Unit 3 X-6 Penetration Front Chamber Investigation Results

December 26, 2024

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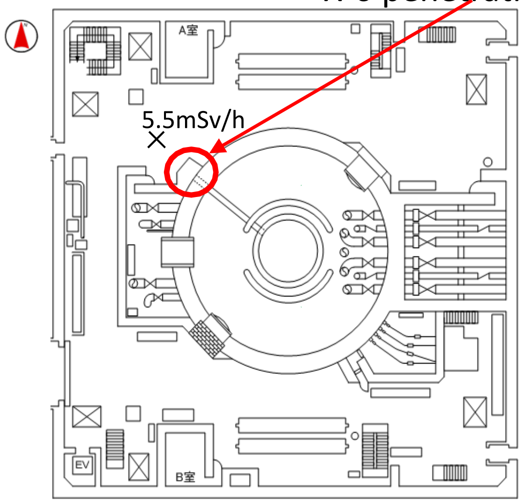
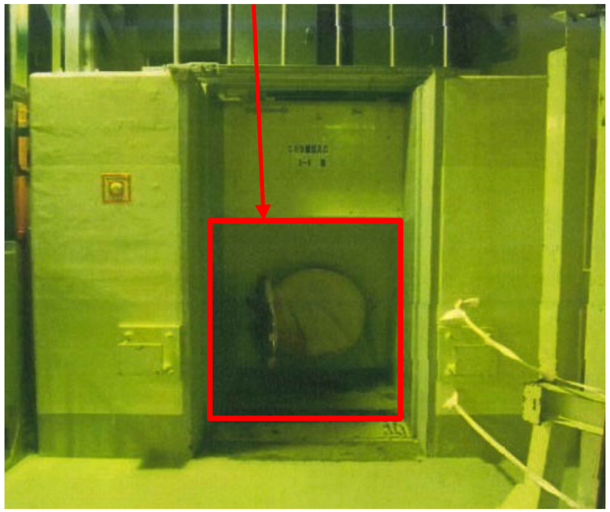
Tokyo Electric Power Company Holdings, Inc.

1. Overview

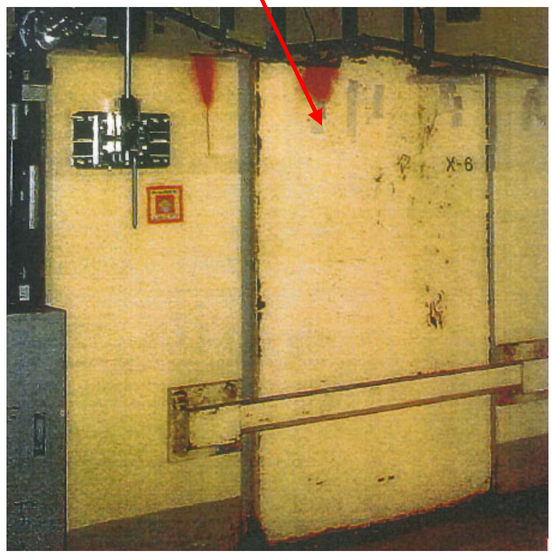
- The X-6 penetration is being used to retrieve fuel debris at Unit 2. As with Unit 2, there is also an X-6 penetration at Unit 3 that we expect to be able to effectively use as an access route for PCV internal investigations and fuel debris retrieval.
- In order to leverage the X-6 penetration for PCV internal investigations and as an access route, we must first check the condition of the Unit 3 X-6 penetration and are therefore planning an investigation of X-6 Penetration front chamber.
- The aforementioned penetration front chamber is shielded by a steel wall (filled with concrete). Since we expect that the penetration front chamber will be a high-dose environment just like Unit 2, we shall drill a hole in the shield wall and insert an investigation device to take camera footage and dose measurements.
- Camera footage will be taken on December 4, dose measurements on December 6, and a smear sample taken on December 12 and 13th.



