

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

(Labour Standards Bureau Notification No.0412-2, as of 12 April 2013)

(Revision: Labour Standards Bureau Notification No.1226-21, 26 December 2013)

(Revised parts from the previous version are underlined)

Section 1. Objectives

With the progress in decontamination, full-scale works regarding disposal of waste and soil contaminated with radioactive materials discharged by the accident of TEPCO Fukushima Daiichi Nuclear Power Plant associated with the Great East Japan Earthquake on 11 March 2011 (hereinafter the waste and soil are referred to as “accident-derived waste” and the radioactive material is referred to as “radioactive materials discharged by the accident”) are expected to be undertaken. Under such circumstances, there is an increased need for measures to protect workers engaged in those works from radiation hazards. Therefore, in light of the characteristics of the works, the Ordinance on Prevention of Ionizing Radiation Hazards (Ministry of Labour Ordinance No. 41, 1972, hereinafter referred to as "Ionizing Radiation Ordinance") will be revised in order to define necessary actions to protect workers from radiation hazards. The revised ordinance will come into effect on 1 July 2013 except some provisions.

Together with the revised Ionizing Radiation Ordinance, in a proper effort to help further promote the measures for the prevention of radiation hazards during the accident-derived waste disposal, these guidelines aim at collectively providing the essence of the actions that employer should take and the provisions specified in the Industrial Safety and Health Act (Act No. 57, 1972) and other relevant laws and regulations, in addition to the provisions specified by the revised Ionizing Radiation Ordinance.

As much as possible, the employer should strive to take measures for the prevention of radiation hazards based on the actual situation of the sites, in addition to properly carry out the actions described in the guidelines.

Section 2. Scope

1. Scope

- (1) These guidelines should be applied to the employers engaged in the operation involving disposal of accident-derived waste, etc. as defined in a to c below (hereinafter the employer and operation are referred to as the "disposal operator" and "accident-derived waste disposal" respectively).
 - a. Soil generated from actions including decontamination (removal of soil, grass and trees, soil attached to structures, fallen leaves and branches, and sludge accumulated in waterways contaminated with radioactive materials discharged by the accident, actions necessary to prevent spread of contamination, or other measures to mitigate the impact of the contamination) and soil generated associated with other actions to handle contaminated soil and waste (whose radioactivity concentrations of Cesium 134 and Cesium 137 exceed 10,000 Bq/kg. Hereinafter referred to as "removed soil").
 - b. Waste contaminated with radioactive materials discharged by the accident (whose radioactivity concentrations of Cesium 134 and Cesium 137 exceed 10,000 Bq/kg. Hereinafter referred to as "contaminated waste")
 - c. In addition to those listed in (a) and (b), any other objects whose quantities or concentration of radioisotopes, except radioactive cesium, is larger than the values specified in Article 2, paragraph 2, of the Ionizing Radiation Ordinance due to concentration through processes toward disposal.
- (2) The following statements should be noted when these guidelines are applied:
 - a. "Radioactive material" should refer to radioactive material defined in Article 2, paragraph 2, of the Ionizing Radiation Ordinance
 - b. "Disposal" should include final disposal (landfill), interim storage, interim processing (classification, crushing, compression, concentration, incineration, etc.), and the maintenance, inspection and repair of the relevant facilities or systems.

2. Relation to the Ionizing Radiation Ordinance for Decontamination

- (1) The guidelines exclude works falling under "decontamination works" or "works under a designated dose rate" defined by 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 (Ministry of Health, Labour and Welfare Ordinance No.152, 2011. Hereinafter referred to as "the Ionizing Radiation Ordinance for Decontamination"). For the former, "Guidelines on the Prevention of Radiation Hazards for Workers Engaged in Decontamination Works"

(Labour Standards Bureau Notification No.1222-6, as of 22 December, 2011, hereinafter referred to as "the guidelines on decontamination works"), should be applied. For the latter, "Guidelines on the Prevention of Radiation Hazards for Workers Engaged in Works under a Designated Dose Rate" (Labour Standards Bureau Notification No.0615-6, as of 15 June 2012, hereinafter referred to as "the guidelines on works under a designated dose rate") should be applied.

- (2) The Ionizing Radiation Ordinance for Decontamination and the guidelines on decontamination works (hereinafter referred to as "the Ionizing Radiation Ordinance for Decontamination") cover certain works in special decontamination areas specified in Article 25, paragraph 1, of the " Act on Special Measures Concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District of the Pacific Ocean Earthquake That Occurred on 11 March 2011" (Act No.110, 2013) or intensive contamination survey areas specified in Article 32, paragraph 1, of the same act (hereinafter referred to as "special decontamination areas, etc.") where radiation sources cannot be controlled (i.e., current exposure situation). These guidelines should be for works involving the disposal of accident-derived waste, etc. that can be handled as a controlled radiation source, and when exposure from the source is dominant (i.e., a planned exposure situation).
 - a. Disposal of controlled radiation sources is not the objective of the works for simply storing incineration ashes of municipal or industrial waste (including the works for packing sludge into containers with a method that workers do not touch directly, such as by remote handling), or sludge falling under the accident-derived waste generated at water supply and sewerage facilities (which turned out to exceed 10,000 Bq/kg). Therefore, these works are excluded from those for accident-derived waste disposal, and should be subject to the regulations for storing radioactive material other than accident-derived waste. Also, the works for storing removed soil generated from decontamination or contaminated waste at a decontamination site should be governed by the Ionizing Radiation Ordinance for Decontamination, and others as decontamination works (waste collection works).
 - b. Collecting, transporting, and storing accident-derived waste at the sites used for the accident-derived waste disposal (hereinafter referred to as "disposal site") should be subject to these guidelines as "the accident-derived waste disposal", and should not be governed by the Ionizing Radiation Ordinance for Decontamination.
 - c. Crushing and classification of accident-derived waste outside of a disposal site is not included in "the accident-derived waste disposal". If these works fall under "works for decontamination of soil and wastes" or "works for handling designated contaminated

soil and wastes", they should be governed by the Ionizing Radiation Ordinance for Decontamination.

Section 3. Methodology for setting radiation controlled areas and radiation dose control

1. General Principles

- (1) The disposal operator should strive to minimize the ionizing radiation exposure that workers may receive.
- (2) Therefore, when constructing a disposal site in special decontamination areas, etc., the disposal operator should be required to decontaminate the area around the site in advance in order to reduce radiation dose in the area and assign workers to the works after reducing dose rate as low as possible.

2. Clear indication of radiation controlled areas

- (1) The disposal operator should post signs to clearly indicate the areas that fall under any of the following criteria (hereinafter referred to as "radiation controlled areas"):
 - a. The area where the sum of effective doses from external radiation and radioactive material in air may exceed 1.3 mSv per three months.
 - b. The area where the surface density of radioactive material may exceed one-tenth (4 Bq/cm²) of the surface contamination limit specified in the attached Table 3 of the Ionizing Radiation Ordinance (hereinafter referred to as "surface contamination limit")
- (2) The disposal operator should prohibit all personnel except those required from entering into the radiation controlled areas.
- (3) The statements below should be taken into consideration when the radiation controlled areas are set:
 - a. The area where the dose may exceed 1.3 mSv per three months should be determined by whether effective doses may exceed 2.5 µSv/h based on the assumption that working hours are 2,000 hours per year.
 - b. The effective dose from external radiation should include that from the environment other than accident-derived waste, etc.
 - c. Details for specifying radiation controlled areas should be subject to the provision in Article 3 of the Ionizing Radiation Ordinance and the Labour Standards Bureau Notification No.253, as of 30 March 2001.

3. Measurement of dose

- (1) The disposal operator should measure the radiation dose of external and internal exposure that workers engaged in accident-derived waste disposal (hereinafter referred to as “workers for accident-derived waste disposal”) receive in a radiation controlled area, while giving due consideration to following statements:
 - (2) The radiation dose from external exposure should be measured according to the methods described below.
 - a. The radiation dose from external exposure should be measured by the methods described below.
 - (i) Measure the radiation dose by attaching a measurement instrument on the chest for men or women who were diagnosed with no possibility of pregnancy, and on the abdomen for other women.
 - (ii) The measurement instrument should be able to measure 1cm dose equivalent.
 - b. If beta ray exposure is more than 10 times higher than gamma ray exposure in such a case as handling a processed waste solution after removing radioactive cesium out of accident-derived waste, the radiation dose should be measured by using the following methods (in addition to the measurement by the methods stated in a):
 - (i) The measurement instrument to be attached in a. (i) above should be able to measure 1cm dose equivalent and 70 μ m dose equivalent.
 - (ii) Measure the radiation dose with the instrument attached on the body part that may have the highest exposure. The measurement instrument should be able to measure 70 μ m dose equivalent.
 - c. The disposal operator should provide measurement instruments such as electronic dosimeters that allow measurement of radiation dose per day for workers whose daily external exposure dose may exceed 1 mSv.
 - (3) The radiation dose from internal exposure should be measured according to the methods described below.
 - a. Measure internal exposure dose once every three months for those who access to the places in radiation controlled areas where they may intake radioactive materials by inhalation or ingestion.

