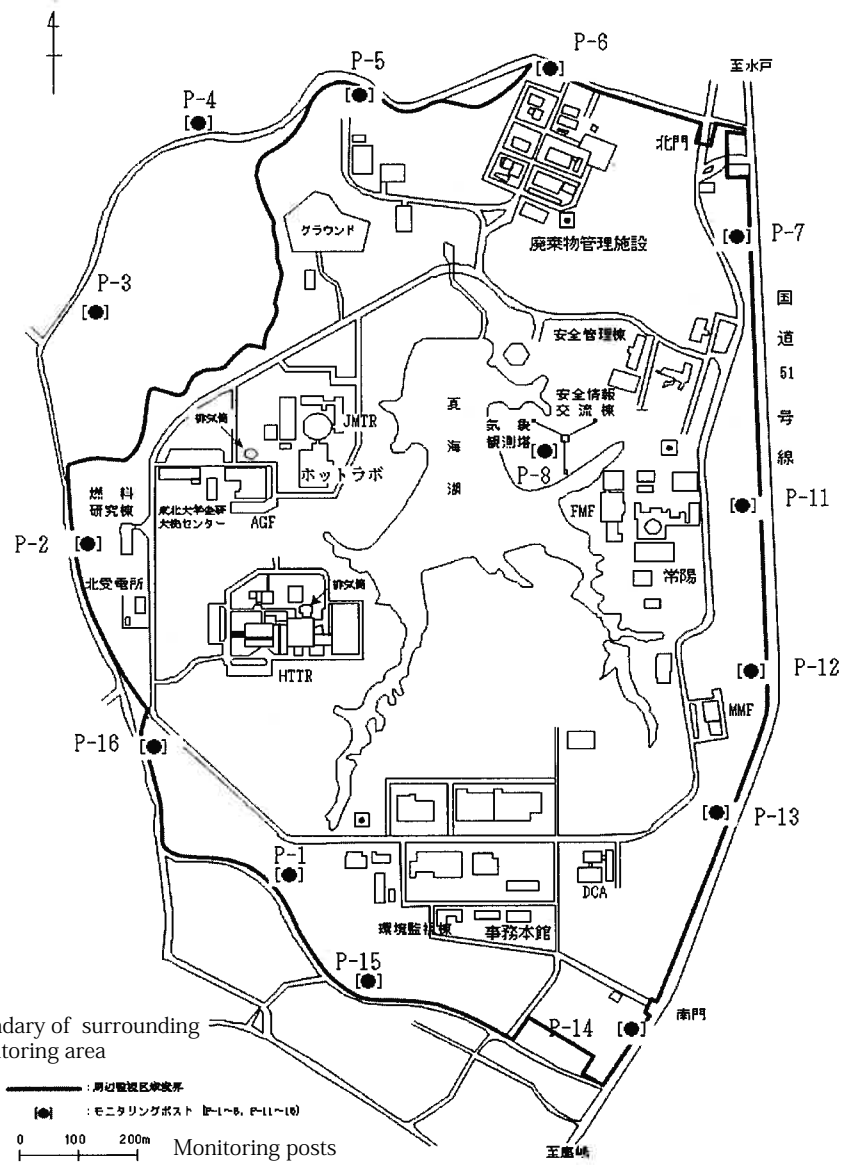
Attachment 2

Issue No.
発行番号 10 - 02

Environment Monitoring Result (13:00 June 15, 2017)

環境監視結果（2017年06月15日13時00分）

記入者 [redacted]