Unit 3 reactor building, 1st floor



In front of the X-6 penetration
(during periodic inspection prior to the disaster: no shielding)



In front of the X-6 penetration
(after the disaster: Shielding in place)

Reference 1. X-6 penetration front chamber investigation

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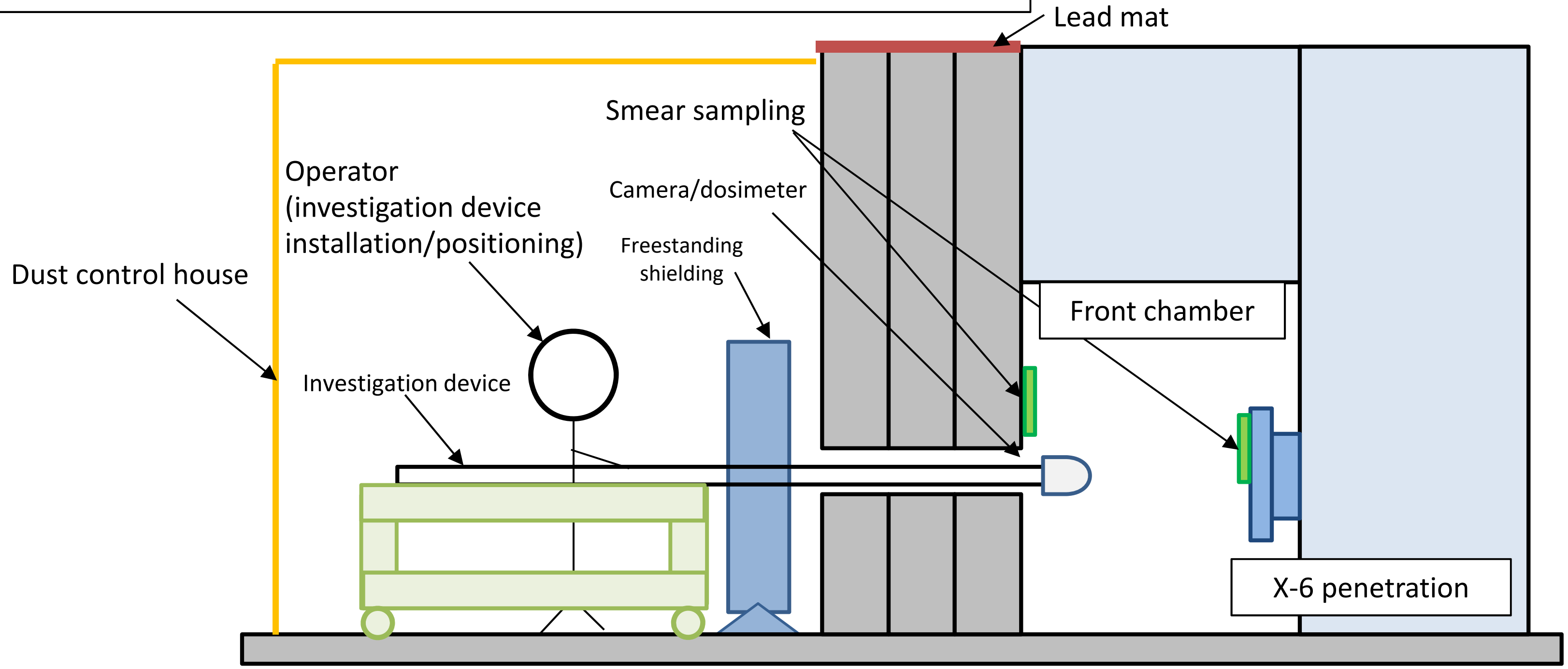
- After a hole has been bored into the shield wall of the aforementioned penetration front chamber, an investigation device shall be inserted through the hole for conducting investigation.
  - A camera will be used to perform a visual check, dose measurements will be taken, and smear samples (from the inner wall of the shielding ※1, and the face of the flange) will be taken.
  - The camera footage will be taken remotely, and the device installation/positioning adjustment will be done manually※2.
- The operator will be behind a freestanding shield that will be placed in addition to the existing shielding in order to reduce exposure.
- The investigation device (camera/dosimeter) will be covered in order to prevent the spread of contamination.
- In addition to plugging up the hole after the investigation, portable shielding will be installed to prevent the spread of contamination from inside the front chamber and prevent exposure

※1 A sample will be taken from the inner wall of the shielding as a test
※2 When the camera footage is being reviewed, the investigation device does not need to be operated so the operator will retreat to a low-dose area to wait

【 Worker exposure reduction measures 】
- It is expected that the maximum surface dose of the X-6 penetration flange will be 1.6Sv/h
- Planned worker dose: 3mSv/person/day
- In order to avoid the effect of gamma rays from the hole (direct radiation) the operator will not stand in front of the hole and shielding will be erected to reduce exposure



