

# Dose Rate Reduction Experiences of Piping Replacement at Fukushima Daiichi Unit 4 and 5

Atsutoshi Makihira

ALALA Mini-Workshop

Nov.9, 2005 Hamaoka NPS



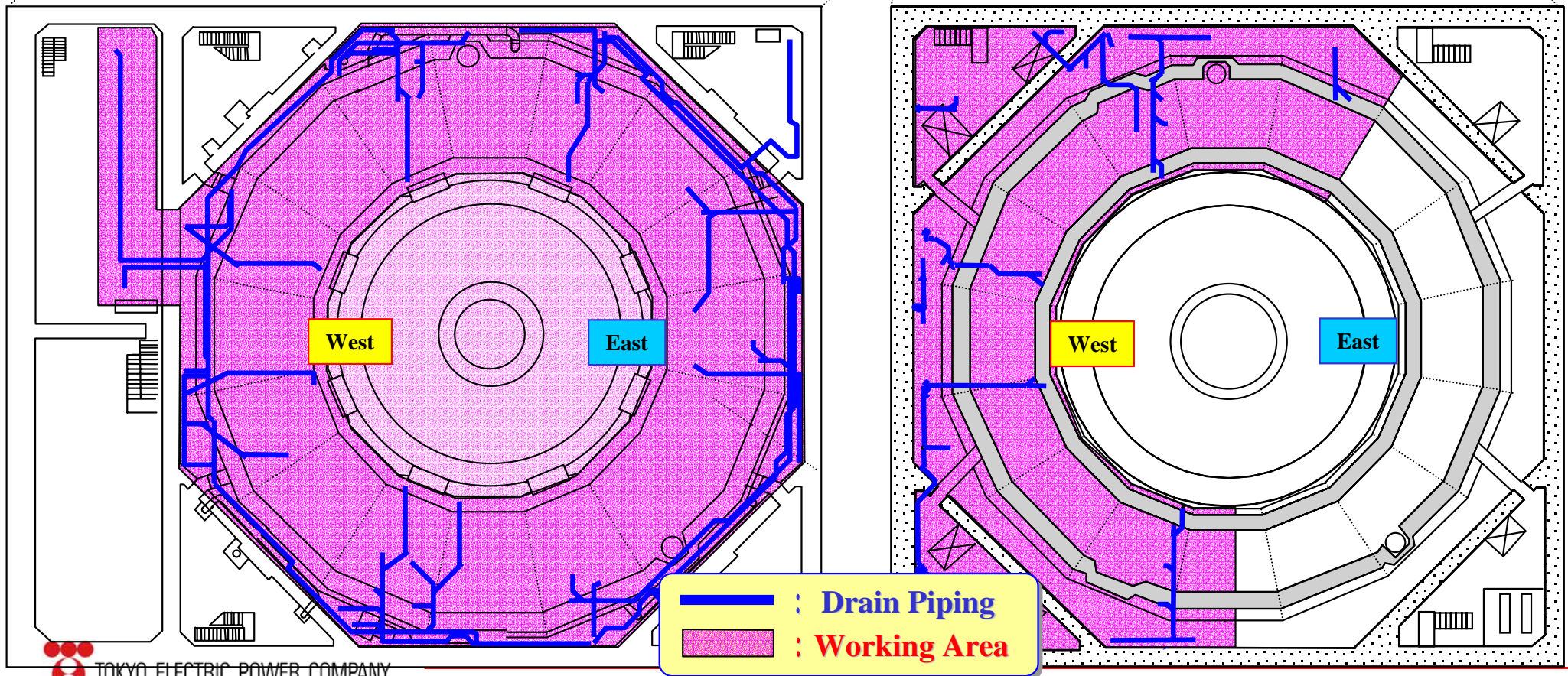
TOKYO ELECTRIC POWER COMPANY

