Current Status of JRR-3

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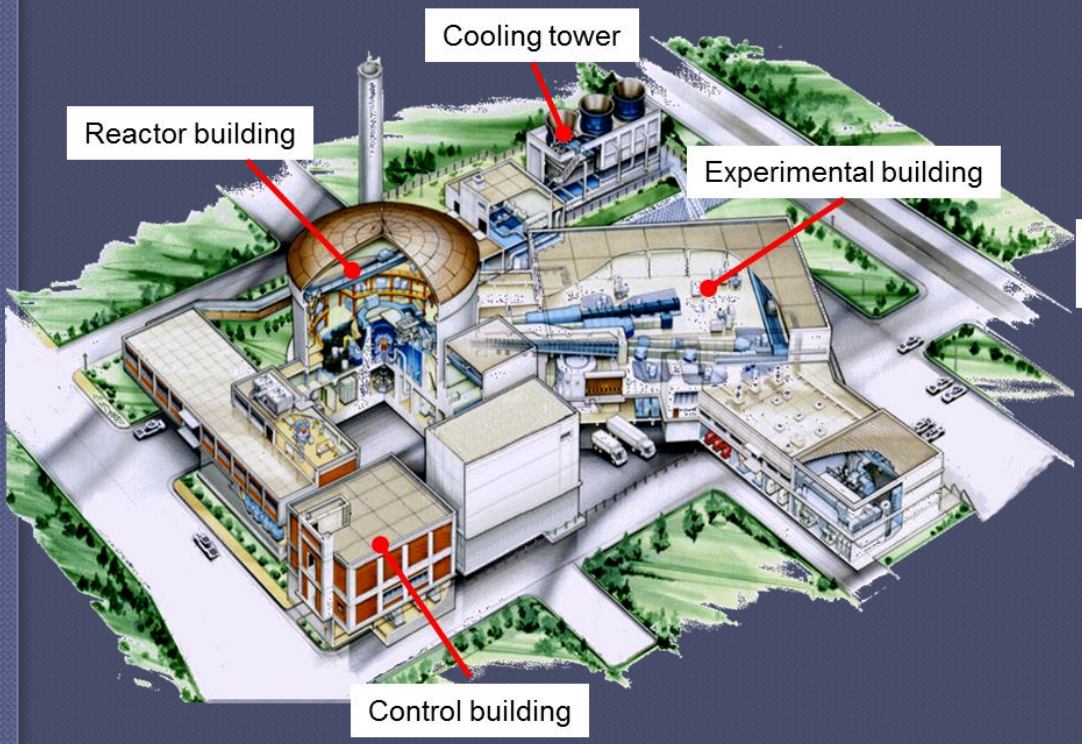
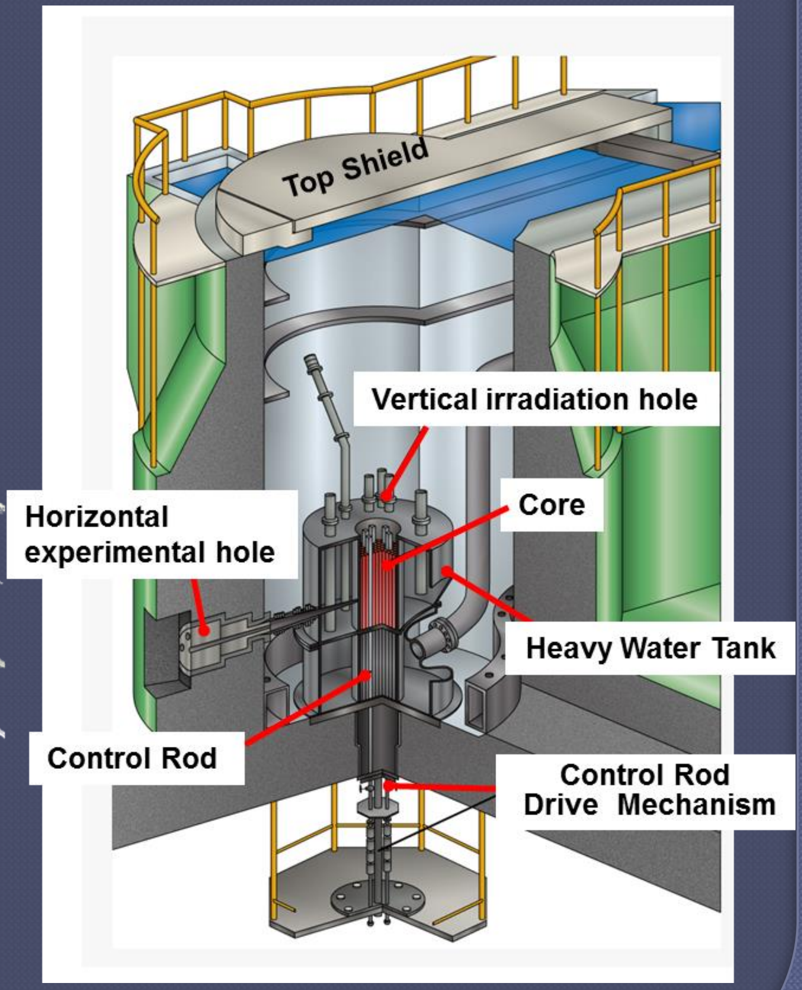
1. JRR-3 (Japan R.R. No.3)