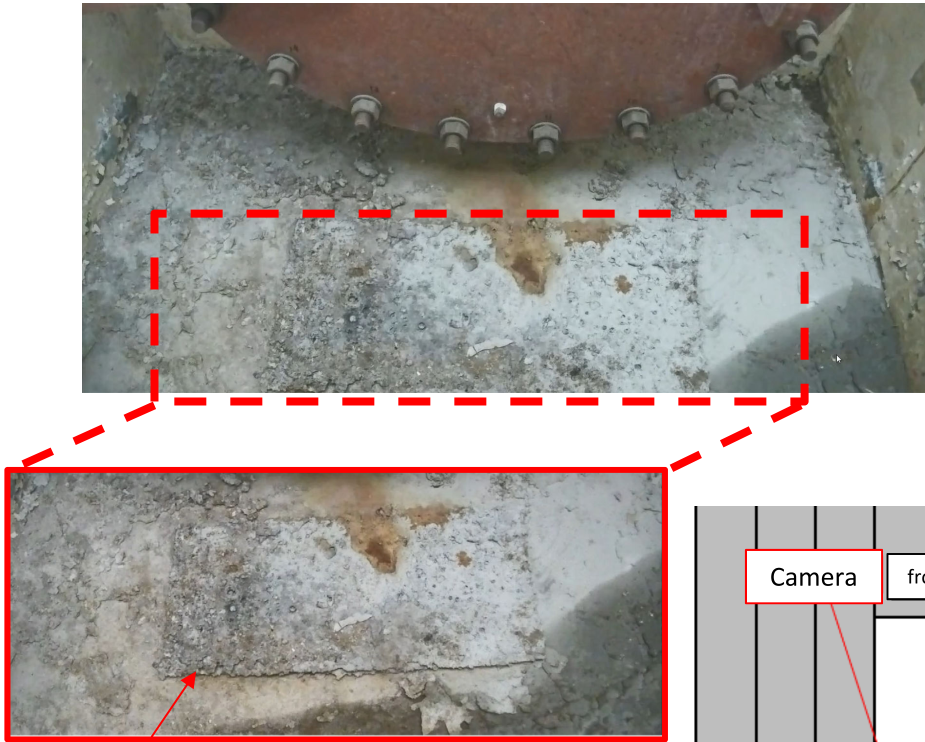
2. Photos from inside the X-6 penetration front chamber (1/3)

- No adhesions of molten material were found on the flange face of X-6 penetration like those seen at Unit 2, and the external conditions are not very different compared to prior to the disaster.
- There are no deposits on the front chamber floor like those confirmed at Unit 2, and small diameter clumps of what is assumed to be concrete can be seen.

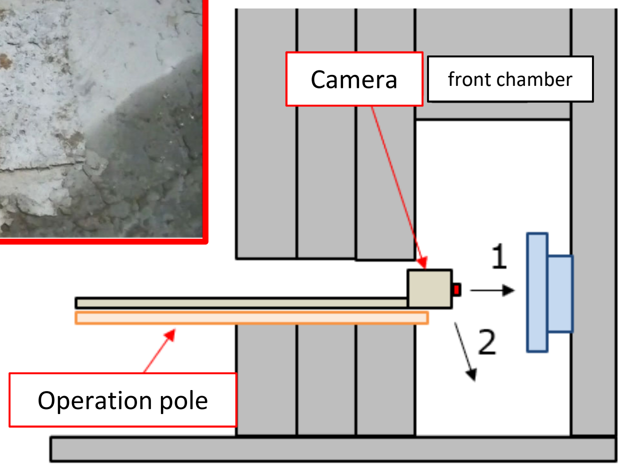
1. Front (flange face)