# Removal Work Scope of Equipment and Floor Drain Piping

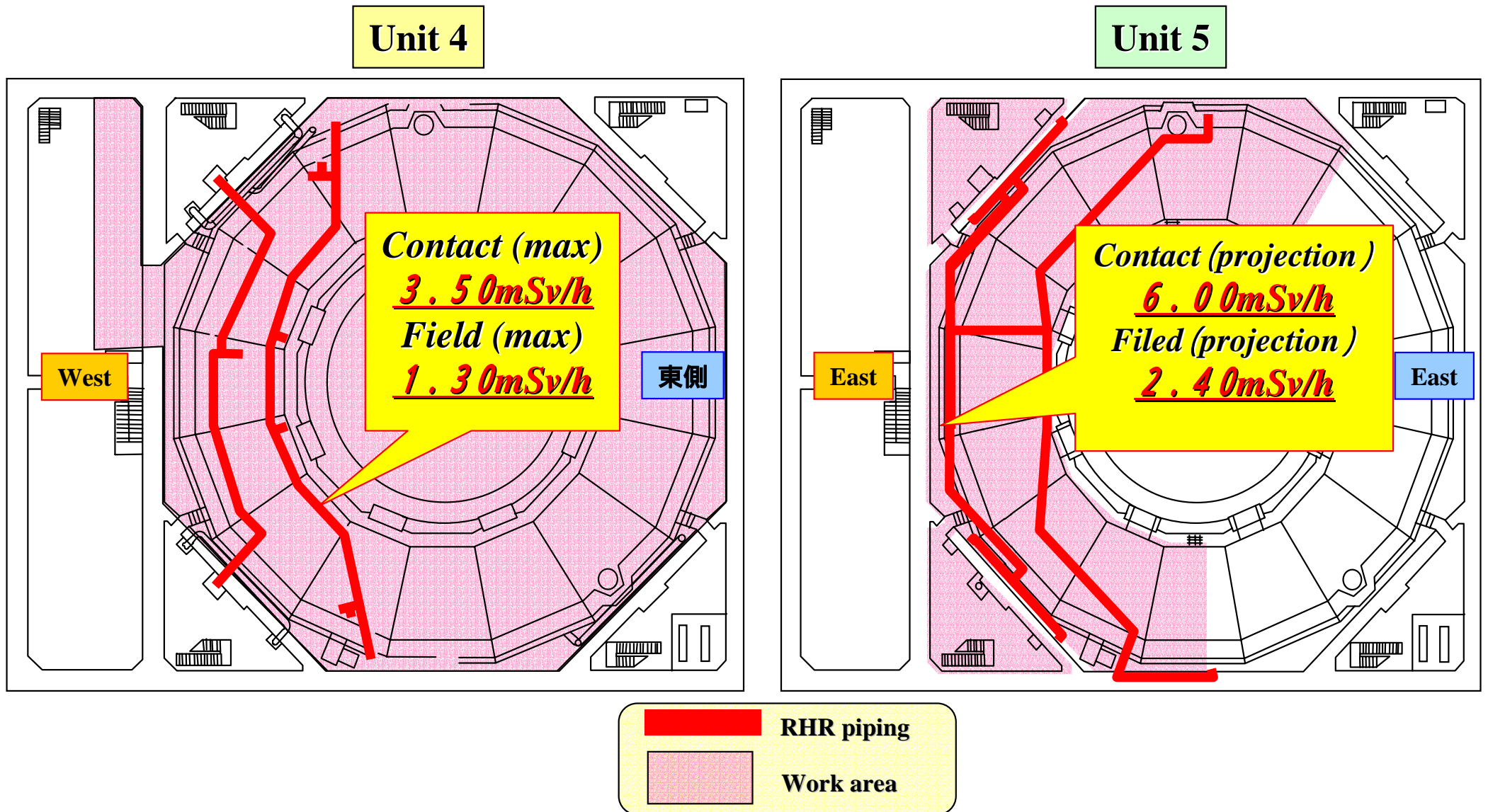
Unit	4(BWR4)	5(BWR4)
Schedule	Nov.22, 2002 ~ May 21,2003	Jan.20, 2003 ~ Sep.26, 2003
Work	Removal:415m Installation:556m	Removal:446m Installation:446m