- Reactor：Swimming pool type
- Thermal Power：20MW
- 1st critic.：03 / 22 / 90





1.1 Post-quake situation of JRR-3

【March 11, 2011 (Fri.) 14:46 】
Strong earthquake with the seismic energy of magnitude 9.0
JRR-3 was not operated for periodic inspection.

- Nuclear fuels and reactor confinement system were checked.
- Fuels stayed in normal position. No damage.
- No radioactive leakage

- Ground around reactor building sunk about 40cm
- Reactor building and equipment important for safe survival without getting serious damage.

2.1 Recovery works (1/2)

	Before	After
Ground sinking		
Ceiling panel in reactor building		
Emergency exhaust piping system		

2.1 Recovery works (2/2)

- Cracks of reinforced concrete structure were investigated with the installation of a scaffold.
- The cracks were mostly less than 1mm in width. Exfoliation or falling was not found.

Reactor building

Cooling tower

All recovery works have already been completed.

2.2 Verification of the Integrity

(1) Impact of station blackout

The maximum fuel surface temperature after the automatic shutdown by station blackout reaches to about 120 C. Integrity of the core is kept.

(2) Check and test

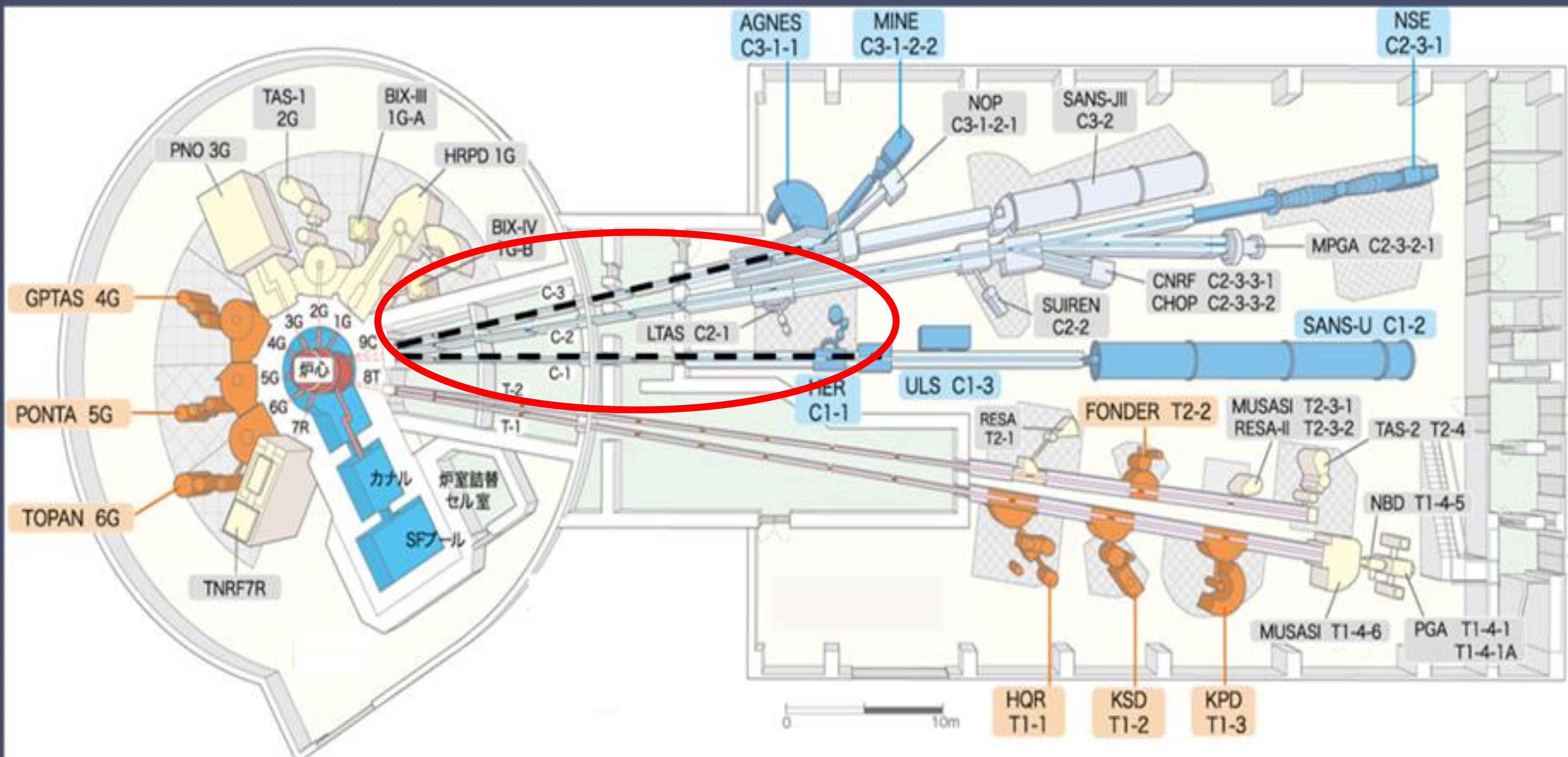
Soundness of the cooling system, instrumentation and control system etc. needed for reactor re-operation was confirmed by the performance inspection.