Boundary of surrounding monitoring area

Monitoring posts

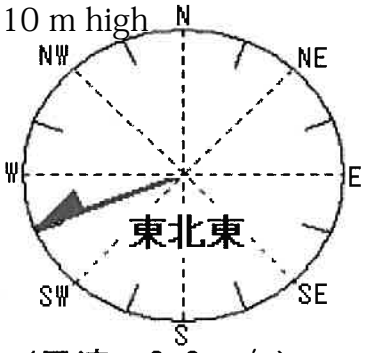
空間γ線量率測定地点及び気象観測地点

Measuring points of spatial γ ray dose rate and weather

Wind direction and speed

10m高風向・風速

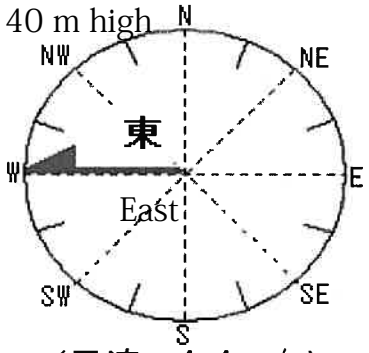
10 m high



（風速：2.9 m/s）

40m高風向・風速

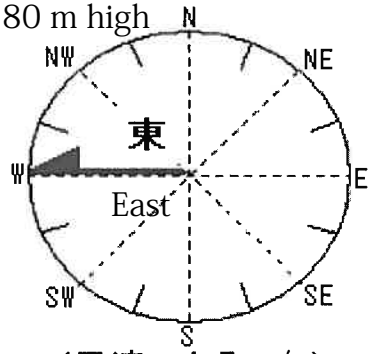
40 m high



（風速：4.4 m/s）

80m高風向・風速

80 m high



（風速：4.7 m/s）

大気安定度 A (B) C D E F G

Atomospheric stability

感雨 有・(無)

No raining

Next page

モニタリングポスト測定値（※）

ポストNo.	測定値 (nGy/h)	平常値 (nGy/h)	異常	ポストNo.	測定値 (nGy/h)	平常値 (nGy/h)	異常
P－1	63	63 55～80	有(無)	P－11	108	105 91～121	有(無)
P－2	68	65 58～81	有(無)	P－12	97	92 81～105	有(無)
P－3	51	54 46～67	有(無)	P－13	70	69 58～84	有(無)
P－4	60	59 52～68	有(無)	P－14	59	58 50～82	有(無)
P－5	53	57 51～70	有(無)	P－15	67	65 56～78	有(無)
P－6	53	55 49～68	有(無)	P－16	55	53 45～66	有(無)
P－7	76	78 69～91	有(無)				
P－8	58	58 51～71	有(無)				

特記事項：平常値の欄の上段の数値はH29年3月の1時間平均値。
下段の数値は1分値の最小～最大値を使用。

備考欄

測定値は通常値と比較して変化はない。

H23年3月以降、福島第一原子力発電所事故の影響により事故前に比べ高い線量率で推移している。
(※)緊急事態発生時において実効線量に換算する場合、環境放射線モニタリング指針に基づき換算係数1(Sv/Gy)を適用する。

Monitoring post measured values (※)

Post No.	Measured value (nGy/h)	Normal value (nGy/h)	Abnormality	Post No.	Measured value (nGy/h)	Normal value (nGy/h)	Abnormality
P-1	63	63 55-80	No	P-11	108	105 91-121	No
P-2	68	65 58-81	No	P-12	97	92 81-105	No
P-3	51	54 46-67	No	P-13	70	69 58-84	No
P-4	60	59 52-68	No	P-14	59	58 50-82	No
P-5	53	57 51-70	No	P-15	67	65 56-78	No
P-6	53	55 49-68	No	P-16	55	53 45-66	No
P-7	76	78 69-91	No	Notes: Upper values in "Normal value" columns are average values per hour in March, 2017. Lower values are minimum-maximum values in 1 minute.			
P-8	58	58 51-71	No				

Remarks

Measured values are no change from the normal values.

After March 2011, because of the influence of Fukushima Daiichi nuclear power plant accident, dose rates have been higher than before.

(※)When converting to effective dose at the time of emergency situation occurrence, conversion factor 1 (Sv/Gy) should be adapted based on the environmental radiation monitoring guidelines.

PFRF Radiation Monitor Data

(Radiation Protection Report No. 70)

Recipients	General manager of Alpha-Gamma Section, General manager of Radiation Safety Management Section II
Report time	13:13 June 15, 2017

