

Life Safety in Asian Region

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Life Safety in Asian Region

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Background and Scope of Study

Law and Standard for Underground Structures

1. There is no Law and Standard to the ILC Underground Structures such as Tunnel and Cavern.
2. Even Fire Laws do not apply to these Underground Facilities.
3. The Business Corporation itself *made* the original Standard, designed and built until now.

What should we do with ILC Facility?

1. We should establish Individual Standard for ILC Design
2. **JSCE** Committee is working now the Guideline for ILC Facility Design and Construction by Contract Research from KEK
 - **ILC Safety Guideline** is advancing by Sub-Committee
 - JSCE: Japan Society of Civil Engineers (Academic society)
 - Sub-Committee members /University, Institute, Consultant, GCC. etc

Law and Standard in Japan's Civil Construction Works

(semi)Public Corporation	Construction standard & Specification	Application			
		Building	Civil Works		ILC Tunnel & Cavern
			General	Tunnel	
Ministry of Land, Infrastructure.	Building Standard Law	○			—
	Common-specifications	○		○	—
JAIA (Architectural Institute)	Construction work master specification	○			—
JSCE (Society of Civil Engineers)	Public works master specification		○	○	—
NEXCO (Highway)	Design Standard Tunnel section			○	—
JRTT (Railway)	Mountain tunnel design & construction standard	○	○	○	—
Road association	Road tunnel Standard		○		—

Guideline Draft for ILC Safety Design

— under examination by JSCE now —

1. Basics on Disaster Prevention

- 1.1 Features of ILC Disaster prevention
- 1.2 Accident case history of Accelerator
- 1.3 Extraction of important matters on disaster prevention
- 1.4 Disaster risks assumed
- 1.5 Regulations

2. Guidelines for Fire

- 2.1 Fire Prevention
- 2.2 Finding and Announcement
- 2.3 Evacuation
- 2.5 Maintenance, Training
- 2.6 Prevent Impact to the Surrounding

3. Guidelines for Water Leakage

- 3.1 Drainage measures
- 3.2 Evacuation

4. Guidelines for Power Outage

5. Guidelines for Helium Leak

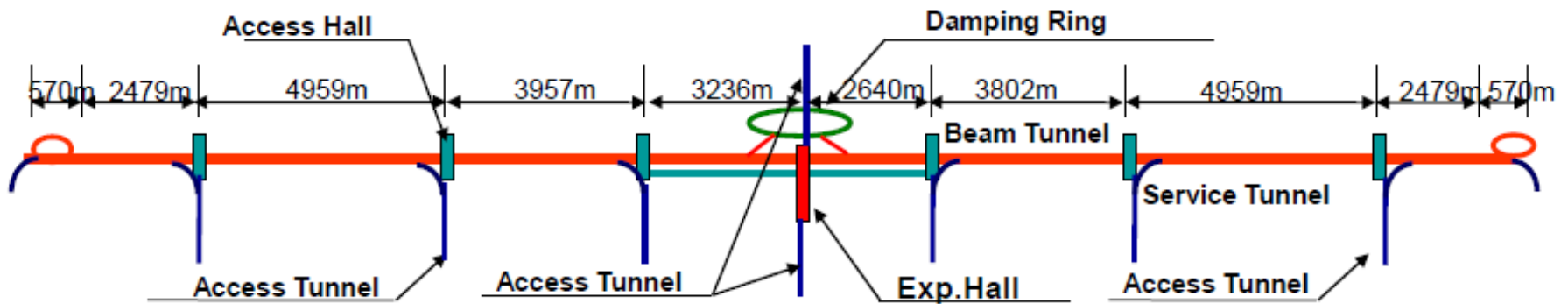
- 5.1 Concept
- 5.2 Evacuation

6. Guidelines for Earthquake

- 6.1 Measures in Connecting portion
- 6.2 Consideration for the active fault
- 6.3 Air, Water and Energy Supply

7. Guidelines for Rescue

Scope of Study for ILC Safety Design



Tunnel Structures

- ML Tunnel (include RTML) : 25km
- BDS Tunnel : 5.8km
- Damping Tunnel : 3.2km
- Access Tunnel

Cavern Facilities

- Large Cavern for the Detector Hall.: 1
- Medium Cavern for Access Hall : 6
- Small Cavern for Substation and Machinery

