

# The Study of Radiation Safety Treatment for Dismantling Contaminated Piping in NPP

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## 1. Introduction

The Kori Unit 1, which started commercial operation in 1978, will be decommissioned after a cooling process of about 5 years. There are several steps to be taken before the decommissioning the NPP. The most important thing is maintaining and managing System in the 'Alive state' even during the decommissioning process. For example, HVAC (Heating, Ventilation, Air Conditioning) of the building, the power supply system, the air supply system, the water utilization for fire protection, the water for living system and Area & Effluent Radiation Monitoring System should be maintained during the decommissioning process.

NPP's systems are originally designed for the purpose of transporting fluid (coolant or gas such as hydrogen, pneumatic gas). For example, the coolant is moved from a tank through pump, pipe line, valve, Hxs and other tanks or devices. These are built into the building with supports and various types of the gantries. Table 1 is information of piping in the major system of the NPP.

Table 1. Design information of major piping of PWR for referencing of dismantling (examples)

Related System (s/s)	Place	Type (P/S)	about Weight (t/m)	*Active or □Expected Contamination (Note)	Decontamination	
					*In&Out	Operat or (line up)
RCS	cv	27-32	typ.	●	●	□
	cv to aux	3-14	143-426 (sch30)	●	●	□
Residualventil	cv to aux	8-14	195-232 (sch30)	□	●	□
OCS	cv to aux	3-6	148 (sch30)	●	●	□
Type drive	cv thr aux to rad	4-8	55-217 (sch30)	□	●	□
Rt	yd thr aux to cv or aux to cv	8-14	217-267 (sch30)	□	●	□
Off piping	cv, aux etc.	2-3/1 or 3/8	123 (sch30)	□	●	□

Ref: Typical P&ID of NPP (PWR), Piping Hand Book  
note: In Socket Welding Gap may contaminated foreign materials even after decontamination.

NPP is contaminated by radioactive materials during the operation, so it is required to accumulate 'know-how' through research and development of radiation safety management for dismantling

This paper describes the technical factors for the safe treatment of contaminated piping during dismantling

## 2. Main Subject

### 2.1 Overview

The basic purpose for the dismantling contaminated NPP is to reduce the amount of radioactive waste and secondary radioactive waste. In addition to prevent spreading from contaminated radioactive materials and reducing radiation exposure to NPP workers. The dismantling should be treated in the order from high-dose, high-pollution equipment, structures and systems, but in some countries high-dose reactor is left for later disposal of it. Dismantling is especially necessary to ensure suitability of disposal and public acceptance (PA). The key factor for safe handling of dismantling is shown in Tab.1 below.

Table 2. Factors of the objective for issue

	Education training	management and supervision	Procedure observance	Analysis of measurement	Reduction of exposure	protectio n of environment	related laws	internati onal Cooperati on
Prevention of safety-accident	○	○	○	○	○	○	○	○
Radiation protection	○	○	○	○	○	○	○	○
Reduction of RIT	○	○	○	○	○	○	○	○
Conform of disposal suitability	○	○	○	○	○	○	○	○
National consensus	○	○	○	○	○	○	○	○
Work Performance	○	○	○	○	○	○	○	○

### 2.2 Strategy of safe treatment of dismantling

The basic strategy of safe treatment of contaminated components in NPP is to meet regulations of NSSC

(Nuclear Safety and Security Commission) and manage it in an economical way without any social confliction. Those components should be classified according to configuration and size, radioactivity concentration and maintaining structural integrity, satisfying key information markings in the dismantling process. It also needs to safely dispose of low, intermediate-level radioactive waste even after chemical treatment in dismantling process.

