6. Outline of decontamination methods, applications and conditions thereof, and examination of the effects

Chapter 6.1 outlines the decontamination methods and their applications and conditions for the decontamination works in the Special Decontamination Area as directed by the Ministry of Environment (MOE). Chapter 6.2 shows some of the verification results of decontamination effects in the decontamination works executed.

The methods to apply and their conditions and the decontamination effects depend on various environmental conditions such as site situations, material properties and surface conditions of the objects subject to decontamination, and their aging variation with time. Therefore, the best decontamination methods and conditions are not easy to specify beforehand, even for a particular item to be decontaminated.

For example, the decontamination methods for the decontamination works have been changing with time after the accident. In the early stage, high-pressure water cleaning was effective in decontaminating paved road surfaces. But after some time, radioactive cesium has migrated from the surface deep into the materials so that scraping of the paved road surfaces by shot-blasting became a practical and effective approach, instead of simply washing the surfaces.

Meanwhile, weeds have grown in house gardens and on unpaved road surfaces as time elapsed after the accident. Also underbrush and shrubs have grown in farmland. Weed removal and underbrush/shrubs cutting are currently being added to the decontamination work, which had not been practiced in the early stage.

6.1. Outline of Decontamination Methods and Their Applications and Conditions

Outlines of decontamination methods, and their applications and conditions used in the decontamination works in the Special Decontamination Areas as directed by the MOE are given below.

Decontamination methods are specified in the Common Specifications of Decontamination Works (“Common Specifications” in this report) (7th Edition), and this report summarizes the decontamination methods for each decontamination object shown in Table 6-1. As mentioned in Chapter 4.1.3 (4), the Common Specifications (7th Edition) deals with not only (i) decontamination methods for reducing air dose rates, but also (ii) the methods for pre-decontamination works and post-decontamination works for restoration.

It should be noted that the amount of materials removed such as soil is not given in Chapter 6.1. It can be estimated, for instance, the reference soil thickness of about 5 cm set when scraping farmland (rice fields, dry fields, grassland) is multiplied by the size of the decontamination area (if the area of 100 m^2 is decontaminated by surface scraping, the soil to remove is estimated as 5 m^3). In actual cases, it is not possible to scrape the surface land uniformly. Uncertainties to some degree cannot be avoided. (See the case given later in Chapter 6.2.1-(4) 2) i).)

Table 6-1 Methods of decontamination for individual objects subject to decontamination

Classification of objects subject to decontamination		Classification of decontamination methods
Residential areas, schools, parks, large facilities, roads, etc.	sediments	sediment removal
	Roofs/ rooftops, exterior walls/outside walls, paved surfaces (concrete, asphalt) and the like of structures	wiping
		brush cleaning
		high-pressure water cleaning
		shot-blasting
		Superhigh pressure water cleaning
		Cleaning by road sweepers
	Weeds, lawns	Weeding, lawn mowing
		deep pruning of lawns
	Gravel, crushed stones	Removal of gravel, crushed stones
	Soil	Surface soil removal from rainwater guttering drains, and under-eaves
		Scraping of surface soil
		Soil surface covering
		Deep plowing
	Garden trees, planted vegetation and roadside trees	Surface soil removal from the bases of trees
		Delimbing of garden trees, planted vegetation, roadside trees
		Logging of garden trees, planted vegetation
	Others	Wiping, cleaning, scraping of playground equipment
		Removal of bottom sediments and the like in the street drains along the roads
Slopes		Removal of weeds, fallen leaves, and sediments from the slopes
Rice fields, dry fields, grassland, etc.	Weeds	Weeding the rice fields and dry fields by hands
		Weeding the rice fields and dry fields by machinery
		Collection of weeds removed from rice fields and dry fields
		Weeding the grassland
	Soil	Leveling of unevenness
		Spreading of surface solidification materials
		Scraping of surface soil (standard transfer method)
		Dual plowing
		Deep tillage
		Soil replacement
		Restoration of soil fertility
	Waterways	Removal of bottom sediments (soil sucking)
		Removal of bottom sediments (packing into bags)
	Others	Packing into bags (standard transfer method)
		Petit transfer on site (standard transfer method)
Grassland, lawns		Weeding (dense shrubs)
		Weeding (sparse shrubs)

Forests	Common items to the forests with mixed trees of coniferous evergreen trees, deciduous broad-leaf trees and others	Removal of deposited organic sediments
		Removal of deposited organic sediments (uncontrolled areas)
		Prevention of soil secondary dispersion (lining up of sandbags)
		Weeding underbrush and shrubs
		Removal of organic sediment residues
	Coniferous evergreen trees	Pruning of coniferous trees, collection of slips

6.1.1. Residential Areas, Schools, Parks, Large Facilities, Roads, etc.

（1） Sediment

1）Sediment removal

Locations to be decontaminated[137]	“1.1.1. Roofs (other than concrete)” of “1.1 Roofs/rooftops” in “1. Residential areas and the like” “1.1.2. Roofs (concrete)” of “1.1 Roofs/rooftops” in “1. Residential areas and the like” “1.3.1. Roof gutters” of “1.3 Rainwater gutters” in “1. Residential areas and the like” “1.4.1. Unpaved surfaces” of “1.4. Gardens and the like” in “1. Residential areas and the like.” “1.4.2. Paved surfaces” of “1.4. Gardens and the like.” in “1. Residential areas and the like.” “2.1. Roofs/rooftops” at “2. Schools” “2.3.1. Roof gutters” of “2.3. Rainwater gutters” at “2. Schools” “2.4.1. Sediment” of “2.4. School grounds and the like” at “2. Schools” “2.4.6. Paved surfaces” of “2.4. School grounds and the like” at “2. Schools” “3.1. Roofs/rooftops” in “3. Parks (small)” “3.3.1. Roof gutters” of “3.3. Rainwater gutters” in “3. Parks (small)” “3.4.1.Sediment” of “3.4. Playgrounds and the like” in “3. Parks (small)” “3.4.6.Paved surfaces” of “3.4. Playgrounds and the like” in “3. Parks (small)” “4.1. Roofs/rooftops” in 4. Parks (large)” “4.3.1. Roof gutters” of “4.3. Rainwater gutters” in “4. Parks (large)” “4.4.1.Sediment” of “4.4. Playgrounds and the like” in “4. Parks (large)” “4.4.6.Paved surfaces” of “4.4. Playgrounds and the like” in “4. Parks (large)” “5.1.1. Roofs/rooftops” of “5.1. Roofs/rooftops” of “5. Large facilities” “5.3.1. Roof gutters” of “5.3. Rainwater gutters” of “5. Large facilities” “5.4.1.Sediment” of “5.4. Playgrounds and the like” of “5. Large facilities” “5.4.6. Parking lots (concrete, asphalt)” of “5.4. Playgrounds and the like” of “5. Large facilities” “6.1.1. Sediment” of “6.1. Paved roads” of “6. Roads” “6.2.1. Road surfaces (soil)” of “6.2. Unpaved roads” of “6. Roads” “6.2.2. Road surfaces (gravel, crushed stone)” of “6.2. Unpaved roads” of “6. Roads” “6.5.1. Pedestrian overpasses” of “6.5. Pedestrian overpasses” “6. Roads” “6.6.1. Sediment” of “6.6. Roadside trees” of “6. Roads”
Decontamination methods	Sediment removal

[137] Residential areas and the like,” “1.1 Roofs/rooftops,” “1.1.1. Roofs (other than concrete),” etc. in the “Locations to be decontaminated,” “Outline,” and “Required equipment and materials” correspond to the objects subject to decontamination shown in Table 4-7 of the Common Specifications (7th Edition). The same source applies hereafter.

<table>
<tr><td>Outline</td><td>Sediment shall be removed in the following procedures
(i) Removing fallen leaves, moss, mud, etc.
(ii) Packing the removed materials
from roofs/rooftops, roof gutters, gardens, grounds, parking lots (concrete, asphalt), roads/sidewalks, pedestrian overpasses, roadside trees, etc. in residential areas, schools, parks, large facilities, roads, etc.</td></tr>
<tr><td>Decontamination processes</td><td>■ When working on
roofs/rooftops, gardens, etc. of residences, schools, parks (small), parks (large) or large facilities (1.1.1, 1.1.2, 1.4.1, 1.4.2, 2.1.1, 3.1.1, 4.1.1, 5.1.1);
grounds, paved surfaces, etc. of schools, parks (small), and parks (large) (2.4.1, 2.4.6, 3.4.1, 3.4.6, 4.4.1, 4.4.6); and
grounds of large facilities, parking lots (concrete, asphalt) (5.4.1, 5.4.6), paved and unpaved roads (6.1.1, 6.2.1, 6.2.2), as well as pedestrian overpasses (6.5.1) or roadside trees (6.6.1),
● Sediment such as fallen leaves, moss and mud shall be collected using rubber hand gloves, shovels, rakes, etc. and packed into large sandbags; and
● Sediment on easily broken roofs shall be removed with mops or the like, without getting directly on the roofs, by using aerial lift work vehicles and the like.
■ When working on roof gutters of residences, schools, parks (small), parks (large) or large facilities (1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1),
● Fallen leaves, moss, mud, etc. shall be removed using rubber hand gloves, brooms, brushes, etc. and packed into large sandbags.</td></tr>
<tr><td>Tools, equipment and the like for decontamination work</td><td>■ When working on
roofs/rooftops, gardens, etc. of residences, schools, parks (small), parks (large) or large facilities (1.1.1, 1.1.2, 1.4.1, 1.4.2, 2.1.1, 3.1.1, 4.1.1, 5.1.1);
grounds of parks (small), paved surfaces, etc. (3.4.1, 3.4.6); and
pedestrian overpasses (6.5.1), roadside trees (6.6.1),
<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Rubber gloves, shovels, rakes, etc.</td><td>—</td></tr><tr><td>Large sandbags</td><td>—</td></tr></table>*For the work at an elevated place, aerial lift work vehicles or scaffolds shall be used.</td></tr>
</table>