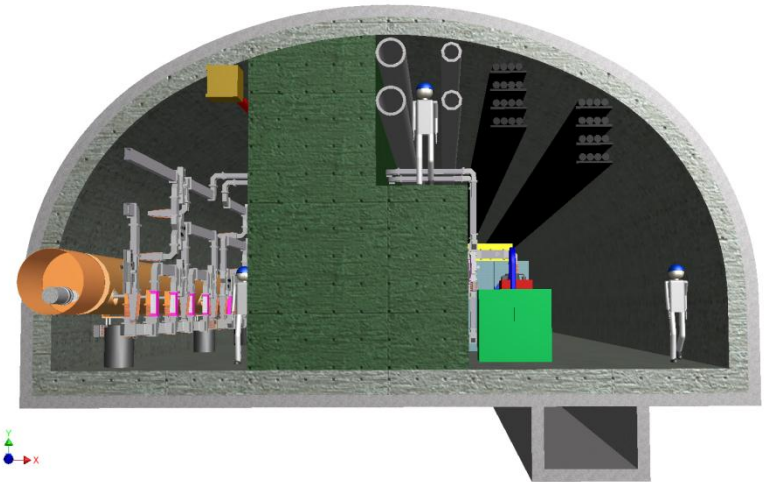
Risks on Disaster Prevention

- ❑ Fire Hazards
- ❑ Earthquake Hazards
- ❑ Helium-gas Hazards
- ❑ Radiation Hazards
- ❑ Power Failure Hazards
- ❑ Flood (Ground Water)
- ❑ etc.



Fire Prevention

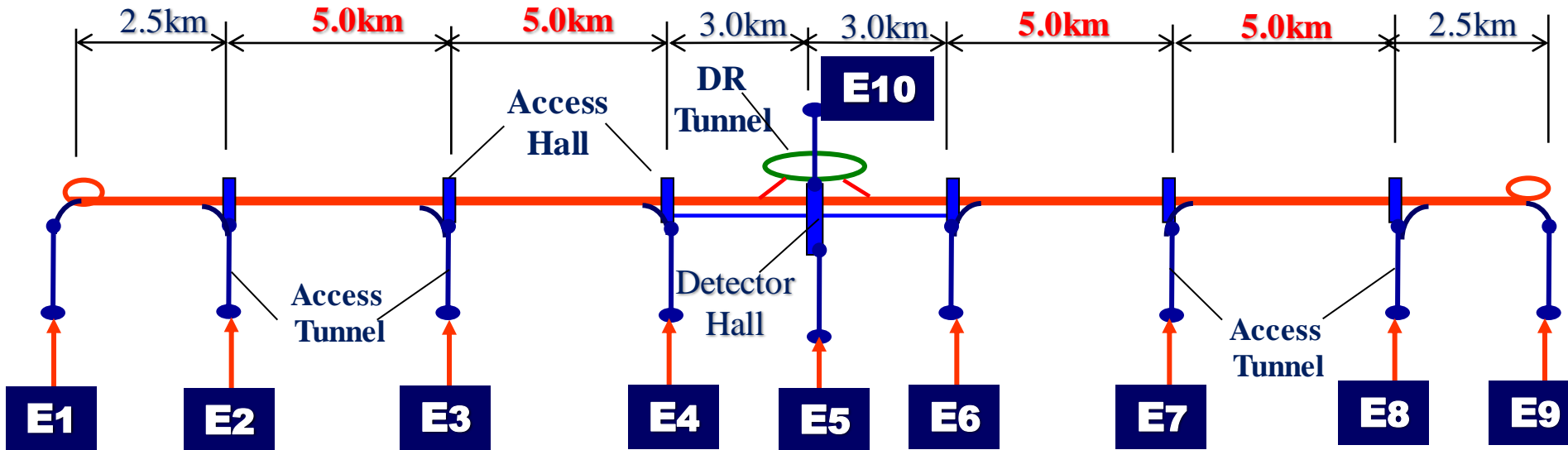
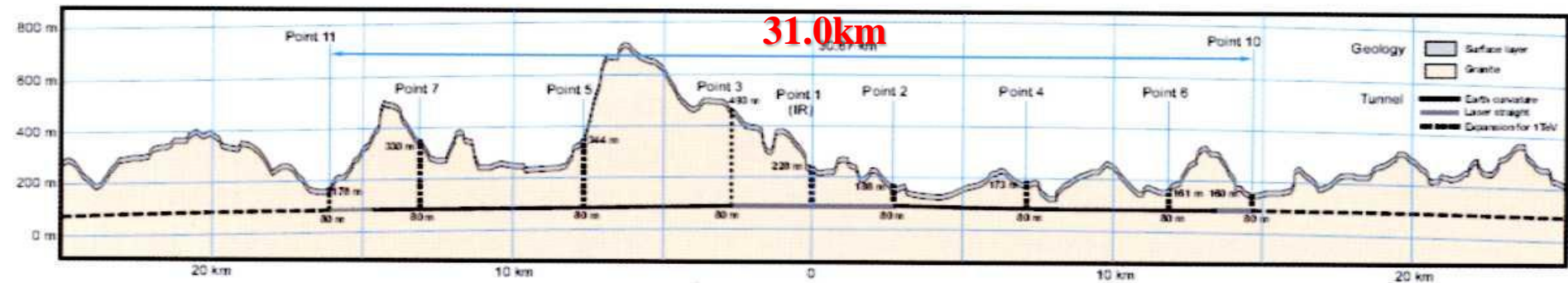
Evacuation Plan