*Reactor Building Suppression Pool Area*

*Reactor Building Suppression Pool Area*



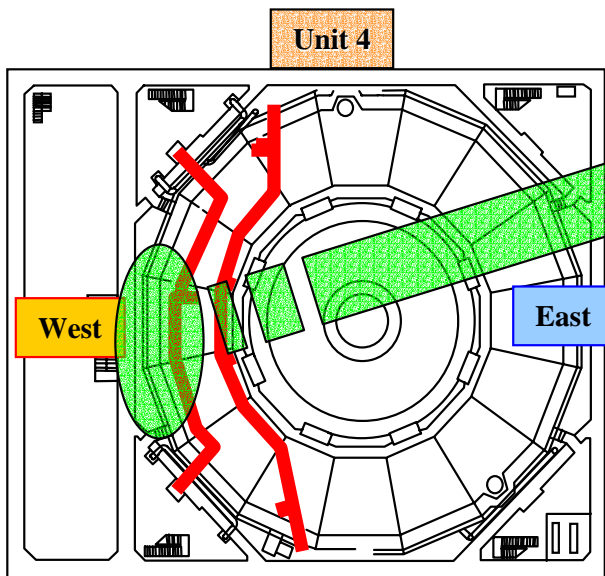
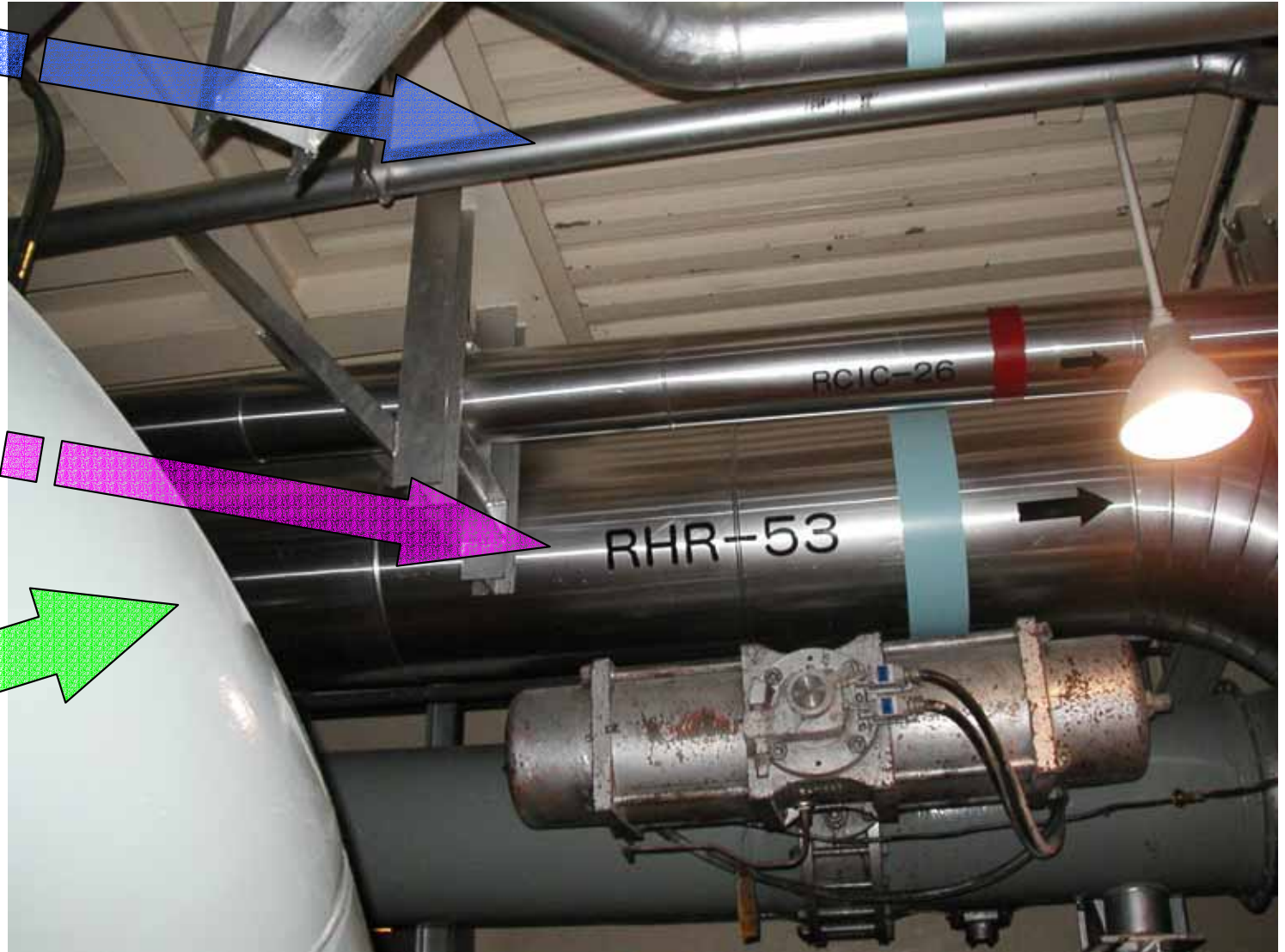
# Dose Rate at Piping Before Replacement Work