■ When working on roof gutters of residences, schools, parks (small), parks (large) or large facilities (1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1),

Tools, equipment to use	Quantity
Rubber gloves, brooms, brushes, etc.	—
Large sandbags	—

■ When working on
grounds, paved surface, etc. of schools, parks (large) or large facilities (2.4.1,2.4.6, 4.4.1, 4.4.6);
grounds, parking lots (concrete, asphalt) of large facilities (5.4.1, 5.4.5), and
paved and unpaved roads (6.1.1, 6.2.1, 6.2.2),

(per 1,300m^2)

Tools, equipment to use	Quantity
Rubber gloves, shovels, rakes, etc.	—
Dump trucks	0.43 service days
Light oil	9.7L
Large sandbags	—

Workforce needed

■When working on
roofs/rooftops, gardens, etc. of residences, schools, parks (small), parks (large) or large facilities (1.1.1, 1.1.2, 1.4.1, 1.4.2, 2.1.1, 3.1.1, 4.1.1, 5.1.1);
grounds of parks (small), paved surfaces, etc. (3.4.1, 3.4.6); and
pedestrian overpasses (6.5.1), roadside trees (6.6.1),

(per 1,300m^2)

Workforce needed	Quantity
Operation leaders	0.5 worker-days
Decontamination workers	3.2 worker-days

■ When working on roof gutters of residences, schools, parks (small), parks (large) or large facilities (1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1),

(per 1,300m^2)

Workforce needed	Quantity
Operation leaders	0.5 worker-days
Decontamination workers	3.2 worker-days

<table>
<tr><td colspan="2"></td><td>■ When working on
grounds, paved surface, etc. of schools, parks (large) or large facilities (2.4.1,2.4.6, 4.4.1, 4.4.6);
grounds, parking lots (concrete, asphalt) of large facilities (5.4.1, 5.4.5), and
paved and unpaved roads (6.1.1, 6.2.1, 6.2.2),
(per 1,300m²)
<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.5 worker-days</td></tr><tr><td>Decontamination workers</td><td>3.2 worker-days</td></tr><tr><td>Drivers (ordinary decontamination)</td><td>0.37 worker-days</td></tr></table></td></tr>
<tr><td rowspan="5">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● In order to prevent contamination from spreading due to decontamination work, the order of tasks shall be considered. For instance, when decontaminating residential areas and the like, the decontamination work shall be done starting with roofs followed by rainwater gutters and then gardens and the like.
● When decontaminating for the first time after the accident at a certain place, sediment shall be checked as to whether the fallen leaves and the like are from after the accident or they were there at around the time of the accident.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Rubber gloves shall be worn.
● The removed objects shall be immediately packed to avoid unwanted exposure by contact.</td></tr>
<tr><td>General labor safety of workers</td><td>● For work at an elevated place, aerial lift work vehicles or scaffolds shall be used.
● For the work on roads, barricades and traffic controllers shall be arranged.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>－</td></tr>
<tr><td>Others</td><td>－</td></tr>
</table>

（2） Roofs/rooftops, exterior walls, outside walls, paved surfaces (concrete, asphalt), etc. of structures

1）Wiping

Locations to be decontaminated	“1.1.1. Roofs (other than concrete)” of “1.1 Roofs/rooftops” in “1. “Residential areas and the like” “1.1.2. Roofs (concrete)” of “1.1 Roofs/rooftops” in “1. Residential areas and the like” “1.2.1. Other than earthen walls” of “1.2. Exterior walls/outside walls” in “1. Residential areas and the like” “1.2.2. Earthen walls” of “1.2. Exterior walls/outside walls” in “1. Residential areas and the like” “1.3.1. Roof gutters” of “1.3 Rainwater gutters” in “1. Residential areas and the like” “2.1. Roofs/rooftops” at “2. Schools” “2.2. Exterior walls/outside walls” at “2. Schools” “2.3.1. Roof gutters” of “2.3. Rainwater gutters” at “2. Schools” “3.1. Roofs/rooftops” in “3. Parks (small)” “3.2.1. Exterior walls/outside walls” of “3.2. Exterior walls/outside walls” in “3. Parks (small)” “3.3.1. Roof gutters” of “3.3. Rainwater gutters” in “3. Parks (small)” “4.1. Roofs/rooftops” in “4. Parks (large)” “4.2.1. Exterior walls/outside walls” of “4.2. Exterior walls/outside walls” in “4. Parks (large)” “4.3.1. Roof gutters” of “4.3. Rainwater gutters” in “4. Parks (large)” “5.1.1. Roofs/rooftops” of “5.1. Roofs/rooftops” of “5. Large facilities” “5.2.1. Exterior walls/outside walls” of “5.2. Exterior walls/outside walls” of “5. Large facilities” “5.3.1. Roof gutters” of “5.3. Rainwater gutters” of “5. Large facilities” “6.3.1. Guardrails” of “6.3.Guardrails” of “6. Roads” “6.5.1. Pedestrian overpasses” of “6.5. Pedestrian overpasses” of “6. Roads”
Decontamination methods	Wiping

Outline	Roofs/rooftops, exterior walls/outside walls, roof gutters, guardrails, pedestrian overpasses, etc. in residential areas, schools, parks, large facilities, etc. shall be decontaminated through wiping.
Decontamination processes	● The objects to be decontaminated shall be carefully wiped by using cleaning cloths and the like moistened with water or the like (including neutral detergents or vinegar). In wiping, their folded clean faces shall be used until repeated wiping gives hardly any further reduction in the surface contamination density.
Tools, equipment and the like for	

<table>
<tr><td colspan="2">decontamination work</td><td>
<table>
<tr><th>Tools, equipment to use</th><th>Quantity</th></tr>
<tr><td>Cleaning cloths and the like</td><td>—</td></tr>
<tr><td>Brushes (including deck brushes, car washing brushes)</td><td>—</td></tr>
</table>
* For the work at elevated places, adequate safety measures shall be taken for scaffolds, aerial lift work vehicles and fall arresting devices/systems using fixed ropes/safety belts, etc.
</td></tr>
<tr><td colspan="2">Workforce needed</td><td>
■ When working on roofs/rooftops (1.1.1, 1.1.2, 2.1.1, 3.1.1, 4.1.1, 5.1.1) of residential areas, schools, parks (small), parks (large), large facilities, etc. and pedestrian overpasses (6.5.1),

(per 130m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.3 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>2.2 worker-days</td></tr>
</table>
■ When working on exterior walls/outside walls (1.2.1, 1.2.2, 2.2.1, 3.2.1, 4.2.1, 5.2.1) of residential areas, schools, parks (small), parks (large), large facilities, etc.,

(per 1,300m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>2.6 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>17.2 worker-days</td></tr>
</table>
■ When working on roof gutters（1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1） of residential areas, schools, parks (small), parks (large), large facilities, etc.,

(per 130m)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.2 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>1.1 worker-days</td></tr>
</table>
■ When working on guard rails (6.3.1),

(per 100m)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.1 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>0.8 worker-days</td></tr>
</table>
</td></tr>
<tr><td>Idea development, lessons,</td><td>Prerequisites and constraints regarding objects and locations</td><td>● In order to prevent contamination from spreading due to decontamination work, wiping shall be done from top to bottom, for</td></tr>
</table>

points to keep in mind, etc.	to be decontaminated	instance, when wiping residential areas and the like, starting with roofs first followed by rainwater gutters and the like. ● Surfaces with attached materials like moss or mud which are difficult to remove by wiping, or clearly visible dirty surfaces shall be decontaminated by carefully removing the attached dirt using brushes with dry conditions without damaging the objects. ● Folded clean faces of the cleaning cloths shall be used for each wiping step, in order to prevent contaminants being reattached to the surfaces. ● When decontaminating earthen walls, brushes and the like shall be used, not cleaning cloths and the like, to remove dirt with dry conditions without damaging the objects. ● When decontaminating exterior walls/outside walls other than earthen walls, or when decontaminating guardrails, brushes (including car washing brushes, deck brushes) and the like shall be used to remove dirt with dry conditions without damaging the objects. Surfaces with attached materials like moss or mud which are difficult to remove, or clearly visible dirty surfaces shall be decontaminated by carefully removing the attached dirt using metal brushes or brushes moistened with water or the like without damaging the objects. ● When decontaminating pedestrian overpasses, their handrails shall be decontaminated through wiping. ● When rust is present, the rust itself shall be removed through wiping and other means.
	Radiation exposure protection of workers	● Hand gloves and the like shall be worn. ● Cleaning cloths and the like shall not be directly touched, because they might be contaminated by radiocesium.
	General labor safety of workers	● For the work at elevated places, adequate safety measures shall be taken for scaffolds, aerial lift work vehicles and fall arresting devices/systems using fixed ropes/safety belts and the like. ● For the work on roads, barricades and traffic controllers shall be arranged.
	Measures to prevent secondary wastes	−
	Others	−