Basic Policy under consideration by JSCE

- ☐ **Priority of Human Life**
 - **Evacuation Plan**
 - **Redundancy of the Escape Route**
- ☐ **Mitigation of Disaster Damage**
 - **Initial Firefighting Equipment**
 - **Self Defense Fire Fighting System**
- ☐ **Continuity of the Experiment Function**
 - **Backup of the Emergency Power Source**
 - **Prevention Division from Damage Expansion**

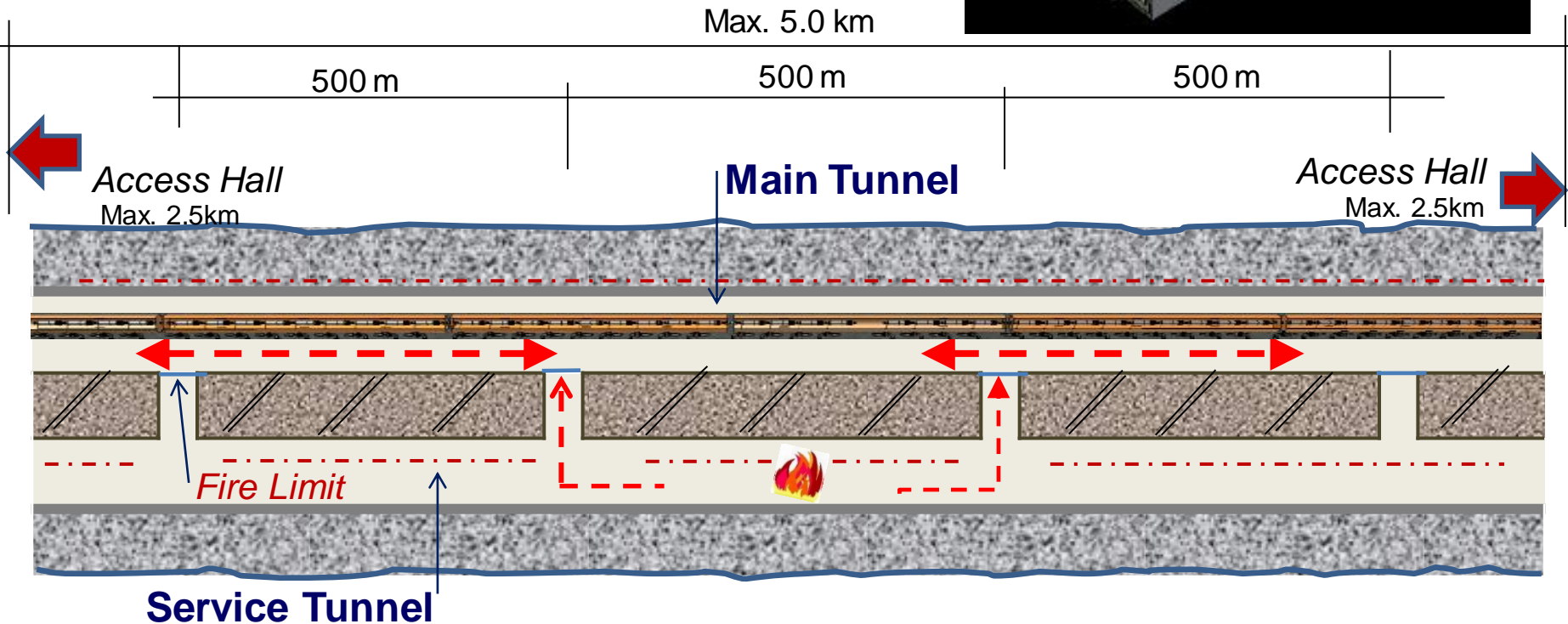
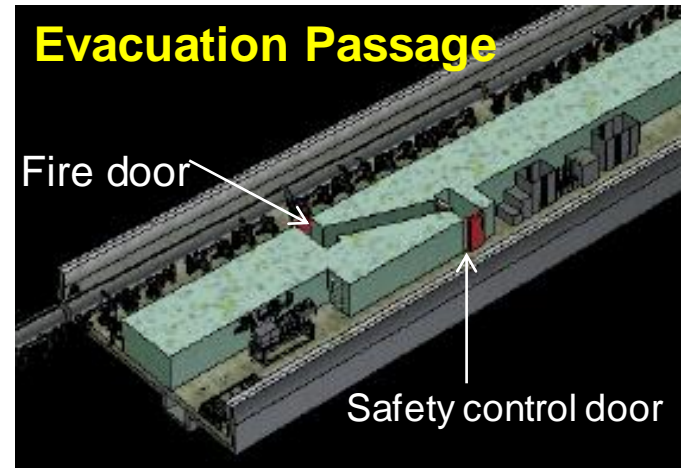
Design Study for ILC Disaster Prevention