# RHR and Drain Piping at West Part of Suppression Pool Area

*Drain Piping*

*RHR Piping*



# Estimated Working Time for the Task

## (1) Filed Dose Rate and Estimated Working Time per Person-Day

	Field Dose Rate	Planned Exposure	Estimated Time
<b>Unit 4</b>	1 . 3 0 mSv/h	0.9mSv/person-day	<b>41min.</b>
<b>Unit 5</b>	2 . 4 0 mSv/h	0.9mSv/person-day	<b>22min.</b>

## (2) Estimated Working Time per Person with Annual Dose Limit <20mSv

	Exposure Dose at 2002	Remaining Dose at 2002	Filed Dose Rate (Geometric Ave.)	Estimated Working Hours	Estimated Working Days (4 hours/day)
<b>Unit 4</b>	Max : 8 . 6 4 mSv	1 1 . 3 6 mSv	0 . 1 5 1 mSv/h	<b>75</b>	<b>19</b>
	Min : 0 . 0 0 mSv	2 0 . 0 0 mSv		<b>133</b>	<b>33</b>
<b>Unit 5</b>	Max : 8 . 6 4 mSv	1 0 . 3 6 mSv	0 . 3 0 0 mSv/h	<b>34</b>	<b>8</b>
	Min : 0 . 0 0 mSv	2 0 . 0 0 mSv		<b>66</b>	<b>16</b>

# Proposals for Improvement

---

## *1. Work Schedule Conditioning*

### Unit 4

- Increase of field dose rate (  $\sim 1.3\text{mSv/h}$  ) at west area because RHR is used for intermediate shutdown
- Shortage of temporary shielding materials for other high radiation work
  - Start working at east area
  - Work at west area after installing temporary shielding

### Unit 5

- Installing scaffold and temporary shielding for the task during operation when RHR dose rate is low

