環境省
Ministry of the Environment

Part IV

Guidelines for Waste from Decontamination Work

(Tentative Translation)

2nd Edition, 2013

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Chapter 1 Summary

1.1 Definitions of Terms

Definition of terms used herein is indicated below.

Term	Explanation
Act	Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District - Off the Pacific Ocean Earthquake that Occurred on March 11, 2011 (Act No. 110 of 2011)
Ordinance	Ordinance for Enforcement of the Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District - Off the Pacific Ocean Earthquake that Occurred on March 11, 2011 (Ordinance of the Ministry of the Environment No. 33 of 2011)
Contaminated Waste Management Area	The areas which are designated by the Minister of the Environment as requiring management of the waste in the areas due to contamination of the waste in the areas by radioactive materials discharged by the accident to a level requiring special controls (the Act, Article 11, paragraph (1))
Waste within the Management Area	Waste in the contaminated waste management area (if the waste was carried out of the contaminated waste management area, including the waste carried out and excluding those determined by the Ordinance of Ministry of the Environment (the Act, Article 13, paragraph (1)))
Designated Waste	Waste generated from water facilities, public sewerage, basin sewerage, industrial water facilities, incineration facilities, which are specified municipal solid waste disposal facilities or specified industrial waste disposal facilities and community effluent treatment systems, designated by the Minister of the Environment as not conforming to the requirements provided for in the Ordinance of Ministry of the Environment based on the survey of the administrators, etc., of the facilities with regard to the pollution state by radioactive materials discharged by the accident. For waste other than that, if waste is regarded as not conforming to the requirements provided for in the Ordinance of Ministry of the Environment as a result of a survey by the possessor of the waste, waste may be applied to the Minister of the Environment to be designated to designated waste (Act, Article 16 ~ Article 18)
Specified Waste	Waste within the management area or designated waste (Act, Article 20)
Disaster Waste	In the Guidelines, it refers to the waste generated from the East Japan Great Earthquake (wreckage of buildings collapsed by the Earthquake and tsunami and cars and ships, etc., damaged by tsunami)
Measures for Decontamination of the Soil, etc.	Removal of soil, fallen leaves and twigs, sludge piled up in waterways related to the contamination, prevention of spread of the contamination and any other measures, which are carried out for the soil, plants and structures, etc., contaminated by radioactive materials discharged by the accident (Act, Article 2, paragraph (3))
Removed Soil	Soil generated from measures for decontamination of the soil, etc., in the specific area for decontamination or decontamination zone (Act, Article 2, paragraph (4))
Removed Soil, etc.	Removed soil and waste generated from measures for decontamination of the soil, etc. (Act, Article 31, paragraph (1))
Measures for Decontamination, etc.	Measures for decontamination of the soil, etc., and collection, transportation, storage and disposal of the removed soil (Act, Article 25, paragraph (1))
Specific Area for Decontamination	The area designated by the Minister of the Environment as it is necessary for the national government to conduct decontamination, etc., due to significant environmental contamination by radioactive materials discharged by the accident in the area and for any other reasons (Act, Article 25, paragraph (1))
Intensive Contamination Survey Area	Area designated by the Minister of the Environment as it is necessary to conduct a focused survey of the contamination state of the environment by radioactive materials discharged by the accident in the area (the Act, Article 32, paragraph (1))
Decontamination Plan	Plan of implementation of measures, including decontamination, etc., with respect to the area in the intensive contamination survey area, whose status of environmental contamination by radioactive materials discharged by the accident is recognized as not satisfying the requirements provided for in the Ordinance of the Ministry of the Environment as a result of a survey under the Act. The plan shall be developed by governors of prefectures or mayors of municipalities (the Act, Article 36, paragraph (1)).
Decontamination Zone	Zone covered by the decontamination plan (Act, Article 35, paragraph (1))
Decontaminator	Person who implements decontamination measures, etc. In the specific area for decontamination, the national government (the Ministry of the Environment), in the decontamination zone, the national government, prefectures and municipalities (Act, Article 38, paragraph (1))

The Waste Disposal Act	The Waste Management and Public Cleansing Act
Waste from Decontamination Work	In the Guidelines, it means waste (except for specified waste) generated from measures for decontamination of the soil, etc. applicable to the land, etc., in specific area for decontamination or decontamination zone.
Perishable waste from decontamination work	Waste from Decontamination Work containing perishable organic substances.
Guidelines for Measurement	Guidelines for measurement of radiation in storage and treatment of the waste contaminated with radioactive materials discharged by the accident

1.2 Purpose of the Guidelines

In treatment of waste contaminated with radioactive materials discharged by the accident under Act on Special Measures concerning the Handling of Environment Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District - Off the Pacific Ocean Earthquake that Occurred on March 11, 2011, (Act No. 110 of August 30, 2011), in order to be of help to appropriate and smooth operation of the standards for storage of waste generated from measures for decontamination of the soil, etc., applicable to the land, etc., in specific area for decontamination or decontamination zone, provided for in the Act, Article 41, paragraph (4), the Guidelines has the purpose of indicating the matters of note for operation of the standards for storage.

1.3 Summary of the Standards for Site Storage of Waste from Decontamination Work

(Standard for Storing Waste Generated as a Result of Measures such as Decontamination of Soil and others)

Ordinance, Article 60

The standard for storage of waste generated from measures for decontamination of the soil, etc., aplicable to the land, etc., within the specific area for decontaminations or decontamination zones prescribed by the Ordinance of the Ministry of the Environment as under the Act, Article 41, paragraph (4), (excluding any specified waste) shall be as follows:

(i) The provisions under Article 15, item (iii), item (v), item (vi) and item (viii), as well as Article 24, paragraph (1), item (ii) (excluding (a)) and the exceptional clause under item (iv) and paragraph (2), item (ii) shall govern.

(ii) In cases where such waste which has putrefied or poses a risk to become putrefied is stored, the provisions under Article 15, item (ix), (a) and (b) shall govern.

(iii) Record of measurement pursuant to the provision under the exceptional clause of Article 24, paragraph (1), item (iv), which shall govern pursuant to the provision under item (i) shall be prepared, which shall be retained until storage of such waste is terminated.

[Objective]

Storage of waste from decontamination work at the land where decontaminator (contractors, etc of the national government and municipalities) or landowners etc. accomplished the decontamination work.

[Purpose of Measures]

When storing waste from decontamination work at the site where it was generated, it is necessary to take such measures as those to prevent it from flowing out or becoming airborne and spreading as in the case of designated waste and specified waste, in order to prevent impacts of radioactive substances on the surrounding environment.

[Examples of Measure]

Examples of specific measures are shown in Chapter 2.

In this regard, in description of the text of Ordinance for each item, it is described by reading “specified waste”

or “designated waste” as “waste from decontamination work.”

In Table 1-1, summary of the storage standards under the Act is shown.

Table 1-1: Summary of Storage Standards

	Content of Storage Standards	1. Storage Standards for Designated Waste (Site, etc.)	2. Storage Standards for Specified Waste (other than Site)		3. Storage Standards for Waste from Decontamination Work (Site, etc.)
		Over 8,000Bq/kg (Ordinance, Article 15)	Over 8,000Bq/kg (Ordinance, Article, 24, paragraph (1))	Under 8,000Bq/kg (Ordinance, Article 24, paragraph (2))	Under 8,000Bq/kg (Ordinance, Article 60)
1	Requirements for Storage Site (installation of fence and notice board)	Applied	Applied (there are requirements for notice board)	Applied (there are requirements for notice board)	Applied
2	Prevention of Scattering and Outflow of Waste	Applied (storage in containers and packaging, etc., are required)	Applied (storage in containers and packaging, etc., are required)	Applied	Applied
3	Prevention of contamination of Public Water Area and Groundwater	Applied	Applied	Applied	Applied
4	Prevention of Infiltration of Rainwater or Groundwater*1	Applied	Applied	Not applied *2	Not applied *2
5	Prevention of Emission of Foul Odor	Applied	Applied	Applied	Applied
6	Prevention of Emergence of Harmful Insects	Applied	Applied	Applied	Applied
7	Prevention of mixing of Specified Waste with Other Materials	Applied	Applied	Applied	Not applied
8	Prevention of mixing with Waste, etc., Containing Asbestos	Applied	Applied	Applied	Applied
9	Storage Method of Perishable Waste	Applied	Applied	Applied	Applied
10	Prevention of Radiation Hazard	Applied	Applied	Not applied *3	Not applied *3
11	Measurement and Record of Amount of Radiation	Applied (before and after start of storage)	Applied (at least once every seven (7) days)	Applied (at least once every seven (7) days)	Applied (before and after start of storage)
	Water Quality Inspection of Surrounding Groundwater	Not applied	Applied	Applied	Not applied
12	Retention of Records of Measurement of Amount of Radiation (until the storage site is abolished)	Applied	Applied	Applied	Applied
13	Retention of Records of Storage	Not applied	Applied	Applied	Not applied

*1 Measures for reducing contact with water. When the concentration in the waste to be handled is greater than 8,000Bq/kg, measures are taken to minimize contact with water at every stage from transportation to final disposal, in order to prevent from the waste elution of radioactive materials (i.e. radioactive cesium) from the accident so that greater safety is secured.

*2 In this regard, for treatment of waste under 8,000Bq/kg, if waste, which might outflow or wastewater might be generated by rainwater, are stored outdoors, provisions of prevention of scattering and outflow (Storage Standards 2) and provision of prevention of contamination of public water area and groundwater Storage Standards 3) are applied and outflow of waste in suspension with water by rainwater and outflow and permeating into the ground of wastewater from the waste shall be regulated.

*3 For the waste below 8,000Bq/kg, as it is not necessary to take particular isolation measure, such isolation measures as cover soil, etc., are not provided.

Chapter 2 The Standards for Site Storage of Waste from Decontamination Work

(Standard for Storing Waste Generated as a Result of Measures such as Decontamination of Soil and others)

Ordinance, Article 60

The standard for storage of waste generated from measures for decontamination of the soil, etc., aplicable to the land, etc., within the specific area for decontaminations or decontamination zones prescribed by the Ordinance of the Ministry of the Environment as under the Act, Article 41, paragraph (4), (excluding any specified waste) shall be as follows:

(i) The provisions under Article 15, item (iii), item (v), item (vi) and item (viii), as well as Article 24, paragraph (1), item (ii) (excluding (a)) and the exceptional clause under item (iv) and paragraph (2), item (ii) shall govern.

(ii) In cases where such waste which has putrefied or poses a risk to become putrefied is stored, the provisions under Article 15, item (ix), (a) and (b) shall govern.

(iii) Record of measurement pursuant to the provision under the exceptional clause of Article 24, paragraph (1), item (iv), which shall govern pursuant to the provision under item (i) shall be prepared, which shall be retained until storage of such waste is terminated.

2.1 Requirements for Storage Site

Ordinance, Article 24, paragraph (1), item (ii) (except for (a))

Storage shall be carried out at a place that meets the requirements specified under Article 15, item (i), (a) and where a notice board satisfying the following requirements is installed at a clearly viewable location.

Ordinance, Article 15, item (i), (a)

(a) An enclosure shall be set up surrounding the place (if it is of a structure where the waste from decontamination work stored is loaded directly against such enclosure, then it shall be restricted to an enclosure which is safe enough from the point of view of structural strength)

Ordinance, Article 24, paragraph (1), item (ii), (b)

(b) Following matters shall be displayed.

1. That it is a storage site of waste from decontamination work;
2. The kind of waste from decontamination work stored (if such waste from decontamination work includes any of the waste from decontamination work listed from Article 23, paragraph (1), item (v), (a) through (c)* or any waste from decontamination work which has putrefied or poses a risk to become putrefied (hereinafter referred to as “asbestos-containing specified waste, etc.”), such fact shall be included);
3. Contact information in case of emergency; and
4. In cases where waste from decontamination work is stored outdoors without using a container, the maximum of the heights prescribed under Article 15, item (ii), (b).

* Ordinance, Article 23, paragraph (1), item (v) (excerpts)

a. Asbestos-containing waste from decontamination work (except for waste from decontamination work asbestos, etc. provided in (b)) which is designated by the Minister of the Environment

b. Waste from decontamination work in which waste asbestos (only limited to waste from decontamination work) and asbestos are contained or to which these are attached and designated by the Minister of the Environment as might scatter.

c. Soot and dust (only limited to waste from decontamination work)

[Purpose of Measures]

In order to clearly separate the storage site of waste from decontamination work from other sites, the surrounding areas of the storage site are fenced and a notice board is put up to indicate it is the storage site of waste from decontamination work etc..

[Example of Measures]

Enclosures shall be in accordance with the following:

[Note] In the case where waste from decontamination work is stored in a tent, pipe-framed house and others, it is not necessary to fence around them.

- Storage at the site where no person other than the related persons enter, such as on the private land
  - In order to indicate the scope of the storage site, such measures shall be taken as laying out road cones (Figure 2-1) or extending rope (Figure 2-2), etc.
  - In the case where waste from decontamination work is stored at a location where fences may be subjected to strong wind, rain, etc., it is necessary to take such measures as anchoring the fences for securing of them.