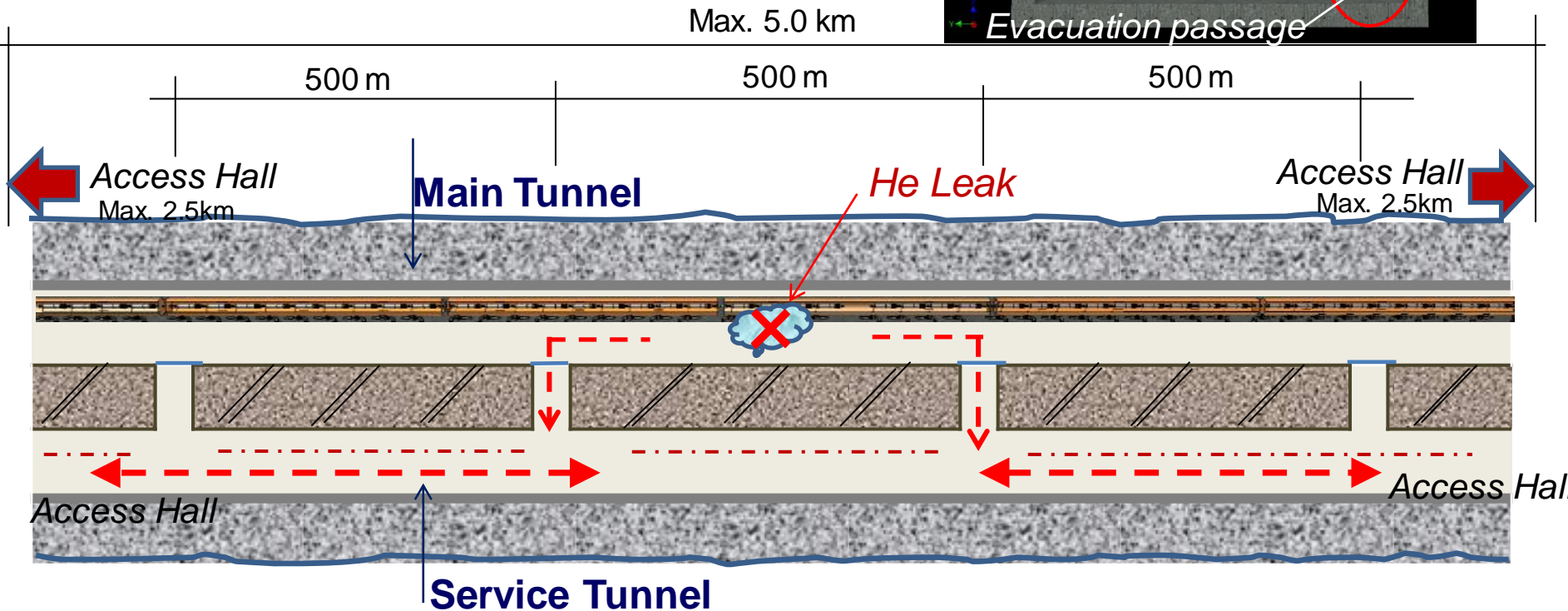
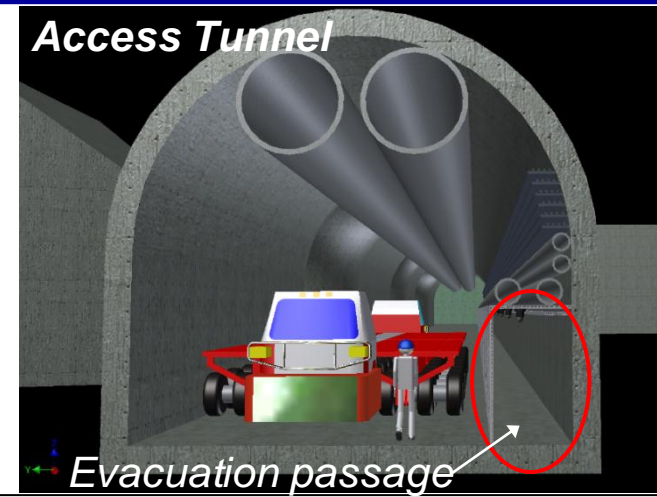
Evacuation to Ground Surface ; max. 5km interval

Evacuation Plan

- In the case which the fire started in the service tunnel, we can take refuge in the Beam-tunnel.
- Evacuation in two directions is attained.