2）Brush cleaning

Locations to be decontaminated	“1.1.1. Roofs (other than concrete)” of “1.1 Roofs/rooftops” in “1. Residential areas and the like” “1.1.2. Roofs (concrete)” of “1.1 Roofs/rooftops” in “1. Residential areas and the like” “1.2.1. Other than earthen walls” of “1.2. Exterior walls/outside walls” in “1. Residential areas and the like” “1.4.2. Paved surfaces” of “1.4. Gardens and the like” in “1. Residential areas and the like” “2.1. Roofs/rooftops” at “2. Schools” “2.2. Exterior walls/outside walls” at “2. Schools” “2.4.6 Paved surfaces” of “2.4. Grounds and the like” at “2. Schools” “3.1. Roofs/rooftops” in “3. Parks (small)” “3.2.1. Exterior walls/outside walls” of “3.2. Exterior walls/outside walls” in “3. Parks (small)” “3.4.6. Paved surfaces” of “3.4. Grounds and the like” in “3. Parks (small)” “4.1. Roofs/rooftops” in “4. Parks (large)” “4.2.1. Exterior walls/outside walls” of “4.2. Exterior walls/outside walls” in “4. Parks (large)” “4.4.6. Paved surfaces” of “4.4. Grounds and the like” in “4. Parks (large)” “5.1.1. Roofs/rooftops” of “5.1. Roofs/rooftops” of “5. Large facilities” “5.2.1. Exterior walls/outside walls” of “5.2. Exterior walls/outside walls” of “5. Large facilities” “5.4.6. Parking lots (concrete, asphalt)” of “5.4. Grounds and the like” of “5. Large facilities” “6.3.1. Guardrails” of “6.3.Guardrails” of “6. Roads” “6.5.1. Pedestrian overpasses” of “6.5. Pedestrian overpasses” of “6. Roads”
Decontamination methods	Brush cleaning

Outline	Roofs/rooftops and exterior walls/ outside walls in residential areas, schools, parks and large facilities, paved surfaces of gardens, grounds and the like, parking lots (concrete, asphalt), guardrails, pedestrian overpasses, etc. shall be cleaned using brushes in the following procedures (i) Cleaning using brushes (ii) Collecting used water
Decontamination processes	● Cleaning by deck brushes or scrubbing brushes shall be repeated carefully until there is hardly any further reduction in the surface contamination densities. ● About 4L/m^2 of water shall be poured on surfaces before brushing and also after

<table>
<tr><td></td><td>brushing for washing.
● The cleaning water discharge lines shall be cleaned beforehand for smooth discharge. The discharge shall be collected in rainwater cisterns and the like. After collection, it shall be transferred to on-site or nearby wastewater treatment facilities.</td></tr>
<tr><td>Tools, equipment and the like for decontamination work</td><td>■ When working on roofs/rooftops of residences, schools, parks (small), parks (large) or large facilities (1.1.1, 1.1.2, 2.1.1, 3.1.1, 4.1.1, 5.1.1),
(per 130m²)
<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Deck brushes, scrubbing brushes, etc.</td><td>—</td></tr><tr><td>Sprinkler trucks (tank capacity 3,800L)</td><td>0.6 service days</td></tr><tr><td>Light oil</td><td>9.9L</td></tr><tr><td>Water</td><td>0.5m³</td></tr><tr><td>Temporary systems and the like for wastewater collection</td><td>—</td></tr></table>* For the work at elevated places, adequate safety measures shall be taken for scaffolds, aerial lift work vehicles and fall arresting devices/systems using fixed ropes/safety belts, etc.

■ When working on exterior walls/outside walls other than earthen walls of residences and the like (1,2,1), exterior walls/outside walls of schools, parks (small), parks (large), large facilities, etc. (2.2.1, 3.2.1, 4.2.1, 5.2.1), paved surfaces of grounds and the like, of residences and the like, schools, parks (small) and parks (large), parking lots (concrete, asphalt) of large facilities (5.4.6) and pedestrian overpasses (6.5.1),
(per 1,300m²)
<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Deck brushes, scrubbing brushes, etc.</td><td>—</td></tr><tr><td>Water</td><td>5m³</td></tr><tr><td>Temporary systems and the like for wastewater collection</td><td>—</td></tr></table>* For the work at elevated places, aerial lift work vehicles and scaffolds shall be used.

■ When working on guardrails (6.3.1),
(per 1,900m)
<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Deck brushes, scrubbing brushes, etc.</td><td>—</td></tr></table></td></tr>
</table>

<table>
<tr><td colspan="2"></td><td>
<table>
<tr><td>Water</td><td>5m³</td></tr>
<tr><td>Temporary systems and the like for wastewater collection</td><td>—</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Workforce needed</td><td>
■ When working on roofs/rooftops of residences, schools, parks (small), parks (large) or large facilities (1.1.1, 1.1.2, 2.1.1, 3.1.1, 4.1.1, 5.1.1),
(per 130 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.6 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>3.6 worker-days</td></tr>
<tr><td>Drivers (ordinary decontamination)</td><td>0.4 worker-days</td></tr>
</table>
■ ■When working on exterior walls/outside walls other than earthen walls of residences and the like (1,2,1), exterior walls/outside walls of schools, parks (small), parks (large), large facilities, etc. (2.2.1, 3.2.1, 4.2.1, 5.2.1), paved surfaces of grounds and the like, of residences and the like, schools, parks (small) and parks (large) (1.4.2, 2.4.6, 3.4.6, 4.4.6), parking lots (concrete, asphalt) of large facilities (5.4.6) and pedestrian overpasses,
(per 1,300m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>4.2 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>28.1 worker-days</td></tr>
</table>
■ When working on guardrails (6.3.1),
(per 1,900m)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>4.2 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>28.1 worker-days</td></tr>
</table>
</td></tr>
<tr><td>Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>
● Brush cleaning shall be done from top to bottom in order to prevent contamination from spreading due to decontamination work, for instance, when cleaning residential areas and the like, starting with roofs first followed by exterior walls, gardens, etc.
● Cleaning shall be done from above in order to avoid water being scattered.
</td></tr>
</table>

		● Rotary brushes shall not be used when decontaminating thatched roofs or tiled roofs, as they are not suitable for such materials. ● When decontaminating pedestrian overpasses, their handrails shall be cleaned with brushes.
	Radiation exposure protection of workers	● Rubber hand gloves, dust masks and other protective gear shall be worn.
	General labor safety of workers	● For the work at elevated places, adequate safety measures shall be taken for scaffolds, aerial lift work vehicles and fall arresting devices/systems using fixed ropes/safety belts, etc. ● For the work on roads, barricades and traffic controllers shall be arranged.
	Measures to prevent secondary wastes	−
	Others	−

3）High-pressure water cleaning

Locations to be decontaminated	“1.3.1. Roof gutters” of “1.3 Rainwater gutters” in “1. Residential areas and the like” “1.3.2. Rainwater pipes” of “1.3 Rainwater gutters” in “1. Residential areas and the like” “1.4.2. Paved surfaces” of “1.4. Gardens and the like” in “1. Residential areas and the like” “2.1. Roofs/rooftops” at “2. Schools” “2.2. Exterior walls/outside walls” at “2. Schools” “2.3.1. Roof gutters” of “2.3. Rainwater gutters” at “2. Schools” “2.3.2 Rainwater pipes” of “2.3. Rainwater gutters” at “2. Schools” “2.4.6. Paved surfaces” of “2.4. Grounds and the like” at “2. Schools” “3.1. Roofs/rooftops” in “3. Parks (small)” “3.2.1 Exterior walls/outside walls” of “3.2. Exterior walls/outside walls” in “3. Parks (small)” “3.3.1. Roof gutters” of “3.3. Rainwater gutters” in “3. Parks (small)” “3.3.2. Rainwater pipes” of “3.3. Rainwater gutters” in “3. Parks (small)” “3.4.6.Paved surfaces” of “3.4. Playgrounds and the like” in “3. Parks (small)” “4.1. Roofs/rooftops” in “4. Parks (large)” “4.2.1 Exterior walls/outside walls” of “4.2. Exterior walls/outside walls” in “4. Parks (large)” “4.3.1. Roof gutters” of “4.3. Rainwater gutters” in “4. Parks (large)” “4.3.2. Rainwater pipes” of “4.3. Rainwater gutters” in “4. Parks (large)” “4.4.6.Paved surfaces” of “4.4. Playgrounds and the like” in “4. Parks (large)” “5.1.1. Roofs/rooftops” of “5.1. Roofs/rooftops” of “5. Large facilities” “5.2.1 Exterior walls/outside walls” of “5.2. Exterior walls/outside walls” of “5. Large facilities” “5.3.1.” of “5.3. Rainwater gutters” of “5. Large facilities” “5.3.2. Rainwater pipes” of “5.3. Rainwater gutters” of “5. Large facilities” “5.4.6. Parking lots (concrete, asphalt)” of “5.4. Playgrounds and the like” of “5. Large facilities” “6.1.2. Roads/Sidewalks” of “6.1. Paved roads” of “6. Roads” “6.3.1. Guardrails” of “6.3. Guardrails” of “6. Roads” “6.5.1. Pedestrian overpasses” of “6.5. Pedestrian overpasses” of “6. Roads”
Decontamination methods	High-pressure water cleaning