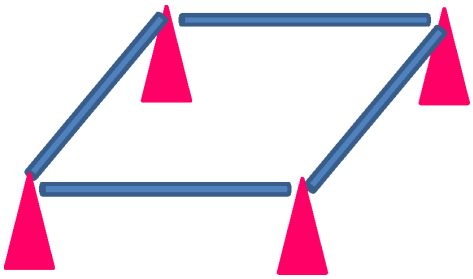


Figure 2-1: Road cone fence (Example)

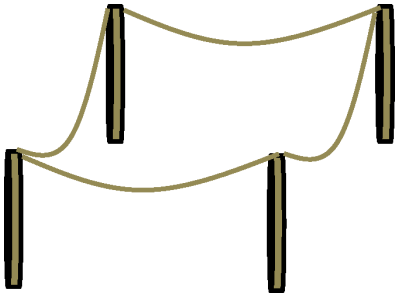


Figure 2-2: Rope fence (Example)

- Storage at the site where people other than the related persons enter, such as the outside of private land
  - Fencing in the storage site by means of multi-tiered roping is an effective way to prevent people from unnecessarily entering the storage site (Figure 2-3).
  - If the load of waste from decontamination work stored directly is put on the fence, etc., it is necessary to select a fence, etc., having the structural and strength to withstand the load.
  - In the case where waste from decontamination work is stored at a location where fences may be subjected to strong wind, rain, etc., it is necessary to take measures for securing the fences.

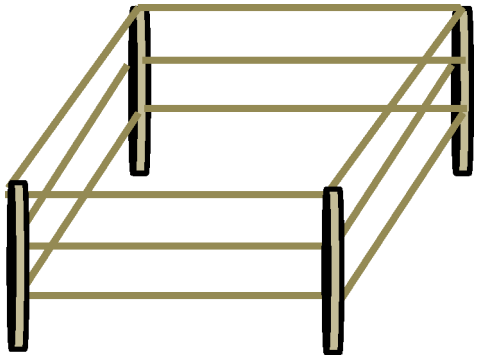


Figure 2-3: Multiple-rope fence (Example)

・ Notice board is in accordance with that in Figure 2-4.

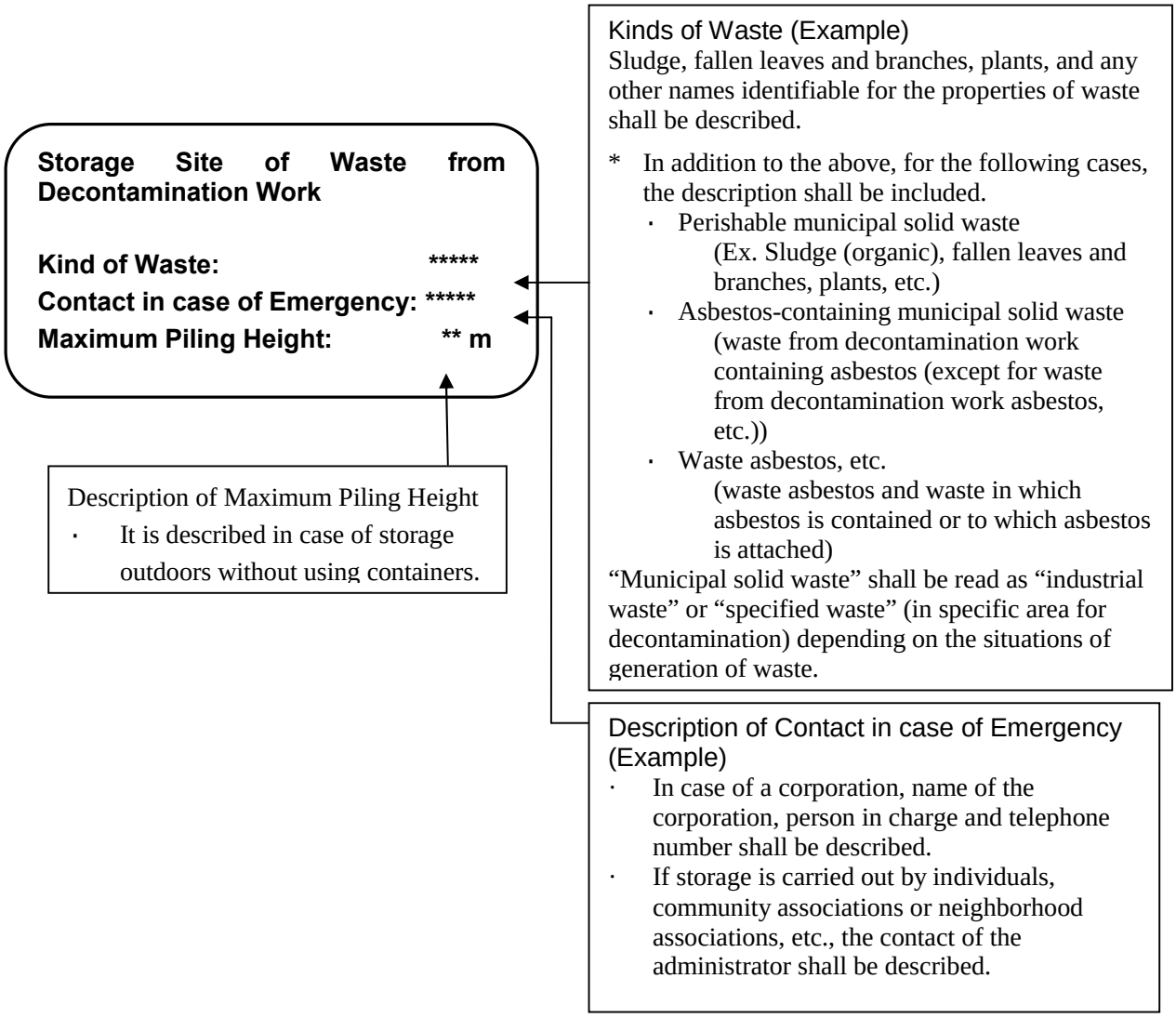


Figure 2-4: Notice board (Example)

2.2 Prevention of Dispersion and Outflow of Waste from Decontamination Work

Ordinance, Article 24, paragraph (2), item (ii)

In order that no waste from decontamination work will scatter or flow out of the storage site, the following measures shall be taken

(a) In cases where the waste from decontamination work is stored outdoors without using a container, the height of such waste from decontamination work piled up shall not exceed such height prescribed under Article 15, item (ii), (b).

Ordinance, Article 15, item (ii)

(b) In the case where waste from decontamination work is stored outdoors without using a container, it shall be ensured that the height of the waste from decontamination work piles does not exceed the height prescribed under (1) or (2) below, whichever is applicable.

(1) If it is without a structure which has an area where the waste from decontamination work stored is loaded directly against the enclosure of the storage site (hereinafter referred to as "directly loaded area"), for any given point of such storage site, the height from the ground to the intersecting point

of a vertical line that goes through such given point and a surface that goes through the bottom of that enclosure (if the bottom is not touching the ground, the intersecting line of the surface that is vertically extended from that bottom and the ground) and has a gradient of 50% upward from a level surface (if there are 2 or more intersecting points, it shall be the one nearest to the ground).

(2) If it is with a directly loaded area against the enclosure of the storage site, the height as prescribed under the following a., and b., for the areas specified under such a., and b.:

a. For the area within 2 m horizontally to such storage site side from the vertical downward line of 50 cm from the top of the directly loaded area (if the height of such enclosure of the directly loaded area is less than 50 cm, this shall be its bottom) (hereinafter referred to as "base line"): for any given point of such area within 2 m, the height prescribed under the following i., (If the enclosure of such storage site includes any area which is not a directly loaded area, the lower of the heights prescribed under i., and ii.):

i. The height from the ground to the intersecting point of the vertical line which goes through such given point and the horizontal surface which goes through the base line with a minimum horizontal distance to such vertical line

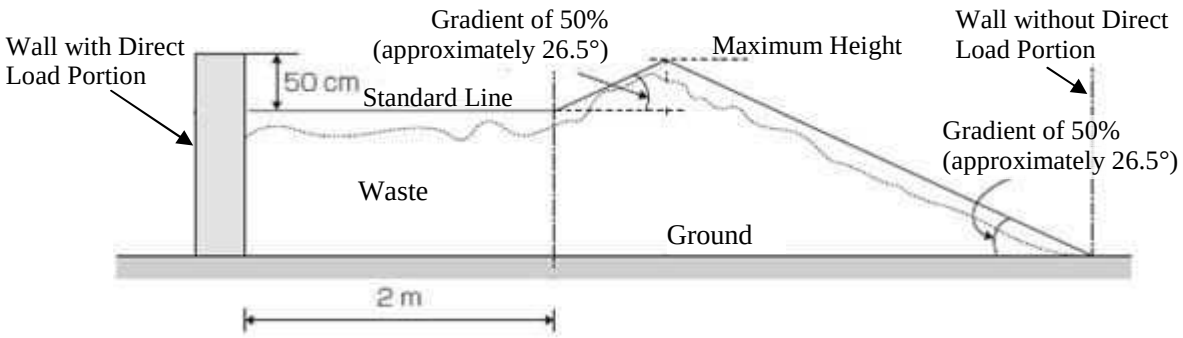
ii. The height prescribed under 1.

b. For the area beyond 2 m horizontally to such storage site side from the base line: for any given point in such area beyond 2 m, the height prescribed under the following i., (If the enclosure of such storage site includes any area which is not a directly loaded area, the lower of the heights prescribed under i., and ii.):

i. The height from such given point to the intersecting point of a vertical line which goes through such point and a surface which goes through the line that is 2 m horizontally to the storage site side from the base line and has a gradient of 50% upward from a level surface (if there are 2 or more intersecting points, it shall be the one nearest to the ground)

ii. The height prescribed under 1.

Note) Piling height of waste from decontamination work stored outdoors without using containers



- If the waste does not contact the fence, less than gradient of 50% from the bottom of the fence
- If the waste contacts the fence (load is directly put on the fence), within 2m inside of the fence shall be 50cm lower than the height of fence and the inside more distant than 2m from the fence shall have gradient of 50%. (gradient of 50% is the gradient at ratio of bottom : height = 2:1 which is approximately 26.5°)

(Source: Website of Japan Industrial Waste Technology Center)

[Purpose of Measures]

It is necessary to ensure that waste from decontamination work is stored in such a way that it is piled to heights that are appropriate to prevent conservation impairment of the living environments by scattering and outflow of waste from decontamination work from the storage site.

If waste from decontamination work might scattering or flow out due to infiltration of rainwater or groundwater, it is necessary to take measures for preventing infiltration of rainwater or groundwater.

[Examples of Measures]

- In the case where there is a risk of scattering or outflow of waste from decontamination work because of the type or characteristics of the waste from decontamination work, storing the waste from decontamination work in containers is effective.
- In the case where there is a risk of scattering or outflow of waste from decontamination work caused by infiltration of rainwater etc., storing the waste from decontamination work in waterproof containers, covering the waste from decontamination work with waterproof sheets or storing the waste from decontamination work at a location that is higher than the surrounding area is effective.

– Storage in Flexible Containers

- The types of flexible containers are as shown in Table 2-1. The flexible containers to use should be selected taking into consideration the characteristics of the waste from decontamination work to be stored, the storage period and other relevant factors. For storage of relatively light waste from decontamination work, it is considered that common cross-type flexible containers (Figure 2-5) will normally be sufficient. For storage for a relatively long period (2 or more years) or storage of waste from decontamination work with high moisture content or relatively heavy waste from decontamination work, using high-durability flexible containers, such as cross-type flexible containers equipped with a weatherproof inner bag or running-type flexible containers (Figure 2-6), is effective.
- In the case where waste from decontamination work with high moisture content such as sludge or waste from decontamination work mixed with a large amount of snow or other forms of moisture is stored in flexible containers, it is recommended to avoid stacking up flexible containers containing waste from decontamination work wherever possible, because the weight of the upper containers containing waste from decontamination work may cause wastewater to seep out of the lower containers containing waste from decontamination work. This does not apply to cases where no wastewater leaks out of the storage site such as the case where flexible containers containing waste from decontamination work are stored in a building equipped with a drain containment facility.
- In the case where waste from decontamination work is stored in flexible containers with the flexible containers stacked up, limiting the stacking height to 2 to 3 m (which corresponds to 2 to 3 stacked layers of containers) is effective in preventing containers from collapsing or getting damaged. In case of perishable waste, refer to “2.7 Storage Method of Perishable Waste from Decontamination Work.”

Table 2-1: Types of Flexible Containers

Type of Flexible Container	Features, etc.
Cross-type*	· One-way use is assumed. · Inferior to running-type flexible containers in weather resistant and waterproof capacity. · Cross-type flexible containers with enhanced weatherproofness (achieved through UV treatment etc.), as well as cross-type flexible containers with enhanced waterproofness (achieved through inner coating or incorporation of an inner bag), are also commercially available.
Running-type*	· Reuse is assumed. · Superior to cross-type flexible containers in weather resistance and waterproof property.