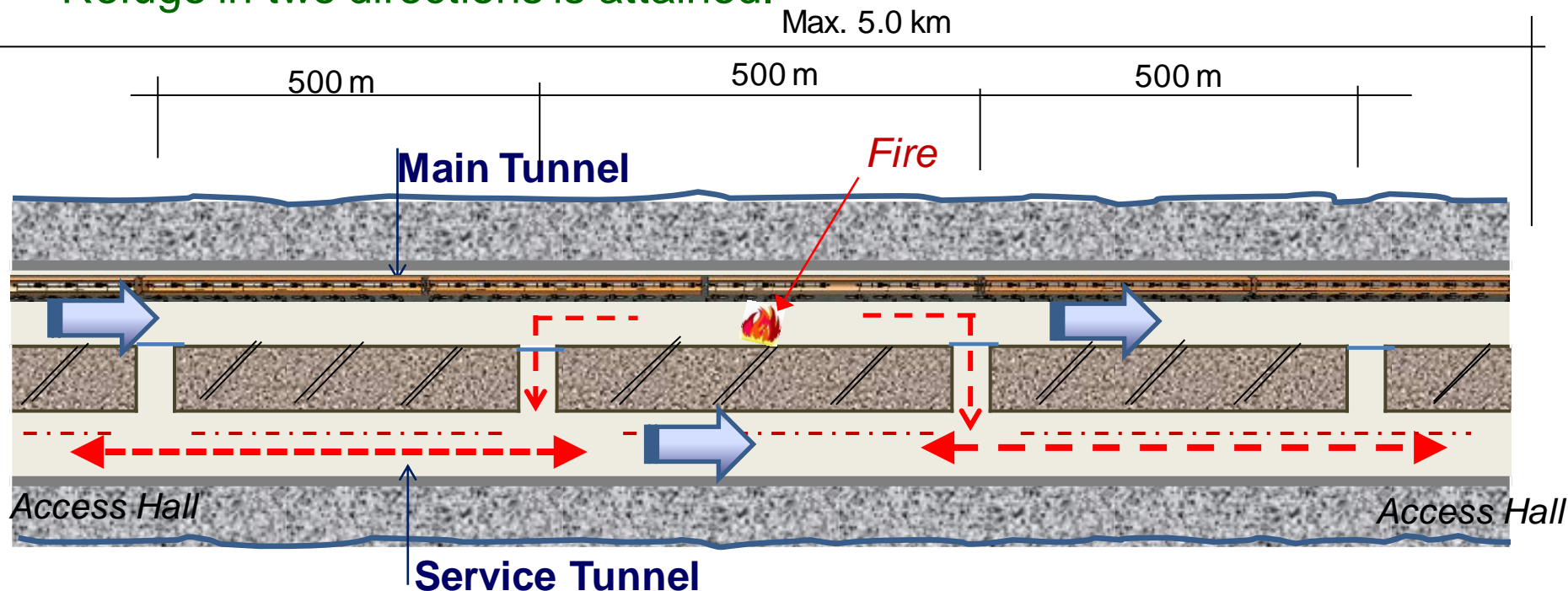


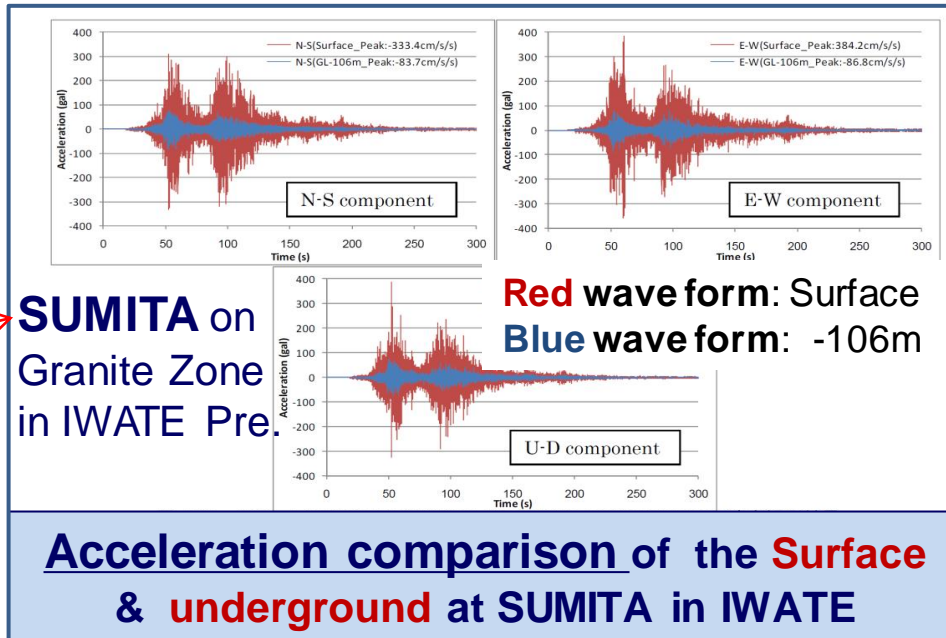
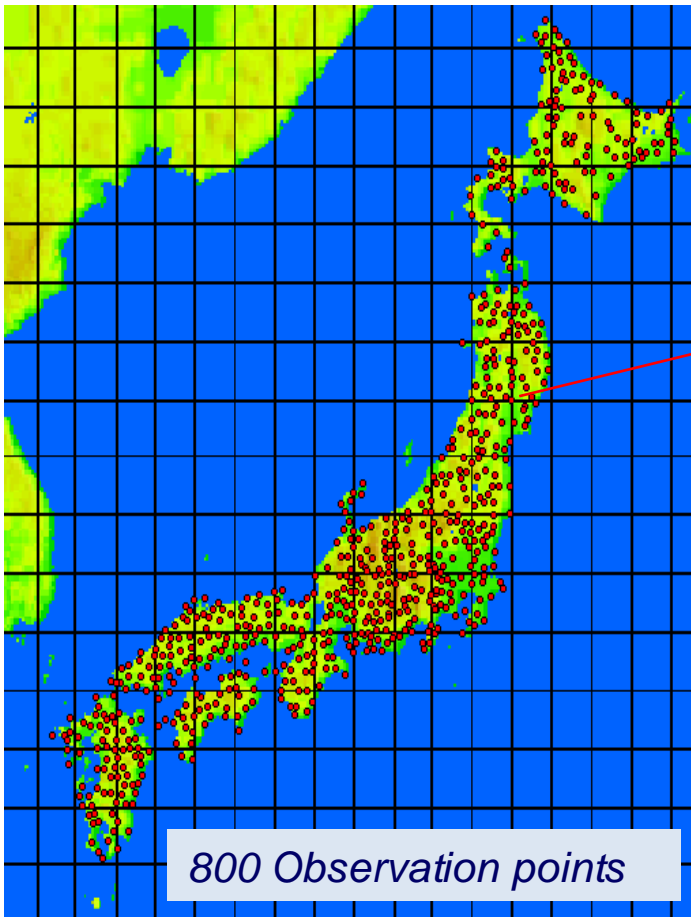
- In the case which the **He-Leak** started in the Beam-tunnel, we can take refuge to the service tunnel.
- **Evacuation passage** is taken into consideration in preparation for the accident in the Access tunnel.



Air Ventilation in case of Fire