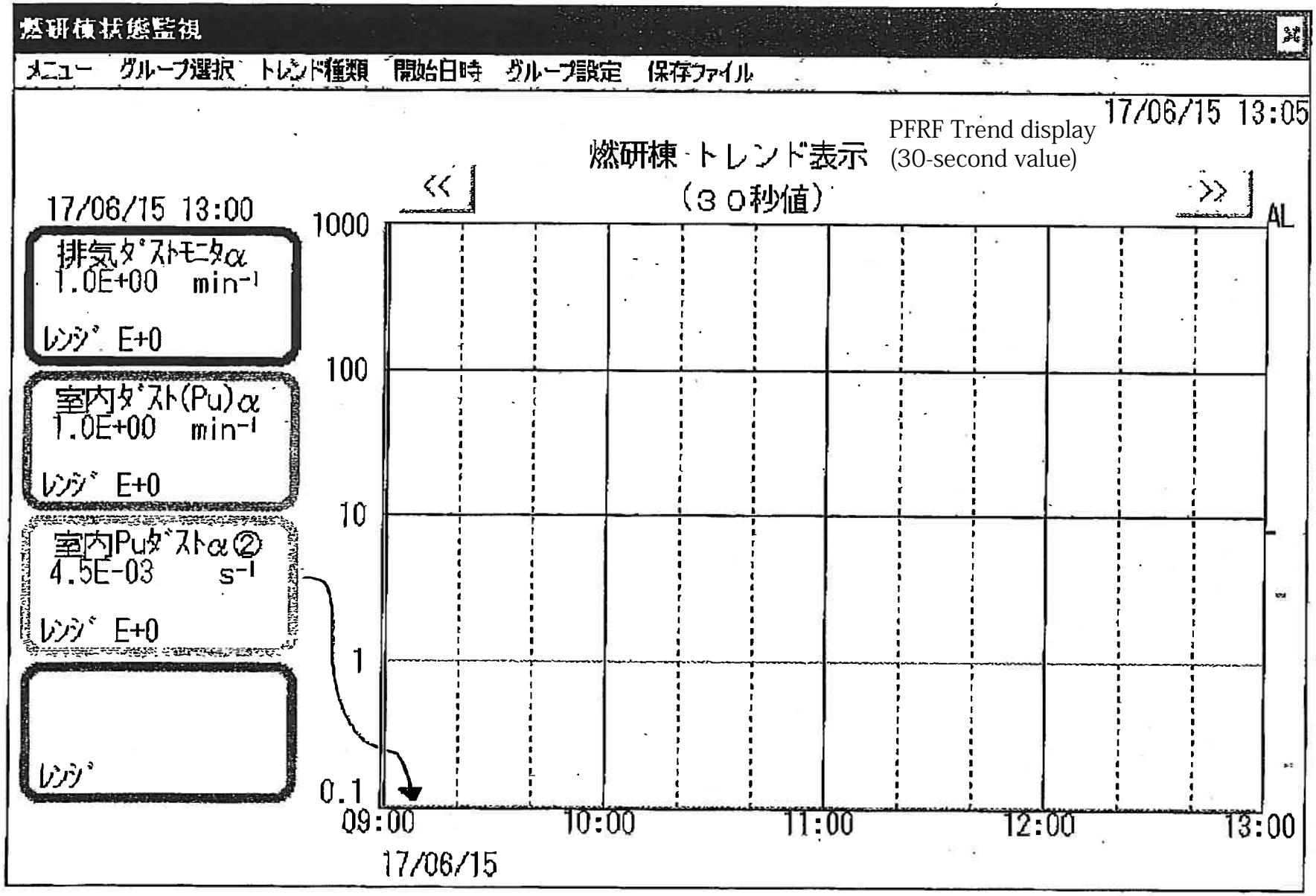
Confirmed time	13:00 June 13, 2017		-
Monitor	Indicated value	Normal indicated value	Judgement
Ventilation dust monitor α (min^{-1})	< 1.0	1.0E+00 ~ 4.1E+00	Within the normal indicated value range
Room dust monitor α (min^{-1})	< 1.0	1.0E+00 ~ 1.7E+00	Within the normal indicated value range
Pu dust monitor No.1 (s^{-1})	< 0.1	~ 1.0E-01	Within the normal indicated value range
Pu dust monitor No.2 (s^{-1})	< 0.1	~ 1.0E-01	Within the normal indicated value range

Monitor		Indicated value (μ Sv/h)	Normal indicated value (μ Sv/h)	Judgement
Gamma-ray area monitors	Area monitor No.1	80	80 ~ 110	Within the normal indicated value range
	Area monitor No.2	110	90 ~ 120	Within the normal indicated value range
	Area monitor No.3	79	70 ~ 100	Within the normal indicated value range
	Area monitor No.4	120	90 ~ 120	Within the normal indicated value range
	Area monitor No.5	70	70 ~ 100	Within the normal indicated value range

Confirmed result of radiation monitor	No abnormality
Notices	Area monitors contain radiation sources, so the values indicate around 100 μ Sv/h constantly. Pu dust monitor No.2 indicated value is normal, no change from before the incident.
Attachments	2 sheets (Trends)