Measure it once a month for women (except those who were diagnosed with no possibility of pregnancy) whose effective dose in a month may exceed 1.7 mSv and pregnant women.

It should be noted that, when workers intake radioactive materials by inhalation or ingestion by accident, the dose should be measured immediately after the intake.
 - b. The method for measuring internal exposure dose should be subject to the provisions in

Article 2 of "the Limit and Method Determined by Minister of Health, Labour and Welfare, pursuant to the regulations including Article 3, paragraph 3, of the Ordinance on Prevention of Ionizing Radiation Hazards (Notification of Ministry of Labour No.93, 1988, hereinafter referred to as "the measurement notification").

- (4) The disposal operator should give due consideration to the following statements when measuring radiation dosages:
 - a. Exposure in radiation controlled areas should be evaluated by adding the exposure from accident-derived waste, and other sources altogether.
 - b. "The places where one may intake radioactive materials by inhalation or ingestion" in which internal exposure is measured should mean the places where the surface density of radioactive materials may exceed one-tenth (4 Bq/cm^2) of the surface contamination limit, or the places where the concentration of radioactive material in the air may exceed one-tenth (correspond to approx. 5 mSv/y) of the concentration limit in the air specified in Article 1 of the measurement notification (hereinafter referred to as "the air concentration limit").
 - c. The disposal operator should be required to give due consideration that a sufficient number of whole-body counters are prepared, according to the number of the target individuals for measuring internal exposure.

4. Exposure dose limit

- (1) The disposal operator should prevent the total radiation dose that a worker engaged in accident-derived waste disposal receives from exceeding the following limits:
 - a. For men, or women who were diagnosed with no possibility of pregnancy, the effective dose should not exceed 100 mSv in 5 years and 50 mSv in a year.
 - b. For women except those who were diagnosed with no possibility of pregnancy and women in c., the effective dose should not exceed 5 mSv per three months.
 - c. For women who were diagnosed with pregnancy, the effective dose from internal exposure should not exceed 1 mSv , and the equivalent dose received on the surface of her abdomen should not exceed 2 mSv during pregnancy.
- (2) The disposal operator should prevent the equivalent dose that a worker engaged in accident-derived waste disposal receives from exceeding each limit specified for each of the following categories:
 - a. Eye lens: 150 mSv/y
 - b. Skin: 500 mSv/y
- (3) When conducting emergency work to protect workers from health impairment by radiation in case of an accident (hereinafter referred to as "emergency work"), the

disposal operator should prevent men, or women who were diagnosed with no possibility of pregnancy from exceeding each limit specified for each of the following categories:

- a. Effective dose: 100 mSv
 - b. Equivalent dose received on eye lens: 300 mSv
 - c. Equivalent dose received on skin: 1 Sv
- (4) The disposal operator should control exposure dose to ensure that it will not exceed the exposure dose limit by adding the exposure dose received during the accident-derived waste disposal and those received during decontamination works, works under a designated dose rate, and other radiation works that are subject to the Ionizing Radiation Ordinance.

5. Recording dose measurement results

- (1) On a daily basis, the disposal operator should check and record the measurement results of external exposure described in 4, for workers whose daily external exposure dose may exceed 1 mSv.
- (2) The disposal operator should use the measurement results in 4 to calculate the following exposure dose by using the method specified in Article 3 of the measurement notification, and record and keep them for thirty years. It should be noted, however, that this should not apply when the records are transferred to the organization designated by Minister of Health, Labour and Welfare (Radiation Effects Association) after keeping them for five years. In this case, Form 1 should be available as an example of the record form.
 - a. The sum of every three months, every year, and every five years of the effective doses for men, or women who were diagnosed with no possibility of pregnancy (the sum of every three months and every year for those whose annual effective doses have not exceeded 20mSv for five years)
 - b. The sum of every month and every three months of the effective doses for women (except those who were diagnosed with no possibility of pregnancy) (the sum of every three months and every year for those whose monthly effective doses have not exceeded 1.7mSv for a month)
 - c. The sum of every three months and every year of the equivalent doses per body organ
 - d. The sums of effective dose from internal exposure and equivalent dose that a pregnant woman receives on the surface of her abdomen every month, and during pregnancy
- (3) The disposal operator should notify workers of the records regarding (1) and (2) without delay.
- (4) The disposal operator should transfer the records stated in (2) to the institution designated by Minister of Health, Labour and Welfare (Radiation Effects Association)

when terminating its business.

Section 4. Dose limits at facilities

1. Dose limits at facilities

- (1) The disposal operator should ensure that the sum of the effective dose from external radiation and the effective dose from radioactive material in the air at places where workers constantly access, will not exceed 1 mSv per week, by setting up shielding, a local ventilation system, and air-tight system at the facilities dedicated to handle unsealed accident-derived waste (hereinafter referred to as "accident-derived waste handling facilities"), storing accident-derived waste (hereinafter referred to as "storage facilities"), and burying accident-derived waste (hereinafter referred to as "landfill facilities").
- (2) The disposal operator should give due consideration to the following statements regarding radiation dose limits.
 - a. 1 mSv per week should mean 25 μ Sv/h under the assumption that work hours are 40 per week. In order not to exceed 1 mSv per week, at least the concentration of radioactive material in the air should be required to equal to or less than the concentration limit in the air (correspond to approx. 50 mSv/y).
 - b. In the case of constructing a disposal site in a special decontamination areas, etc., measures should be required not to exceed 1 mSv per week at the places where workers constantly access, such as by setting up shielding and using remotely operated construction vehicles and vehicles with shielding, if the effective dose may exceed the limit at such places in facilities, except stated in (1).
 - c. The radiation dose limit stated in (1) should be applied to the places where workers constantly access. This limit should not be applied when workers enter an incinerator and/or crushing, classification, compression, and concentration systems to conduct non-routine work including maintenance and inspection.

2. Surface contamination limits at accident-derived waste handling facilities

- (1) The disposal operator should measure the surface concentration of ceilings, floors, walls and equipment (only where workers may touch) in accident-derived waste handling facilities once every month. If there is contamination exceeding the surface contamination limit (40Bq/cm²), remove it to the limit level, or less.
- (2) In case contamination occurs due to reasons such as spillage of radioactive materials discharged by the accident in an accident-derived waste handling facility, the disposal

operator should take measures immediately to prevent spread of contamination, clearly indicate the contaminated zone, and remove it to the surface contamination limit ($40\text{Bq}/\text{cm}^2$) or below.

- (3) The disposal operator should give due consideration to the following statements regarding measurement of the contamination stated in (1).
 - a. No contamination measurement should be required for the parts workers are unlikely to touch during their regular work, including ceilings and walls that are too high to touch.
 - b. One or two portions which may be possibly contaminated most should be selected for each wall face or equipment for the measurement.
 - c. The limit of radioisotopes that do not emit alpha rays ($40\text{ Bq}/\text{cm}^2$) should be applied to the surface contamination limit related to accident-derived waste. This is because radioactive cesium is the major exposure source during the accident-derived waste disposal.

3. Surface contamination limits at facilities except accident-derived waste handling facilities

(1) Actions in case of accident-derived waste spillage

In case contamination occurs due to reasons such as spillage of accident-derived waste,, the disposal operator should take measures immediately to prevent spread of contamination, clearly indicate the contaminated zone, and remove it to the level one-tenth ($4\text{ Bq}/\text{cm}^2$) of the surface contamination limit or below.

(2) Concentration of radioactive material in air

The disposal operator should retain the average of every three months of the weekly average concentration to the level one-tenth (approx. $5\text{mSv}/\text{y}$) of the concentration limit in the air or below at disposal sites, except accident-derived waste handling facilities.

4. Measurement of working environment

(1) The disposal operator should measure the following items in radiation controlled areas and accident-derived waste handling facilities, using radiation measurement devices once every month on a regular basis.

- a. Radiation controlled area: dose equivalent rate or dose equivalent from external radiation
- b. Accident-derived waste handling facilities: concentration of radioactive material in air

(2) The disposal operator should record the following items during each measurement in (1), and save the records for five years.

- a. Measurement date and time
 - b. Measurement method
 - c. Type, model, and performance of radiation measurement devices
 - d. Measurement location
 - e. Measurement conditions
 - f. Measurement results
 - g. Name of the person who carried out the measurements
 - h. Outline of the actions carried out based on the measurement results
- (3) The disposal operator should inform workers who access radiation controlled areas of the measurement results of dose equivalent, or dose equivalent rate from external radiation in the areas, by putting notices in an easily visible place.
- (4) The disposal operator should give due consideration to the following statements when carrying out the measurement.
- a. Dose equivalent rate or dose equivalent in radiation controlled areas should be measured by using the methods specified in Articles 7 and 8 of the Working Environment Measurement Standards (Notification of Ministry of Labour No.46, 1976) and Labour Standards Bureau Notification No.253, as of 30 March 2001.
 - b. The concentration of radioactive material in the air at accident-derived waste handling facilities should be measured by a working environment measurement expert using the method specified in Articles 7 and 9 of the Working Environment Measurement Standards.