N_2 injection insertion line for flange leak tests

2. Front chamber floor

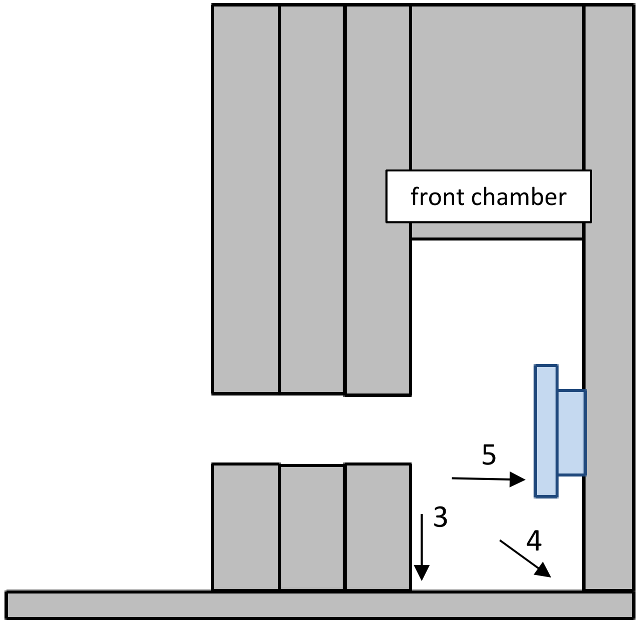


Embedded metal fixture that serves as a base for the CRD replacement rails

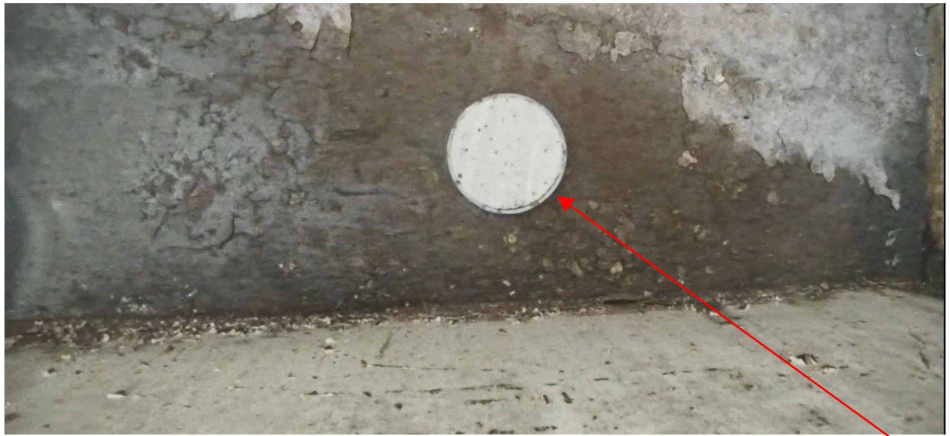


Direction of photos (side view)

2. Photos from inside the X-6 penetration front chamber (2/3)



5. N_2 injection insertion line for flange leak tests



3． Floor (shield wall side)

4． Floor (back right)

External frame of shielding that fell when the hole was bored

2. Photos from inside the X-6 penetration front chamber (3/3)

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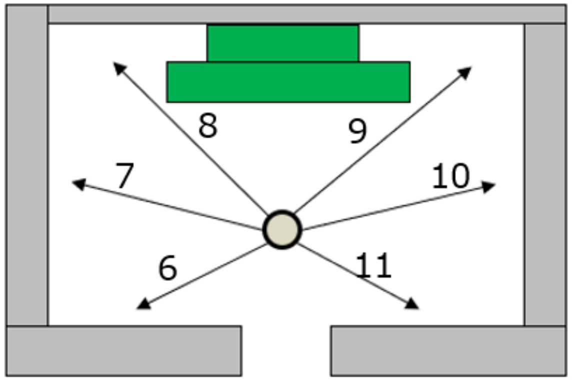
8. Left side of flange

Direction of ceiling

9. Right side of flange

Direction of ceiling

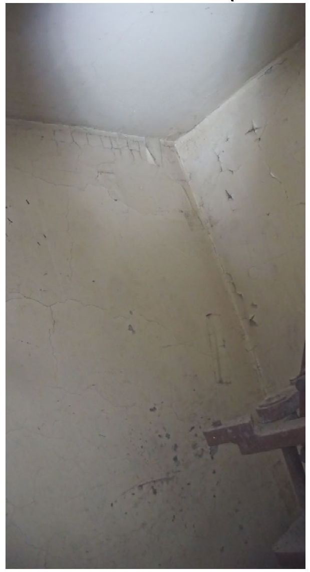


Direction of photos (top view)