- Smoke Detector operates, Emergency Warning works.
- All the Fire Doors are closed down.
- Air Ventilation System changes to the Smoke Extraction Mode in an Emergency.
- Refuge in two directions is attained.





KiK-net Observation Network
(*K*iban:Bedrock, *K*yoshin:Strong-Motion)

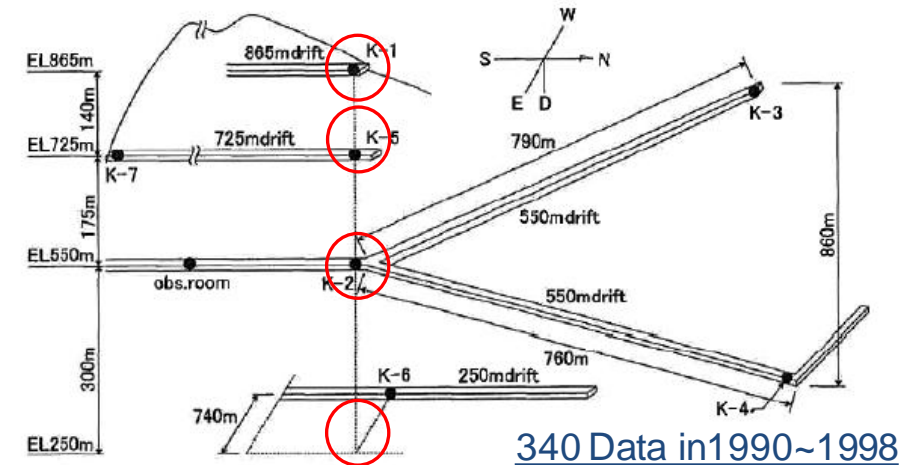
Data by "National Research Institute for Earth Science and Disaster Prevention"