放管 70 報 別添 ①

PFRF Situation Monitor



Ventilation dust monitor α

Room dust monitor (Pu) α

Room Pu dust monitor α ②

室内Puダストα② 通常指示範囲内 (< 0.1 s^{-1})

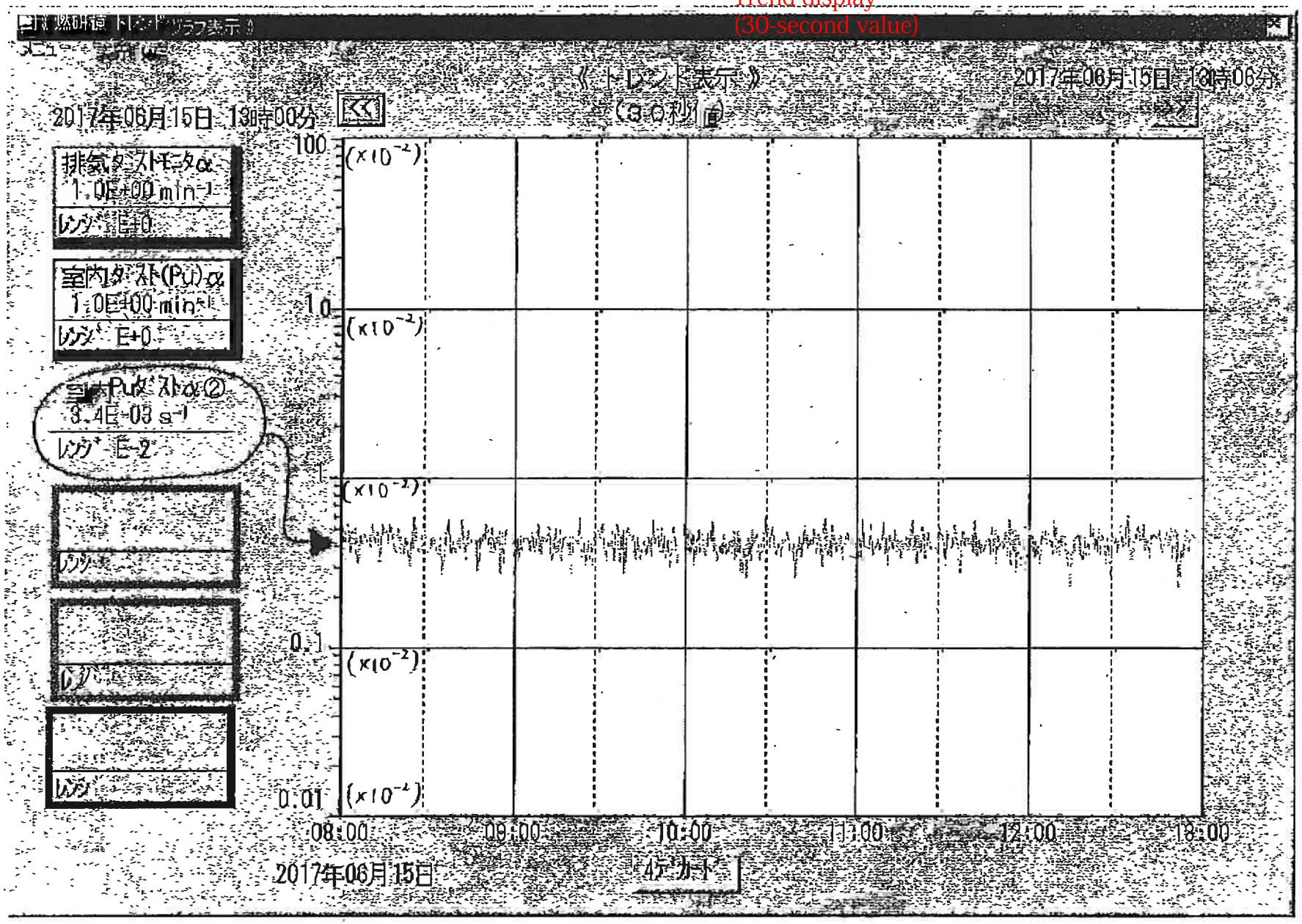
Room Pu dust monitor α ② indicated value within the range ofnormal. (0.1 s_{-1})
→Vertical axis range switched.→Attachment②

→ 縦軸レンジを切替え → 別添 ②

放管 70 報 別添②

PFRF Trend Graphic Display

Trend display
(30-second value)



Ventilation dust monitor α

Room dust monitor (Pu) α

Room Pu dust monitor α ②

室内 Pu ダスト α ② 通常指示範囲内 (<0.1 s^{-1})

Room Pu dust monitor α ② indicated value within the range of normal. (<0.1 s^{-1})

Attachment 3

June 15, 2017

Position of inspection work with hood

Oarai Research and Development Center

Japan Atomic Energy Agency

1. Outline

The accident occurred during the work for appropriately control the nuclear fuel materials stored in glove boxes, etc. of PFRF. This work is divided into below three steps.