6. Shield wall (left side of flange)

Direction of ceiling

7. Side of front chamber (left side of flange)

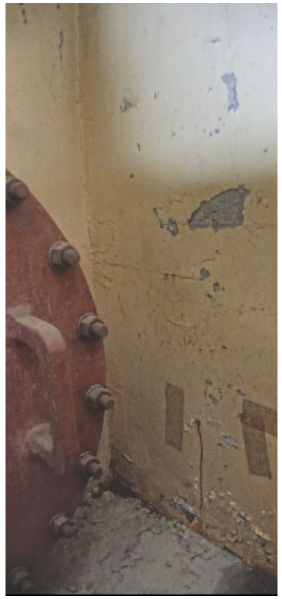


Direction of ceiling

11. Shield wall (right side of flange)

Direction of ceiling

10. Side of front chamber (right side of flange)



Direction of ceiling

3. Unit 3 X-6 penetration front chamber interior dose measurement results

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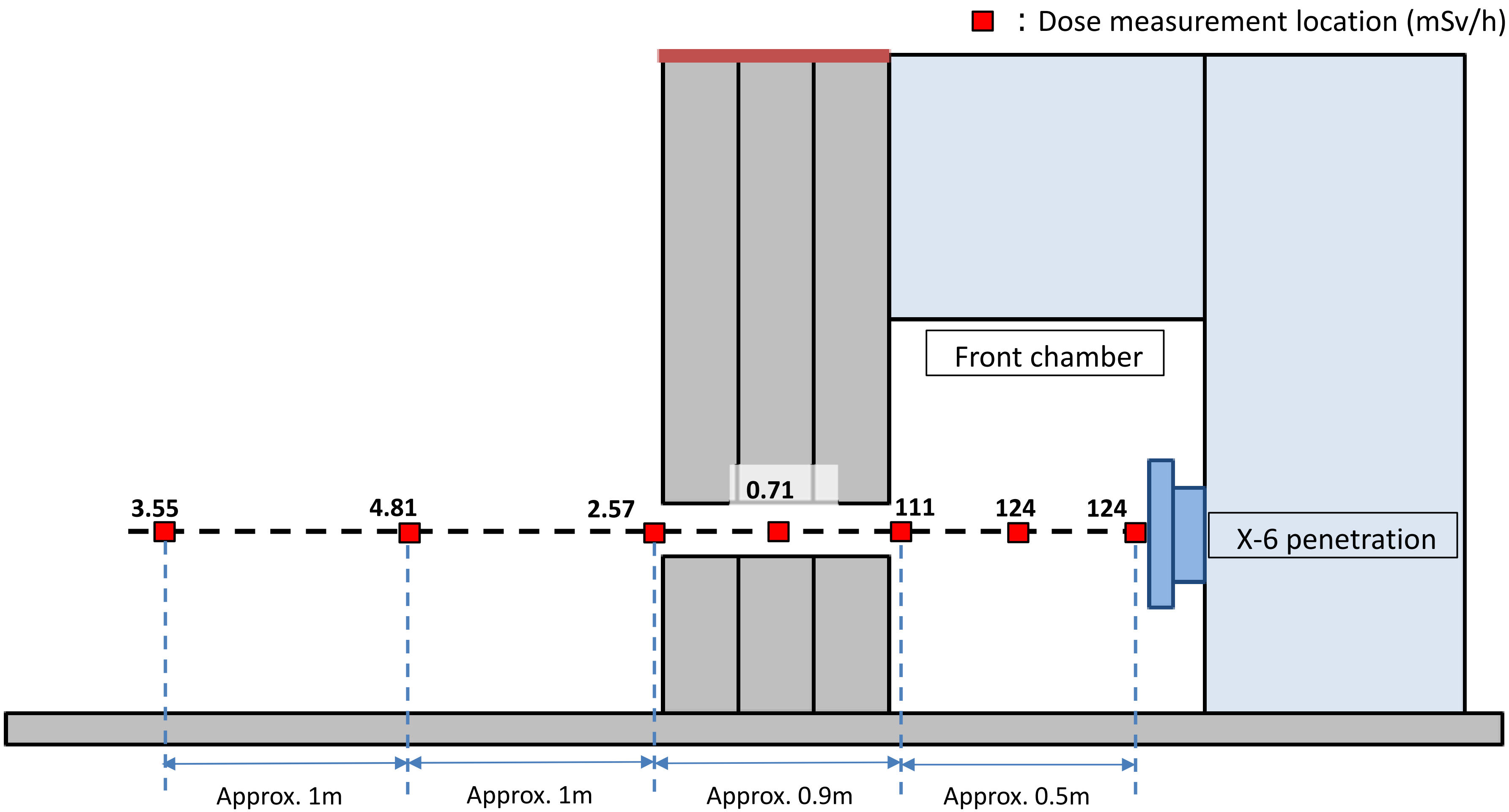
- A maximum dose of 124mSv/h was measured inside the X-6 penetration front chamber.