(3) Seismic analysis

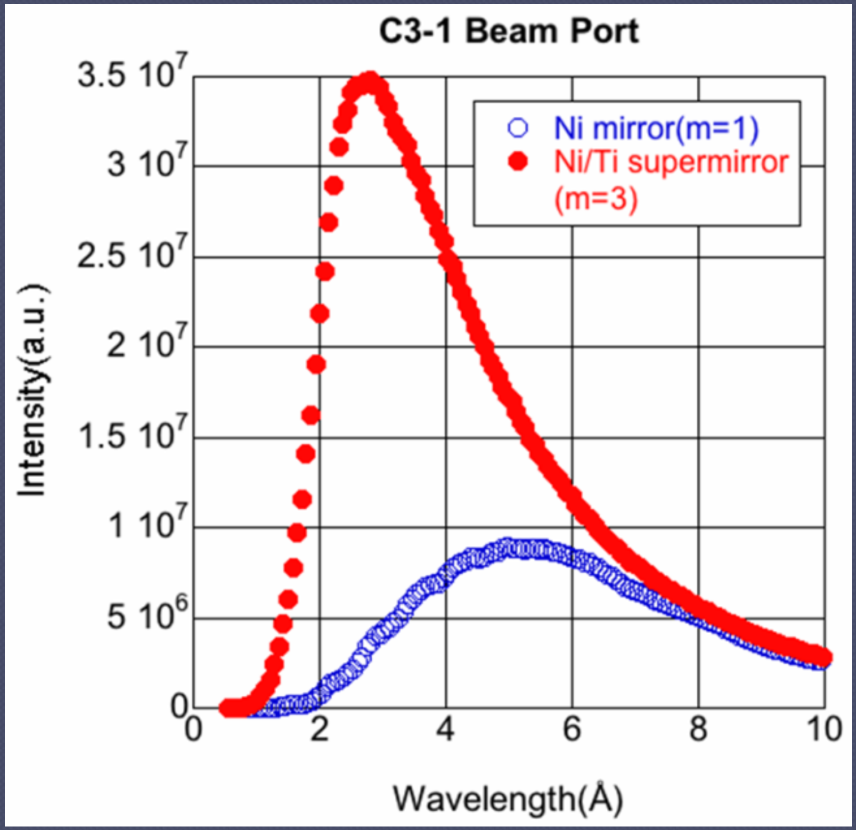
The initiation stress is much smaller than the evaluation criterion, because each component is designed with margin.