* According to JIS Z 16512

(Note) Commercially available bags that have not been verified regarding their conformance with JIS standards and are categorized as sandbags can also be used. Such bags should be used only after confirming their suitability for the storage conditions.

Figure 2-5: Cross-type (Example)

Figure 2-6: Running-type (Example)

(Source: A pamphlet of a manufacturer)

- Storage in Drum Cans
  - If it is assumed that wastewater would flow out to the surrounding environment by storage of waste from decontamination work containing much water such as sludge, it is effective to select drum cans.
  - If it is highly likely to perish for such perishable waste from decontamination work as plants, fallen leaves and branches, since these might accumulate heat in connection with fermentation, it is effective to store in such containers having good heat resistance such as drum cans (with cover) avoiding storage in flexible containers.
  - Since drum cans are mainly made of metals, taking such measures as the adoption of chemical drum cans is effective in reducing the corrosion.

- Storage in Plastic Bags
  - In storage of a small amount of plants and fallen leaves and branches, etc., plastic bags having a certain strength can be used (considering durability, home garbage bags shall be avoided).
  - In storage, double packaging of plastic bag is effective as counter measures for breaking of a single layer plastic bag.

- Storage in Removable Container
  - In the case where waste from decontamination work is stored in containers that can be set on and removed from a vehicle such as hook roll car so that the transport of the waste from decontamination work at a later date is made easier, it is effective that covering the top of the containers with a waterproof sheet to prevent scattering and outflow and infiltration of rainwater, with the central part of the sheet elevated (that is, with the sheet installed in such a way that it is sloped) so that rainwater etc. does not pool on the waterproof sheet.

- Storage Outdoors without using Containers
  - In the case where waste from decontamination work is stored outdoors without using a container, securing the sheets used to cover the waste firmly to the waste or the ground to prevent them from being dislocated or partially peeled off by wind, rain, etc., storing the waste at a location that is higher than the surrounding area, or taking the measures necessary to prevent the infiltration of rainwater etc. through sheet joints or contact of the waste with rainwater is effective (Figures 2-7 and 2-8).
  - In the case where plural sheets are joined together to cover waste from decontamination work, it is necessary to ensure that the joints will not be damaged when the sheets are subjected to load as a result of settlement or deformation of the pile of the stored waste.
  - Elevating the central part of the cover sheet to make the sheet sloped is effective in preventing rainwater etc. from pooling on the sheet.
  - Constructing drainage ditches around the storage site is an effective countermeasure for the case where there is concern that water from the surrounding area (surface water etc.) may flow into the storage site (because of proximity of the site to a slope or for other reasons).
  - In the case where there is concern that rainwater etc. may flow into stored waste from decontamination work through the bottom of the piled waste, storing the waste from decontamination work on pallets (those used for transport in the physical distribution sector) etc. installed on the ground of the storage site is effective.

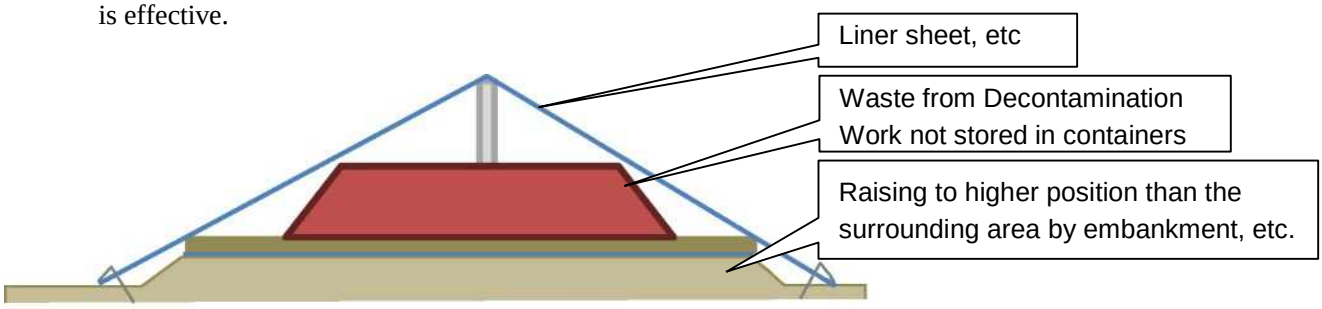


Figure 2-7: Prevention of Dispersion and Outflow of Waste from Decontamination Work not stored in Containers (Example 1)

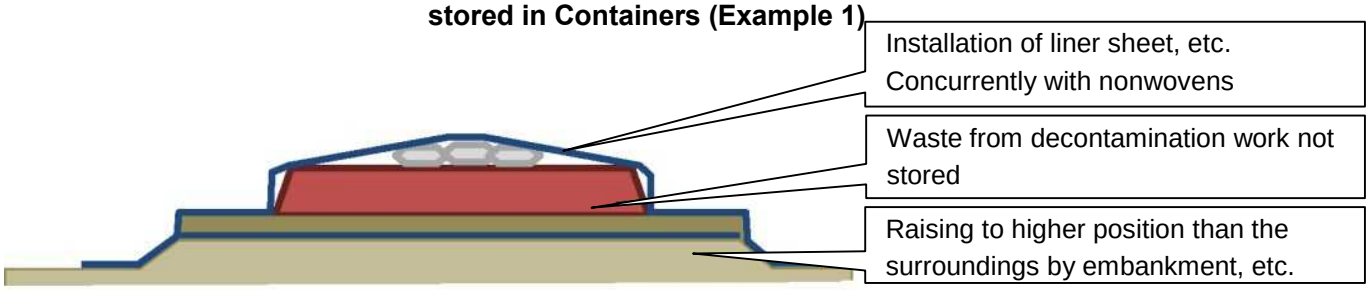


Figure 2-8: Prevention of Dispersion and Outflow of Waste from Decontamination Work not stored in Containers (Example 2)

* In the event that damage is found in the installed seepage control sheet etc., it is necessary to repair it as soon as possible to prevent infiltration of rainwater etc.

- Storage in Sloped Areas
  - In the case where a storage site is set up in a sloped area, it is necessary to pay particular attention to the prevention of collapses of the waste.
  - Specifically, constructing earth-retaining structures on the lower side of the area around the storage site according to the slope gradient or making a flat ground surface by earth moving (cutting/banking) according to the slope gradient is effective (Figure 2-9).
  - When constructing earth-retaining structures or performing earth moving to make a flat ground surface, it is necessary to confirm the strength of the ground, groundwater level and other conditions of the ground and to take measures to deal with surface water before commencing the construction work.

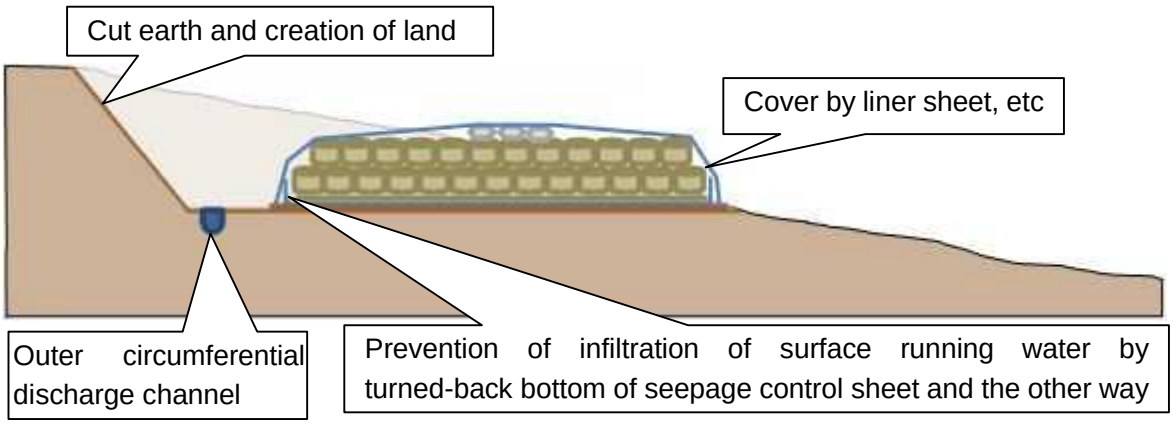


Figure 2-9: Setting up a Storage Site in a Sloped Area (Example)

- Storage in Buildings without Using Containers
  - In the case where waste from decontamination work is stored in a building without using a container, it is necessary to pay attention to the prevention of scattering and outflow of waste from decontamination work to the outside.

- Storage of Asbestos-Containing Waste
  - When storing asbestos-containing waste from decontamination work, moistening the waste from decontamination work in advance by spraying water, scattering prevention agent, etc. onto it to prevent the scattering of asbestos and then storing the moistened waste from decontamination work in plastic bags having sufficient strength (using bags with a thickness of 0.15mm or more is recommended) in the form of double-bagging or in robust containers (closed-type containers such as drum cans) is effective.
  - Asbestos-Containing Municipal Solid Waste shall also be packaged in double bags or covered by sheets or packed in bags, etc., so as not to scatter.

"(Manual of Treatment of Waste containing Asbestos, 2nd Edition" (March 2011, the Ministry of the Environment))

(Note) Storage of containers waste stored in buildings

- Indoor storage of waste from decontamination work in flexible containers, drum cans, etc. is effective in preventing scattering and outflow.

[Matters of concern]

- Creation of Records
  - A recommended method of managing containers containing waste from decontamination work is to control it by the type of the waste from decontamination work contained (if asbestos is contained in the waste of the container it should be mentioned as for the containment information), the concentrations of

the radioactive cesium and other information (for example by attaching a label or a tag to a container or, for the same type waste storage only, by installing a notice board alongside the containers). Separately records of such waste from decontamination work information with summary information on the place and time of generation of the waste should be provided as managing lists and controlled.

2.3 Prevention of Contamination of Public Water Area and Groundwater

Ordinance, Article 15, paragraph (1), item (iii)

In order to prevent contamination of public water area and groundwater by the sewage water generated from the storage of waste from decontamination work, necessary measures shall be taken such as covering the bottom surface of the storage site with a seepage control sheet, etc.

[Purpose of Measures]

To prevent the contamination of public waters and groundwater in the area around the storage site, it is necessary to prevent the wastewater generated as a result of storage of waste from decontamination work from flowing out and seeping into the ground.

It is necessary to reduce the moisture content of the waste from decontamination work to the maximum extent possible, because waste from decontamination work that has been mixed with a large amount of snow or contains a large amount of other form of moisture may emit wastewater, which may flow out.

[Examples of Measures]

- If it is possible that wastewater would flow out to the surrounding environment by storage of waste from decontamination work containing much water such as sludge, it is effective to select airtight containers, including drum cans.
- In the case where wastewater generated as a result of storage of waste from decontamination work may flow out and seep into the ground, securing drain paths by constructing drainage ditches etc. is effective, and, in the case where such wastewater is discharged to a public water, treating the wastewater through precipitation separation treatment and treatment using adsorbent etc. is effective.
- In the event that damage is found in an installed seepage control sheet or an airtight container, the landowner etc. shall replace or repair it as appropriate. If it is difficult to replace or repair the sheet or container, the administrative authority shall be consulted.

– Installation of Seepage Control Sheets etc.

- In the case where wastewater may flow out and seep into the ground, it is necessary to install seepage control sheets etc.
- When selecting the structures and materials of the seepage control sheets etc., the standard for sheets for water blocking structures/facilities of final disposal sites, which is shown below, can be used as a source of reference.
- In principle, storing waste in a manner that may damage seepage control sheets etc. should be avoided. In the case where there is concern that seepage control sheets etc. may be damaged because of the presence in the waste to be stored of objects that have protrusions or for other reasons, installing protective mats (nonwoven fabric etc.), a protective earth layer or steel plates (those used for access roads for heavy equipment) between the seepage control sheets etc. and the ground or waste is effective in protecting the seepage control sheets etc.
- In the case where there is concern that seepage control sheet etc. may be damaged by the use of heavy equipment, countermeasures such as installing protective earth layer or steel plates in the pathway of entry are effective.

(Reference)

Matters of Note in connection with Operation of the Order determining the Technical Standards for Final Landfill Site of Municipal Solid Waste and Final Landfill Site of Industrial Waste (July 16, 1998, Kansuiki No. 301, Eikan No. 63)

(6) Seepage Control Sheet

It is common to use seepage control sheets as the seepage control material of surface seepage control work and for the materials, synthetic rubber, synthetic resin and asphalt are commonly used.

The thickness of a seepage control sheet shall be more than 1.5mm for seepage control sheets other than asphalt and seepage control sheet of asphalt shall be more than 3mm, considering that it shall ensure sufficient strength and seepage control even after the surface is damaged or the quality is deteriorated and the possibility of repair, etc.