Section 5. Requirements that should be met by accident-derived waste disposal facilities

1. Clear indication of the border of the disposal site
- (1) The disposal operator should clearly indicate the border of the disposal site with signs and set up fences and others.
- (2) The disposal operator should give due consideration to the following statements when posting the signs.
- a. A narrower border of a disposal site than the actual site border should be allowed to confine the area necessary to conduct accident-derived waste disposal.
 - b. "Fences and others" should not be limited to fences and the like, but include simple objects such as safety cones.

2. Accident-derived waste handling facilities

- (1) The disposal operator should set up a facility dedicated for handling accident-derived waste. when handling unsealed waste, and the handling should be conducted within the facility.
- (2) The disposal operator should conform to the following regulations regarding ceilings, walls, floors, and other parts that may potentially be contaminated inside the accident-derived waste handling facilities.
 - a. The parts should be made of material impermeable to gas or liquid, and corrosion resistant.
 - b. Surfaces should be finished smoothly.
 - c. The structure should have few protrusions, dents, or gaps.
- (3) In addition to (2), the disposal operator should take the following actions, depending on the properties of accident-derived waste. to be handled:
 - a. Accident-derived waste that may generate liquid should be handled in a facility with a leakage resistant structure.
 - b. Measures should be taken to control dust dispersion when handling accident-derived waste that may generate dust.
- (4) The disposal operator should take measures to prevent spread of contamination, such as by making a double-entry door available at the entrance and exit of the accident-derived waste handling facilities.
- (5) The disposal operator should post a sign indicating the accident-derived waste handling facilities outside the facility in an easily visible place, and prohibit all personnel except those required from entering.
- (6) The disposal operator should give due consideration to the following statements regarding the accident-derived waste handling facilities:
 - a. Materials, finishes, and structures stated in (2) should be durable to withstand operation with trucks and construction vehicles.
 - b. "Measures to control dust dispersion" should include measures to confine facilities, ensure that the structure has less gaps in ceilings and walls, set up local ventilation system (with a dust collector), and spray a small amount of water to the extent without the need of discharge.
 - c. "Setting up double-entry doors and others" should include setting items which are made of material effective to prevent spread of contamination, such as an impermeable liner, and which can be opened or closed in temporary tents connected to an accident-derived waste handling facility, and setting ventilation systems that can maintain airflow from outside to inside of the facility when openings are released.

3. Crushing processes, and other treatments of accident-derived waste

- (1) When crushing, classifying, compressing, and concentrating accident-derived waste or contaminated objects exceeding one-tenth (4 Bq/cm^2) of the surface contamination limit (hereinafter referred to as "contaminated objects") outside an accident-derived waste handling facility, the disposal operator should use the processes that conform to the following regulations (hereinafter referred to as "crushing equipment, etc.") according to the properties of such waste to be handled.
 - a. For the case that gas may be generated, the equipment should have a structure resistant to gas leakage and corrosion, and should be made of material with low gas permeability.
 - b. In cases which that liquid may be generated, the equipment should have a structure resistant to liquid leakage and corrosion, and should be made of material with low liquid permeability.
 - c. In cases which dust may cause contamination, equipment with no possible dust dispersion should be used.
- (2) The disposal operator should post a crushing equipment sign in an easily visible place outside the equipment.
- (3) The disposal operator should give due consideration to the following statements regarding crushing equipment:
 - a. The purpose of the requirements for the crushing equipment should be to maintain its sealability to prevent workers from being exposed to debris of accident-derived waste. Therefore, for the case that the equipment does not have sealability, and that dust may be dispersed into the vicinity of the equipment, the crushing equipment should be required to be placed in an accident-derived waste handling facility.
 - b. "Crushing equipment, etc." should include accessory pipes and joints.
 - c. "No possible gas leakage" and "no possible dust dispersion" should mean that the equipment is required to have no possibility of gas leakage or dust dispersion from the parts other than its supply and exhaust ventilation system. "No possible liquid leakage" should mean that it is required to have no possibility of liquid leakage from the parts other than its water supply and drain system.

4. Incinerators for accident-derived waste

- (1) The disposal operator should incinerate accident-derived waste or contaminated objects using an incinerator with a structure that has no possibility of gas leakage or ash dispersion.
- (2) The disposal operator should post an incinerator sign in an easily visible place outside the

incinerator.

- (3) The disposal operator should give due consideration to the following statements regarding incinerators:
 - a. "Incinerator" should include the transportation system, supply and exhaust ventilation system, and accessory pipes that are integrated with the incinerator.
 - b. "No possible gas leakage" should mean that the incinerator is required to have no possibility of gas leakage from the parts other than its supply and exhaust ventilation system.

5. Facilities for burying accident-derived waste,

- (1) The disposal operator should bury accident-derived waste or contaminated objects at a landfill facility which is separated from the surrounding environment and which has keys and other systems or devices to shut doors, lids and other parts connected to the surrounding environment.
- (2) The disposal operator should landfill unsealed accident-derived waste at a facility that meets the requirement of accident-derived waste handling facilities.
- (3) The disposal operator should post a sign indicating the landfill facility outside the facility in an easily visible place, set up fences and the like, and prohibit all persons, except those required, from entering.
- (4) The disposal operator should give due consideration to the following statements regarding landfill facilities:
 - a. The provisions concerning landfill in the guidelines should apply to interim storage based on burial of removed soil or contaminated waste.
 - b. When removed soil without being sealed is landfilled, dumping should be conducted in temporary tents and other locations surrounded by walls and ceilings. Once it is covered by uncontaminated soil, the temporary tents may be removed or transferred to other place. This case should require a concrete pit, or a water shielding lining, to prevent spread of contamination.

6. Facilities for storing accident-derived waste

- (1) The disposal operator should store accident-derived waste at a storage facility which is separated from the surrounding environment and which has keys and other systems or devices to shut doors, lids and other parts connected to outside.
- (2) The disposal operator should post a sign indicating the storage facility outside the facility in an easily visible place, and prohibit all persons, except those required, from entering.

7. Ventilation and effluent facilities regarding accident-derived waste

- (1) When leading, storing, or purifying waste gas or liquid from accident-derived waste handling facilities, crushing equipment, or belt conveyors and other transportation equipment, the disposal operator should use a facility whose structure has no possible leakage of waste gas or liquid, and which is made of corrosion-resistant material with low liquid permeability.
- (2) The disposal operator should post a sign of the facility in an easily visible place outside the facility.
- (3) The disposal operator should give due consideration to the following statements regarding ventilation and liquid discharging facilities:
 - a. Facilities associated with ventilation should include local ventilation systems, dust collectors (bag filter), and accessory pipes.
 - b. Facilities associated with waste liquid should include waste liquid tank, waste liquid treatment equipment, and accessory pipes.

8. Systems for transporting accident-derived waste

- (1) When transporting unsealed accident-derived waste or contaminated objects outside an accident-derived waste handling facility, the disposal operator should use belt conveyors and other transportation equipment that conform to the regulations below, according to the properties of such waste to be transported. It should be noted, however, that this should not be applied when effective measures were taken to shield external radiation, or prevent spread of contamination or the containers stated in the 1Containers of Section 6 are used.
 - a. For the case that gas may be generated, the equipment should have a structure resistant to gas leakage and corrosion, and should be made of material with low gas permeability.
 - b. For the case that liquid may be generated, the equipment should have a structure resistant to liquid leakage and corrosion, and should be made of material with low liquid permeability.
 - c. For the case that dust may be dispersed, equipment with no possible dust dispersion should be used.
- (2) The disposal operator should post a sign of belt conveyors and other transportation equipment in an easily visible place outside the equipment.
- (3) The "belt conveyors and other transportation equipment" should include bridge cranes.

Section 6. Measures for preventing contamination

1. Containers

- (1) The disposal operator should use containers when temporarily storing accident-derived waste in order to keep, store, transport, dispose, or bury it. These containers should also be used when contaminated objects are transported, temporarily stored for disposal, or landfilled. It should be noted, however, that this should not be applied when effective measures were taken to shield external radiation or prevent spread of contamination from waste which is extremely difficult to put in containers, when such waste is handled within an accident-derived waste handling facility, or when such waste is transported using belt conveyors and other transportation equipment.
- (2) When using the containers stated in (1) for the following purposes listed in the left column in the table below, the disposal operator should use those with structure described in the right column of the table, according to the corresponding purpose.

Purpose of use	Structure
To contain accident-derived waste or contaminated objects that may cause air contamination.	Containers should be made of corrosion-resistant material and have no possibilities of gas leakage.
To contain liquid accident-derived waste or wet contaminated objects due to the liquid waste.	Containers should be made of corrosion-resistant material with low liquid permeability, and have structure with low possibility of liquid leakage or spillage.
To transport accident-derived waste or contaminated objects outside of radiation controlled areas.	<ol style="list-style-type: none">a. 1 cm dose equivalent rate on the container surface (i.e. on the package surface when container is packed) should not exceed 2mSv per hour.b. 1 cm dose equivalent rate at the distance of 1 meter from the container surface should not exceed 0.1mSv per hour.