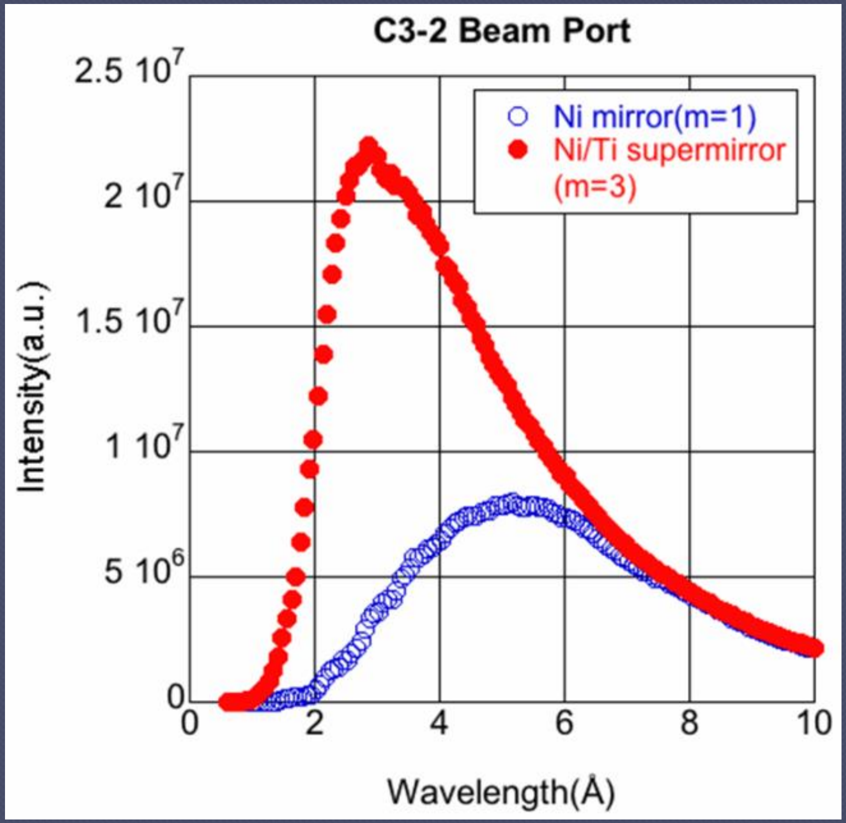
2.3 Upgrade of Cold neutron beam (1/2)

Current Ni mirror in two cold neutron guide tubes C1 and C3 were replaced with Ni/Ti supermirror.



2.3 Upgrade of Cold neutron beam (2/2)





The characteristic wavelength would be shifted from 5 Å to 2.4 Å and the gross neutron intensity would be increased about 2.5 times with Ni/Ti suppermirror case.

3.1 New Regulatory Requirements

December 18, 2013.

【Main points 】

○ Evaluations of strong earthquakes and tsunamis

○ Evaluations of based on the latest findings related to natural disasters (e.g. volcanic eruptions, tornados, and forest fires)

○ " Beyond Design Basis Accidents (BDBA) " for research reactors with nuclear power exceeding 500kW

3.2.1 Evaluation of earthquake and tsunami

○ Earthquake

- ➢ Seismic motion (for JRR-3)

  Horizontal: 0.796 m/s^2 (in original design 0.6 m/s^2)

  Vertical : 0.577 m/s^2 (in original design 0.4 m/s^2)

- ➢ Each component has enough strength, because of designing with margin.

○ Tsunami

- ➢ Design basis tsunami (for JRR-3)

  Maximum water reaching level :+13 m (sea water level)

  JRR-3 is located at the altitude of 19 m.

- ➢ There is no need to take particular countermeasures.

3.2.2 Evaluation of tornados and volcanic eruptions

○ Tornados

- ➢ Maximum wind speed: 92 m/s (the most powerful tornado in Japan)
- ➢ Soundness of the reactor building would not be ruined by the tornado or flying objects.

○ Volcanic eruptions

- ➢ The nearest volcano is located 88km away from JRR-3.
- ➢ Safety functions would not be lost by the falling tephra (volcanic ash).

3.2.3 Evaluation of Beyond Design Basis Accidents (BDBA)

Conceivable event		Countermeasure
Loss of shutdown function	2 control rods insert failed	If 2 control rods are not inserted, JRR-3 will be shut down with 4 other control rods.
Loss of cooling function	Loss of commercial and emergency power supply (BLACKOUT)	JRR-3 is shutdown automatically and removes its decay heat by the natural cooling circulation.
	Primary cooling water leakage (LOCA)	We can supply the reactor pool with alternative water by using mobile injection pumps, water injection lines or buckets.
Loss of containment function	Loss of emergency exhaust function in case of fuel failure accident	All ventilation equipment is stopped, radioactive materials are locked in the reactor building by the isolation valves.

Conclusions

- Damages by the earthquake have not diminished the safety of the JRR-3.
- We have conducted the necessary checks and assessments of JRR-3, and completed the preparations for the relevant applications.
- We had confirmed that JRR-3 conforms to new regulatory requirements and submitted an application document for re-operation to the regulatory body **on September 26, 2014**.


Thank you for your attention!