# Proposals for Improvement

---

## *2. Flushing*

### Unit 4

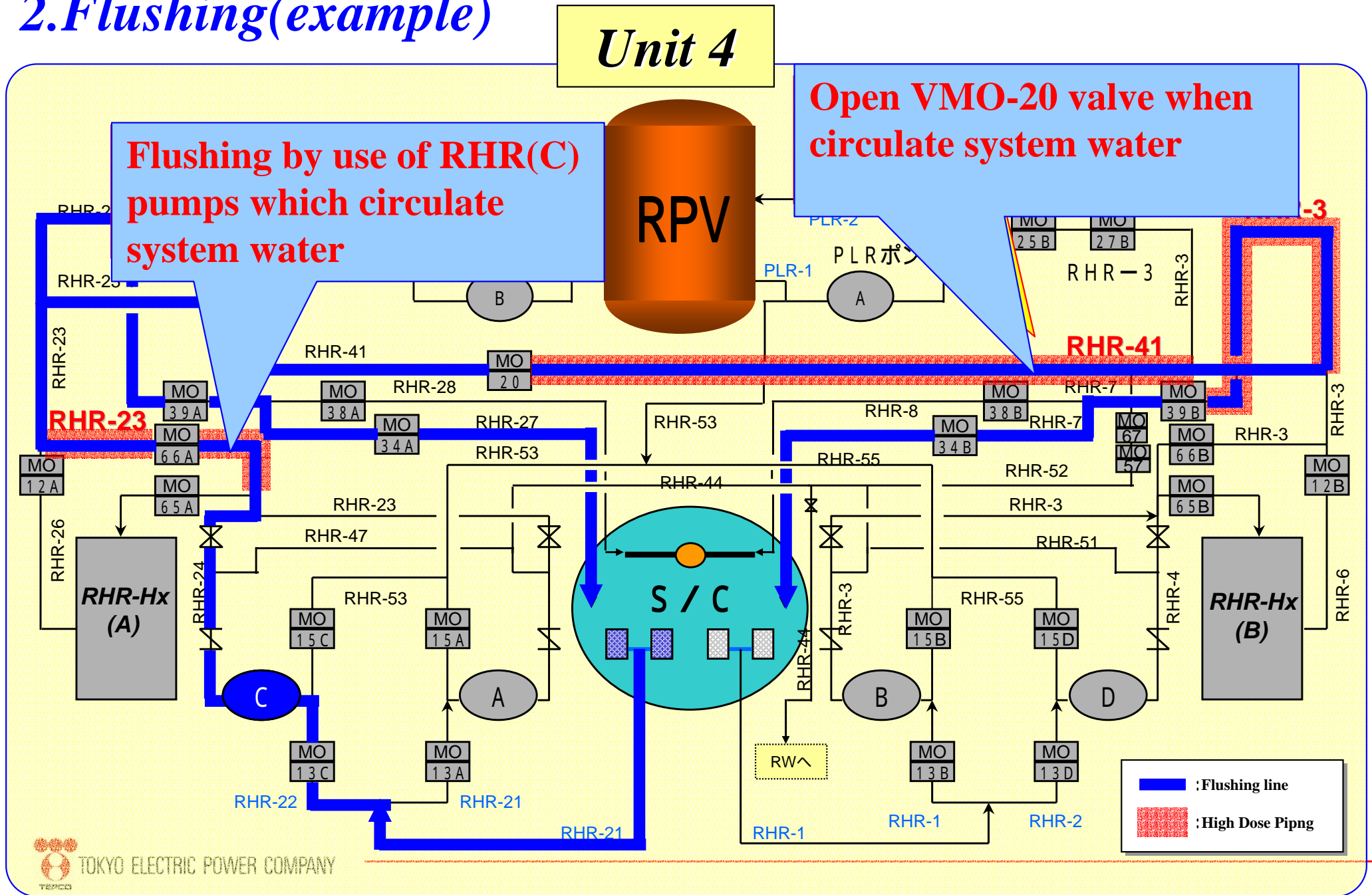
- High dose rate at RHR-4, RHR-41, RHR-23 because of RHR operation in shutdown
  - Flushing RHR-4, RHR-41 by using RHR(C) pump which circulates water in suppression pool
  - Flushing RHR-23 by opening MO-23 valve when RHR(C) pump running

