

Overview of the Guidelines on Prevention of Radiation Hazards for Workers Engaged in (Nuclear) Accident-derived Waste Disposal

1. Scope

These guidelines are developed for operators that implement disposal of the following objects contaminated with radioactive materials discharged by the accident (Hereinafter the operator, operation, and objects are referred to as the "disposal operator", "accident-derived waste disposal" and "accident-derived waste", respectively).

- (1) Soil generated by decontamination activities. (This is soil having a radioactivity concentration of cesium-134 and cesium-137 higher than 10,000 Bq/kg; hereinafter referred to as "removed soil".)
- (2) Waste contaminated with radioactive materials discharged by the accident. (This is waste having a radioactivity concentration of cesium-134 and cesium-137 higher than 10,000 Bq/kg; hereinafter referred to as "contaminated waste")
- (3) In addition to those materials listed in (1) and (2), any other objects having quantities or concentrations of radioisotopes other than radioactive cesium larger than the values specified in the paragraph 2 of Article 2 of the Ionizing Radiation Ordinance due to concentration through disposal processes.

It should be noted that the guidelines are not intended to be applied to the activities falling under "works of decontamination, etc", "work for collecting waste, etc", "works for handling designated contaminated soil and wastes" and "works under a designated dose rate" as defined in the Ordinance on Prevention of Ionizing Radiation Hazards at Works to Decontaminate Soil and Wastes Contaminated by Radioactive Materials Resulting from the Great East Japan Earthquake and Related Works (hereinafter referred to as "Ionizing Radiation Ordinance for Decontamination") and the relevant guidelines.

2. General Principles

The disposal operator should strive to minimize the amount of ionizing radiation that workers would receive. In building a disposal site in a special decontamination area, the disposal operator

should strive to decontaminate the area around the disposal site in advance in order to reduce radiation exposure to workers.

3. Methods on setting radiation controlled areas and radiation dose control

- (1) The disposal operator should clearly specify the radiation controlled area with posts and prohibit access to the area except for the authorized personnel. (The radiation controlled area refers to the area where (i) the sum of effective doses from external source and radioactive materials in air could exceed 1.3 mSv per three months, or (ii) the surface density of radioactive materials could exceed one-tenth of the surface contamination limit (4 Bq/cm².)
- (2) The disposal operator should measure the exposure dose that workers engaged in disposal of accident-derived waste are exposed to in radiation controlled areas by the following methods.

a. External exposure

Dosimeters to measure radiation dose should be worn on the chest for men or women who were diagnosed with no possibility of pregnancy, or on the abdomen for other women.

An additional dosimeter should be worn on the body part that may be exposed to the highest radiation dose, if the worker may be exposed to beta rays.

b. Internal exposure

Internal exposure should be measured every three months in principle, for those who access places in the radiation controlled areas where they may inhale or ingest radioactive materials.

- (3) The disposal operator should prevent workers from having exposures in excess of the following limits, even by adding the exposures from other radiation work.

	Effective Dose	Equivalent Dose
Men or women who were diagnosed with no possibility of pregnancy	100 mSv in 5 years and 50 mSv in a year	150 mSv for (lens of the eye) and 500 mSv (for the skin) in a year
Women (except those who were diagnosed with no possibility of pregnancy)	5 mSv in 3 months	
Pregnant women	1 mSv	2 mSv (at the surface of the abdomen) in addition to the above.

- (4) The dose measurements should be recorded basically every three months, every year, and every five years, and kept for thirty years. The records may be transferred to a designated organization after being kept for five years.

4. Dose limit at facilities

- (1) The disposal operator should ensure to restrict the dose rate so that the sum of external dose and committed effective dose from radioactive materials in air in a constantly accessed place should not exceed 1mSv per week for facilities handling unsealed accident-derived waste (hereinafter referred to as "accident-derived waste handling facility"), storage facilities and landfill facilities for accident-derived waste.
- (2) The disposal operator should inspect the contamination of ceilings, floors, walls and equipment (only which workers may touch) in the accident-derived waste handling facility every month, and remove contamination if any.
- (3) The disposal operator should remove contamination if accident-derived waste is spilled.
- (4) The disposal operator should restrict the weekly average concentration every three months to less than or equivalent to 5 mSv/y in disposal sites other than the accident-derived waste handling facility.
- (5) The disposal operator should measure the working environment in radiation controlled areas and the accident-derived waste handling facility periodically once a month.

5. Requirements on equipment for preventing contamination

- (1) In handling unsealed accident-derived waste, the disposal operator should use materials and structures for the following facilities and systems that prevent spread of contamination and ensure that workers in the facilities are not exposed to radiation exposure
 - a. Accident-derived waste handling facility
 - b. Systems for crushing, classification, compression and concentration
 - c. Incinerators

- d. Landfill facilities and storage facilities
 - e. Gaseous and liquid effluent facilities
 - f. Transportation systems such as belt conveyors
- (2) Signs should be posted at the sites for disposing accident-derived waste and in the facilities and systems listed in 5 (1) to prohibit access to the area except by the authorized personnel.

6. Measures to prevent spread of contamination

- (1) The disposal operator should use containers that prevent dispersion and spillage, and label them as the containers for accident-derived waste in order to prevent spread of contamination in keeping, storing, transporting, temporarily storing before disposal or landfilling accident-derived waste.
- (2) The disposal operator should make a contamination inspection area available at the exit of the radiation controlled area, and check the contamination levels of workers. Workers, when contaminated, should wash their bodies and equipment, when contaminated, should be taken from the workers. It should be noted that contaminated items are basically not allowed to be taken from the radiation controlled areas.
- (3) The disposal operator should make available effective respiratory protective equipment and protective clothing for workers to prevent body contamination and/or internal exposure according to the following criteria.