Seepage control sheet having effect of seepage control, strength and durability necessary for prevention of infiltration of retained water provided for in the Order, Article 1, paragraph (1), item (v), (a), (1) shall be the seepage control sheet having the following properties. In this regard, it is necessary that the joint parts of seepage control sheets shall have similar properties and capacities.

[1] Effect of Seepage Control

For the material of seepage control sheet, it shall have sufficient seepage control property in which the retained water, etc., in the landfill site would not seep. There is no hole or crack, etc., is found on the surface of seepage control sheet.

[2] Strength

It shall have the capacity to respond by strength and extension to the load presumed by waste or retained water, etc., the impact power by vehicles of landfill work, etc., changes in base ground which might arise from them and tolerable in stable computation and presumed temperature stress.

[3] Durability

a. Weather Resistance

As the quality of seepage control sheet might deteriorate by the impact of ultraviolet rays, it shall have the property in which the strength and extension rate of seepage control sheet would not deteriorate significantly even after long time exposure to ultraviolet rays compared with the status before exposure to ultraviolet rays.

b. Heat Stability

The surface temperature of seepage control sheet might increase to approximately 60ºC through 70ºC in summer by direct sunshine, while the temperature might decrease to approximately ―20ºC in winter. Also the inside temperature of a landfill site might increase due to decomposing reaction of waste, seepage control sheet shall have resistance to such temperature fluctuations.

c. Acid resistance and alkaline resistance, etc.

Presuming the hydrogen ion concentration of retained water, etc., of a landfill site, seepage control sheet shall have the property resistant to acid and alkaline.

In addition, seepage control sheet shall have resistance to oil and other chemical status of reclaimed waste.

d. Other

Seepage control sheet shall have resistance to the quality deterioration by the impact of ozone in the air and cracks emerging in case of continued stress by bent.

[4] Other

Seepage control sheet shall have good workability so that defect shall not occur in laying and jointing, etc., of seepage control sheets.

(Notes) When installing seepage control sheets etc., attention should be paid to the following.

- Install the seepage control sheet larger than the scope of placing waste so that the waste from decontamination work shall not protrude out of the sheet.
- If the ground surface is uneven, prevent damage to the sheet by leveling the land.
- Seepage control sheet shall generally be single, however, if storage continues for a certain period, double laying shall be considered.

- The appropriate thickness of the seepage control sheet shall be selected, considering the conditions of the storage site and presumed storage period. While there are such different thicknesses of 0.5mm, 1.0mm and 1.5mm in seepage control sheets, and the thickness required for seepage control work of a final landfill site should be 1.5mm, however, depending on the conditions of the storage site, it is conceivable that a thinner sheet might be appropriate.
- In order to prevent stagnant waste from decontamination work water leaked from the waste on the seepage control sheet, the following measures shall be taken.
  - Soil (with certain clayish property. Fine factions are 15~50%.) shall be laid on the seepage control sheet and containers shall be placed on it. In the case where composite soil is to be used, using substances capable of adsorbing cesium such as bentonite and zeolite is effective.
  - The stagnant wastewater shall be prevented by an incline and other methods.

– Laying of Clayish Soil, etc.

· Instead of liner sheet, there is a method for installing a bentonite sheet, clayish soil and etc. In particular, in the case where waste from decontamination work with high moisture content is to be stored for a certain period of time, installing a layer of cohesive soil (such as composite soil containing bentonite) or a layer of soil capable of adsorbing cesium is effective.

– Storage in Containers

· In the case where storage of waste from decontamination work with high moisture content such as sludge may result in outflow of wastewater to the surrounding environment, adopting chemical drum cans, which are corrosion-resistant and airtight, is effective. If it is not possible to adopt chemical drum cans, using ordinary drum cans in combination with seepage control sheets to solve the problem of possible corrosion of the drum cans during the storage period can be an appropriate option (Figure 2-10).

· In the case where waste containing moisture is stored in flexible containers, using cross-type flexible containers that have an inner bag or inner coating or running-type flexible containers is effective in preventing wastewater from flowing out (Figure 2-11).

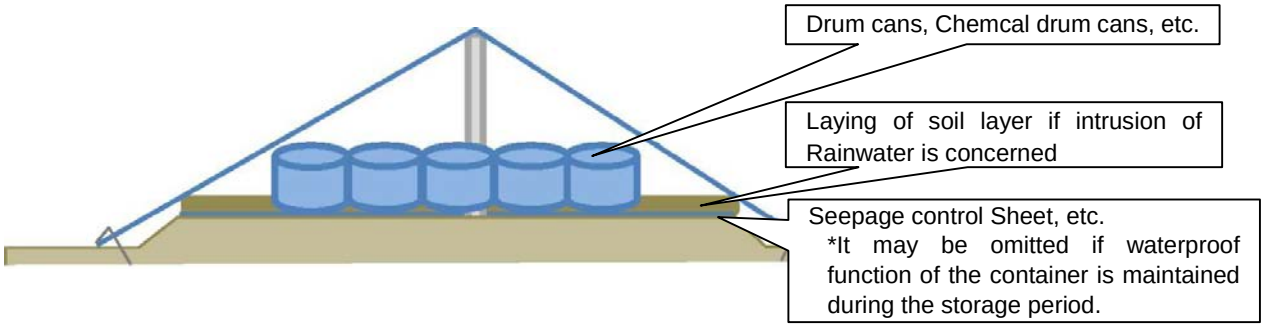


Figure 2-10: Prevention of leakage of wastewater where waste containing much water is stored in airtight containers (Example)

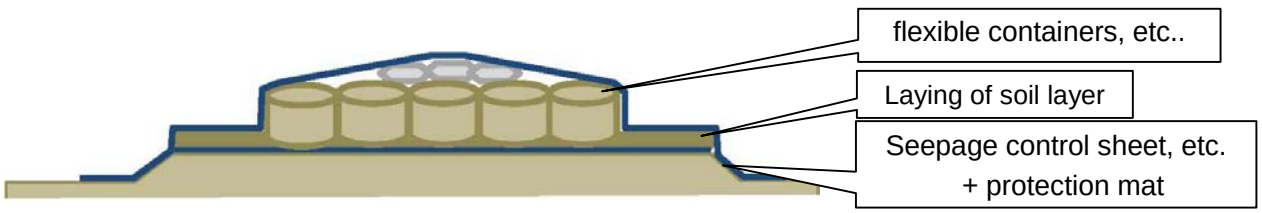


Figure 2-11: Prevention of leakage of wastewater where waste containing water is stored in flexible containers (Example)

- Storage without Use of Containers
  - In the case where waste from decontamination work with high moisture content is stored without using a container, installing a layer of sandbags in addition to installing seepage control sheets is effective in preventing the contamination of the public waters and groundwater resulting from the generation of wastewater (Figure 2-12).

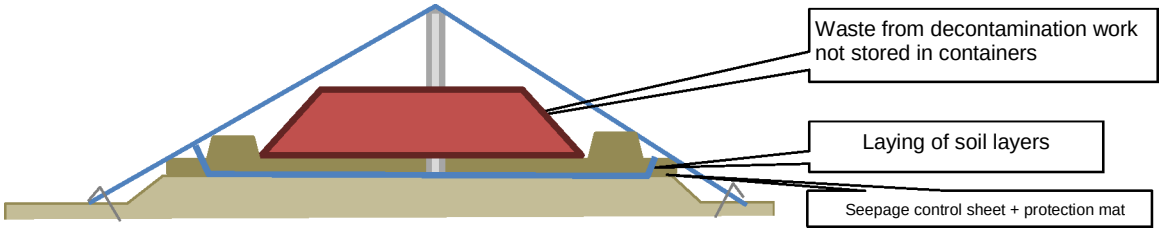


Figure 2-12: Prevention of Outflow of Wastewater where Waste containing Water Content is not stored in Containers (Example)

- Storage in Excavated Holes
  - In the case where the ground is excavated and part of the waste from decontamination work is stored underground, it is necessary to prevent outflow and collapse of the waste from decontamination work caused by the infiltration of surface water (Figure 2-13).
  - When excavating the ground to store part of the waste from decontamination work underground, it is necessary to confirm the strength of the ground, groundwater level, etc. and condition the ground and take measures to deal with surface water before commencing the excavation work.
  - In the case where the groundwater level is high and groundwater may infiltrate into the waste from decontamination work storage site, the above-mentioned form of storage should be avoided.
  - In the case where there is concern that water may seep out of waste from decontamination work, it is important to take measures to deal with the seeped water such as installing pipes for draining and collecting water at a level below the bottom of the part of the waste stored underground and pumping the collected water up to water collection tanks installed on the ground.
  - By any chance when the surface water invades the storage area from the surface of the earth, it is effective to lay the seepage control sheet so that it is turned down and wraps waste to prevent waste from being buried in water.

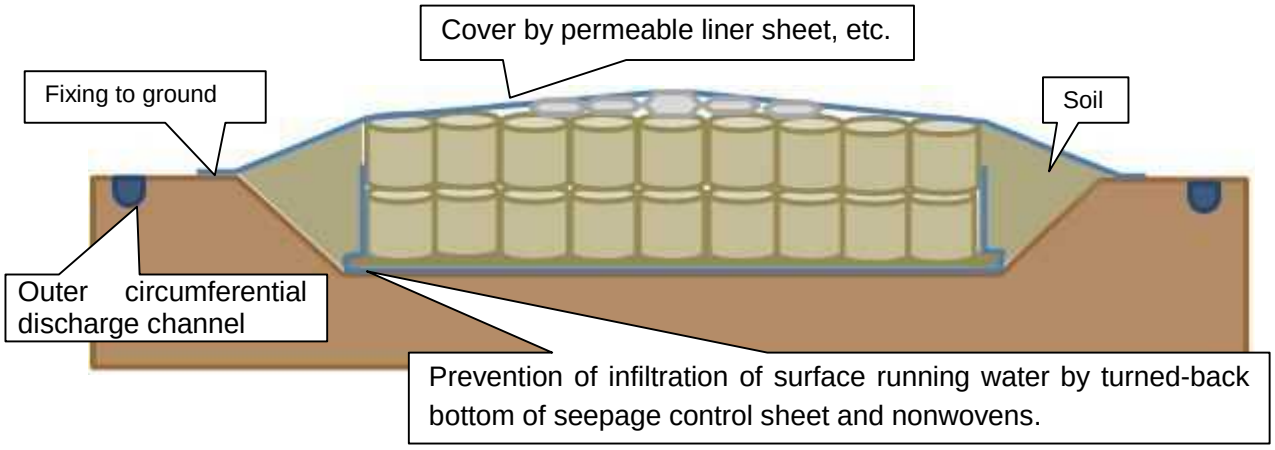


Figure 2-13 : Scattering/Outflow and Rainwater Infiltration Prevention Measures for the Case where the Ground Is Excavated and Part of the Waste from Decontamination Work is Stored Underground (Example)

- Indoor Storage
  - In case of storing waste from decontamination work not containing much water indoors (concrete floor structure), etc., if prevention of outflow of wastewater can be secured to the same extent as installation of seepage control sheets and clayish soil layers, etc., according to the nature of the waste from decontamination work and status of the site, it is possible to store without installing seepage control sheets, etc., provided that since radioactive materials permeated into the concrete are difficult to remove (it is necessary to tear off together with the concrete), it is effective to protect by coating.
  - Exercising management to prevent rain, wind, etc. from entering the building storing waste from decontamination work to prevent the outflow of wastewater from the building and installing wastewater reservoir boxes etc. to store wastewater that has seeped out of the waste from decontamination work is effective.

2.4 Prevention of Foul Odors

Ordinance, Article 15, item (v)

Necessary measures shall be taken to prevent any foul odors from emitting from the storage site.

[Purpose of Measures]

In terms of conservation of the living environment around the storage site, it is necessary to take measures so that foul odors would not be emitted from the stored waste from decontamination work.

[Examples of Measures]

- If the waste from decontamination work about which emission of foul odors is a concern is stored such as sludge, it is effective that increasing the air tightness of storage by covering with sheets etc. and selecting such containers as drum cans or running-type flexible containers.
- For waste from decontamination work that is likely to perish, as such waste may accumulate heat in it and ignite in an airtight space, adding measures such as placing the waste from decontamination work at a location that is sufficiently distant from the surrounding objects taking into consideration the layout of the surrounding objects is effective.

2.5 Prevention of Emergence of Harmful Insects

Ordinance, Article 15, paragraph (1), item (vi)

It shall be ensured that neither any rodents will live nor any mosquitoes or flies or any other harmful insects will break out at the storage site.

[Purpose of Measures]

In terms of conservation of the living environment around the storage site, it is necessary to keep conditions in which rats will not inhabit and mosquitoes, flies and any other harmful insects shall not emerge.

[Examples of Measures]

- Measures for Prevention of Emergence, etc.
  - Performing regular visual inspections around the storage site to check whether there are rats and insects harmful to sanitation and grasp the approximate numbers of the rats and insects harmful to sanitation and using insecticides and rodenticides as necessary is effective.
  - Storing the perishable waste from decontamination work at one location wherever possible with it sorted by type and avoiding storing the perishable waste from decontamination work at multiple locations is effective for the purposes of taking measures such as the spraying of insecticide.