Observation Data

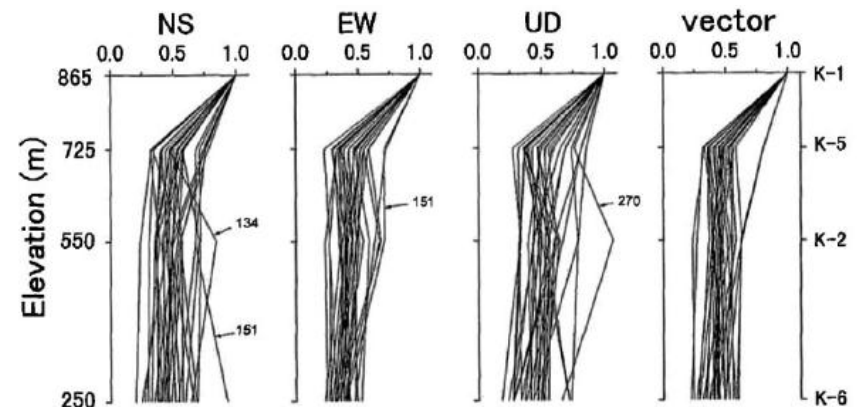
Direction	Acceleration (gal)		Rate Undergrund /Surface
	Surface	Underground	
N-S	333.4	83.7	0.25
E-W	384.2	86.8	0.23
U-D	388.9	73.5	0.19