① Check the storage situation of each storage container

② Encapsulate nuclear fuel materials taken out from the glove boxes

③ Store recovered containers in storage containers

The accident occurred during the work ①.

2. Work plan

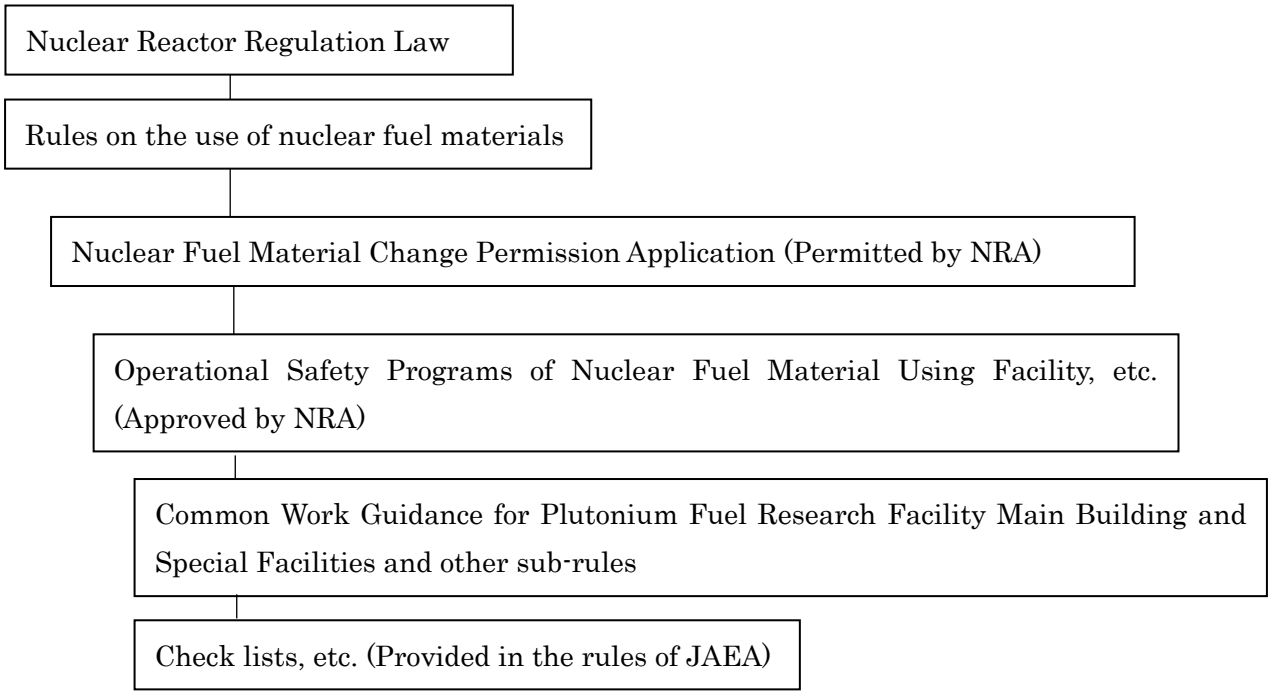
The work shown above falls into work carried out in a controlled area, and the radiation work slip is supposed to be made as a radiation work plan based on the Chapter 2, Article 16 of the "Operational Safety Programs of Nuclear Fuel Material Using Facility, etc., Oarai Research and Development Center (North Zone), Japan Atomic Energy Agency" *1.

When making the radiation work slip, it is required by the "Common Work Guidance for Plutonium Fuel Research Facility Main Building and Special Facilities" which is a sub-rule of the operational safety programs to attach the following documents: the safety work manual ("storing work of nuclear fuel materials"*2 in the case of this work), the general safety check list, the risk assessment, the check list of the operational safety programs, the use permission check list and the radiation safety check list.