- (3) The disposal operator should label the container indicating that it is used to contain accident-derived waste or contaminated objects.
- (4) The disposal operator should give due consideration to the following statements regarding containers:
 - a. "Waste which is extremely difficult to put in containers" should include large

machines, and cut trees, dismantled structures, or debris larger than container capacity.

- b. "Effective measures to prevent spread of contamination" should include transportation using a truck whose cargo bed is sealed, or whose cargo bed is entirely covered by a waterproof sheet.

2. Tools for handling accident-derived waste

The disposal operator should put labels on scoops and other tools indicating that they are used to handle accident-derived waste., and also should not use them for other purposes. These tools should be stored using hooks and/or shelves with structures and materials from which contamination can be easily removed.

3. Contamination Inspection

- (1) The disposal operator should make a contamination inspection area available at the exit of the radiation controlled area (i.e. where workers' bodies, wearable equipment, or items may be contaminated exceeding one-tenth (4 Bq/cm^2) of the surface contamination limit) and check the contamination levels of workers' bodies and their wearable equipment.
- (2) When the inspection result shows that a worker's contamination level exceeds one-tenth (4 Bq/cm^2) of the surface contamination limit, the disposal operator should make him or her stay in the radiation controlled area until the following actions are taken:
 - a. Contaminated body should be washed until the contamination level falls to one-tenth (4 Bq/cm^2) of the surface contamination limit, or below.
 - b. Contaminated wearable equipment should be taken off or detached.
- (3) Before items are taken out of the radiation controlled areas, the disposal operator should inspect the contamination levels of these items at the contamination inspection area stated in (1). It should be noted, however, that this should not be applied when such items are transported using belt conveyors and other transportation equipment.
- (4) When the inspection result shows that the contamination level of an item exceeds one-tenth (4 Bq/cm^2) of the surface contamination limit, the item should not be taken out of the radiation controlled area. It should be noted, however, that this should not be applied when such items are transported using belt conveyors and other transportation equipment, and when such items are transported to the facilities for removing contamination, and for disposing of or discarding accident-derived waste, etc. after measures such as putting them in a container were taken to prevent spread of contamination.
- (5) The disposal operator should give due consideration to the following statements when

conducting contamination inspection:

- a. The "contamination inspection area" stated in (1) should be equipped with radiation measurement instruments used for the inspection, a cleaning system to remove contamination, and facilities for temporary storage of contaminated waste such as dust masks.
 - b. The provisions in Section 7 (5) require the disposal operator to conduct medical examinations for workers whose contamination levels cannot be reduced to one-tenth ($4\text{Bq}/\text{cm}^2$) of the surface contamination limit, or below, even after washing. In this case, the disposal operator may make these workers leave the radiation controlled area.
 - c. As for vehicles transporting removed soil or contaminated waste, it is recommended that contamination on their cargo beds and other contaminated areas be removed and inspected in unloading areas. If this is difficult, such vehicles should return to a contamination inspection area, and be inspected after measures to prevent dispersion were taken as specified in the note of 1 (1) of Section 6.
- (6) The disposal operator should prepare equipment for removing contamination such as equipment for washing eyes and bodies, and for gargling, locker rooms, and laundry facilities at the disposal site. It should be noted that equipment for washing bodies should include bathing facilities and shower.

4. Protective equipment

(1) Respiratory protective equipment

- a. The disposal operator should prepare effective respiratory protective equipment to be used by workers engaged in the works that may cause them to inhale air exceeding the concentration limit in air (approx. $50\text{ mSv}/\text{y}$).
- b. The effective respiratory protective equipment should have capability with dust collection efficiencies corresponding to the following categories for works and radioactivity concentrations of accident-derived waste, or those with equivalent or better dust collection efficiencies.

	Radioactivity Concentration above 2,000,000 Bq/kg	Radioactivity Concentration above 500,000 Bq/kg or 2,000,000 Bq/kg or below	Radioactivity Concentration 500,000 Bq/kg or below
Work under high dust concentration environment (Dust concentration: higher than 10 mg/m ³)	Dust collection efficiency: ≥ 99.9% (full face)	Dust collection efficiency: ≥ 95%	Dust collection efficiency: ≥ 80%
Work other than that under high dust concentration environment (Dust concentration: 10 mg/m ³ or below)	Dust collection efficiency: ≥ 95%	Dust collection efficiency: ≥ 80%	Dust collection efficiency: ≥ 80%

- c. Workers engaged in the works stated in a. should use the respiratory protective equipment specified in b.
- d. The disposal operator should give due consideration to the following statements regarding respiratory protective equipment:
 - (i) Dust masks should have three types of dust collection efficiencies: 99.9% or above (RS3/RL3, full face), 95% or above (RS2/RL2 or DS2/DL2), and 80% or above (RS1/RL1 or DS1/DL1).
 - (ii) Use RL or DL as a filter for dust masks when handling accident-derived waste, etc. in a liquid state.
 - (iii) Use a cartridge with dust proof function along the gas type when handling accident-derived waste, etc. in a gas state.
 - (iv) It should be noted that non-woven fabric masks (*) may be used instead of dust masks if the works occurring will not handle accident-derived waste, etc. exceeding 500,000 Bq/kg and if the works are associated with work other than that under high dust concentration, and if those works (handling grass, tree or leaf mold) do not fall under Articles 7 or 27 of the "Ordinance on Prevention of Hazards Due to Dust" (Ministry of Labour Ordinance No.18, 1979). (*: Masks except dust masks certified by the national test. Made of non-woven fabric material, and commonly used to prevent cold and/or used as measures against pollinosis. Also known as surgical masks, pleated masks, and face masks. Gauze masks are not included.)

(2) Protective clothing

- a. The disposal operator should prepare effective protective clothing, gloves, or shoes to

be used by workers engaged in the works that may exceed one-tenth (4 Bq/cm^2) of the surface contamination limit.

- b. The disposal operator should provide effective protective clothing, gloves, or shoes to workers handling accident-derived waste who may be exposed to splashing or flying powder that come from such waste.
- c. The disposal operator should prepare dedicated work clothes to be used by workers engaged in the works at accident-derived waste handling facilities.
- d. The effective protective clothing, gloves, or shoes should include those corresponding to the categories below for works and radioactivity concentrations of accident-derived waste, or the equivalent or better.

	Radioactivity Concentration Higher than 2,000,000 Bq/kg	Radioactivity Concentration Higher than 500,000 Bq/kg to 2,000,000 Bq/kg	Radioactivity Concentration 500,000 Bq/kg or less
Work under high dust concentration environment (Dust concentration: higher than 10 mg/m^3)	Double air-tight chemical protective suits on a long sleeve shirt, double pairs of rubber gloves on cotton gloves, rubber boots,	Air-tight chemical protective suit on a long sleeve shirt, rubber gloves on cotton gloves, rubber boots	A long sleeve shirt, cotton gloves, and rubber boots
Work other than that under high dust concentration environment (Dust concentration: 10 mg/m^3 or below)	Air-tight chemical protective suit on a long sleeve shirt, rubber gloves on cotton gloves, rubber boots	A long sleeve shirt, rubber gloves on cotton gloves, and rubber boots	A long sleeve shirt, cotton gloves, and rubber boots

- e. Workers engaged in the works stated in a. should use the protective equipment specified in d.
- f. The disposal operator should give due consideration to the following statements regarding protective equipment:
 - (i) When it is expected that, during maintenance work inside the facility, the entire body will be contaminated with accident-derived waste, etc. exceeding the radioactivity concentration of 2,000,000 Bq/kg, it should be recommended that positive-pressure type or airtight full body chemical protective clothing (e.g., airline suit) be used.
 - (ii) When handling liquid contaminated with radioactive materials discharged by the accident such as treatment of contaminated water, workers should wear waterproof clothing with hood, which separates into upper and lower parts, on protective clothing.

- (3) The statements below should be noted when determining radioactivity concentration and dust concentration of accident-derived waste.
 - a. See Attachment 1 to determine which category radioactivity concentration falls under.
 - b. See below to determine whether work falls under the work under high dust concentration.
 - (i) The works handling dried accident-derived waste that is not sealed in containers and the works that require workers to enter inside equipment for crushing, classification, compression, concentration, and incineration of accident-derived waste should be considered as the work exceeding a dust concentration of 10mg/m^3 , and fall under the category of work under high dust concentration.
 - (ii) Regardless of (1), when measuring dust concentration during work, determine whether it falls under the work under high dust concentration environment based on the measurement results. See Annex 2 for the method for dust concentration measurement.
- (4) When it was found that the respiratory protective equipment or protective clothing planned to be used by workers were contaminated in excess of the surface contamination limit (40Bq/cm^2) (one-tenth (4Bq/cm^2) for the portion that will come in contact with workers), the disposal operator should not provide workers with such equipment unless the contamination is washed off in advance to reduce the contamination level to the limit, or below.

5. Prohibition of Smoking and others

- (1) The disposal operator should prohibit workers from smoking, drinking or eating in an accident-derived waste handling facility and any other workplaces where they may inhale or ingest accident-derived waste, and put notices of the prohibition in visible locations.
- (2) Workers should not smoke, drink or eat in the workplaces specified in (1).