### Unit 5

- High dose rate at RHR-3, RHR-7, RHR-27 because of RHR operation in shutdown
  - Flushing by using RHR pumps which circulates water in suppression pool

# Proposals for Improvement

## 2. Flushing (example)





# Proposals for Improvement

## 3. Temporary Shielding

### [Unit 4]

- Installing temporary shielding at high radiation piping after RHR flushing



### [Unit 5]

- Installing temporary shielding at projected high radiation piping during operation
- Installing temporary shielding at high radiation piping after RHR flushing

[Installing during operation]



[Installing after flushing]

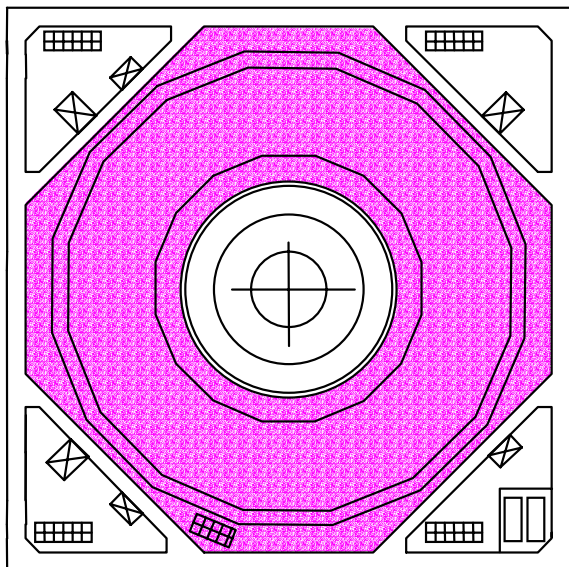


# Proposals for Improvement

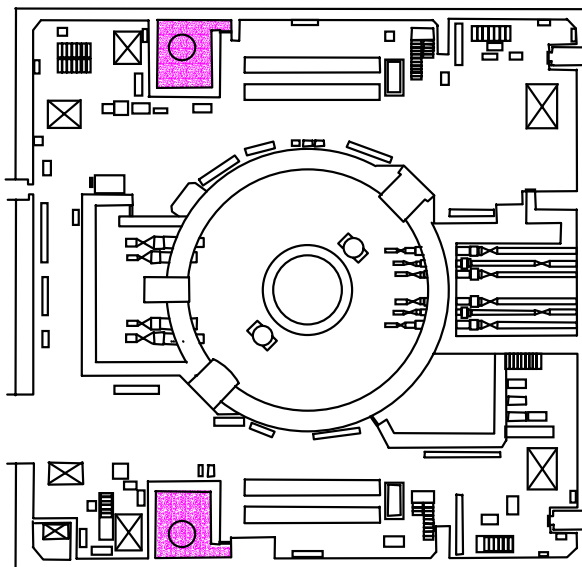
## *4. Blow Down Water Treatment at Unit 4*

- Reactor water drained because of RRS replacement work
- High dose rate was projected at RHR-Hx, RHR pumps, suppression pool area