- In the case where waste is to be stored which is prone to accumulation of water in its inside (such as waste tires and waste bathtubs), it is necessary to remove water from the inside and take measures to make the waste unsusceptible to accumulation of rainwater etc. in its inside prior to storing it, to control mosquitos.
- When storing perishable waste from decontamination work, storing it in containers is effective in reducing the heat and odor that attract flies. In the case where perishable waste from decontamination work is stored without using a container, covering it with sheets or earth is an appropriate option.
- When storing perishable waste from decontamination work, taking measures such as covering it with sheets is effective in preventing rats from getting into it.

(Notes)Possibility of Emergence of Rats and Insects harmful to Sanitation

- For perishable waste from decontamination work (compost, scrap wood, etc.), since high temperature is maintained by fermentation and generation change of flies is made in winter and they might emerge in bulk at the time of temperature increase.
- For rodents, the same as the case with flies shall apply as food and temperature are secured.
- The surrounding discharge channel and the place where water collects might be the source of emergence of mosquitoes.

2.6 Prevention of Mixing of Waste from Decontamination Work, etc. containing Asbestos

Ordinance, Article 15, item (viii)

In cases where the waste from decontamination work prescribed under item (i), (b), 2., a., b., and d., is stored, necessary measures shall be taken such as setting up partitions, etc. in the storage site, so that such waste from decontamination work will pose no risk of mixing with any waste from decontamination work other than such waste from decontamination work.

[Purpose of Measures]

Under the Waste Management Act, standards for treatment of asbestos-containing waste (waste containing asbestos, waste asbestos, etc.) are established respectively as the waste might impair human health and the living environment.

As described above, for the asbestos-containing waste requiring treatment under the special treatment standards, if these fall under the waste from decontamination work, it is necessary to store by separating from other waste from decontamination work so that transfer to the subsequent treatment will be easier.

[Examples of Measures]

- When storing asbestos-containing waste from decontamination work, setting up a dedicated storage area for it is effective in preventing it from getting mixed with other waste from decontamination work.
- In the case where asbestos-containing waste from decontamination work is stored in containers etc., taking measures such as attaching tags or labels to the containers etc. is an appropriate option to prevent it from getting mixed with other waste from decontamination work.

2.7 Storage Method of Perishable Designated Waste

Ordinance, Article 15, item (ix)

Storage of any perishable waste from decontamination work shall be in accordance with the following.

(a) In order to eliminate the gas that is generated from the perishable waste from decontamination work, necessary measures shall be taken such as installing a vent, etc.

(b) Necessary measures shall be taken to prevent fire from breaking out, as well as fire extinguishers and other firefighting equipment shall be installed.

[Purpose of Measures]

At storage sites for waste containing organic matters, fires have occurred that are attributable to the emission of heat and/or the generation of methane gas etc. caused by biological and/or chemical actions within stacked layers of waste. Therefore, it is necessary to exercise proper management such as installing degassing holes when storing perishable waste from decontamination work to prevent the spread of radioactive substances to the surrounding environment resulting from fires.

[Examples of Measures]

- In case of Storage in Flexible Containers, etc.
  - If perishable waste from decontamination work is stored in flexible containers, it avoid piling storage in terms of prevention of accumulation of fermentation heat, prevention of fire, etc., in addition to prevention of falling.
  - In the case where flexible containers containing perishable waste from decontamination work are stacked up, it is necessary to limit the stacking height to about 2 m (which corresponds to about 2 stacked layers of flexible containers), make each block of stacked layers of flexible containers as small as possible by limiting the length and width of each block to about 5 m (which corresponds to about 5 flexible containers) and about 20 m, respectively (Figures 2-14), and, once the stacking is completed, confirm the state of the stacked flexible containers containing waste on a regular basis (about once a month under normal circumstances) to prevent collapse.

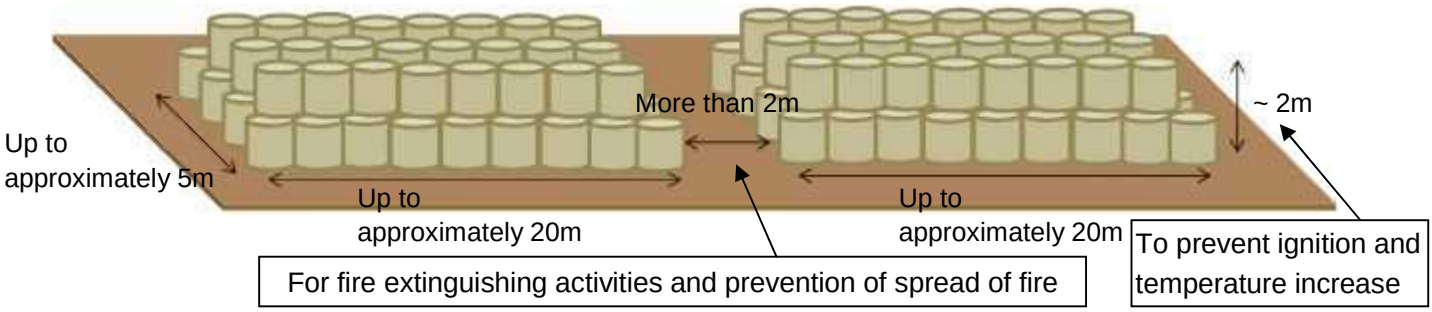


Figure 2-14: Conceptual Diagram of the Method of Piling Up and Storing Perishable Waste from Decontamination Work at Temporary Storage Sites

Source: Prevention of Fire of Flammable Waste at the Temporary Storage Site (2nd Edition)
Network Responding to Earthquake Disaster (Field of Waste and Human Waste, etc.)
National Institute for Environmental Studies, September 19, 2011

- Storage in Airtight Containers such as Drum Cans
  - In the case where perishable waste from decontamination work is stored in airtight containers such as drum cans, it is necessary to take appropriate measures based on the result of the regular check, such as the releasing of the gas generated inside of a can.

- Storage in Cargo Containers or Buildings
  - It is necessary to take appropriate measures based on the result of the regular check, to control temperature increases within the perishable waste from decontamination work, such as ventilation of the storage site.

- In Case of Storage outdoors without using Containers
  - In the case where perishable waste from decontamination work is stored outdoors without using a container, limiting the piling height to about 2 m and the area of the bottom of each pile of perishable waste from decontamination work to 200 m^2 is important for fire prevention and other purposes. Spacing the piles of perishable waste from decontamination work 2 m or more apart is also effective in mitigating the accumulation of heat, making it easier to perform fire exginguishing activities and preventing fires from spreading (Figure 2-14).
  - In the case where perishable waste from decontamination work is covered with sheets etc. to prevent it from scattering, using porous sheets etc. is effective (Figure 2-15).

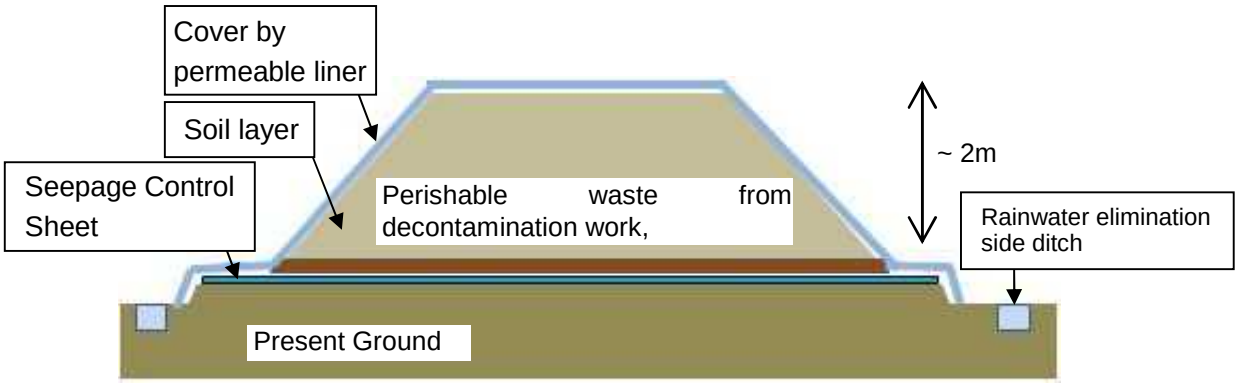


Figure 2-15: Conceptual Diagram of Storage of Perishable Waste from Decontamination Work

  - When installing degassing pipes at a perishable waste from decontamination work storage site, the following rules must be observed (Figure 2-16).
    - U-shape pipes or umbrellas, etc., shall be installed at the degassing pipes to prevent infiltrating of rainwater.
    - The diameter and number of degassing pipes to be installed shall be determined based on the scale of the storage site and other relevant criteria (For example, pipes with a diameter of xx mm or larger must be used in the case of a large-scale storage site).
  - Installing a layer of covering earth over waterproof sheets etc. is effective in protecting the waterproof sheets etc.

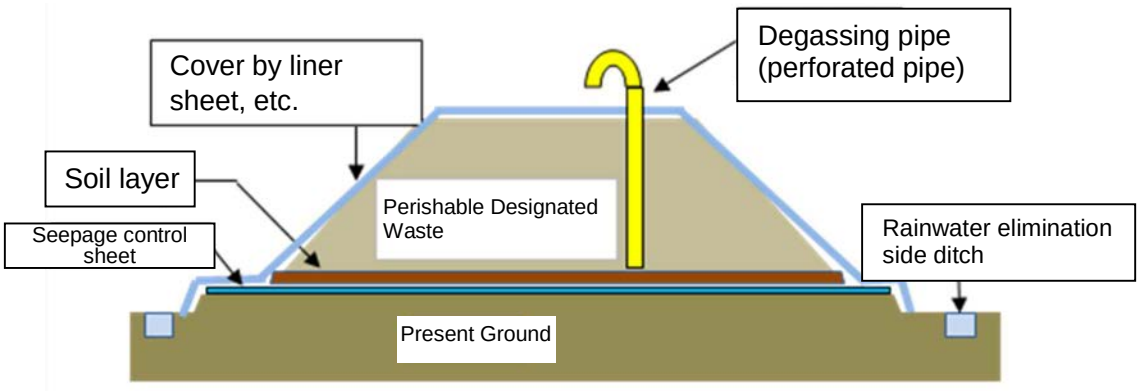


Figure 2-16: Conceptual Diagram of Storage of Perishable Waste from Decontamination Work

➢ As areas near degassing pipe installation locations are prone to sink, measures must be taken in advance to prevent infiltration of rainwater such as employing a double-pipe structure (that is composed of a sheath pipe and a main pipe) for the degassing pipe joints (Figure 2-17).

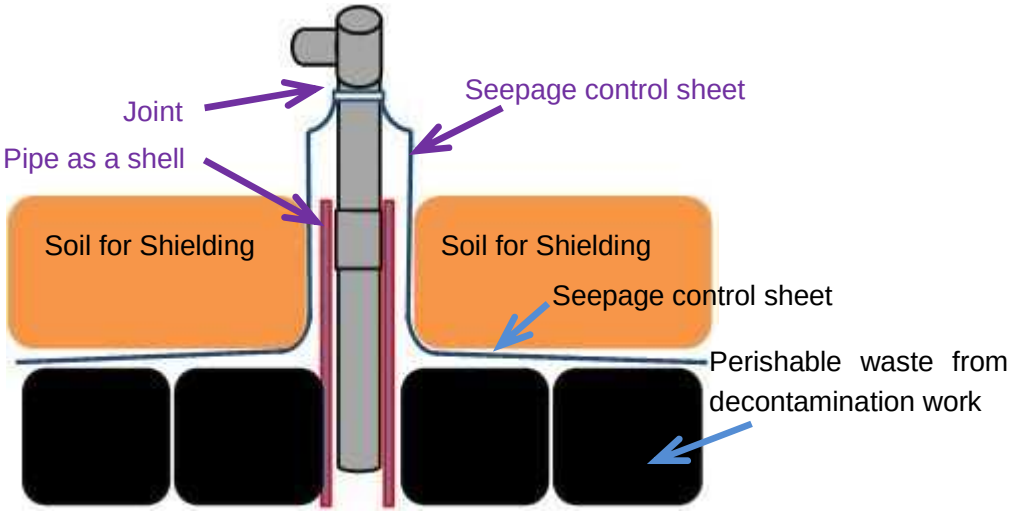


Figure 2-17: Rainwater Infiltration Prevention Measure for Degassing Pipe Joints (Example of a Measure Taken at the Time of Installation)

➢ In the event that sink/deformation or an increase in the rate at which water seeps out is observed in any of the piles of stored perishable waste from decontamination work, checks must be made as necessary for damage, gaps, etc. in the sections where the degassing pipes are joined with sheets. If the results of the checks show that there is a risk of infiltration of rainwater etc., necessary measures, such as repair, must be taken as soon as possible (Figure 2-18).