Outline	Roofs/rooftops, exterior walls/ outside walls, rainwater gutters (roof gutters, rainwater pipes) in the residential areas, schools, parks and large facilities; grounds and the like (paved surfaces); parking lots (concrete, asphalt); and paved roads/sidewalks, guardrails, and pedestrian overpasses shall be cleaned by using high-pressure water cleaning in the following procedures

	(i) Cleaning by using high-pressure water cleaners (ii) Collecting waste water
Decontamination processes	■When working on roof gutters of residences and the like, schools, parks (small), parks (large) and large facilities (1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1) ● The cleaning water discharge lines shall be cleaned beforehand for smooth discharge. The discharge shall be collected in rainwater cisterns or the like. After collection, it shall be transferred to on-site or nearby wastewater treatment facilities. ● High-pressure water cleaning shall be applied mainly where, for instance, it is too narrow for a hand to reach for wiping. High-pressure water of about 2 L/min below 5 MPa in principle shall be sprayed by using high-pressure water cleaners, with attention to avoid damaging rainwater gutters. ● The spray nozzle shall be brought near the objects to be cleaned (about 20 cm) at an appropriate moving speed for achieving the cleaning effect. ● The water cleaning shall be done from the upper stream to the lower stream of gradients to avoid water scattering to the surroundings. ■When working on rainwater pipes of residences and the like, schools, parks (small), parks (large) and large facilities (1.3.2, 2.3.2, 3.3.2, 4.3.2, 5.3.2), ● Sediment, if any, shall be removed before the cleaning. ● The cleaning water discharge lines shall be cleaned beforehand for smooth discharge. The discharge shall be collected in rainwater cisterns and the like. After collection, it shall be transferred to on-site or nearby wastewater treatment facilities. ● High-pressure water of about 2 L/min below 5 MPa in principle shall be sprayed by using high-pressure water cleaners, with attention to avoid damaging rainwater gutters. ■When working on paved surfaces in the gardens and the like of residences and the like, grounds and the like of parks (small), and pedestrian overpasses (1.4.2, 3.4.6, 6.5.1); paved surfaces of the grounds and the like at schools and parks (large), parking lots (concrete, asphalt) of large facilities, and paved roads/sidewalks (2.4.6, 4.4.6, 5.4.6, 6.1.2), ● High-pressure water of about 20 MPa in

	principle shall be sprayed in about 20 L/m^2 by using suction-type high-pressure water cleaners. ● The cleaning water collected shall be transferred to on-site or nearby wastewater treatment facilities. ● The water cleaning shall be done from peripheries to inner sides and from the upper stream to the lower stream of gradients to avoid water scattering to the surrounding. ● The cleaning shall be done in a shielded environment in order to avoid water scattering when buildings stand closely next to each other. ■ When working on roofs/rooftops of schools, parks (small), parks (large) and large facilities (2.1.1, 3.1.1, 4.1.1, 5.1.1), ● The cleaning water discharge lines shall be cleaned beforehand for smooth discharge. The discharge shall be collected in rainwater cisterns and the like. After collection, it shall be transferred to on-site or nearby wastewater treatment facilities. ● High-pressure water of about 15 MPa in principle shall be sprayed in about 20 L/m^2 using high-pressure water cleaners. ● The spray nozzle shall be brought near the objects to be cleaned (about 20cm) at an appropriate moving speed for achieving the cleaning effect. ● The water cleaning shall be done from peripheries to inner sides and from the upper stream to the lower stream of gradients to avoid water scattering to the surrounding. ● The cleaning shall be done in a shielded environment by using sheets or the like in order to avoid water scattering. ● Attention shall be paid to protect water-proof paints or water-proof sheets from damage. ■When working on exterior walls/outside walls of schools, parks (small), parks (large) and large facilities (2.2.1, 3.2.1, 4.2.1, 5.2.1), or guardrails of roads (6.3.1), ● The cleaning water discharge lines shall be cleaned beforehand for smooth discharge. The discharge shall be collected in rainwater cisterns and the like. After collection, it shall be transferred to on-site or nearby wastewater treatment facilities. ● High-pressure water of about 15 MPa in principle shall be sprayed in about 20 L/m^2 using high-pressure water cleaners.

<table>
<tr><td></td><td>

The spray nozzle shall be brought near the objects to be cleaned (about 20 cm) at an appropriate moving speed for achieving the cleaning effect.
The water cleaning shall be done from peripheries to inner sides and from the upper stream to the lower stream of gradients to avoid water scattering to the surrounding.

</td></tr>
<tr><td>Tools, equipment and the like for decontamination work</td><td>
■When working on roof gutters of residences and the like, schools, parks (small), parks (large) and large facilities (1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1)
(per 130m)
<table>
<tr><th>Tools, equipment to use</th><th>Quantity</th></tr>
<tr><td>Sprinkler trucks (Tank capacity 3,800L)</td><td>0.6 service days</td></tr>
<tr><td>High-pressure cleaners (Motor-driven, Output 3.7kw)</td><td>1.9 service days</td></tr>
<tr><td>Engine generators (rated 17/20kvA, exhaust gas suppression type (primary side))</td><td>1.9 service days</td></tr>
<tr><td>Light oil</td><td>36.4 L</td></tr>
<tr><td>Water</td><td>0.3 m^3</td></tr>
<tr><td>Temporary systems and the like for wastewater collection</td><td>－</td></tr>
</table>
■When working on rainwater pipes of residences and the like, schools, parks (small), parks (large) and large facilities (1.3.2, 2.3.2, 3.3.2, 4.3.2, 5.3.2),
(per 130m)
<table>
<tr><th>Tools, equipment to use</th><th>Quantity</th></tr>
<tr><td>Sprinkler trucks (Tank capacity 3,800 L)</td><td>1.7 service days</td></tr>
<tr><td>High-pressure cleaners (Motor-driven, Output 3.7 kw)</td><td>1.4 service days</td></tr>
<tr><td>Engine generators (rated 17/20 kvA, exhaust gas suppression type (primary side))</td><td>1.4 service days</td></tr>
<tr><td>Light oil</td><td>46.1 L</td></tr>
<tr><td>Water</td><td>0.3 m^3</td></tr>
<tr><td>Temporary systems and the like for wastewater collection</td><td>－</td></tr>
</table>
■When working on paved surfaces in the gardens and the like of residences and the like and parks (small), pedestrian overpasses (1.4.2, 3.4.6, 6.5.1),
(per 300 m^2)
<table>
<tr><th>Tools, equipment to use</th><th>Quantity</th></tr>
<tr><td>Suction-type high-pressure cleaners (discharge pressure 20.5MPa, vacuum pump)</td><td>1 service day</td></tr>
</table>
</td></tr>
</table>

Rotary-type water collecting vehicles (ϕ 300)	1 service day
Sprinkler trucks (tank capacity 3,800L)	1 service day
Crane trucks (load capacity 2 t, suspension weight 2.9 t)	1 service day
Sewage filters (200 L)	1 service day
Sewage tank (1 m^3 polyethylene)	6 service days
Feedwater tank (1 m^3 polyethylene)	1 service day
Light oil	53.3 L
Water	6 m^3

■ When working on roofs/rooftops of schools, parks (small), parks (large) and large facilities (2.1.1, 3.1.1, 4.1.1, 5.1.1),

(per 1,300 m^2)

Tools, equipment to use	Quantity
High-pressure cleaners (Engine-driven, output 18 kw)	4.2 service days
Street drain cleaner (Blower-type, hopper capacity 3.1m^3, air-flow 20m^3/min)	4 service days
Sprinkler trucks (tank capacity 3,800 L)	4.9 service days
Engine-generators (Rated 17/20 kvA, exhaust gas suppression type (primary side))	4.2 service days
Submersible motor pumps for construction work (50 mm caliber, total head 20 m)	4.2 service days
Water tanks (for general construction work, 3 m^3)	4.2 service days
Light oil	196.2 L
Water	27 m^3
Temporary systems and the like for wastewater collection	—

■When working on exterior walls/outside walls of schools, parks (small), parks (large) and large facilities (2.2.1, 3.2.1, 4.2.1, 5.2.1),