Section 7. Work management

1. Work rules for accident-derived waste disposal

- (1) The disposal operator should define the rules concerning the items below related to the works of accident-derived waste disposal, follow them in conducting the works, and disseminate them to the workers involved.

- a. Operation of each piece of equipment used in accident-derived waste disposal
 - b. Adjustment of safety equipment and automatic alarming equipment
 - c. Method and procedures of works
 - d. Actions for monitoring external radiation and radioactive material in air
 - e. Actions related to measurement of the surfaces of ceilings, floors, walls and equipment, and removal of contamination.
 - f. Emergency actions in case of abnormal events
 - g. Other actions for protecting workers from radiation hazards
- (2) The disposal operator should give due consideration to the following statements regarding work rules.
- a. The operation stated in (1)-a. should include, for each piece of equipment, timing of the operation, operation procedures, and necessary information such as for maintaining proper operational state and for maintenance and inspection. "Each piece of equipment" should include equipment associated with accident-derived waste handling facilities, storage facilities, incinerator and landfill facilities, crushing equipment, belt conveyors, and other transportation equipment.
 - b. The statement (1)-b should include when to adjust safety equipment and auto alarm equipment, and the operation tests. "Safety equipment" should include the interlock of crushing equipment. "Auto alarm equipment" should include the systems that automatically notify of leaks at Ventilation and effluent facilities, and abnormal events in incinerators and other equipment.
 - c. (1)-c should include: the procedures for entering and exiting radiation controlled areas, the methods and procedures for handling unsealed accident-derived waste, the methods and steps for classification, crushing, compression/concentration, storage, incineration and burial of accident-derived waste, the methods and steps for maintenance and inspection work on equipment contaminated with accident-derived waste, the methods for inspecting contamination state on bodies and removing contamination, the performance and usage of protective equipment, the measures to prevent exposure such as by setting shielding bodies and selecting remote operation, exposure dose limits and the methods for measuring exposure doses, and the methods for checking and recording the exposure dose measurement results.
 - d. Actions described in (1)-d should include: the method for measuring the dose equivalent rate from external radiation and the concentration of radioactive material in the air, the frequency and implementation system, and measures when these measurement results exceed the limit specified in parts 1 and 3 of Section 4.
 - e. Actions described in (1)-e should include: the methods for measurement of the

contaminated surfaces of ceilings, floors, walls and equipment, the frequency and implementation system, and the methods for removing contamination when the inspection results exceed the limit specified in parts 2 and 3 of Section 4.

- f. Actions described in 1)-f should include: for each facility and equipment, emergency calls regarding each facility or equipment to a department dealing with abnormal events, personnel assignment for maintaining safety, instructions on how to use necessary equipment, and procedures for emergency works. Additionally, emergency action training should be provided regularly based on the work rules.

2. Measures relevant to maintenance and inspection of equipment or facilities

- (1) Before keeping inspection access doors open while maintaining and inspecting equipment or facilities, the disposal operator should take measures to prevent spread of contamination such as by using water shielding sheets for covering. Before conducting works that may cause spread of contaminated dust over a wide area, such as replacement of ventilation filter, the disposal operator should take measures to prevent spread of contamination such as by setting temporary tents and/or local ventilation systems.
- (2) Prior to maintenance and inspection work, the disposal operator should measure the dose equivalent rate at the work area, develop work rules that include radiation protective measures conforming to ambient dose rate, designate a work manager, and allow workers do their jobs according to the work rules.
- (3) The disposal operator should make workers engaged in maintenance and inspection use the protective equipment specified in part 4 of Section 6.
- (4) The disposal operator should measure contamination near the opening sections after the work, and remove it to below one-tenth (4 Bq/cm^2) of the surface contamination limit.

3. Submission of work request

- (1) The disposal operator (limited to the primary contractor, if there is any entity that falls under the operator assigned work directly, hereinafter referred to as "the primary contractor") should submit a "work request" in Form 2 to the head of the Labour Standard Inspection Office within the jurisdiction of the disposal site (hereinafter referred to as the head of the Labour Standard Inspection Office within the jurisdiction), before undertaking the works below.
 - a. Disassembly work or requiring entry into the system contaminated with accident-derived waste in order to dismantle, remodel, repair, clean, and inspect the system.
 - b. Work that may cause the sum of effective doses from external radiation and

radioactive material in the air to exceed 1 mSv per week

- (2) Work requests should include the following items:
 - a. Name and address of the site
 - b. Description of the work
 - c. Name of the facility or system and its owner
 - d. Overview of the work
 - (i) Primary Contractor
 - (ii) Address of the work site
 - (iii) Duration of the work
 - (iv) Name of the manager responsible for the work
 - (v) Dose equivalent rate in work area
 - (vi) Work category (dismantling work, work requiring entry into the systems, the work stated in (1)-b.)
 - e. List of relevant subcontractors and estimation of number of workers
- (3) The disposal operator should give due consideration to the following statements regarding work request:
 - a. "Inspection" stated in (1)-a. should include non-destructive testing and painting.
 - b. The dismantling work stated in (1)-a. should not include the work dismantling uncontaminated parts.
 - c. A work request should be submitted per facility or equipment.

4. Evacuation in case of accidents

- (1) In case of accidents that fall under any of the events below, the disposal operator should use signs to clearly indicate the area where the effective dose due to the accident may exceed 15mSv, prohibit access except emergency workers, and immediately report it to the head of the Labour Standard Inspection Office within the jurisdiction.
 - a. In case shielding objects were damaged.
 - b. In case of failure or damage of local exhaust ventilation, or equipment sealing the source of scattering leading to loss of functions.
 - c. In case a large volume of radioactive material leaked, spilled, or scattered.
 - d. In case any other unexpected events occurred
- (2) The disposal operator should record the items below and save them for five years if any of the accidents stated in (1) occurred, and the areas stated in (1) were specified.
 - a. Equivalent doses to eye lenses and skin of the workers, or emergency workers, in the zone described in (1).
 - b. Date, time, and location of the accident occurrence

- c. Cause and status of the accident
- d. Status of radiation-induced disorder emergence
- e. Description of the emergency actions

5. Medical examination by medical doctors

- (1) The disposal operator should immediately provide a worker who falls under any of the categories below with a medical doctor's medical examination or treatment, and immediately report it to the head of the Labour Standard Inspection Office within the jurisdiction.
 - a. Workers who were in the area stated in 4 (1) when any of the accidents stated in 4 (1) occurred.
 - b. Workers whose radiation dose exceeded his/her exposure limit.
 - c. Workers who inhaled or ingested radioactive material by accident.
 - d. Workers whose contamination was unable to be reduced to one-tenth ($4\text{Bq}/\text{cm}^2$) of the surface contamination limit or below by washing his/her body.
 - e. Workers whose injured part was contaminated.
- (2) Case c. should be limited to the cases expected to receive a certain level of internal exposure, such as when a worker was buried under a large volume of accident-derived waste due to an accident, or when a large volume of accident-derived waste or other objects contaminated with the waste was ingested orally.

Section 8. Education for workers

1. The disposal operator should train workers by using the following courses before assigning any works for accident-derived waste disposal:
 - (1) Accident-derived waste (30 minute lecture)
 - (2) How to dispose of accident-derived waste, etc. (90 minute lecture)
 - (3) The structure of and how to handle the equipment used for accident-derived waste disposal (1 hour lecture)
 - (4) The impact of ionizing radiation on living organisms and the exposure dose control method (1 hour lecture)
 - (5) Relevant laws and regulations (1 hour lecture)
 - (6) How to dispose of accident-derived waste and handle the equipment used for the work (2 hour training)
2. See Attachment 3 for details on the implementation of education.

Section 9. Actions for health care

1. Special medical examination

- (1) The disposal operator should provide full-time workers engaged in accident-derived waste disposal who enter radiation controlled areas with medical examinations on the tests stated below by medical doctors at the time of employment, or being transferred to the work, and once every 6 months thereafter on a regular basis.

It should be noted that the disposal operator should provide a medical examination at the time of employment for a (dispatched) worker who signed a (dispatch) labour contract with a duration of less than six months. This is required in order to know his or her health condition, and if he or she has any exposure history.

- a. Investigation and evaluation on whether he or she has exposure history (for those with exposure history, work locations, work descriptions and durations, if he/she has radiation impairment or subjective symptoms, and others relevant to radiation exposure)
 - b. White blood cell count and differential
 - c. Red blood cell count and hemoglobin content test or hematocrit test
 - d. Cataract eye test
 - e. Skin test
- (2) Of the medical examination stated in (1), which is provided on a regular basis, a worker should be able to skip all or part of the tests stated in (1) b. to e., if a medical doctor considers that they are unnecessary.
 - (3) Regardless of (1), the tests stated in (1) b. to e. should not be required, if a medical doctor agrees, for a worker whose effective dose of the previous year of medical examination (provided on a regular basis) was below 5 mSv and whose effective dose of the present year is unlikely to exceed 5 mSv.
 - (4) At the time of the medical examination stated in (1), the disposal operator should inform the medical doctor of the dose that workers received after the previous medical examination.
 - (5) The disposal operator should prepare the "ionizing radiation medical examination card (Form 3)" based on the results of the medical examination in (1) and keep them for 30 years. It should be noted, however, that this should not apply when the records are transferred to the organization designated by Minister of Health, Labour and Welfare (Radiation Effects Association) after keeping them for five years.