	Radioactivity Concentration Higher than 2 million Bq/kg	Radioactivity Concentration Higher than 0.5 million Bq/kg to 2 million Bq/kg	Radioactivity Concentration 0.5 million Bq/kg or less
Work under high dust concentration environment (Dust concentration: higher than 10 mg/m ³)	Double air-tight chemical protective suit to be worn over a long sleeve shirt, double rubber gloves worn over cotton gloves, rubber boots, and a dust mask (full face) with dust collection efficiency of > 99.9%	Air-tight chemical protective suit to be worn over a long sleeve shirt, rubber gloves worn over cotton gloves, rubber boots, and a dust mask (full face) with dust collection efficiency of > 95%	A long sleeve shirt, cotton gloves, rubber boots, and a dust mask with dust collection efficiency of > 80%
Work other than that under high dust concentration environment (Dust	Air-tight chemical protective suit to be worn over a long sleeve shirt, rubber gloves worn over cotton gloves, rubber boots, and a dust	A long sleeve shirt, rubber gloves worn over cotton gloves, and a dust mask (full face) with dust collection efficiency	A long sleeve shirt, cotton gloves, rubber boots, and a dust mask with dust collection efficiency of over 80% *

concentration: 10 mg/m ³ or below)	mask (full face) with dust collection efficiency of > 95%	of > 80%	
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* Non-woven fabric masks are allowed in handling plants and humus.

- (4) No smoking, eating or drinking is allowed for workers in the workplace where they may inhale or ingest accident-derived waste.

7. Work management

- (1) The disposal operator should define rules on work methods and procedures and on adjusting safety equipment and observe that those rules are followed for the disposal of accident-derived waste, and disseminate those rules to the workers engaged in the work.
- (2) The disposal operator should submit a "work permit" to the head of the relevant Labour Standards Inspection Office, prior to undertaking the following activities in the disposal sites.
 - a. Work to dismantle systems or to access the disposal site for dismantling, modifying, repairing, cleaning and inspecting systems contaminated with accident-derived radioactive materials,
 - b. Work that may cause the sum of effective doses from external source and radioactive materials in air to exceed 1 mSv per week
- (3) The disposal operator should post the area where the effective dose caused by any of the following events may exceed 15 mSv to prohibit access by anyone except emergency workers, and report this event to the head of the relevant Labour Standards Inspection Office, in cases that: (i) shielding structure is damaged, (ii) there is loss of the functions of local ventilation or equipment that seals the radioactive source due to their failure or damage, (iii) there is a large scale radioactive material leak, spill or dispersion, or (iv) there are any other unexpected events.
- (4) The disposal operator should immediately provide medical examination or treatment to any workers who stayed in the area where any of the events described in 7 (3) occurred, or to any workers whose exposure dose exceeds the limit.

8. Education for workers

The disposal operator should provide workers with special education consisting of the following categories.

- (1) Knowledge about accident-derived waste (30 minute lecture)
- (2) Knowledge about how to dispose of accident-derived waste (90 minute lecture)
- (3) Knowledge about the structure of the equipment and how to handle the equipment used for accident-derived waste disposal (1 hour lecture)
- (4) Knowledge about the effects of ionizing radiation on the ecosystem and dose control methods (1 hour lecture)
- (5) Relevant laws and regulations (1 hour lecture)
- (6) How to dispose accident-derived waste and handle the equipment used for the work (2 hour training)

9. Actions for health care

- (1) The disposal operator should provide full-time workers engaged in accident-derived waste disposal with special and general medical examination at the time of employment or being transferred to the work, and once every 6 months thereafter periodically.
- (2) The disposal operator should prepare "ionizing radiation medical examination card" based on the medical examination results and keep them for thirty years. The records may be transferred to a designated organization after being kept for five years.
- (3) The disposal operator should hear opinions from medical doctors on the medical examination results, and notify the results to the workers who had the medical examination.

10. Safety and health management system

- (1) The facility management operator (facility owner) should establish a council consisting of relevant operators and manage the systems in the facility.
- (2) The primary contractor for the accident-derived waste disposal should assign a general safety and health manager and act as a liaison to coordinate with subcontractors and hold safety and health coordinating meeting in order to ensure appropriate safety and health management.

- (3) The primary contractor for the accident-derived waste disposal should assign a general safety and health manager among the persons who supervise and manage activities of accident-derived waste disposal to perform the following tasks in order to ensure appropriate safety and health management.
 - a. Communicate and coordinate with safety administrators of relevant subcontractors.
 - b. Hold safety and health coordination meetings consisting of all the relevant subcontractors once a month periodically.
 - c. Provide instruction or support to relevant subcontractors who develop operation rules.

- (4) The primary contractor should assign a radiation administrator to consolidate radiation control including dose control of workers of relevant subcontractors under the direction of the general safety and health manager.

11. Special cases in the special decontamination areas, etc.

- (1) Given that the soil is contaminated before constructing the disposal facility in building disposal facilities in the special decontamination areas, etc., some exemptions should be set about the contamination inspection and contamination limits.

- (2) Given that the soil is contaminated before constructing the disposal facility in burying removed soil in the facilities constructed in the special decontamination areas, etc., some exemptions should be set about the requirements for use of containers and requirements for the accident-derived waste handling facility, provided that: (i) contamination is prevented by remote operation, (ii) measures are taken to control dust dispersion, and (iii) contamination is inspected and removed at the boundaries of the landfill facility.