(per 1,300 m^2)

Tools, equipment to use	Quantity
High-pressure cleaners (Engine-driven, output 18kw)	4.2 service days
Street drain cleaners (Blower-type, hopper capacity 3.1 m^3, air-flow 20 m^3/min)	4 service days

Sprinkler trucks (tank capacity 3,800 L)	4.9 service days
Light oil	183.9 L
Water	27 m^3
Temporary systems and the like for wastewater collection	—

■When working on paved surfaces in the school grounds and the like and parks (large), parking lots (concrete, asphalt) of large facilities, and paved roads/sidewalks (2.4.6, 4.4.6, 5.4.6, 6.1.2),

(per 350 m^2)

Tools, equipment to use	Quantity
Suction-type high-pressure water cleaners (discharge pressure 20.5 MPa, vacuum pump)	1 service day
Rotary-type water collecting vehicles (ϕ 450)	1 service day
Sprinkler trucks (tank capacity 3,800L)	1 service day
Crane trucks (load capacity 2t, suspension weight 2.9t)	1 service day
Sewage filters (200 L)	1 service day
Sewage tank (1 m^3 polyethylene)	7 service days
Feedwater tank (1 m^3 polyethylene)	1 service day
Light oil	53.3 L
Water	7 m^3

■When working on road guardrails (6.3.1),

(per 1,900 m)

Tools, equipment to use	Quantity
High-pressure cleaners (Engine-driven, output 18 kw)	4.2 service days
Street drain cleaners (Blower-type, hopper capacity 3.1 m^3, air-flow 20 m^3/min)	4 service days
Sprinkler trucks (tank capacity 3,800 L)	4.9 service days
Light oil	183.1 L
Water	27 m^3
Temporary systems and the like for wastewater collection	—

Workforce needed	■When working on roof gutters of residences and the like, schools, parks (small), parks (large) and

large facilities (1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1)

(per 130 m)

Workforce needed	Quantity
Operation leaders	0.4 worker-days
Decontamination workers	2.1 worker-days
Drivers (ordinary decontamination)	0.4 worker-days

■When working on rainwater pipes of residences and the like, schools, parks (small), parks (large) and large facilities (1.3.2, 2.3.2, 3.3.2, 4.3.2, 5.3.2)

(per 130 m)

Workforce needed	Quantity
Operation leaders	0.5 worker-days
Decontamination workers	2.2 worker-days
Drivers (ordinary decontamination)	1.1 worker-days

■When working on paved surfaces in the gardens and the like of residences and the like and parks (small), pedestrian overpasses (1.4.2, 3.4.6, 6.5.1),

(per 300 m^2)

Workforce needed	Quantity
Operation leaders	1.0 worker-day
Specialized decontamination workers	1.0 worker-day
Decontamination workers	3.0 worker-days
Drivers (ordinary decontamination)	1.0 worker-day

■ When working on roofs/rooftops of schools, parks (small), parks (large) and large facilities (2.1.1, 3.1.1, 4.1.1, 5.1.1), exterior walls/outside walls of schools, parks (small), parks (large) and large facilities (2.2.1, 3.2.1, 4.2.1, 5.2.1),

(per 1,300 m^2)

Workforce needed	Quantity
Operation leaders	2.1 worker-days
Decontamination workers	7.9 worker-days
Drivers (ordinary decontamination)	6.2 worker-days

■When working on paved surfaces in the school grounds and the like and parks (large), parking lots (concrete, asphalt) of large facilities, and

paved roads/sidewalks (2.4.6, 4.4.6, 5.4.6, 6.1.2),
(per 350 m^2)

Workforce needed	Quantity
Operation leaders	1.0 worker-day
Specialized decontamination workers	1.0 worker-day
Decontamination workers	3.0 worker-days
Drivers (ordinary decontamination)	1.0 worker-day

■When working on road guardrails (6.3.1),
(per 1,900 m)

Workforce needed	Quantity
Operation leaders	2.1 worker-days
Decontamination workers	7.9 worker-days
Drivers (ordinary decontamination)	6.2 worker-days

Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● In order to prevent contamination from spreading due to decontamination work, the order of works shall be considered. For instance, when decontaminating residential areas and the like, the decontamination work shall be done starting with roofs followed by rainwater gutters and then gardens and the like. If residences and the like stand closely next to each other, the cleaning shall be done in a shielded environment by using sheets and the like in order to avoid water scattering over surrounding residences and the like. ● No risk of damaging the objects by high-pressure water cleaning shall be checked beforehand. Attention shall be paid to the possibility of damaging objects by stripping off the surface. ● Soil shall be cleaned at low pressures first in order to prevent soil dispersion. The pressure shall be increased gradually by confirming the cleaning water flows and dispersion conditions. ● Special attention shall be paid when cleaning the overlapping sections of roofs, places where the metal is corroded, and around the drains for rooftops. At these places large amounts of sediment are attached. ● Paved surfaces shall not be cleaned when frozen or snow covered. ● Suction-type high-pressure water cleaners shall be used when cleaning paved surfaces of gardens and the like of residences and the

<table>
<tr><td></td><td></td><td>like, grounds and the like, of parks (small), pedestrian overpasses (1.4.2, 3.4.6, 6.5.1), those of school grounds and the like, parks (large), parking lots (concrete, asphalt) of large facilities, or paved roads/sidewalks (2.4.6, 4.4.6, 5.4.6, 6.1.2). When cleaning other objects, the discharge water shall be collected in the rainwater cisterns and the like.
● Cleaning conditions for decontaminating respective objects shall be as follows in principle.

<table><tr><th>Objects to be decontaminated</th><th>Conditions (principle)</th></tr><tr><td>Roof gutters (1.3.1, 2.3.1, 3.3.1, 4.3.1, 5.3.1) and rainwater pipes (1.3.2, 2.3.2, 3.3.2, 4.3.2, 5.3.2) of residences and the like, schools, parks (small), parks (large) and large facilities</td><td>Cleaning with high pressure water of about 5 MPa in about 2 L/m^2, in principle, by using a high-pressure water cleaner</td></tr><tr><td>Roofs/rooftops (2.1.1, 3.1.1, 4.1.1, 5.1.1) and exterior walls/outside walls (2.2.1, 3.2.1, 4.2.1, 5.2.1) of schools, parks (small), parks (large), and large facilities, and road guardrails (6.3.1)</td><td>Cleaning with high pressure water of about 15 MPa in about 20 L/m^2, in principle, by using a high-pressure water cleaner</td></tr><tr><td>Paved surfaces of gardens and the like of residences and the like, grounds of parks (small), and pedestrian overpasses (1.4.2, 3.4.6, 6.5.1), those of school grounds and the like, parks (large), parking lots (concrete, asphalt) of large facilities, and paved roads/sidewalks (2.4.6, 4.4.6, 5.4.6, 6.1.2)</td><td>Cleaning with high pressure water of about 20 MPa in about 20 L/m^2, in principle, by using a suction-type high-pressure water cleaner</td></tr></table></td></tr>
<tr><td></td><td>Radiation exposure protection of workers</td><td>● Safety glasses, dust masks, hand gloves, etc. shall be worn</td></tr>
<tr><td></td><td>General labor safety of workers</td><td>● For the work at elevated places, adequate safety measures shall be taken for scaffolds, aerial lift work vehicles and fall arresting devices/systems using fixed ropes/safety belts, etc.
● For the work on roads, barricades and traffic</td></tr>
</table>

		controllers shall be arranged.
	Measures to prevent secondary wastes	−
	Others	−

4）Shot-blasting

Locations to be decontaminated	"1.4.2. Paved surfaces" of "1.4. Gardens and the like" in "1. Residential areas and the like" "2.4.6. Paved surfaces" of "2.4. Grounds and the like" at "2. Schools" "3.4.6.Paved surfaces" of "3.4. Grounds and the like" in "3. Parks (small)" "4.4.6.Paved surfaces" of "4.4. Grounds and the like" in "4. Parks (large)" "5.4.6. Parking lots (concrete, asphalt)" of "5.4. Grounds and the like" of "5. Large facilities" "6.1.2. Roads/Sidewalks" of "6.1. Paved roads" of "6. Roads"
Decontamination methods	Shot-blasting

Outline	Paved surfaces of gardens/grounds in the residential areas, schools, parks and large facilities, etc.,, parking lots (concrete, asphalt), and paved roads/sidewalks shall be cleaned by shot-blasting in the following procedures (i) Scraping off object surfaces with shot-blasters (ii) Packing scrapped materials
Decontamination processes	● Scraping shall be done in a fairly wide paved place. ● Abrasive materials such as steel shot shall be shot on the surface with a shot-blaster for scraping away the said surface uniformly. ● Scrapped materials, asphalt and the like, shall be collected by a dust collector connected to the shot-blaster. ● Collected scrapped materials shall be packed in large sandbags. ● Fine particles generated shall be prevented from dispersion to the surroundings by covers and shall be collected. ● A small amount of abrasive materials left behind on the surfaces shall be collected by a manual magnet car and cleaning.
Tools, equipment and the like for decontamination work	■When working on paved surfaces of gardens and the like, of residences and the like (1.4.2), (per 350 m²)