2. General medical examination

- (1) The disposal operator (the employer of dispatched workers, for the general medical examination provided to dispatched workers, the same hereinafter.) should provide full-time workers engaged in accident-derived waste disposal who enter radiation controlled areas with medical examination specified below by a medical doctor at the time of employment or being transferred to the work, and once every 6 months thereafter on a regular basis.

It should be noted, however, that it should be sufficient to provide test d. once a year on a regular basis.

- a. Survey of medical history and work history
 - b. Check for subjective and objective symptoms
 - c. Measurement of height, weight, and abdominal circumference, and visual and hearing acuity tests
 - d. Thoracic spine X-ray and sputum tests
 - e. Measurement of blood pressure
 - f. Anemia test
 - g. Liver function tests
 - h. Lipid blood tests
 - i. Glucose test
 - j. Urine test
 - k. Electrocardiography
- (2) Those who previously underwent the medical examination with respect to the tests listed in f. to i and k. should be able to skip all or part of them in the medical examination (provided on a regular basis only) stated in (1) if a medical doctor considers it is unnecessary.
- (3) A worker should be able to skip the measurement and tests of c., d., k., and f. to i. in (1) if a medical doctor considers it is unnecessary, based on the standards specified by the Minister of Health, Labour and Welfare.
- (4) Workers who underwent the hearing acuity test stated in (1)-c. in the previous medical examination (limited to that provided on a regular basis), or under age 45 (except ages 35 and 40) should be able to substitute other hearing acuity test that a medical doctor considers as appropriate (except hearing acuity as to a sound at 1,000 Hz or 4,000 Hz).
- (5) The disposal operator should prepare "medical examination card" based on the results of the medical examination in (1) and save them for 5 years.

3. Follow-up actions regarding medical examination results

- (1) The disposal operator should collect doctor's opinions regarding the medical examination results in 1 or 2 in accordance with the provisions below:
 - a. Within three months from the date of the medical examination.
 - b. The doctor's opinion should be recorded in the ionizing radiation medical examination card or medical examination card.
- (2) The disposal operator should notify without delay workers engaged in accident-derived waste disposal who underwent the medical examinations regarding the results.
- (3) When conducting the medical examination stated in 1 (on the regular basis only), the disposal operator should submit the "status report on the ionizing radiation medical examination results" to the head of the Labour Standard Inspection Office within the jurisdiction, without delay.
- (4) For workers who were diagnosed based on the medical examination as having or possibly having a radiation-induced impairment, or having the probability of developing such a impairment, the disposal operator should take measures necessary to maintain his/her health such as by changing the workplace or transferring to other work, shortening the time of exposure, or changing the work method.

4. Transfer of records

When terminating its business, the disposal operator should transfer the ionizing radiation medical examination cards to an organization designated by the Minister of Health, Labour and Welfare (Radiation Effects Association).

Section 10. Safety and health management system

1. Tasks of facility maintenance operator

- (1) The facility maintenance operator (facility owner) should implement the following tasks:
 - a. Establishing councils for involved operators
 - b. Management of systems for their maintenance and repair.
 - c. Tasks described in 2 and 3, for establishing safety and health management system of relevant subcontractors (contracted operators) including workers when the primary contractor is the facility maintenance operator during normal operations.
 - d. Tasks described in 4, for establishing a safety and health management system of its own workers.
- (2) The facility operator (e.g., contractor commissioned to conduct all or part of the

operations management in the facility) and the facility maintenance operator (e.g., contractor commissioned to conduct all or part of the maintenance management in the facility) should implement the following tasks:

- a. Tasks described in 2 and 3, for establishing the safety and health management system of relevant subcontractors (contracted operators), including workers when the primary contractor is the facility operator during normal operations.
- b. Tasks described in 2 and 3, for establishing a safety and health management system for relevant subcontractors (contracted operators), including workers, when the primary contractor is the facility maintenance operator during maintenance and inspection.
- c. Tasks described in 4, for establishing safety and health management system of its own workers.

2. Establishment of a safety and health management system by the primary contractor

(1) Assigning a general safety and health manager

The primary contractor involved in accident-derived waste disposal should assign a general safety and health manager for the individuals who supervise the works of accident-derived waste disposal to perform tasks (2) to (4) below, in order to ensure that the safety and health management relevant to the work is implemented in an appropriate manner.

(2) Assigning a responsible person for safety and health management by relevant subcontractors

The primary contractor should let the relevant subcontractors assign a responsible person for safety and health management and let him/her perform the following tasks:

- a. Contacting the general safety and health manager
- b. Coordination with the general safety and health manager to facilitate the following tasks related to the relevant subcontractors.
- c. Contacting and coordinating tasks with all of the other relevant subcontractors when the subcontractors assign part of its work to other subcontractors.

(3) Holding safety and health coordinating meeting consisting all of the relevant subcontractors

- a. Establish a safety and health coordinating meeting consisting of all of the relevant subcontractors, and hold meetings once a month on a regular basis.
- b. The meeting should discuss the following matters.
 - (i) Implementation of necessary safety and health education, including special education for workers who will be newly engaged in the works for

accident-derived waste disposal.

- (ii) Development and improvement of work rules
- (iii) Establishing contamination measurement areas and its implementation
- (iv) Communication and emergency actions in case of abnormal events including occupational hazards

(4) Guidance and support for developing work rules

- a. The primary contractor should guide or support the relevant subcontractors as necessary to ensure that the contents of work rules developed are appropriate.
- b. The primary contractor should guide or support relevant subcontractors to ensure that the relevant subcontractors inform its workers of the contents of the work rules in an appropriate manner.

3. Consolidated management of exposure status by primary contractor

The primary contractor engaged in the works for accident-derived waste disposal should assign a radiation administrator to consolidate management including worker exposure doses of relevant subcontractors under the direction of the general safety and health manager, to ensure that exposure is controlled in an appropriate manner.

It is recommended that a radiation administrator be selected among those with radiation-related national qualifications, or those trained through courses regarding radiation control at professional education institutions.

- (1) The radiation administrator should construct contamination measurement areas and measure contamination in an appropriate manner upon consulting with the primary contractor.
- (2) The radiation administrator should guide or support the relevant subcontractors' radiation administrator to ensure that the relevant subcontractors takes the measures stated in parts 3 to 5 of Section 3 in an appropriate manner.
- (3) Take part in the Organization for Registration Control of Radiation Exposure Doses for Decontamination and Related Works in order to properly determine the accumulated exposure doses of workers and to prevent exposure dose records from getting scattered or lost.
- (4) The radiation administrator should implement any other tasks necessary for radiation control.

4. Safety and health management system by disposal operator

- (1) The disposal operator should assign a health officer or safety and health promoter according to the site scale to manage technical matters regarding: dose measurement and

recording, contamination inspection, prevention of body/internal contamination, education for workers, and actions for health management.

It is advisable that a safety and health promoter be assigned even at a site where the number of workers is less than ten.

- (2) The disposal operator should assign a radiation administrator regardless of the site scale to perform works regarding dose measurement and recording, contamination inspection, and prevention of body/internal contamination.

Section 11 Exemption for special decontamination areas, etc.

1. Exemption in case of constructing disposal sites in special decontamination areas, etc.

- (1) Measures against spillage of accident-derived waste outside an accident-derived waste handling facility

In case of spillage of accident-derived waste at a disposal site established in special decontamination areas, etc., regardless of the provision in part 3 of Section 4, the disposal operator should take immediate actions to prevent spread of contamination. Also, upon clearly indicating the contaminated area, the disposal operator will remove the contamination to whichever is higher of the surface contamination limit ($40\text{Bq}/\text{cm}^2$) or average surface contamination around the disposal site (background) if outdoors, and to the surface contamination limit ($40\text{Bq}/\text{cm}^2$) if indoors.

- (2) Contamination measurement and acceptable contamination limits
 - a. Regardless of the provision in part 3 of Section 6, it should be sufficient to locate one contamination measurement area at the exit of the disposal site in a special decontamination areas, etc., and it should be acceptable to define the surface contamination limit ($40\text{Bq}/\text{cm}^2$) as the contamination reference level that prohibits workers from leaving and taking items out of the area.
 - b. Regardless of the provision in part 3 of Section 5, only items contaminated with accident-derived waste exceeding the surface contamination limit ($40\text{Bq}/\text{cm}^2$) may be handled as the contaminated object.
 - c. $40\text{Bq}/\text{cm}^2$ may be defined as the equivalent to a count of 13,000 per minute from GM Counters. If measuring the contamination is difficult due to high ambient dose rate in the surrounding area, the contamination measurement area should be built at a place where ambient dose rate is sufficiently low.

2. Exemption in the case of burying removed soil at disposal sites built in special decontamination areas, etc.

(1) Containers

When the disposal operator took the measures a-d below, in the case of burying removed soil at its disposal site built in a special decontamination areas, etc., it should be acceptable not to use containers regardless of provisions in part 1 of Section 6.