Acceleration Comparison of surface of and underground

Seismic Observation at KAMAISHI Mine

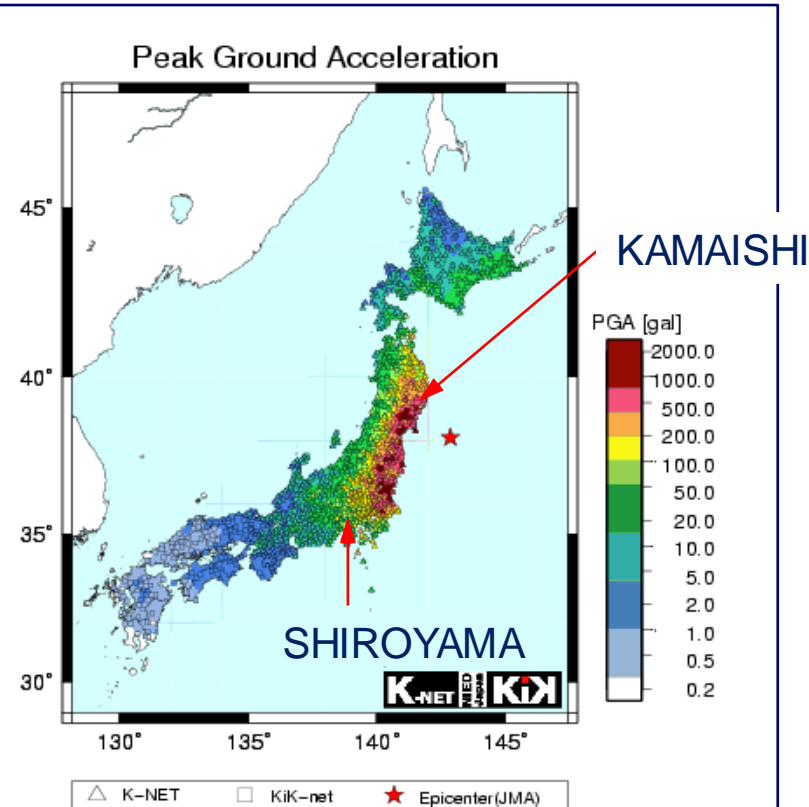


Seismic Observation Point

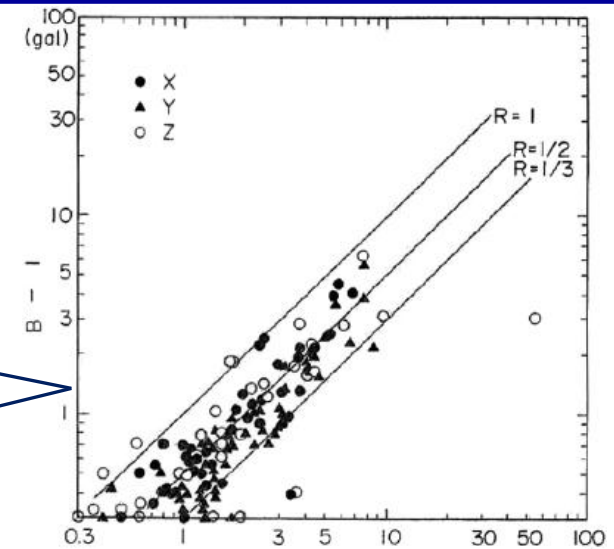
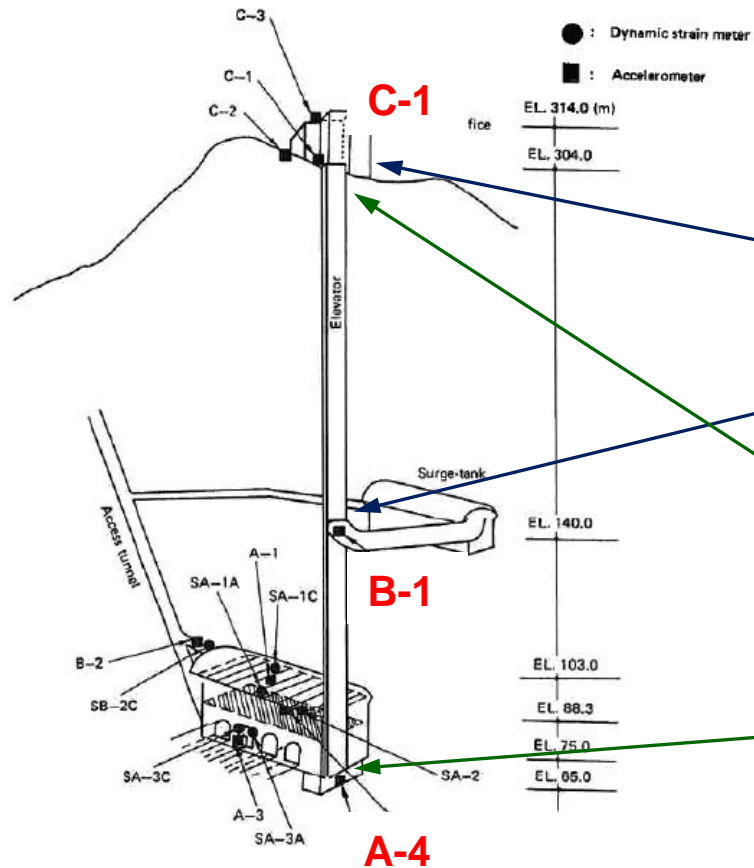


Acceleration Attenuation in every Depth

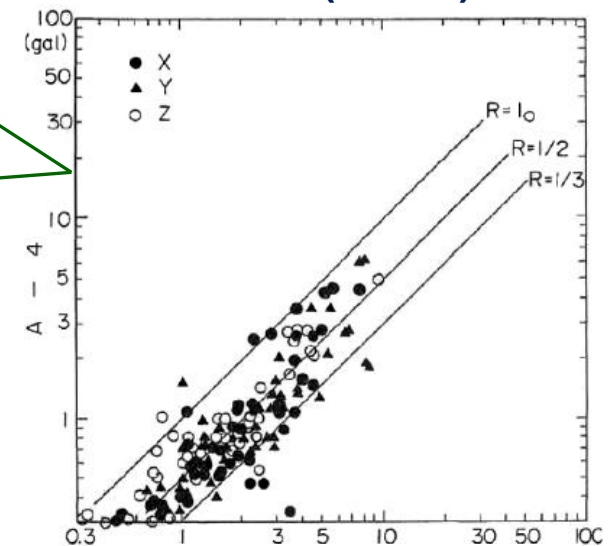
quotes from the Central Research Institute of Electric Power Industry Report 385043



Peak Ground Acceleration in 3.11 Great Earthquake



C-1 & B-1 (-164m)



C-1 & A-4 (-240m)

Seismic Observation in SHIROYAMA hydroelectric power station

quotes from the Central Research Institute of
Electric Power Industry Report 385043

5. Summary

- ❑ **Law and Guidelines for ILC Safety**
- ❑ **Priority of Refuge in an Emergency**
- ❑ **Continuity of the Experiment Function by Reduction of Disaster Damage**
- ❑ **Future Subjects**
 - **Simulation and Model Experiment of Disaster Influence**
 - **Details Examination united suitable the Candidate Site Situation**