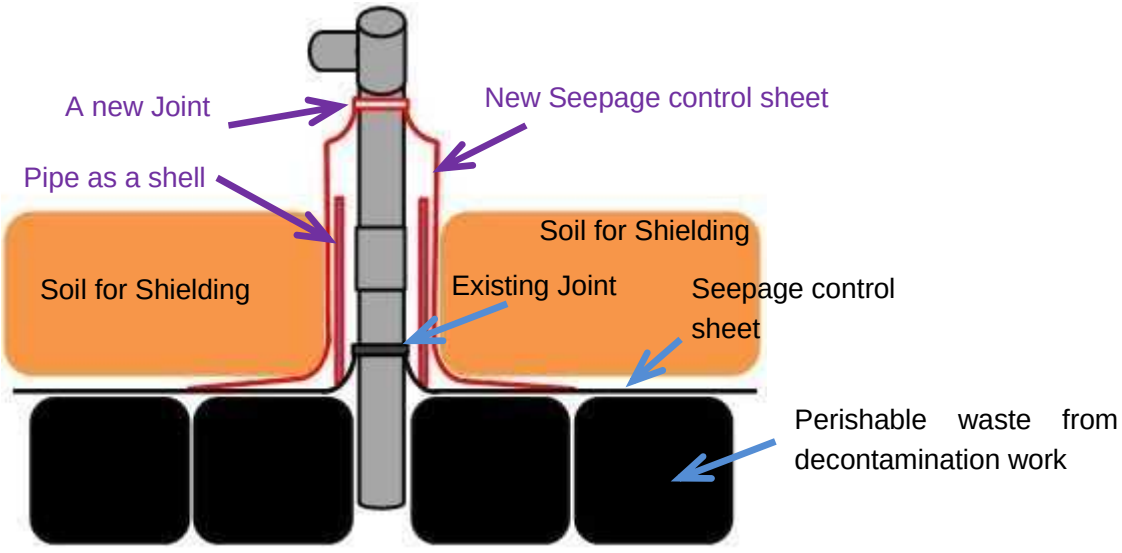


Figure 2-18: Rainwater Infiltration Prevention Measure for Degassing Pipe Joints (Example of a Measure Taken at the Time of Repair)

- Fire Prevention Measures

In order to prevent heat accumulation and ignition by fermentation, etc., of perishable waste from decontamination work, note the following points.

- Avoid storing dangerous articles including fuel (such as gas cylinders, lighters and kerosene cans) together with waste that produces sparks (such as home appliances, batteries and cells).
- Prevent temperature increases caused by accumulation of heat by limiting the piling height for perishable waste from decontamination work to about 2 m. In addition, make sure that excessive compaction is not performed, as it will produce an anaerobic condition, under which methane and hydrogen sulfide can be generated.
- Perform visual checks on a regular basis (about once every 10 days*) for emission of white smoke or water vapor from the waste from decontamination work or for sink and deformation. In the event that emission of white smoke or water vapor from the waste from decontamination work or sink/deformation is observed, perform measurement of temperature and carbon monoxide concentration in the waste at the locations where the emission of white smoke or water vapor or sink/deformation has occurred and in the surrounding areas, to confirm whether there is a risk of ignition caused by heat generation (because it is likely that heat has been accumulated at such locations as a result of fermentation), and take the necessary countermeasures based on the measurement results. The temperature measurement can be accomplished by measuring temperature at a depth of about 1 m from the surface or at the bottom using thermocouple thermometers etc., and the carbon monoxide concentration measurement can be accomplished by measuring CO concentration at a depth of about 1 m from the surface or at the bottom using electrochemical sensor-based CO meters etc.

  The confirmation as to whether there is a risk of ignition caused by heat generation can also be made by performing flammable gas concentration measurement (methane, hydrogen sulfide, etc.) instead of performing measurement of internal temperature and CO concentration.

  * For storage sites at which perishable waste from decontamination work is covered with seepage control sheets etc., which constitute a hindrance to the release of the gases generated in the perishable waste from decontamination work, it is important to perform visual checks about once every 10 days, because there are past cases in which sudden temperature increases occurred at such storage sites as a result of unintended inflow of air.
- In the case of indoor storage, ventilate the building regularly to avoid increases in the temperature of the inside of the building and prevent the building from being filled with the gases generated by the decomposition of organic matters.
- Make provision against fires taking into consideration the size of the storage site, storage conditions, etc., including the installation/storage of the equipment necessary for fire extinguishing activities (sand for extinguishing fire, fire extinguishers and fire cisterns).

  In the case where perishable waste from decontamination work is stored in a building (including a tent), confirm what equipment is required under the Fire Services Act and install such equipment.
- It is necessary to confirm that the ends of the sheets installed to cover the waste are firmly secured to achieve complete closure with no gap. If there is a gap, it is necessary to close the gap by re-fusing etc., because the inflow of air through the gap will accelerate the heat generation, thereby increasing the risk of ignition.
- Reduce the volume of the perishable waste from decontamination work to be stored using a means of volume reduction such as incineration.

<Reference>

Measure the temperature and concentration of carbon monoxide at a depth of about 1m from the surface or at the bottom. If the temperature is higher than 75-80 ºC, it is likely that heat has been accumulated as a result of chemical reactions and oxidation heat generation. Such heat accumulation can cause an underground fire. If the concentration of carbon monoxide exceeds 100ppmv, similar conditions are assumed. If such conditions were observed, it is desirable to notify the fire department as a precautionary measure. If the temperature was below 60ºC, only micro organism

fermentation is assumed and it is considered that the possibility of generation of fire is low.
(Source: Prevention of Fire of Flammable Waste at the Temporary Storage Site (2nd Edition ,addendum)
Network Responding to Earthquake Disaster (Field of Waste and Human Waste, etc.)
National Institute for Environmental Studies, December 22, 2011)

- Ensuring Stability
  - One appropriate way to stack containers containing waste to prevent collapse and accumulation of rainwater for the case where perishable waste from decontamination work such as tree and plant waste is stored is to place the containers of nonflammable waste, whose volume reduction rate is relatively low, in the load-bearing parts of the block of stacked layers of waste containers and place the containers of perishable waste from decontamination work in the outer slope parts of the block, so that the shape of the block will be maintained even when the volume of the perishable waste from decontamination work decreases to some extent and sink occurs. One good practice for stacking waste containers in this way is to take measures to clearly distinguish the perishable waste from decontamination work from the other non-flammable waste to prevent the former from getting mixed with the latter, such as color coding the containers (Figure 2-19).

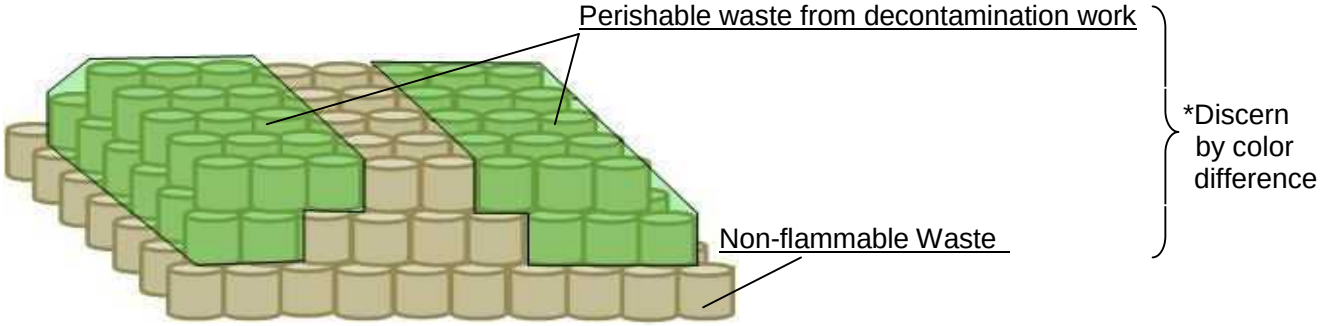


Figure 2-19: Placement of Perishable Waste and Non-flammable Waste (Example)

  - One appropriate way to store perishable waste from decontamination work in flexible containers with it evenly placed in the containers to minimize the sink and deformation during storage is to perform certain volume reduction first and then evenly place the waste in containers.
  - One appropriate way to store perishable waste from decontamination work in flexible containers with it evenly placed in the containers is to perform certain volume reduction before placing the waste in containers. This volume reduction can be accomplished by using a chipper. When reducing the volume of perishable waste from decontamination work using a chipper, it is necessary to take measures to prevent scattering such as the covering of the work area with sheets (Figure 2-20). It is also necessary to take measures to prevent heat generation and ignition during storage of the perishable waste from decontamination work whose volume has been reduced, because heat may be generated in the waste during storage depending on the storage conditions. In addition, taking measures to ensure the stability of the block of stacked layers of waste containers, such as the adoption of a stacking work procedure in which containers are set alternately with the spaces between them filled as appropriate, is also effective.

Figure 2-20: Volume Reduction Using a Chipper (Example)

(Source: JAEA Report of the Decontamination Demonstration Operation Conducted in the Evacuation Areas etc. Designated to Respond to the Fukushima Daiichi Nuclear Power Station Accident)

- In the event that sink or deformation of the perishable waste from decontamination work occurs, the shape of the block of stacked layers of waste containers must be corrected by re-stacking waste containers, to prevent accumulation of rainwater and collapsing that causes scattering and outflow.

[Matters of concern]

- About Turf Grass to which Soil Has Adhered
  - In the case where it is difficult to separate the waste from decontamination work generated as a result of turf stripping, that is, the turf grass, from the soil adhering to it and it is necessary to store the turf grass underground together with the adhering soil, it is important to prevent fire, scattering and outflow, infiltration of rainwater and contamination of groundwater etc., by, for example, storing the grass and soil at an appropriate depth and covering the top and bottom surfaces of grass and soil with sheets.
  - After burying the waste from decontamination work (turf grass and soil), it is important to inspect the burial storage area on a regular basis (about once a month), because sink of the ground in the burial storage area and generation of gases in the buried waste from decontamination work and their release through the surface of the ground in the burial storage area may occur depending on the state of decomposition of the buried waste from decontamination work. In the event that sink occurs, maintenance measures (banking etc.) must be taken. In addition, it is important to avoid using fire or fire- or spark-producing devices in and around the area after completion of burial, because methane gas can be generated and released through the ground surface.

2.8 Measurement, Record and Retention of Amount of Radiation

Ordinance, Article 24, paragraph (1), item (iv), exceptional clause

In cases as provided by the exceptional clause under item (ii), (a), exceptional clause*, amount of radiation shall be measured and recorded in accordance with the method determined by the Minister of the Environment under Article 15, item (xi) at the Boundary of Storage Site, etc. (if measures for prevention of arbitrary entry of people in the area adjacent to the storage site were taken, the boundary of the area) before start of storage of waste from decontamination work and after start of storage without delay, in accordance with the method determined by the Minister of the Environment.

In cases provided for in Ordinance, Article 24, paragraph (1), item (ii), a. exceptional clause

Where waste generated from measures for decontamination of the soil, etc., applicable to the land, etc., in specific

area for decontamination or decontamination zone (only limited to the waste within the management area and the waste related to designation under the Act, Article 17, paragraph (1)) is stored on the land to which measures for decontamination of the soil, etc., was implemented.

* December 28 2011, Announcement of the Ministry of the Environment, No.110
The measurement shall be accomplished using gamma-ray measurement device at a height from 50 cm to 1 m

[Purpose of Measures]

Out of waste from decontamination work, is stored, in order to check whether measures for protection of people other than the related persons from radiation were properly taken, it is necessary to measure air dose rate before and after storage of waste from decontamination work at the boundary of storage site of waste from decontamination work and record and manage the results.

<Examples of Measures>

One effective measure is to perform air dose rate measurement at the cleared storage site after the removal of the waste from decontamination work following the completion of the storage in addition to performing air dose rate measurement prior to and after the commencement of the storage in order to confirm that there is no significant difference between the air dose rates before the commencement of the storage and after the removal of the waste from decontamination work.

- Measurement of Air Dose Rate
  - Specific measurement of the air dose rates shall be conducted by the method set forth in "Part V: Guidelines for Measurement Method of Radioactive Concentration," Chapter 2.

- Management of Measurement Results
  - Background measurement shall be performed at the storage site prior to bringing in the waste. If air dose rate cannot be measured because storage already started, etc., air dose rate at the point sufficiently distant from the stored waste shall be measured and the results shall be used as the background.
  - It shall be confirmed through the above-mentioned measurement that the additional dose at the boundary of the storage site (around the fences) does not exceed an additional dose of 0.19μSv/h*[1] (1mSv/y). For areas whose surrounding area of the fences has a relatively high air dose rate, the air dose rate around the fences shall be so controlled that it is kept at the same level as the level of the air dose rate in the surrounding area. In addition this guideline shall be complied with to reduce the additional dose to the extent possible
  - After bringing the waste into the storage site, it shall be confirmed prior to going on to the storage stage that the air dose rate is "about the same as" the background.