- a. Measures for preventing workers body contamination from removed soil by methods such as by handling removed soil using remotely operated machines
- b. Measures for controlling dust dispersion by methods such as by keeping the removed soil in a wet state.
- c. Measures for controlling dust dispersion by methods such as by working at a place as far away from the border of the landfill facility as possible.
- d. Measuring the surface contamination of radioactive materials discharged by the accident at the border of the landfill facility on a regular basis within a period not exceeding a month, and measures to reduce the surface contamination to whichever is higher of the surface contamination limit (40 Bq/cm²) or the average surface contamination around the landfill facility (background)

(2) Accident-derived waste handling facilities

When burying removed soil without packaging in containers in accordance with (1), the disposal operator may decide not to take any measures listed in (2) to (4) in part 2, Section 5.

(3) The disposal operator should give due consideration to the following statements when conducting works under the provision of exemption:

- a. Workers may enter the facility for a short period of time in order to handle removed soil using remotely operated machines, troubleshoot failed components, investigate the state of contamination, or perform maintenance and inspection on the facility or equipment. In this case, however, such workers should be required to interrupt the operation in advance to control dust dispersion and, at the time of entry, use effective respiratory protective equipment and protective clothing stated in part 4, Section 6.
- b. The "methods such as by handling removed soil using remotely operated machines" stated in (1)-a. includes the works by using specially customized vehicles with higher sealability. In this case, however, based on provisions in parts 1 and 2 of Section 4, and part 2 of Section 5, it should be required that the sum of the effective dose from external radiation inside the said vehicles and the effective dose from radioactive material in the air does not exceed 1 mSv per week, that measures be taken to easily

remove surface contamination, that surface contamination be measured once a month, and that contamination be removed if it exceeds the surface contamination limit (40 Bq/cm^2).

- c. The "methods such as by maintaining removed soil in a wet state" stated in (1)-b should include the works spraying chemicals that are effective to control dispersion of dust.
- d. The "methods such as by working at a place as far away from the border of the landfill facility as possible" stated in c should include setting wind shielding walls at the border of the landfill facility that help prevent dispersion of dust.
- e. "Measures to reduce the surface contamination to whichever is higher of the surface contamination limit (40 Bq/cm^2), or the average surface contamination around the landfill facility (background)" stated in d should include covering with material such as concrete and iron, which have a shielding effect as well as removing contaminated soil.

Attachment 1- Measurement method of radioactivity concentration of accident-derived waste

1. Objectives

The objectives of measuring radioactivity concentration of accident-derived waste is to help the disposal operator determine whether the accident-derived waste exceeds the reference value (10,000 Bq/kg, 500,000 Bq/kg or 2,000,000 Bq/kg) and decide necessary radiation protection measures in assigning their workers accident-derived waste disposal.

2. Basic concept

- (1) The disposal operator is not required to re-measure the radioactivity concentration when receiving the waste at its disposal site, provided that a collecting/transporting operator provides a written form of radioactivity concentration already measured for each waste container containing the said accident-derived waste (or each truck, if the waste is not in containers).
- (2) The disposal operator is not required to measure the radioactivity concentration at the time of reception, provided that actions specified in the relevant laws and regulations have been taken under the assumption that the concentration of the received waste exceeds 10,000Bq/kg, based on the radioactivity concentration measurements provided by the collecting/transporting operator, and that the accident-derived waste will be handled is sealed in a container.
- (3) It is advisable that radioactivity concentration be measured by commissioned experts.

3. Sampling

- (1) Principles for sampling
 - a. Take one sample from each container.
 - b. It is acceptable to measure the whole container as a sample when the simplified measurement in 4 (2) is selected.

4. Analysis methods

Either method below should be used for analysis.

- (1) The gross gamma ray measurement or gamma spectrum analysis, as specified in Paragraph 1-2 of Article 9 of the Working Environment Measurement Standards.
- (2) Simplified measurement method
 - a. The radioactivity concentration should be calculated using the method below if the correlation between the dose rate on the sample surface and the sum of the

concentrations of Cesium 134 and 137 is known. (See Attachment 1-1 for details.)

- (i) Place the sample in a container and measure the weight.
 - (ii) Measure the maximum dose rate on the surface of the container.
 - (iii) Use the measured weight and dose rate to calculate the sum of the concentrations of Cesium 134 and 137 of the sample in the container.
- b. It is difficult to measure radioactivity concentration equal to 300,000 Bq/kg or above with the simplified method even when using Round V-series Container (plastic jar of 128 mmφ x 56 mmH)) because the upper measurement limit of the typical NaI Scintillation Survey Meter is as low as 30μSv/h. Therefore, when the needle on the indicator of the survey meter passes 30μSv/h, the relevant regulations should be applied under the assumption that the concentration of the measured object exceeds 2,000,000 Bq/kg, or analysis should be carried out using the method (1).

Attachment 1-1. Simplified measurement procedures of radioactivity concentration

1. Types of containers to be used

- (1) Round V-series Container (plastic jar 128 mmφ x 56 mmH, hereinafter referred to as "V5 Container")
- (2) Sandbag
- (3) Flexible container
- (4) 200L Drum
- (5) 2L Polyester bottle

2. Below are the criteria for determining whether the radioactivity concentration of a container containing accident-derived waste is below 10,000 Bq/kg, 500,000 Bq/kg or 2,000,000 Bq/kg.

- 1) Measure the radiation dose rate on the surfaces of containers containing accident-derived waste, and define the largest value as A (μSv/h).
- 2) Determine the radioactivity B (Bq) of the containers containing accident-derived waste by substituting factor X, depending on the measurement date and the measured radiation dose rate A (μSv/h) by the formula below. Table 1 lists the factor X by measurement date and container type.

$$A * \text{Factor X} = B$$

- 3) Measure weight of the containers containing accident-derived waste. This is set as C (kg).
- 4) To determine the radioactivity concentration D (Bq) of the containers containing accident-derived waste, substitute the radioactivity of bags containing accident-derived waste for B (Bq) and the weight for C (kg) in the following formula:

$$B / C = D$$

Thus, it can be determined whether the radioactivity concentration D of the containers containing accident-derived waste is below 10,000 Bq/kg, 500,000 Bq/kg or 2,000,000 Bq/kg.

Table 1 Factors by type of container and measurement date

Measurement date	Factor X				
	V5 Container	Sandbag	Flexible container	200L Drum	2L Polyester bottle
until January 2013	3.3E+04	7.4E+05	9.8E+06	2.6E+06	9.4E+04
until April 2013	3.3E+04	7.5E+05	1.0E+07	2.6E+06	9.6E+04
until July 2013	3.4E+04	7.6E+05	1.0E+07	2.7E+06	9.8E+04
until October 2013	3.4E+04	7.8E+05	1.0E+07	2.7E+06	1.0E+05
until January 2014	3.5E+04	7.9E+05	1.1E+07	2.8E+06	1.0E+05
until April 2014	3.6E+04	8.1E+05	1.1E+07	2.8E+06	1.0E+05
until July 2014	3.6E+04	8.2E+05	1.1E+07	2.9E+06	1.0E+05
until October 2014	3.7E+04	8.3E+05	1.1E+07	2.9E+06	1.1E+05
until January 2015	3.8E+04	8.5E+05	1.1E+07	2.9E+06	1.1E+05

Attachment 2- Criteria to determine whether or not a work is considered work under a high dust concentration

1. Objectives

The criteria to determine whether or not a work is work under a high dust concentration should be used for the disposal operator to understand whether dust concentration exceeded the lower limit of high-level dust concentration of 10 mg/m^3 during the work, and determine the measurement methods necessary to control internal exposure doses.

2. Basic concept

- (1) A simplified measurement instead of an accurate one can be accepted so long as one can determine whether the dust concentration exceeds the lower limit of high-level dust concentration of 10 mg/m^3 .
- (2) It is advisable that the measurement be performed by commissioned experts.

3. Measurement method (with parallel measurement)

- (1) In order to determine whether the work is considered work under a high dust concentration, use a personal sampler during the work, or follow the relative concentration indication method basically using a digital dust meter to measure concentration near workers during the work that generates dust.
- (2) The measurement method should be as follows:
 - a. During the work that generates dust, measure the relative concentration (cpm) for 2 - 3 minutes using a digital dust meter (e.g., LD-5) in the vicinity, to the extent that it does not disturb workers engaged in the works.
 - b. It is desirable to collect the relative concentration measurements stated in a. from all of the workers engaged in the work. However, when several workers do similar tasks within a distance of several meters, it is sufficient to measure one worker of the group.
 - c. Set a digital dust meter and inhalable dust concentration measurement instrument in parallel in the vicinity (downwind), to the extent that it does not disturb the work, of the worker with the highest relative concentration (cpm) from the simplified measurement in a., and measure the concentration continuously for 10 minutes or more to calculate a mass-concentration conversion factor.
 - (i) The target particle diameter for dust concentration measurement should be airborne inhalable dust (respiratory dust, particle diameter $100\mu\text{m}$, 50% cut) that is inhaled through one's nose or mouth

- (ii) Use an open-face type of sampler to measure inhalable dust at the surface velocity of 18 (cm/s) on a sampling filter paper.
 - (iii) Follow Article 2 of the Working Environment Measurement Standards except for the particle diameters of a dust particle separator and measurement positions.
- (3) Calculate dust concentrations (mg/m^3) from the relative concentration measurements a., using a mass-concentration conversion factor determined by result c. If the highest value of the measurements exceeds $10 \text{ mg}/\text{m}^3$, the concentrations of all the other workers involved in the same task should be considered as higher than $10 \text{ mg}/\text{m}^3$.