4. Smear results from inside the Unit 3 X-6 penetration front chamber

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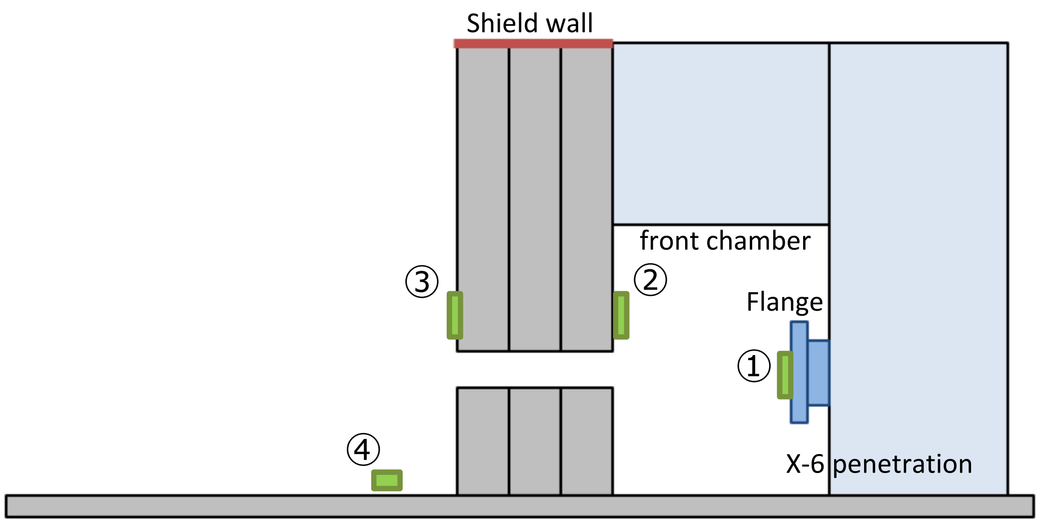
Smear results from inside the X-6 penetration front chamber

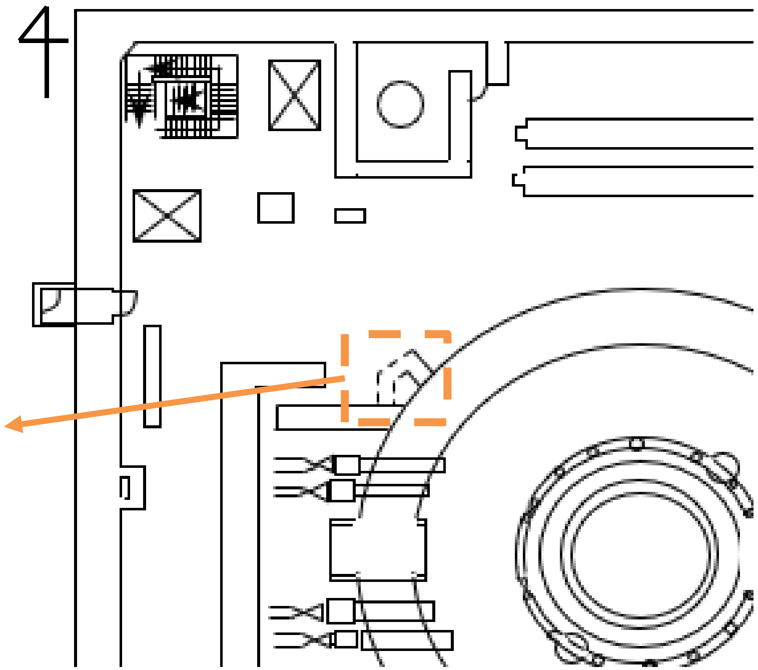
Results of analysis by TEPCO

No.	Smear sampling location	Unit	Cs-134	Cs-137	Gross β	Gross α
①	Flange surface	Bq/cm^2	4.2E-01	4.2E+01	3.1E+01	<1.5E-03
②	Inner wall of the shielding	Bq/cm^2	1.8E+02	1.4E+04	9.4E+03	<2.0E-01
③	(Reference) Outside surface of shielding wall	Bq/cm^2	8.4E+00	6.6E+02	5.1E+02	6.0E-03
④	(Reference) Floor on the northwest side of the first floor of the R/B	Bq/cm^2	1.5E+02	1.1E+04	7.2E+03	<2.0E-01

※ Assumed reason why contamination is higher at ② than ①
In addition to the flange, it is possible that radioactive substances could find their way into the X-6 penetration front chamber through gaps in the ceiling of the front chamber and shield walls. Since the top of the shield walls were showered with water to decontaminate them after the disaster, it is possible that radioactive substances found their way in through these gaps.



X-6penetration front chamber



Unit 3 R/B 1st Fl. Northwest corner

5. Conclusions

- We have investigated X-6 penetration front chamber at Unit 3, no adhesions of molten material were found on the flange face of X-6 penetration like those seen at Unit 2, and the external conditions are not very different compared to prior to the disaster.
- Furthermore, air dose rates inside the front chamber were high at maximum 124mSv/h, but compared to inside the Unit 2 front chamber, the air dose rate is low, and no molten materials were found on the floor.
- Going forward, we shall deliberate methods for reducing the dose rates inside the front chamber and removing the shield walls based on these results. And, after doing so, we shall decide whether or not additional investigations are needed and plan them accordingly.