- Measures in Case of Confirmation of Abnormal Figures in Measurement Results
  - In the event that the waste storage conditions are altered by effects of heavy rain, typhoon, etc., air dose rate measurement must be performed at the boundary of the storage site.
  - In this regard, if any abnormal values were confirmed in the measurement results after the heavy rain or typhoon (significantly high value as compared with the measurement results after start of storage), the causes shall be surveyed and if the storage site was determined to be the cause, necessary measures shall be taken, including restoration of storage status and addition of shielding materials, etc.
  - If any abnormal values were confirmed in the measurement results of the vacant lot after termination of storage (significantly high value as compared with the measurement results before start of storage), the

[1] Additional dose 1mSv/year is calculated based on the supposition of a life pattern that the person spent in a day 8 hours in outside and 16 hours in room inside (wooden house that had shield effect of 0.4), if convert it to in any one hour by following a formula, it is 0.19μm. 0.19μSv/h*(8h+0.4*16h)*365days=1mSv/year

causes shall be surveyed and if the storage site was determined to be the cause, necessary measures shall be taken, including decontamination, etc.

- Records
  - Form of records should be referred to "records of measurement of air dose rate in storage" that is the 2nd section of " Part V Guideline for measurement of radioactive concentration and others"

(Reference)

Study on Shielding Effects for a Position of Premise Boundary*1

Average radioactive concentration (Cs:Bq/kg)	dimensions of mound of waste (depth×width×height)	Shielding measures	A position of premises boundary that additional dose is less than 1mSv a year (i.e. isolation distance to residential area)							
			0m	1m	2m	4m	6m	8m	10m	20m
3000 Bq/kg Surface dose rate of packages; approximately 0.7μSv/h *2	2m×2m×1m	No measures taken		●						
	5m×5m×2m	No measures taken				●				
		Cover only the side surface by sandbags		●						
	10m×10m×1m	Cover only the side surface by sandbags		●						
	20m×20m×2m	Cover only the side surface by sandbags		●						
	50m×50m×2m	Cover only the side surface by sandbags			●					
	200m×200m×2m	Cover only the side surface by sandbags			●					
	Add for all of the above cases	Cover by 30cm thickness of soil	●							
8000 Bq/kg Surface dose rate of package; approximately 1.8 μSv/h*2	2m×2m×1m	Cover only the side surface by sandbags		●						
	5m×5m×2m	No measures taken					●			
		Cover only the side surface by sandbags			●					
	10m×10m×1m	Cover only the side surface by sandbags				●				
	20m×20m×2m	Cover only the side surface by sandbags				●				
	50m×50m×2m	Cover only the side surface by sandbags				●				
	200m×200m×2m	Cover only the side surface by sandbags				●				
	Add for all of the above cases	Cover by 30cm thickness of soil	●							

*1: The above table uses as reference values the "sky shine" and direct dose rate evaluation results for the case where shielding in the form of a 30cm-thick layer of covering earth (with a density of 1.5g/cm3) is provided on the top or sides and the case where no shielding is provided. For example, in the case where removed soil with a radioactivity concentration of 3,000 Bq/kg is piled on the ground in the form of a pile with a length of 20m, a width of 20m and a height of 2m, the isolation distance at which the additional annual external exposure dose becomes 1mSv or less is 1m with only the sides shielded by 30cm-thick layer of sandbags , but the distance will decrease to 0m after completion of the installation of a 30cm-thick layer of covering earth on its top. The assumption here is that no radionuclides other than 134Cs and 137Cs is present in the waste(removed soil) and their radioactivity ratio is 1:1 (It is expected that the radioactivity ratio of Cesium 134 and Cesium 137 will change over time because the decay rates of Cesium 134 and Cesium 137 are different. However, because the decay rate of Cesium 134, which causes stronger radioactivity effects, is higher, it is considered that the radioactivity ratio changes will take place on the safer side). For the radioactive cesium concentration in the waste, two different values are assumed; an average value of 3,000Bq/kg and an average value of 8,000Bq/kg. (The above table was created with the help of the Waste Safety Research Group of the Safety Research Center of the Japan Atomic Energy Agency (JAEA)).

In the case of removed soil containing non-negligible amounts of radioactive substances other than 134Cs and 137Cs, such as contaminated soil removed from areas near facilities of the Fukushima Daiichi Nuclear Power Station, it is necessary to perform separate safety evaluations as necessary and provide the necessary shielding or isolation distance.

*2: When removed soil with a density of 2.0g/cm3 and an average radioactive cesium concentration of 3,000Bq/kg or 8,000Bq/kg is filled in a cylindrical container with a diameter of 50cm and a height of 100cm (with the shielding effect of the container

disregarded), the air dose rate at a distance of 1cm from the side surface of the cylindrical container at a height of 50cm as measured from the bottom of the container is 0.7 or 1.8μSv/h, respectively (These are figures that were confirmed with the help of the Japan Atomic Energy Agency).

* This evaluation was made by using soil as for waste. There will be little difference for other materials than soil in the radioactivity-air dose rate conversion coefficient when the density is the same.
Because the density of incineration ash and that of sludge are lower than the soil density of 2.0g/cm3 assumed in this evaluation, it can be said that the evaluation results are conservative ones.

2.9 Others (Safety management for workers)

[Examples of Measure]

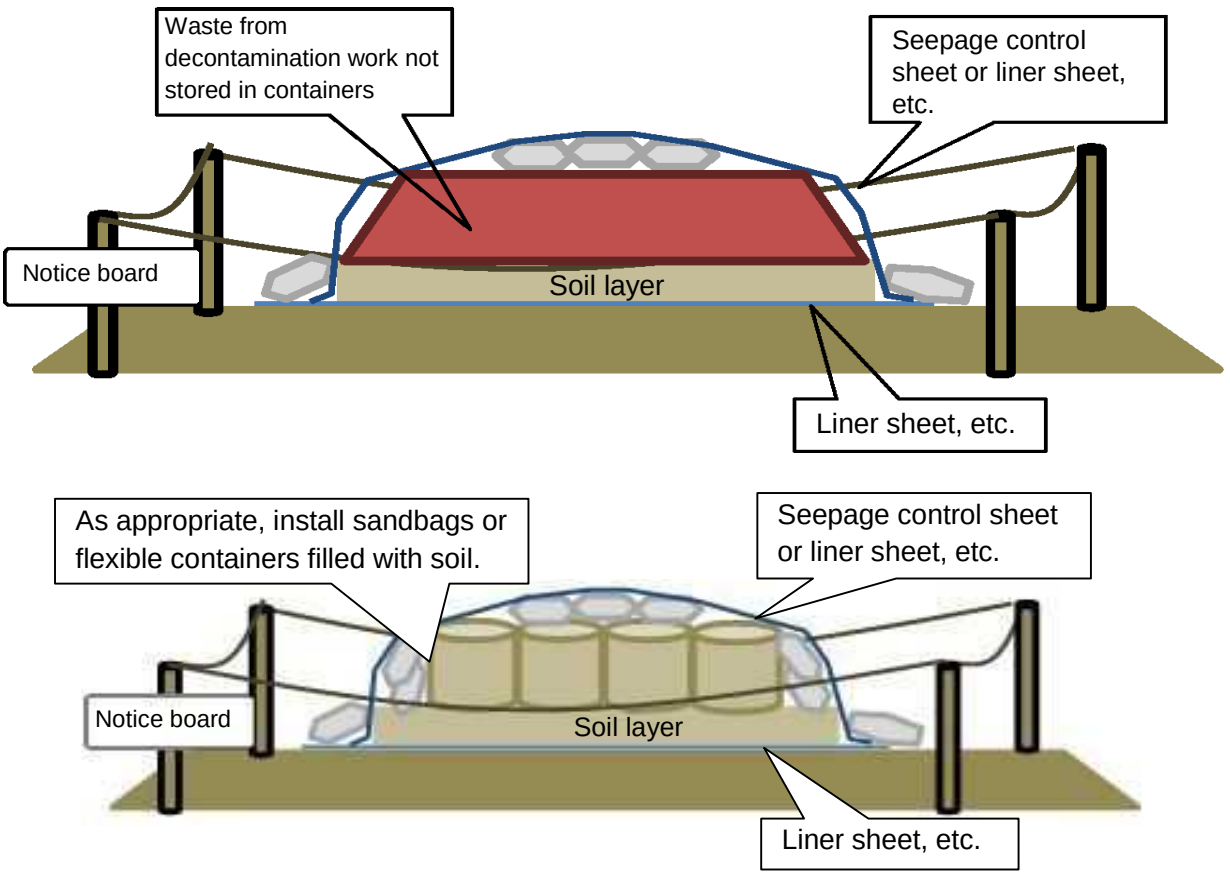
Regarding prevention of dispersion and outflow of waste from decontamination work, Ordinance on Prevention of Ionizing Radiation Hazards at Works to Decontaminate Soil and Wastes Contaminated by Radioactive Materials Resulting from the Great East Japan Earthquake (Dec. 22, 2011, Ordinance of the Ministry of Health, Labour and Welfare, No.152) and Related Works and Guidelines for Protecting Workers Engaged in Decontamination, etc. from Radiation Disorders (Dec. 22, 2011, Ministry of Health, Labour and Welfare) can be used as a source of reference for prevention of radiation hazard against workers involving storage.

[Summary]

- Basic principle : To keep exposure to workers from ionizing radiation as low as possible
- Waste from decontamination work is defined that contaminated waste contains more than 10,000Bq/kg radioactive cesium.
- Dose limit for workers
- Measurement of dose
- Prevention of contamination (divergence suppression of dust, use of vessels and others) , etc.

<Storage of Waste from Decontamination Work: Example (1)>

In Figure 2-21, an example of storage of waste (plants and fallen leaves and branches, etc.) generated from decontamination on the premises of a private house, etc., of ordinary citizens is shown.

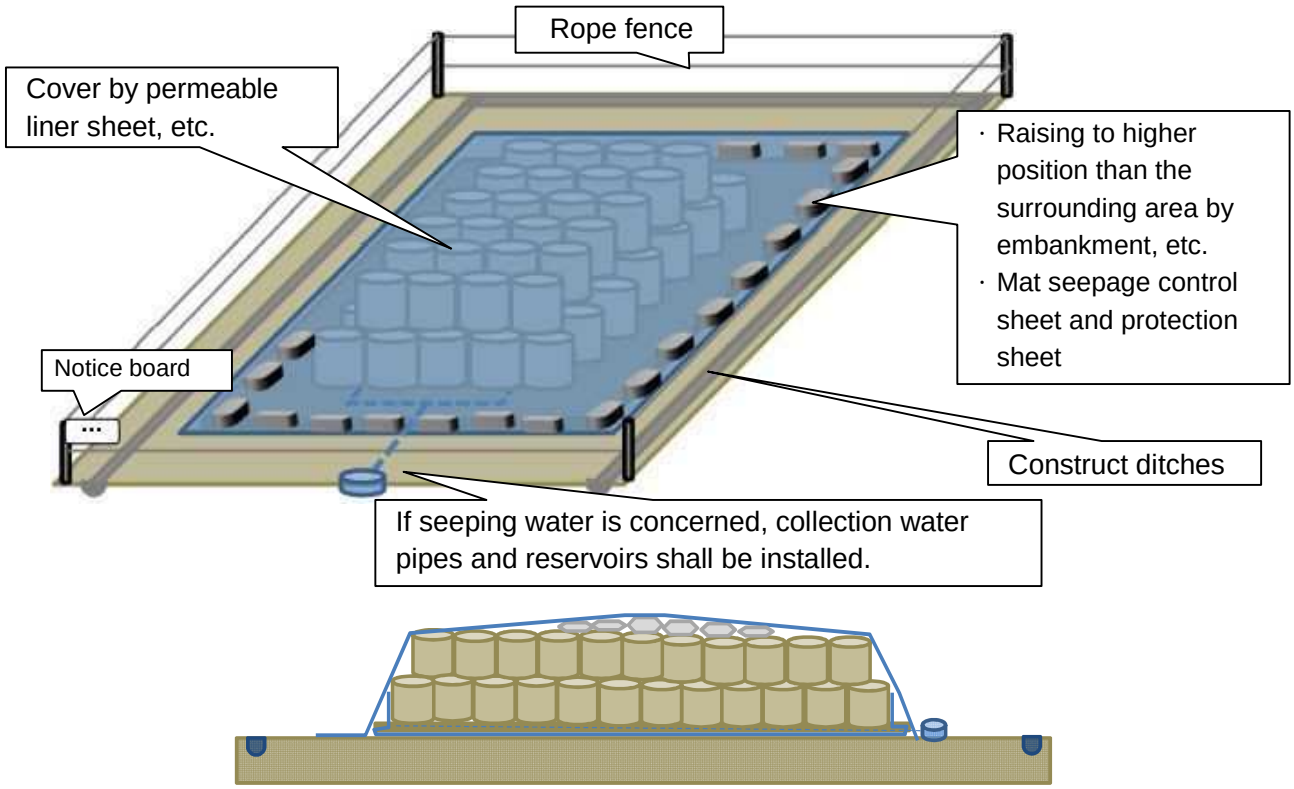


[1] Fence and Notice Board	· The range of storage site shall be clearly indicated (by surrounding with ropes, etc.) · A notice board describing the prescribed matters shall be installed.
[2] Prevention of dispersion, outflow and foul odors	· Cover with seepage control sheet or liner sheet, etc.
[3] Prevention of pollution of groundwater, etc.	· Install a layer of earth and store the waste on it.
[4] Prevention of emission of foul odors	· If a odor might be emitted, such measures as keeping distance from the surroundings shall be concurrently taken.
[5] Prevention of emergence of sanitary harmful insects	· If puddles of rainwater, etc., were generated around, remove them quickly.
[6] Prevention of mixing of waste from decontamination work containing asbestos	· Package in containers, separate the storage site from other waste.
[7] Prevention of generation of fire	· Check the state of the stored waste regularly, and if white smoke, water vapor, etc. is observed, perform temperature or carbon monoxide concentration measurement and take the necessary measures based on the measurement results.
Other	· Check the state of the stored waste regularly, and if an abnormal condition is found, consult the administrative authority.