4. Measurement method (the case where a given mass-concentration conversion factor is used)

(1) Applicable conditions

The measurement method should be applied only when soil is the main target. The measurement method specified in 3 should be used when handling dust largely containing organic matters such as fallen leaves and branches, rice straws, grass, water supply and sewage sludge, and when handling dust that consists mainly of other things, except that come from debris and soil of construction scrap wood.

(2) Setting measurement points

- a. Follow the relative concentration indication method basically using a digital dust meter to measure high levels of dust concentration near workers during the work that generates dust. The measurement point should be set at a location on the downwind side of the dust source where may be considered as having the highest dust concentration, and which has less impact on exhaust gas from heavy machines. Measure the concentration for every work which may generate dust.
- b. When several workers do the same task, select one worker from the group to measure.
- c. Measure the concentration as closely to workers as possible, to the extent that it may not disturb their works and that safety for the measurer is secured. It is desirable that the measurer should measure at a close position to workers, carrying a digital meter if possible. In addition, there should be another measurement method, such that a worker wears LD-6N to measure the concentration if no safety problems arise.

(3) Measurement duration

- a. Measure for 10 minutes or more continuously during the work which may generate the highest concentration. When a cycle of the task taking only a few minutes is repeated, measure the concentration for 10 minutes or longer including the period in

which the task is performed.

- b. When a cycle of the task takes time in the range from 10 minutes to an hour, measure the concentration for one cycle. If the task continues longer than that, measure for approximately 10 minutes several times throughout the task, and determine the highest value among the measurements.

(4) Evaluation

- a. Multiply the relative concentration indication value (count/minute, cpm) measured using a digital dust meter by the mass-concentration conversion factor, to determine the mass concentration and whether it exceeds 10 mg/m^3 .
- b. Mass-concentration conversion factor
Specify $0.15 \text{ mg/m}^3/\text{cpm}$ as the mass-concentration conversion factor for this measurement method. It should be noted, however, that the following statements should be taken into consideration when this factor is used:
 - (i) This factor is defined based on the limited measurements, and requires an occasional review as further studies progress.
 - (ii) This factor is supposed to be used for LD-5 and LD-6, the light-scattering type of digital dust meters.

Attachment 3 - Special Education for workers

Workers engaged in works for accident-derived waste disposal should be educated through lectures and practical trainings.

1. Lectures should provide the education described in the middle column of the table below according to each subject listed in the left column, for at least the time period specified in the right column.

Subject	Coverage	Duration
Accident-derived waste	① Types and properties of accident-derived waste, etc.	30 minutes
Works involved in accident-derived waste disposal	Workers engaged in crushing, classification, compression/concentration (hereinafter referred to as "Crushing and other work) of accident-derived waste should learn the following contents: (i) Radiation controlled areas (ii) Method and steps for crushing and other work, transportation and storage of accident-derived waste (iii) Method and steps for maintenance and inspection of the equipment contaminated with accident-derived waste (iv) Method for measuring radiation (v) Method for monitoring of dose equivalent rate from external radiation and the concentration of radioactive material in air (vi) Methods for measurement of the contaminated surfaces of ceilings, floors, walls and equipment, and removal of the contamination. (vii) Method for inspection and removal of the contaminated bodies, and performance and usage of protective equipment (viii) Emergency actions in case of an abnormal event	1.5 hours
	Workers engaged in incineration of accident-derived waste should learn the following contents: (i) Radiation controlled areas (ii) Method and steps for incineration, transportation, and storage of accident-derived waste (iii) Method and steps for maintenance and inspection of the equipment contaminated with accident-derived waste (iv) Method for measuring radiation (v) Method for monitoring of dose equivalent rate from external radiation and the concentration of radioactive material in air (vi) Method for measurement of the contaminated surfaces of ceilings, floors, walls and	1.5 hours

	<p>equipment, and removal of the contamination.</p> <p>(vii) Method for inspection and removal of the contaminated bodies, and performance and usage of protective equipment</p> <p>(viii) Emergency actions in case of an abnormal event</p>	
	<p>Workers engaged in landfill of accident-derived waste should learn the following contents:</p> <p>(i) Radiation controlled areas</p> <p>(ii) Method and steps for transportation, storage, and landfill of accident-derived waste</p> <p>(iii) Method and steps for maintenance and inspection of the equipment contaminated with accident-derived waste</p> <p>(iv) Method for measuring radiation</p> <p>(v) Method for monitoring of dose equivalent rate from external radiation and the concentration of radioactive material in air</p> <p>(vi) Method for measurement of the contaminated surfaces of ceilings, floors, walls and equipment, and removal of the contamination.</p> <p>(vii) Method for inspection and removal of the contaminated bodies, and performance and usage of protective equipment</p> <p>(viii) Emergency actions in case of an abnormal event</p>	1.5 hours
The structure of and how to handle the equipment used for accident-derived waste disposal	<p>Workers engaged in crushing and other work of accident-derived waste should learn the following contents:</p> <p>Structure and handling of crushing equipment, equipment in accident-derived waste handling facilities, and other equipment</p>	1 hour
	<p>Workers engaged in incineration of accident-derived waste should learn the following contents:</p> <p>Structure and handling of incinerators and other equipment</p>	1 hour
	<p>Workers engaged in landfill of accident-derived waste should learn the following contents:</p> <p>Structure and handling of water collection and drainage system, sealing coat and other equipment</p>	1 hour
The impact of ionizing radiation on living organisms and the exposure dose control method.	<p>(i) Types and properties of ionizing radiation</p> <p>(ii) The impact of ionizing radiation on cells, tissues, organs and entire bodies of living organisms</p> <p>(iii) Exposure dose limits and methods for measuring exposure doses</p> <p>(iv) Methods for checking and recording the exposure dose measurement results</p>	1 hour
Relevant laws and regulations	<p>Relevant provisions of the Industrial Safety and Health Act, Enforcement Order of the Industrial Safety and Health Act, Ordinance on Industrial Safety and Health, and Ionizing Radiation Ordinance.</p>	1 hour

2. Training should provide the education described in the middle column of the following table according to each subject listed in the left column, for at least the time period specified in the right column.

<p>How to dispose of accident-derived waste and handle the equipment to be used for the work</p>	<p>Workers engaged in crushing and other work of accident-derived waste should learn the following contents:</p> <ul style="list-style-type: none"> (i) Procedure for entering and exiting radiation controlled area (ii) Crushing, transportation, and storage of accident-derived waste (iii) Maintenance and inspection of the equipment contaminated with accident-derived waste (iv) Handling of radiation measurement instrument (v) Monitoring of dose equivalent rate from external radiation and the concentration of radioactive material in air (vi) Measurement and removal of the contaminated surfaces of ceilings, floors, walls and equipment (vii) Inspection and removal of the contaminated bodies (viii) Handling of protective equipment (ix) Handling of crushing equipment, equipment in accident-derived waste handling facilities, and other equipment (x) Emergency actions in case of an abnormal event 	<p>2 hours</p>
	<p>Workers engaged in incineration of accident-derived waste should learn the following contents:</p> <ul style="list-style-type: none"> (i) Procedure for entering and exiting radiation controlled area (ii) Incineration, transportation, and storage of accident-derived waste (iii) Maintenance and inspection of the equipment contaminated with accident-derived waste (iv) Handling of radiation measurement instrument (v) Monitoring of dose equivalent rate from external radiation and the concentration of radioactive material in air (vi) Measurement and removal of the contaminated surfaces of ceilings, floors, walls and equipment (vii) Inspection and removal of the contaminated bodies (viii) Handling of protective equipment (ix) Handling of incinerator and other equipment (x) Emergency actions in case of an abnormal event 	<p>2 hours</p>
	<p>Workers engaged in landfill of accident-derived waste should learn the following contents:</p> <ul style="list-style-type: none"> (i) Procedure for entering and exiting radiation controlled area (ii) Transportation, storage, and landfill of accident-derived waste (iii) Maintenance and inspection of the equipment 	<p>2 hours</p>

	<p>contaminated with accident-derived waste</p> <ul style="list-style-type: none"> (iv) Handling of radiation measurement instrument (v) Measurement of dose equivalent rate from external radiation and the concentration of radioactive material in air (vi) Measurement and removal of the contaminated surfaces of ceilings, floors, walls and equipment (vii) Measurement and removal of the contaminated bodies (viii) Handling of protective equipment (ix) Handling of collection and drainage system, sealing coat and other equipment (x) Emergency actions in case of an abnormal event 	
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