  (The issues to be addressed in the removal of the shield wall)

  - Cables for PCV monitoring instruments are laid on top of the shield wall, and the cable route will have to be changed before the shield wall is removed.
  - The shield wall is heavy (more than 1 ton/sheet), and it is necessary to deliberate how to remove it (including transportation/dismantling) in a high-dose environment.
- The investigation results will also be used for the Fukushima Daiichi NPS accident investigation.

Reference 2. Photos of the X-6penetration prior to the accident

Photo from flange leak tests

Cables stored

Double flange seal

Reference 3. Conditions of Unit 2 X-6 penetration front chamber (2015)

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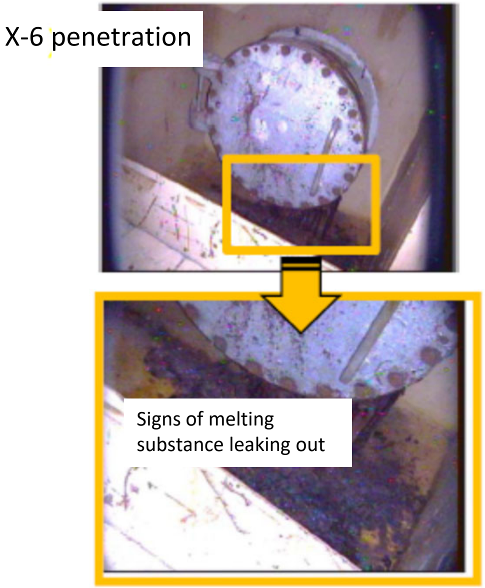
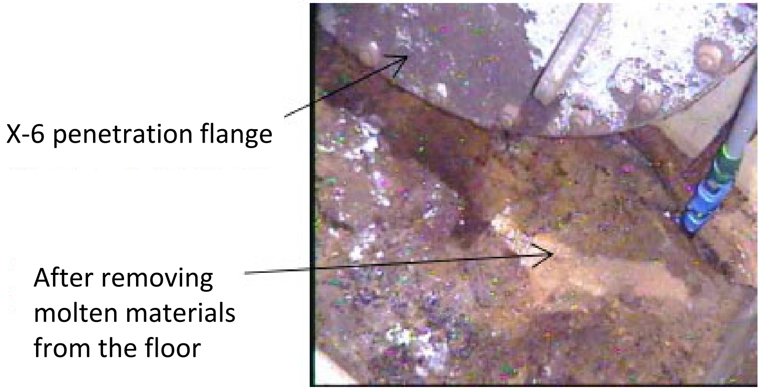
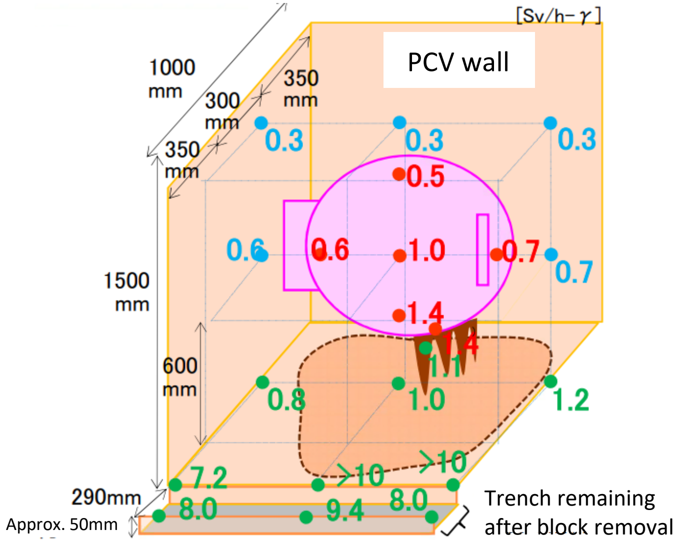
In front of the X-6 penetration
（After removal of concrete blocks）