The accident occurred during the work falling into "check of the storage container and contamination inspection with Hood-1 in association with transporting nuclear fuel materials to nuclear fuel storage" which is written in the third line of "2. work method (1) check and store nuclear fuel materials" of the safety work manual. The inspection work with Hood-1 is permitted in the "Nuclear Fuel Material Change Permission Application of Oarai Research and Development Center (North Zone), Japan Atomic Energy Agency"*3 with aimed use being "contamination inspection" and outline of use being "carry out work such as check of storage container".

3. Work procedure

The work with hood H-1 is provided in the manual “Safety Work with Hood” attached to the “Common Work Guidance for Plutonium Fuel Research Facility Main Building and Special Facilities”. The work was carried out following this manual.



*1:

Chapter 3 Work, work management, etc. in a controlled area

Article 16

Radiation work plan

1. The General Manager is responsible for the radiation management concerning the work of radiation workers.

2. The General Manager shall take measures for safety, taking into the items below consideration:

(i) Place of work and period or work

(ii) Contents of work

(iii) Wearing necessary personal dosimeter and protection

(vi) Measures to lower the dose

(v) Dose associated with work

3. When radiation work of the preceding paragraph is conducted, the General Manager shall obtain consent from the Controlled Area Manager on the place of work and period of work in advance.

*2

“Check of storage container and contamination inspection shall be carried out with Hood H-1 in association with transporting nuclear duel materials to the nuclear fuel storage.”

*3:

Table 2-1 Use method (hood) (continue 5)

Place of use	Hood	Purpose of use	Outline of use
Room No. 108 (Analyzing room)	H-1	Contamination inspection	1) Carry out work such as inspection of the storage container

Attachment 4

Contamination at Plutonium Fuel Research Facility (PFRF) in Oarai Research and Development Center (chronological order)

【June 6 (Tue)】

Around 11:15: During inspection work of storage container containing nuclear fuel materials (work with a hood) in Room No. 108 (controlled area) at PFRF, it is confirmed the resin bag in the storage container was broken, and the possibility of radioactive contamination of five worker's bodies was confirmed. The five workers wore half-faced masks. They wore cloth gloves, rubber gloves①, rubber gloves② from inside in triplicate for the protection gloves for this work.

Around 11:20: The worker in Room No. 108 requested to interrupt the operation of molten salt electrolysis furnace in Room No. 101 in the controlled area by telephone.

The worker in Room No. 108 reported the occurrence incident to the Radiation Safety Management Section II.

Around 11:23: Worker A requested the director of Fukushima Fuels and Materials Department who is the facility management supervisor to "Come to PFRF because of an occurrence of contamination." by telephone.

Around 11:25: Two staffs of the Radiation Safety Management Section II arrived at PFRF. The staff of Radiation Safety Management Section II confirmed Pu dust monitor (No.2: Room No. 108) indicated a normal value.

Around 11:30: The section staff confirmed radiation monitor showed no abnormality.

Around 11:35: The section staff (one of two above) entered the controlled area.

Around 11:37: The section staff confirmed no contamination in the corridor of the laboratory.

Around 11:37: The 5 workers confirmed contamination of all members as a result of using an α ray surface contamination checker for themselves.

Around 11:48: The director of Fukushima Fuels and Materials Department who is the facility management supervisor reported the general manager of Emergency Management Section who is a liaison in charge, on-site Command Post was set.

Around 11:54: The director of Fukushima Fuels and Materials Department who is the facility management supervisor directed setting a greenhouse (*) in the corridor in front of Room No. 108.

12:00: The Oarai on-site Response Headquarters was set up.

12:23: The staff of Radiation Safety Management Section II was requested to enter the area to check contamination of the setting place of the greenhouse.

12:27: FAX (the 1st report) was sent. → 12:52 FAX acceptance was confirmed.

12:43: Greenhouse materials were ready.

12:52: One staff of Radiation Safety Management Section II and one staff of Alpha-Gamma Section entered the controlled area. They confirmed no abnormality on the workers' health condition.

13:05: No contamination of walls etc. of Room No. 108 (outer boundary) was confirmed. Gaps were sealed.

13:15: Five staffs (two from PFRF, three from other facilities) to construct the greenhouse entered the area, construction of the greenhouse at the entrance of Room No. 108 started.

13:22: FAX (the 2nd report) was sent. → 13:40 FAX acceptance was confirmed.