Tools, equipment to use	Quantity
Shot-blasters (scraping/ suction width 700 mm)	6.5 service hours
Engine-generators (Rated 100/125 kvA, exhaust gas suppression type (primary side))	1.09 service days

Dust collectors (suction width 700/1000 mm, wind velocity 75 m^3)	6.5 service hours
Crane trucks (load capacity 4 t, suspension weight 2.9 t)	1.23 service days
Trucks (load capacity 4 t)	1.13 service days
Light oil	192 L
Large sandbags	-

■ When working on paved surfaces in the grounds of schools, parks (small), and parks (large) (2.4.6, 3.4.6, 4.4.6,), parking lots (concrete, asphalt) of large facilities (5.4.6), and paved roads/sidewalks (6.1.2),

(per 500 m^2)

Tools, equipment to use	Quantity
Shot-blasters (scraping/ suction width 1,000 mm)	6.5 service hours
Engine-generators (Rated 125/150 kvA, exhaust gas suppression type (primary side))	1.03 service days
Dust collectors (suction width 700/1000 mm, wind velocity 75 m^3)	6.5 service hours
Crane trucks (load capacity 8 t, suspension weight 2.9 t)	1.23 service days
Trucks (load capacity 8 t)	1.13 service days
Light oil	255 L
Large sandbags	-

Workforce needed

■When working on paved surfaces of gardens and the like, of residences and the like (1.4.2),

(per 350 m^2)

Workforce needed	Quantity
Operation leader	1.0 worker-day
Decontamination worker	2.0 worker-days
Driver (special decontamination)	2.0 worker-days
Driver (ordinary decontamination)	1.0 worker-day

■ When working on paved surfaces in the grounds of schools, parks (small), and parks (large) (2.4.6, 3.4.6, 4.4.6,), parking lots

<table>
<tr><td colspan="2"></td><td>(concrete, asphalt) of large facilities (5.4.6), and paved roads/sidewalks (6.1.2),
(per 500 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leader</td><td>1.0 worker-day</td></tr><tr><td>Decontamination worker</td><td>2.0 worker-days</td></tr><tr><td>Driver (special decontamination)</td><td>2.0 worker-days</td></tr><tr><td>Driver (ordinary decontamination)</td><td>1.0 worker-day</td></tr></table></td></tr>
<tr><td rowspan="5">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Paved surfaces shall not be cleaned when frozen or snow covered.
● Work shall be halted when raining or roads are wet because working and collecting of scrapped materials is difficult.
● It should be noted that the decontamination effect by scraping is lowered when ruts or cracks are present on the paved surfaces relative to smooth surfaces.
● This cleaning method is not effective when the road unevenness or crack depths exceed 5 mm.
● At the edges of blasted area, 5 – 10 cm overlapping is needed for removing surface irregularity.
● High-pressure water cleaning and the like shall be used in place of the shot-blasting method at the edges of paved surfaces 15 – 30 cm from adjacent buildings or other structures.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Safety glasses, dust masks, hand gloves, etc. shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● For the work on roads, barricades and traffic controllers shall be arranged.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>–</td></tr>
<tr><td>Others</td><td>● For the work in narrow spaces of less than about 10 m² of paved surfaces in residential areas, unit space of 350 m² shall be read as 50 m² (tools, equipment, workforce needed).</td></tr>
</table>

5）Superhigh pressure water cleaning

Locations to be decontaminated	"2.4.6. Paved surfaces" of "2.4. Grounds and the like" at "2. Schools" "4.4.6.Paved surfaces" of "4.4. Grounds and the like" in "4. Parks (large)" "5.4.6. Parking lots (concrete, asphalt)" of "5.4. Grounds and the like" of "5. Large facilities" "6.1.2. Roads/Sidewalks" of "6.1. Paved roads" of "6. Roads"
Decontamination methods	Superhigh pressure water cleaning

Outline	Paved surfaces of schools, parks (large) and large facilities, parking lots (concrete, asphalt), and paved roads/sidewalks shall be cleaned by superhigh pressure water in the following procedures (i) Scraping off object surfaces with super high-pressure water cleaners (ii) Collecting wastewater from decontamination
Decontamination processes	● Paved surfaces shall be scraped off by about 5mm with superhigh pressure water cleaners (cleaning water recovery-type) of 150 MPa or higher. ● Wastewater collected shall be separated to scrapings (sludge) and water by the coagulating sedimentation process, or other means.
Tools, equipment and the like for decontamination work	(per 1,300 m^2)

Tools, equipment to use	Quantity
Shovels , brooms and the like	-
Superhigh pressure water cleaners (240MPa maximum pressure (including powerful vacuum trucks)	3.7 service days
Street drain cleaners (Capacity 5.1 m^3)	3.5 service days
Engine-generators (Rated 3 kvA, Low-noise type)	2.9 service days
Air compressor (Portable, Exhaust gas suppression type (Primary side) 3.5-3.7 m^3/min)	4.7 service days
Sprinkler trucks (Tank capacity 3,800 L)	4.3 service days
Light oil	1,207.2 L
Gasoline	9.5 L
Large sandbags	-

<table>
<tr><td colspan="2">Workforce needed</td><td>(per 1,300 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>2.8 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>5.8 worker-days</td></tr><tr><td>Decontamination workers</td><td>4.8 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>2.7 worker-days</td></tr><tr><td>Drivers (ordinary decontamination)</td><td>5.4 worker-days</td></tr></table></td></tr>
<tr><td rowspan="5">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Paved surfaces shall not be cleaned when frozen or snow covered.
● Superhigh pressure water cleaners may be not appropriate for scraping near curbs. Handy-type/edge-scraping type cleaners or high-pressure water cleaners can be used instead (costs of handy-type cleaners shall be reviewed). When non-water-recovery-type cleaners are used, the work shall be done under covers to prevent water dispersion and the cleaning water shall be collected from street drains.
● Radiation dose after decontamination shall be measured after the road surfaces are dried.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Rainwear, safety glasses, dust masks, hand gloves, etc. shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● For the work on roads, barricades and traffic controllers shall be arranged.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>● Scrapings (sludge) collected by coagulating sedimentation shall be thoroughly dehydrated and packed in large sandbags.</td></tr>
<tr><td>Others</td><td>−</td></tr>
</table>

6）Cleaning by road sweepers

Locations to be decontaminated	"6.1.2 Roads/sidewalks" of "6.1 Paved roads" of "6. Roads"
Decontamination methods	Cleaning by road sweepers

Outline	Paved roads/sidewalks shall be cleaned by road sweepers
Decontamination processes	● Paved roads/sidewalks shall be cleaned by road sweepers in preparation for the work by decontamination workers or for maintenance. ● Trash collected shall be packed in flexible containers.
Tools, equipment for decontamination work	(per 1 km) Tools, equipment to use / Quantity Shovels, brooms, brushes, etc. / - Road sweepers (Brush-type, Hopper capacity 3.1m³, 4-wheeled) / *3 (service hours) Light oil / 12 x *3 (L) Note) The estimate shall be changed, if sprinkler trucks are needed.
Workforce needed	(per 1 km) Workforce needed / Quantity Operation leaders / *1 (worker-hours) Decontamination workers / *2 (worker-hours) Drivers (ordinary decontamination) / *3 x 0.14 (worker-hours) Assistants to decontamination workers / *3 x 0.13 (worker-hours) *1: 0.8×T1/T×1/L *2: 1.2×T1/T×1/L *3: T1/L T1=L/V1＋ℓ/V2 T1= Time required for work (h) L= Cleaning distance (km) V1= Cleaning speed (km/h)= 6.0 km/h (time for carrying away trash included) ℓ= Distance of journey (km) =ℓ1＋ℓ2＋ℓ3＋ℓ4 ℓ1= Distance between the workplace and surplus soil repository (km) ℓ2= Distance between the workplace and water

		supply point (km) ℓ3= Distance between the workplace to the next workplace (km) (assuming no need to clean in the section and the section is longer than ℓ4= Distance between the workplace and the base (km) In calculating the distance of journey (ℓ) above, following factors shall be considered. Δ L= Cleaning distance per hopper of street sweepers (km) = hopper capacity x hopper coefficient / amount of trash =(3.10×0.61)/0.1=18.91(km) V2= Driving speed (km/h) =30.0 km/h T= Road sweeper operation time per day =7.6 h/day
Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● Paved surfaces shall not be cleaned when frozen or snow covered. ● Packing work of the contaminated materials removed and collected into flexible containers shall be done under covers to prevent dust from dispersion.
	Radiation exposure protection of workers	● Safety glasses, dust masks, rubber gloves, etc. shall be worn when working outdoors.
	General labor safety of workers	● Barricades and traffic controllers shall be arranged, as the work is done on the roads.
	Measures to prevent secondary wastes	−
	Others	−