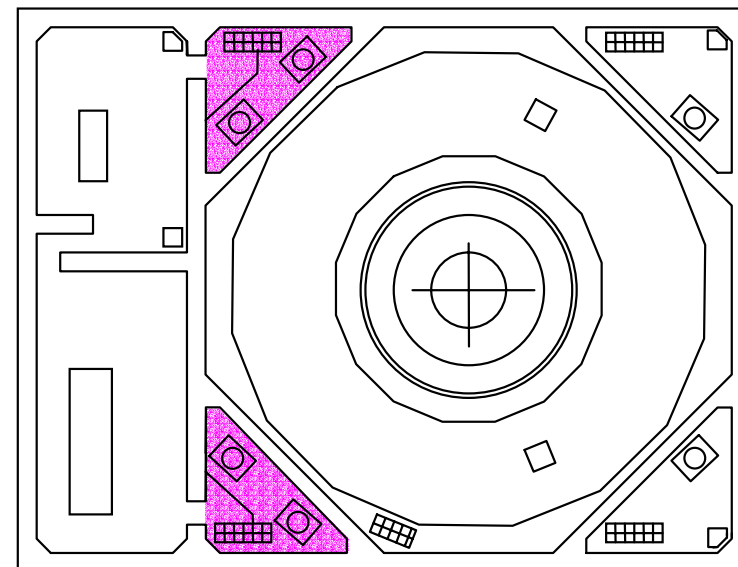
R/B B floor suppression pool area



R/B 1<sup>st</sup> floor RHR-Hx room



R/B B floor RHR pump area



# Proposals for Improvement

---

## *4. Blow Down Water Treatment at Unit 4*

- Planned reactor water blow down twice
- First blow down water drained to suppression pool so as to second blow down which contains higher activity can be transferred to radwaste (because of capacity)
- Removing crud deposited on RPV bottom by temporary pump and filters
- Fill up RHR-44 with water before blow down for preventing crud deposition

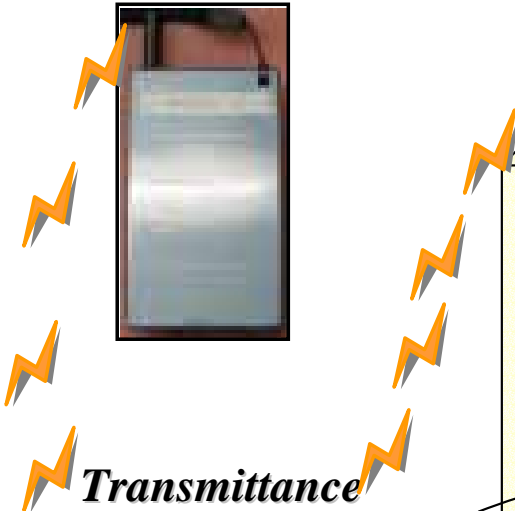
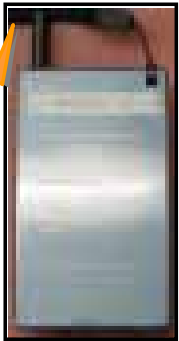
# Proposals for Improvement

## 5. Remote Monitoring

[Unit 5]

Remote monitoring of individual dose

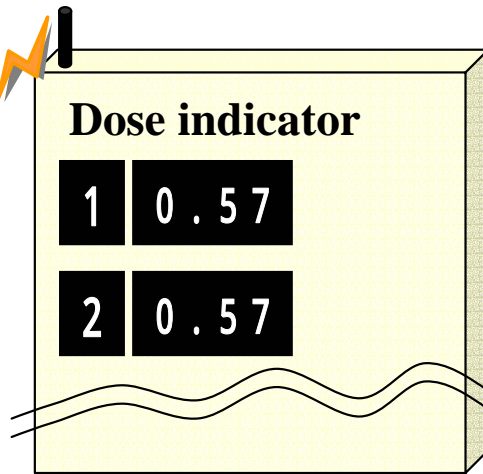
Wireless APD



Transmittance

Dose indicator

1	0.57
2	0.57



[Unit 4 & 5]