It is necessary to have place with facilities and equipments to perform the dismantling process in according to procedure. It also needs to find out and apply detailed techniques. For instance, standardization of cutting equipments considering unit weight and sizing, ease of packing by shape, handling of transportation, analysis of radionuclide to evaluate radiation characteristics, management of work and environment, identification of waste, transportation and transfer to regulatory agency for safe treatment of dismantling

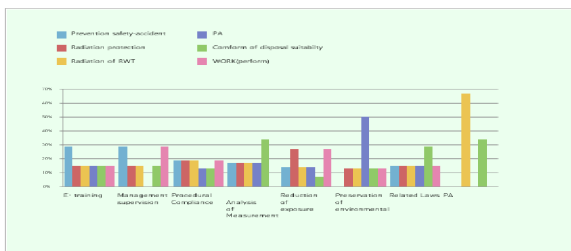


Fig. 1. The Importance of Key Factors.

### 2.3 Analysis of technical factors for a typically safe treatment of dismantling

For example, There are several detailed elements are derived from 7 subjects in the analysis results of technical factors for safe treatment of dismantling by using Fish Bone Diagram (FBD).

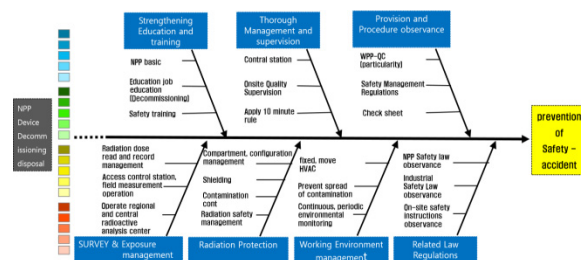


Fig. 2. Prevention of Safety Accident by using FBD.

### 2.4 Detailed factors for safe treatment (Excluding Administrative matters such as plans)

It is necessary to accumulate the academic and experiential knowledge of organization in order to accomplish the achievement corresponding to the derived detailed factors. Based on this, it should be written in the work procedures and the test report reflecting the data of dismantling techniques and regulations.

Table 3. The Detailed Elements for Piping's dismantling

	Prevention of safety-accident	Radiation protection	Reduction of RWT	Conform of disposal suitability	National consensus	Work Performance
Education training	basic education job education safety training safety culture	basic education job education safety training Protection education	Basic education Procedure transporting education	Related law Procedure Transfer regulation Sign, Packing	Public hearing of dismantlement plan	Job Training Fire safety Protection Education
Management and supervision	Control Supervision Applying 10m's rule	Zone cont. Access cont. Exportion cont.	Equipment and waste management Work cont.	measurement Analysis Packing Record		Quality Transition Procedural Compliance Protection Safety
Procedure observance (WPP-QCI)	wpp-QCI Safety regulation Check sheet	Survey Access cont. Exportion cont. Contamination cont. Radiation safety	Procedures for entry and exit of wastes	Related Laws procedure Transfer regulations Cover record		Understanding Content sequence of the work Approved equipment Cover the result
Analysis of measurement	Central station site lane of transportation Package	measurement skills Record amangement Feedback Equipment management Contamination management	Analysis of radiological characterization Characteristic evaluation	Dose measurement Nucleide analysis Packing integrity Scale factor contamination inspection		Measurement accuracy, Data management Record results
Reduction of exposure	Compartment management Shielding and decontamination Identification	Work management Prevention of contamination Work environment manage Procedural compliance	Prevention of contamination work environment manage Procedural compliance			Procedural Compliance Time reduction
Protection of environment	HVAC Prevention of decontamination Supervision	Compartment management Workplace ventilation Prevention of contamination Access cont.	Zone cont. Prevention of decontamination Supervision		Feedback from residents	
Related laws	Safety law Protection law fire law	Radiation safety law Procedure	Safety law Industrial Safety Law Procedure	Transfer regulation Nuclear safety law	Safety law	

### 3. Conclusion

Dismantling is a sophisticated work that can be described as art in terms of technology. Because all legal procedures and detailed requirements should be meet and the dismantling may be proceeded in the reverse order of construction and in addition to control of radiation. Particularly, in order to improve the efficiency, between the organization dealing with cutting components and organization of disposal waste must be established mutual cooperation and close relationships. Through this, it is expected that the achievement of the safe treatment of the NPP's piping dismantling. The end