（3） Weeds/lawns

1）Weeding, lawn mowing

Locations to be decontaminated	“1.4.1. Unpaved surfaces” of “1.4. Gardens and the like” in “1. Residential areas and the like.” “2.4.2. Weeds/lawns” of “2.4. Grounds and the like” at “2. Schools” “3.4.2. Weeds/lawns” of “3.4. Grounds and the like” in “3. Parks (small)” “4.4.2.Paved surfaces” of “4.4. Grounds and the like” in “4. Parks (large)” “5.4.2. Weeds/lawns” of “5.4. Grounds and the like” of “5. Large facilities” “6.6.2. Weeds” of “6.6. Roadside trees” of “6. Roads”
Decontamination methods	Weeding, lawn mowing

Outline	Weeds/lawns of residences, schools, parks, large facilities, and roadside trees, etc. shall be mowed in the following procedures (i) Weeding and mowing by mowers and the like ((ii) Collecting/transferring mowed weeds/grass) (iii) Packing of mowed weeds/grass
Decontamination processes	● Prior to removing sediment and surface soil, weeds that may hinder the work shall be removed or weeded by shoulder-type mowers or by hand. ● Packing of weeds/grass removed in large sandbags
Tools, equipment and the like for decontamination work	■When working on unpaved surfaces of gardens and the like of residences and the like (1.4.1) and grounds and the like of parks (small) (3.4.2), (per 1,300 m²) Tools, equipment to use: Quantity Mowers (shoulder-type, cutter edge 255mm): 18.9 service days Gasoline: 46.2 L Large sandbags: - ■ When working on grounds and the like, of schools, parks (large) and large facilities, etc. (2.4.2, 4.4.2, 5.4.2), (per 1,300 m²) Tools, equipment to use: Quantity Dump trucks (load capacity 2t) (2t): 0.1 service days Mowers (shoulder-type, cutter edge 255mm): 19.0 service days Light oil: 2.6 L

Gasoline	46.2 L
Large sandbags	-

■When weeding roadside trees (6.6.2),

(per 1,300 m²)

Tools, equipment to use	Quantity
Mowers (shoulder-type, cutter edge 255mm)	6.0 service days
Light oil	3.8 L
Gasoline	14.5 L
Large sandbags	-

Workforce needed

■When working on unpaved surfaces of gardens and the like of residences and the like (1.4.1) and grounds and the like of parks (small) (3.4.2),

(per 1,300 m²)

Workforce needed	Quantity
Operation leaders	1.8 worker-days
Specialized decontamination workers	10.2 worker-days
Decontamination workers	1.5 worker-days

■When working on grounds and the like, of schools, parks (large) and large facilities, etc. (2.4.2, 4.4.2, 5.4.2),

(per 1,300 m²)

Workforce needed	Quantity
Operation leaders	1.8 worker-days
Specialized decontamination workers	10.2 worker-days
Decontamination workers	1.5 worker-days
Drivers (ordinary decontamination)	0.1 worker-days

■When working on roadside trees (6.6.2),

(per 1,300 m²)

Workforce needed	Quantity
Operation leaders	1.3 worker-days
Specialized decontamination workers	3.2 worker-days
Decontamination workers	5.5 worker-days
Drivers (special decontamination)	0.1 worker-days

Idea development, lessons,	Prerequisites and constraints regarding objects and locations	● Decontamination work shall be halted when the weeds/lawns to be decontaminated are frozen or snow covered.

points to keep in mind, etc.	to be decontaminated	
	Radiation exposure protection of workers	● Safety glasses, masks, gloves, etc. shall be worn.
	General labor safety of workers	● For the work on road shoulders, barricades and traffic controllers shall be arranged. ● Mowers are simple machines, but it is easy for operators to be hurt. Measures shall be taken to prevent minor collisions with machines. <Major safety measures> ・ Availability of protective covers shall be checked. ・ Proper mounting of protective covers shall be checked. ・ Knife-proof gloves shall be worn. ・ A no-access area shall be set around the weed cutter (5 m). ・ Distance shall be reserved between weed cutters (15 m).
	Measures to prevent secondary wastes	● Cut weeds/grass shall be collected quickly in order to prevent scattering by wind and rain.
	Others	−

2）Deep mowing of lawns

Locations to be decontaminated	"1.4.1. Unpaved surfaces" of "1.4. Gardens and the like" in "1. Residential areas and the like." "2.4.2. Weeds/lawns" of "2.4. Grounds and the like" at "2. Schools" "3.4.2. Weeds/lawns" of "3.4. Grounds and the like" in "3. Parks (small)" "4.4.2.Paved surfaces" of "4.4. Grounds and the like" in "4. Parks (large)" "5.4.2. Weeds/lawns" of "5.4. Grounds and the like" of "5. Large facilities"
Decontamination methods	Sod cutting

Outline	Weeds and lawns of unpaved surfaces of gardens and the like of residences and the like, and grounds of schools, parks, large facilities shall be removed by sod cutting in the following procedures (i) Lifting of lawns by sod cutters and the like ((ii) Collecting mowed weeds/grass, roots and soil (iii) Packing of removed materials
Decontamination processes	■ When working on weeds/lawns of unpaved surfaces of gardens and the like of residences and the like (1.4.1) and grounds and the like of parks (small) (3.4.2), ● Lawns shall be removed (reproducible shallow scraping of about 3 cm depth) using manually-guided sod cutters and the like after mowing. Root mat layers shall be preserved. ● Removed materials shall be packed in large sandbags. ● Bumps shall be covered with soil, and soil of 3 – 6 mm depth shall be scattered over them. ■When working on weeds/lawns of grounds and the like of schools, parks (large) and large facilities and the like (2.4.2, 4.4.2, 5.4.2), ● Large sod cutters, where possible, shall cut deeply (reproducible shallow scraping of about 3 cm depth). ● Where large sod cutters cannot gain access, manually-guided sod cutters and the like shall cut deeply (about 3 cm). ● Root mat layers shall be preserved. ● Removed materials shall be packed in large sandbags. ● Bumps shall be covered with soil, and soil of 3 – 6mm depth shall be scattered over them.

Tools, equipment and the like for decontamination work

■ When working on weeds/lawns of unpaved surfaces of gardens and the like of residences and the like (1.4.1), and grounds and the like of parks (small) (3.4.2),

(per 1,300 m^2)

Tools, equipment to use	Quantity
Manually-guided sod cutters (cutting path 55 – 65 cm)	18.8 service days
Gasoline	63.0 L
Fresh soil for scattering over lawns	6.5 m^3
Large sandbags	-

■When working on weeds/lawns of grounds and the like of schools, parks (large) and large facilities, etc. (2.4.2, 4.4.2, 5.4.2),

(per 1,300 m^2)

Tools, equipment to use	Quantity
Backhoes (Excavators) (Crawler type, Exhaust gas suppression type (secondary), Standard bucket capacity 0.28 m^3 when heaped (0.2 m^3 when flatly filled))	2.1 service days
Dump trucks (load capacity 2 t)	0.7 service day
Manually-guided sod cutters (cutting path 55 – 65 cm)	1.1 service days
Light oil	73.5 L
Gasoline	3.7 L
Fresh soil for scattering over lawns	6.5 m^3
Large sandbags	-

Workforce needed

■ When working on weeds/lawns of unpaved surfaces of gardens and the like of residences and the like (1.4.1), and grounds and the like of parks (small) (3.4.2),

(per 1,300 m^2)

Workforce needed	Quantity
Operation leaders	3.8 worker-days
Specialized decontamination workers	10.0 worker-days
Decontamination workers	15.0 worker-days

■When working on weeds/lawns of grounds and the like of schools, parks (large) and large facilities, etc. (2.4.2, 4.4.2, 5.4.2),

<table>
<tr><td colspan="2"></td><td>(per 1,300 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.6 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>0.6 worker-days</td></tr><tr><td>Decontamination workers</td><td>1.3 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>1.3 worker-days</td></tr><tr><td>Drivers (ordinary decontamination)</td><td>0.6 worker-days</td></tr></table></td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Decontamination work shall be halted when the weeds/lawns to be decontaminated are frozen or snow covered.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Safety glasses, masks and gloves shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>(When mowers, sod cutters and heavy machinery are used,)
● Setting of color cones or cone bars is recommended to designate working areas in order to prevent minor accidents by worker-machine collisions or being caught in a machine (Driver is in charge). (When mowers are used,)
● Mowers are simple machines, but it is easy for operators to be hurt. Measures shall be taken to prevent accidents due to minor collisions.
<Major safety measures>
・ Availability of protective covers shall be checked
・ Proper mounting of protective covers shall be checked.
・ Knife-proof gloves shall be worn.
・ A no-access area shall be set around the weed cutter (5 m).
・ Distance shall be reserved between weed cutters (15 m).</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>－</td></tr>
<tr><td></td><td>Others</td><td>－</td></tr>
</table>