13:45: Additional staffs (one from Alpha-Gamma Section, one from another section) to construct the greenhouse entered the area.

13:55: Rise in the indicated value of the "Pu dust monitor No.2 (Room No. 108)" was confirmed (circa 5×10^{-8} Bq/cm^3 (average density of a week)). The indicated value of "ventilation dust monitor" was confirmed to be within the range of normal.

14:00: Framework of the greenhouse was completed. The work to put vinyl sheet, etc. started.

14:20: The indicated value of the "monitoring post (P-2)" was normal. No impact on environment.

14:29: Construction of the greenhouse at the entrance of the Room No. 108 was completed.

14:30~: The workers started to leave the site (inspection of body contamination).

14:44~: Inspection of Worker A's contamination: 100 min^{-1} at a maximum (α ray, cap), no body contamination after removing radiation protectors; Result of nasal cavity contamination test: normal

14:53: FAX (the 3rd report) was sent. → 15:15 FAX acceptance was confirmed.

14:59~: Inspection of Worker B's contamination: 3,000 min-1 at a maximum (α ray, coverall); Body contamination after removing radiation protectors: body contamination was confirmed; Ears 500 min^{-1} (α ray); Result of nasal cavity contamination test: normal; Shower done.

14:59~: Inspection of Worker B's contamination: 3,000 min^{-1} at a maximum (α ray, coverall); Body contamination after removing radiation protectors: body contamination was confirmed; Ears 500 min^{-1} (α ray); Result of nasal cavity

contamination test: normal; Shower done.

15:25~: Inspection of Worker C's contamination: 1,000 min^{-1} at a maximum (α ray, cap); Result of nasal cavity contamination test: 13 Bq (α ray); Shower done.

16:00~: Inspection of Worker D's contamination: 1,800 min^{-1} at a maximum (α ray, coverall); Result of nasal cavity contamination test: 3 Bq (α ray); Shower done.

16:07~: Inspection of Worker E's contamination: greater than >100,000 min^{-1} at a maximum (α ray, coverall); Result of nasal cavity contamination test: 24 Bq (α ray)

16:27: Room No. 108 was designated as the entry restriction area.

17:05: FAX (the 4th report) was sent. → 17:40 FAX acceptance was confirmed.

18:52: Decontamination of all the five workers completed.

18:55: All the five workers left the area.

19:05: The five workers left for Nuclear Fuel Cycle Engineering Laboratories.

19:40: Dust collection filters of the "Pu dust monitor No.2 (Room No. 108)" were replaced. The indicated value was confirmed to be within the range of normal. Ventilation dust monitor: The indicated value was confirmed to be within the range of normal.

19:41: The five workers arrived at the Nuclear Fuel Cycle Engineering Laboratories.

19:59: Measurement of Worker E using a lung monitor started.

22:05: Injection of chelating agent to the workers started.

23:33: Inspection of the five workers using a lung monitor completed. As a result of the measurement, 2.2×10^{4} Bq and 2.2×10^{2} Bq at maximum were confirmed regarding Pu-239 and Am-241 respectively.

【June 7 (Wed)】

1:05: Injection of chelating agent to all the workers completed.

10:00~: The five workers left Oarai Research and Development Center for the National Institute of Radiological Science (NIRS). At 11:55 they arrived at NIRS. Measurement using lung monitor started after inspection of body contamination and decontamination.

12:18: FAX (the 2nd report, the 5th in total) was sent. → 13:01 FAX acceptance was confirmed.

13:27: JAEA reported the Nuclear Regulation Authority (NRA) judging it as the one which report is required by laws and regulations.

17:05: FAX (the 3rd report, the 6th in total) was sent. → 17:56 FAX acceptance was confirmed.

18:55: As a result of contamination survey in Room No. 108, 55 Bq/cm^2 (α ray) at a maximum was confirmed.

【June 8 (Thu)】

10:43: FAX (the 4th report, the 7th in total) was sent. → 11:20 FAX acceptance was confirmed.

16:40: Clearance and decontamination in the greenhouse was completed.

* Greenhouse

When implementing maintenance of cells with which nuclear fuel materials, etc. are handled, or other radiation works, it should be set up from the viewpoint of prevention of contamination spread.

Last five years (from FY2012 to FY2016), it have been set up about 30 times as part of regular maintenance work at Materials Monitoring Facility (MMF), Fuel Monitoring Facility (FMF) and Alpha Gamma Facility (AGF).