Individual dose can be monitored even on cloths

Worker

APDI

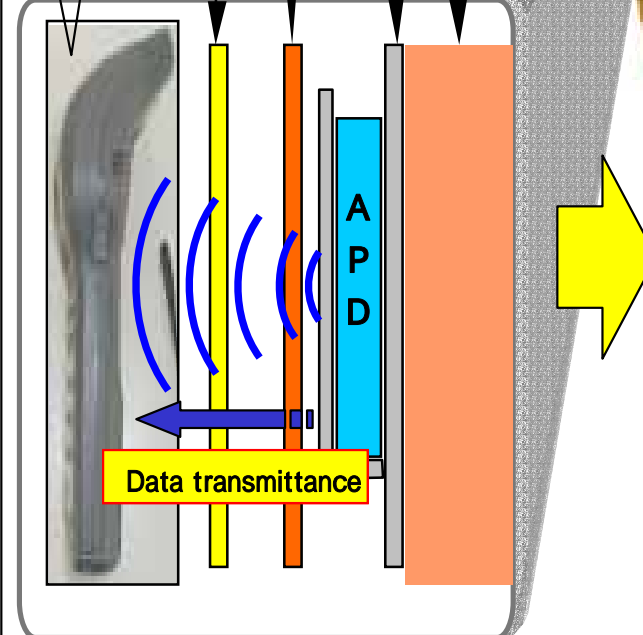
Protective cloths

Anorak

Under wear

worker

APDI



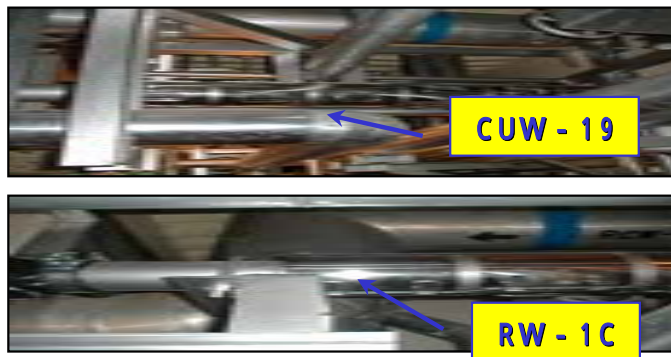
Dose indicator



# Results for Improvement

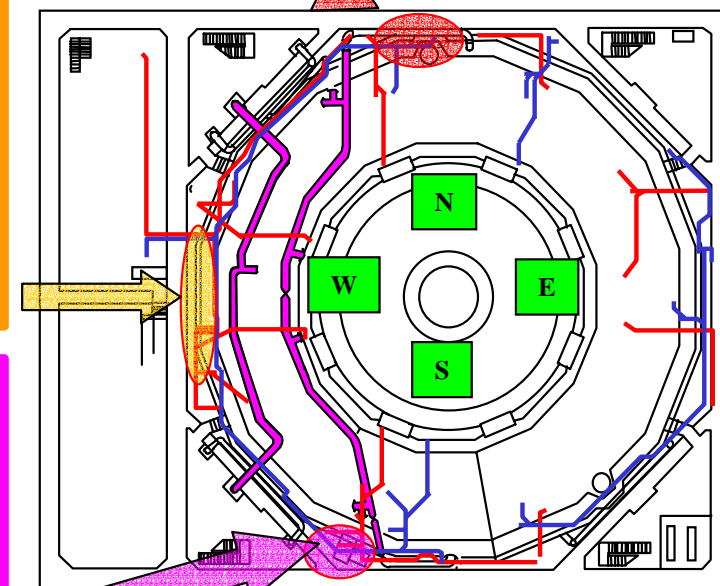
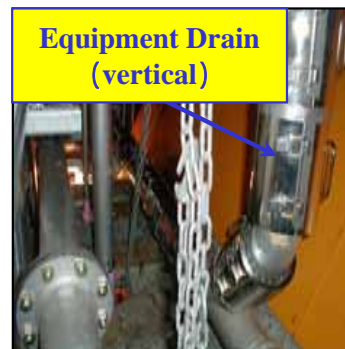
## Dose Rate Reduction Effectiveness after Installing Temporary Shielding

- CUW-19 Contact dose rate: 36.0%
- RW-1C Contact dose rate: 44.4%
- Field dose rate:20.0%



*Unit 4*

- Equipment drain piping
  - Contact:66.7%
  - Field:88.7%



- RW-209 pipings
  - Contact:66.7%
  - Field:86.7%