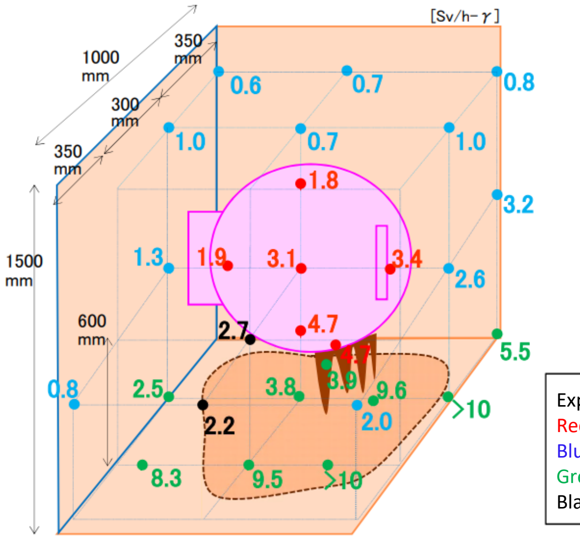
X-6penetration flange molten material
（During removal of concrete blocks）



Floor in front of X-6 penetration
（After removal of concrete blocks）



γ rays Air dose rate measurement results(collimated)



γ rays Air dose rate measurement results (not collimated)

Explanatory note
Red letters: Penetration surface dose rate
Blue letters: Ceiling/wall surface dose rate
Green letters: Floor and molten material surface dose rate
Black letters: Dose rate above the center of the penetration

Reference 4. Unit 2 X-6 penetration shield wall removal (2015)

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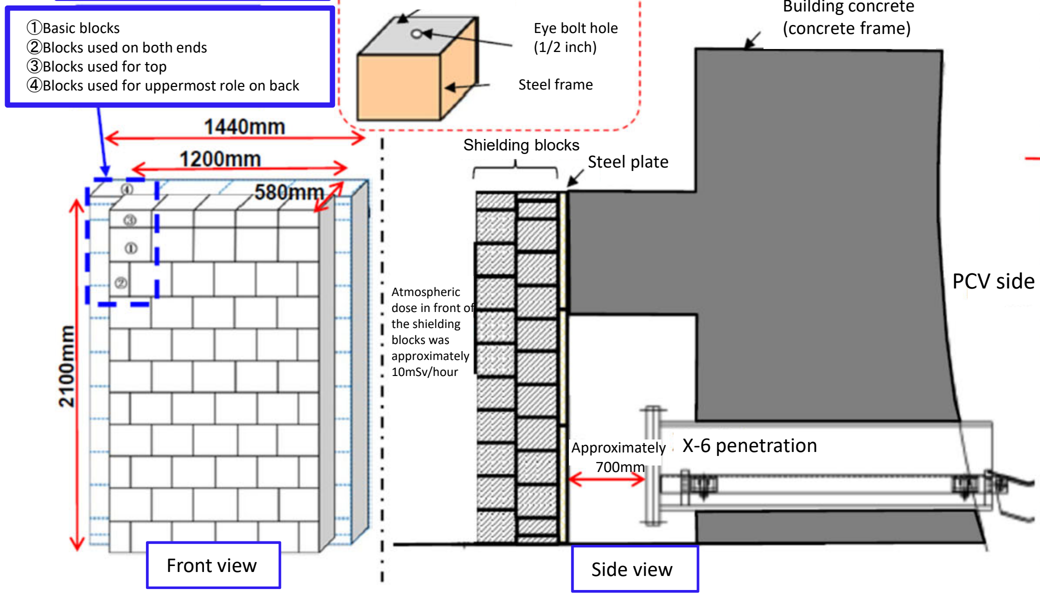
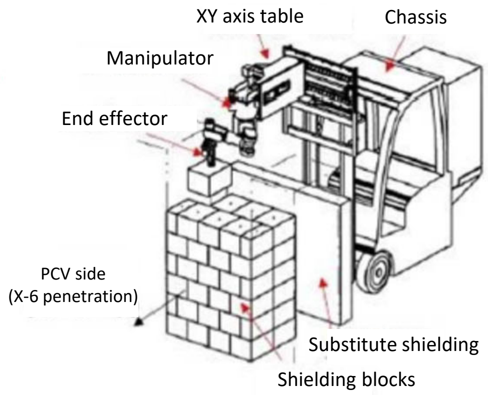
Shielding block diagram



Field investigation results found that the shielding is comprised of concrete blocks with shapes 1~4, that are estimated to weigh approximately 36kg maximum (shape 1)

Field conditions photo



Remotely operated equipment

In front of the X-6penetration
（After concrete block removal）

- ■ Concrete blocks were piled up to shield the front of the Unit 2 X-6 penetration.
- ■ A remote operated device and forklift were used to remove the concrete blocks.

■ The area around the X-6 penetration was photographed, dose measurements were taken, and the following were confirmed:

- Molten material and signs of molten material were found on the floor of the X-6 penetration flange.
- Dose levels exceeded 1000mSv/hour at the center of the X-6 penetration flange.