Figure 2-21: Example of Storage of Waste from Decontamination Work (1)

<Storage of Waste from Decontamination Work: Example (2)>

In Figure 2-22, an example of storage by municipalities of waste (plants and fallen leaves and branches, etc.) generated from decontamination in a relatively large temporary storage site located near the site where the waste is generated is shown.

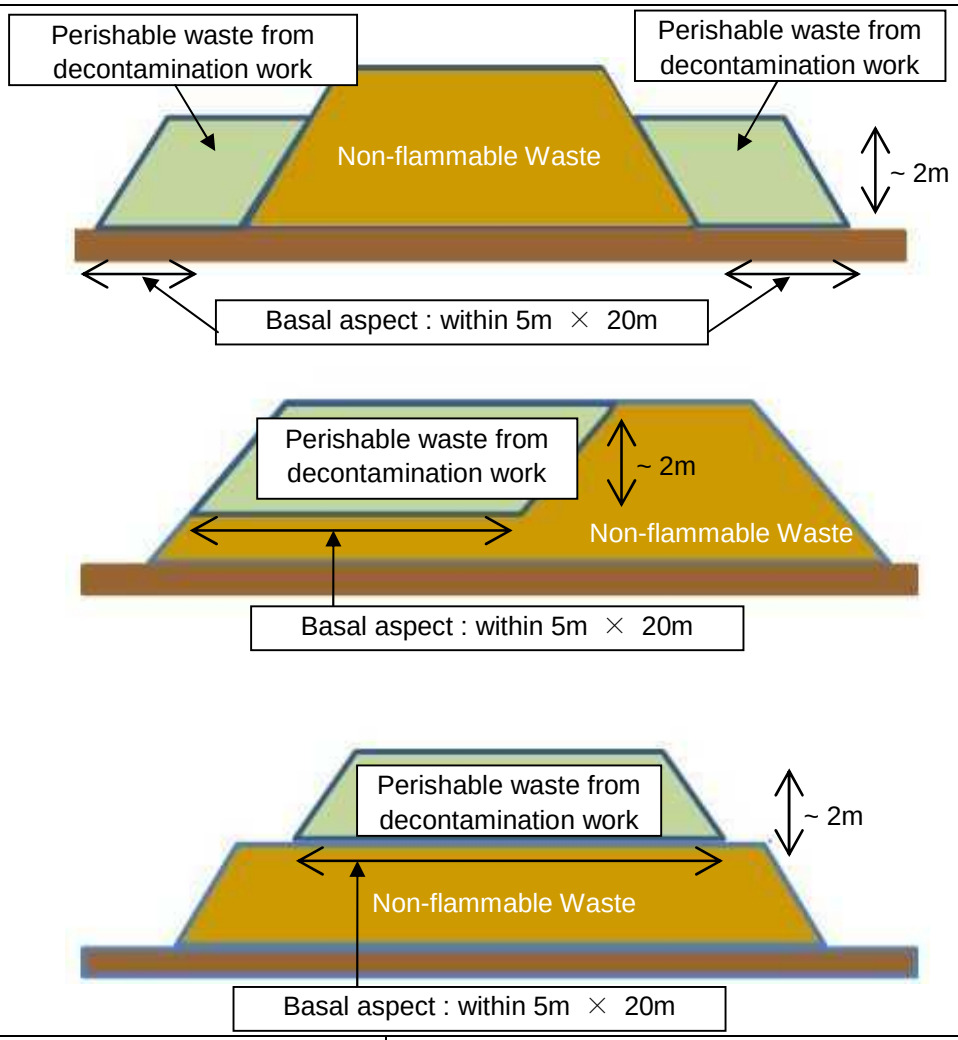


[1] Fence and Notice Board	· The range of storage site shall be clearly indicated (by surrounding with ropes, etc.) · A notice board describing the prescribed 1matters shall be installed.
[2] Prevention of dispersion, outflow and foul odors	· Put the waste in containers and cover the containers with porous waterproof sheets etc. · Construct ditches around the site for collecting and draining water to prevent infiltration of surface water.
[3] Prevention of pollution of groundwater, etc.	· Install seepage control sheets and protective mats on the soil layer and store the waste on it.
[4] Prevention of emission of foul odors	· If a odor might be emitted, such measures as keeping distance from the surroundings shall be concurrently taken.
[5] Prevention of emergence of sanitary harmful insects	· If puddles of rainwater, etc., were generated around, remove them quickly.
[6] Prevention of mixing of waste from decontamination work containing asbestos	· ·Package in containers, separate the storage site from other waste.
[7] Prevention of generation of fire	· Check the state of the stored waste regularly, and if white smoke, water vapor, etc. is observed, perform temperature or carbon monoxide concentration measurement and take the necessary measures based on the measurement results.
Other	· Check the state of the stored waste regularly, and if an abnormal condition etc. is observed, recheck each measure and repair the problem section(s).

Figure 2-22: Example of Storage of Waste from Decontamination Work (2)

<Storage of Waste from Decontamination Work: Example (3)>

In Figure 2-23, an example of storage of perishable waste from decontamination work together with non-flammable waste is shown.



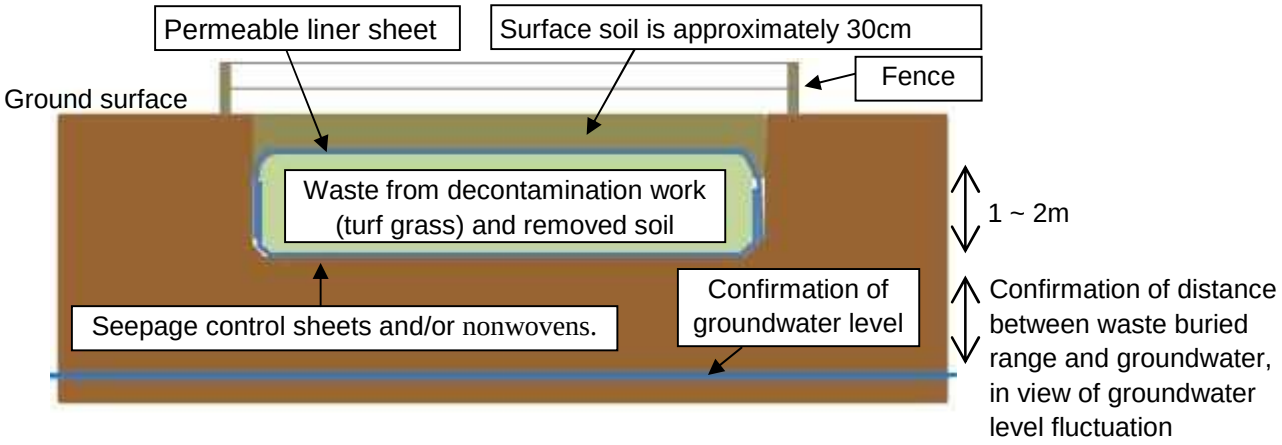
[1]	Fence and Notice Board	· The range of storage site shall be clearly indicated (by surrounding with ropes, etc.) · A notice board describing the prescribed 1matters shall be installed.
[2]	Prevention of dispersion, outflow and foul odors	· Cover with seepage control sheet or liner sheet, etc. · In the case where perishable waste from decontamination work is stored on top of non-flammable waste, exercise due care to ensure the stability of the pile of the perishable waste from decontamination work and non-flammable waste to prevent collapse etc. · Ensure that the stability of the pile of the stored waste will be retained even if the volume of the perishable waste from decontamination work decreases and sink occurs as a result of the volume reduction.
[3]	Prevention of pollution of groundwater, etc.	· Install seepage control sheets and a layer of earth.
[4]	Prevention of emission of foul odors	· If a odor might be emitted, such measures as keeping distance from the surroundings shall be concurrently taken.
[5]	Prevention of emergence of sanitary harmful insects	· If puddles of rainwater, etc., were generated around, remove them quickly.
[6]	Prevention of mixing of waste from	· Package in containers, separate the storage site from other waste.

decontamination work containing asbestos	
[7] Prevention of generation of fire	· Limit the width, length and height of each pile of perishable waste from decontamination work (or each block of stacked layers of containers containing perishable waste from decontamination work) to 5m, 20m and 2m, respectively. · Prevent containers containing perishable waste from decontamination work from getting mixed with containers containing removed soil by taking appropriate waste identification measures such as color coding containers containing perishable waste from decontamination work and those containing removed soil. · Check the state of the stored waste regularly, and if white smoke, water vapor, etc. is observed, perform temperature or carbon monoxide concentration measurement and take the necessary measures based on the measurement results.
Other	· Check the state of the stored waste regularly, and if an abnormal condition is found, consult the administrative authority.

Figure 2-23: Example of Storage of Waste from Decontamination Work (3)

<Storage of Waste from Decontamination Work: Example (4)>

In Figure 2-24, an example of buried storage of waste generated from decontamination (turf grass) together with adhering soil, which is difficult to separate from turf grass, is shown.



[1] Fence and Notice Board	· The range of storage site shall be clearly indicated (by surrounding with ropes, etc.) · A notice board describing the prescribed 1matters shall be installed.
[2] Prevention of dispersion, outflow and foul odors	· Cover the waste with porous waterproof sheets.
[3] Prevention of pollution of groundwater, etc.	· Install seepage control sheets under the waste. · Ensure that the waste is buried at a level that is sufficiently above the groundwater level taking into consideration the fluctuation range of the groundwater level, to prevent the water from reaching the buried waste.
[4] Prevention of emission of foul odors	· Install a layer of covering earth with a thickness of about 30cm over the porous waterproof sheets.
[5] Prevention of emergence of sanitary harmful insects	· If puddles of rainwater, etc., were generated around, remove them quickly.
[6] Prevention of mixing of waste from decontamination work containing asbestos	-
[7] Prevention of generation of fire	· Check the state of the stored waste regularly, and if white smoke, water vapor, etc. is observed, perform temperature, carbon monoxide concentration or flammable gas concentration measurement and take the necessary measures based on the measurement results. · Avoid using fire or fire- or spark-producing devices in and around the area.
Other	· In the case where it is necessary to store the waste at a large storage site or in an area where water does not drain easily, select a location that is not frequently entered by people unless it is not possible to do so, because the ground may become unstable. · Check the state of the stored waste regularly, and if an abnormal condition is found, consult the administrative authority.

Figure 2-24: Example of Storage of Waste from Decontamination Work (turf grass)

Chapter 3 Penal Provisions

3.1 Penality in case of storage not conforming to the standards

Article 51, 5. (Order for Action)

The Minister of the Environment or a prefectural governor who has formulated a decontamination plan may, when waste generated from measures for decontamination of the soil applicable to the land, in a Special Decontamination Area or decontamination zone (excluding specified waste) has not been stored in accordance with the standards set forth by the Ordinance of the Ministry of the Environment referred to in Article 41, paragraph 4 and it is determined to be necessary to ensure the proper storage of the said waste, order the person or entity that has executed the storage, within the limits necessary, to take measures for the proper storage of the said waste or any other necessary measures, by specifying a time limit for compliance.

Article 60,1,(v)

Any person who has violated an order under Article 51, 5. shall be punished by imprisonment not more than five years or fined not more than 10 million yen or both.

[Purpose of Measures]

The Minister of the Environment or a prefectural governor, etc. who has formulated a decontamination plan may, when waste from decontamination work has not been stored in accordance with the standards set forth in the Ordinance, Article 60 and it is determined to be necessary to ensure the proper storage of the said waste, order the person or entity that has executed the storage, within the limits necessary, to take measures for the proper storage of the said waste or any other necessary measures, by specifying a time limit for compliance.

A person who breached these orders shall be punished by imprisonment not more than five (5) years or fined not more than ¥10 million or both.