（4） Gravel, crushed stones

1）Removal of gravel, crushed stones

Locations to be decontaminated	“1.4.1. Unpaved surfaces” of “1.4. Gardens and the like” in “1. Residential areas and the like.” “2.4.3. Gravel, crushed stone” of “2.4. Grounds and the like” at “2. Schools” “3.4.3 Gravel, crushed stone” of “3.4. Grounds and the like” in “3. Parks (small)” “4.4.3. Gravel, crushed stone” of “4.4. Grounds and the like” in “4. Parks (large)” “5.4.3. Gravel, crushed stone” of “5.4. Grounds and the like” of “5. Large facilities” “6.2.2. Road surfaces (roads of gravel, crushed stone)” of “6.2. Unpaved roads” of “6. Roads”
Decontamination methods	Removal of gravel, crushed stone

Outline	Gravel, and crushed stone of unpaved surfaces of gardens and the like of residences and the like, of grounds of schools, parks, large facilities, and unpaved road surfaces (roads of gravel or crushed stones) shall be removed in the following procedures (i) Removing gravel and crushed stone (ii) Packing removed gravel and crushed stone
Decontamination processes	■When working on gravel and crushed stone of unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.3), ● Gravel and crushed stone shall be uniformly removed (to about 5 cm depth) with shovels and the like, and packed in large sandbags. ● When the existing gravel or crushed stone is less than 5 cm deep, the top layer about 5 cm deep and including the soil underneath shall be uniformly removed and be packed in large sandbags. ■When working on gravel and crushed stone from grounds and the like of schools, parks (large), large facilities, etc. (2.4.3, 4.4.3, 5.4.3), ● Gravel and crushed stone shall be uniformly removed (to about 5 cm depth) with backhoes and the like, and packed in large sandbags. ● When the existing gravel or crushed stone is less than 5 cm deep, the top layer about 5 cm deep and including the soil underneath shall be uniformly removed and be packed in large

<table>
<tr><td></td><td>sandbags.

■When working on gravel and crushed stone of unpaved road surfaces (roads of gravel and crushed stone) (6.2.2),
● The top surface layer shall be scraped away in a uniform thicknesses (about 5 cm from the top) by backhoes and the like, and packed in large sandbags.</td></tr>
<tr><td>Tools, equipment and the like for decontamination work</td><td>■When working on gravel and crushed stone of unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.3),
(per 1,300 m²)
<table>
<tr><th>Tools, equipment to use</th><th>Quantity</th></tr>
<tr><td>Shovels and the like</td><td>-</td></tr>
<tr><td>Large sandbags</td><td>-</td></tr>
</table>
■When working on gravel and crushed stone from grounds and the like of schools, parks (large), large facilities, etc. (2.4.3, 4.4.3, 5.4.3),
(per 1,000 m²)
<table>
<tr><th>Tools, equipment to use</th><th>Quantity</th></tr>
<tr><td>Shovels and the like</td><td>-</td></tr>
<tr><td>Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.45 m³ when heaped (0.35 m³ when flatly filled))</td><td>1.4 service days</td></tr>
<tr><td>Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.28 m³ when heaped (0.2 m³ when flatly filled))</td><td>3.9 service days</td></tr>
<tr><td>Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.13 m³ when heaped (0.10 m³ when flatly filled))</td><td>2.8 service days</td></tr>
<tr><td>Light oil</td><td>360.1 L</td></tr>
<tr><td>Large sandbags</td><td>-</td></tr>
</table>
■When working on gravel and crushed stone of unpaved road surfaces (roads of gravel and crushed stones) (6.2.2),
(per 1,300 m²)
<table>
<tr><th>Tools, equipment to use</th><th>Quantity</th></tr>
<tr><td>Shovels and the like</td><td>-</td></tr>
<tr><td>Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity</td><td>11.2 service days</td></tr>
</table></td></tr>
</table>

<table>
<tr><td colspan="2"></td><td>
<table>
<tr><td>0.28m³ when heaped (0.20 m³ when flatly filled))</td><td></td></tr>
<tr><td>Vibratory rollers (Combined type, 3.0 – 4.0 t weight)</td><td>5.6 service days</td></tr>
<tr><td>Light oil</td><td>565.2 L</td></tr>
<tr><td>Large sandbags</td><td>-</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Workforce needed</td><td>
■When working on gravel and crushed stone of unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.3),
(per 1,300 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>7.7 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>51.4 worker-days</td></tr>
</table>
■When working on gravel and crushed stone from grounds, and the like, of schools, parks (large), large facilities, etc. (2.4.3, 4.4.3, 5.4.3),
(per 1,000m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>1.7 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>11.1 worker-days</td></tr>
<tr><td>Drivers (special decontamination)</td><td>8.1 worker-days</td></tr>
</table>
■When working on gravel and crushed stone of unpaved road surfaces (roads of gravel and crushed stones) (6.2.2),
(per 1,300 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>2.7 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>17.9 worker-days</td></tr>
<tr><td>Drivers (special decontamination)</td><td>16.8 worker-days</td></tr>
</table>
</td></tr>
<tr><td rowspan="2">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Heavy machinery (small backhoes and the like) are preferable to the extent possible for better construction efficiency.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Masks, gloves and the like shall be worn when working with shovels and the like.</td></tr>
</table>

	General labor safety of workers	● Setting of color cones or cone bars is recommended to designate working areas in order to prevent minor accidents by worker-machine collisions or being caught in a machine (Driver is in charge). ● For the work on roads, barricades and traffic controllers shall be arranged.
	Measures to prevent secondary wastes	● Attention is needed to prevent excessive digging by machinery. Digging depth indicators shall be set for construction.
	Others	−

（5） Soil

1）Surface soil removal from rainwater gutter drains, under-eaves, etc.

Locations to be decontaminated	■Surface soil removal from rainwater gutter drains, under-eaves, etc. “2.4.4. Soil” of “2.4. Grounds and the like” at “2. Schools” “4.4.4. Soil” of “4.4. Grounds and the like” in “4. Parks (large)” “5.4.4. Soil” of “5.4. Grounds and the like” of “5. Large facilities” ■Surface soil removal from the bases of trees such as roadside trees and the like “1.4.1. Unpaved surfaces” of “1.4. Gardens and the like” in “1. Residential areas and the like” “2.4.5. Planted vegetation” of “2.4. Grounds and the like” at “2. Schools” “3.4.5 Planted vegetation” of “3.4. Grounds and the like” in “3. Parks (small)” “4.4.5. Planted vegetation” of “4.4. Grounds and the like” in “4. Parks (large)” “5.4.5. Planted vegetation” of “5.4. Grounds and the like” of “5. Large facilities” “6.6.3. Roadside trees” of “6.6. Roadside trees” of “6. Roads”
Decontamination methods	Soil sediment removal from rainwater gutter drains, under-eaves, etc. Surface soil removal near the bases of trees and roadside trees

Outline	Soil sediment of rainwater gutter drains, under-eaves, etc. of schools, parks, large facilities, etc. shall be removed in the following procedures. Similarly, surface soil of gardens and the like of residences and the like, and grounds of schools, parks, large facilities, etc., and soil near the bases of planted vegetation on the roads, trees, roadside trees, etc. shall be removed in the following procedures, (i) Removing surface soil (ii) Packing removed soil
Decontamination processes	● Fallen leaves and soil sediment shall be collected using a shovel or rake, etc. and packed in large sandbags.
Tools, equipment and the like for decontamination work	Tools, equipment to use: Quantity Shovels, rakes, etc.: - Large sandbags: -
Workforce needed	(per 1,300 m^2) Workforce needed: Quantity Operation leaders: 2.0 worker-days Decontamination workers: 13.3 worker-days

Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● The work site could be a high dose level place (hereafter hot spot) depending on the rainfall conditions. The work flow to designate a hot spot and monitoring threshold criteria shall be prescribed in advance in consultation with the supervisory personnel by referring to the radiation levels around the hot spot.
	Radiation exposure protection of workers	● Masks and gloves shall be worn under dust handling conditions ● Protective gear shall be considered and a half-face mask and hand gloves (cotton, rubber) shall be worn if the radiocesium concentration is high in the soil to handle, and if the work corresponds to the work under high dust concentrations as designated in relevant guidelines of the Ministry of Health, Labour and Welfare(MHLW). ● If the work site is a hot spot, color cones and the like shall be arranged, as appropriate, for indicating the hot spot in order to facilitate reducing the long-term exposure of workers.
	General labor safety of workers	● Safety measures shall be taken for the work with heavy machinery (proper arrangement for preventing minor collisions of adjacently working heavy machinery, and adequate instructions and supervision, as well as thorough control for preventing access to the machinery)
	Measures to prevent secondary wastes	−
	Others	−

2）Scraping of surface soil

Locations to be decontaminated	"1.4.1. Unpaved surfaces" of "1.4. Gardens and the like" in "1. Residential areas and the like" "2.4.4. Soil" of "2.4. Grounds and the like" at "2. Schools" "3.4.4. Soil" of "3.4. Grounds and the like" in "3. Parks (small)" "4.4.4. Soil" of "4.4. Grounds and the like" in "4. Parks (large)" "5.4.4. Soil" of "5.4. Grounds and the like" of "5. Large facilities" "6.2.1. Road surfaces (soil)" of "6.2. Unpaved roads" of "6. Roads"
Decontamination methods	Scraping of surface soil

Outline	Soil of unpaved gardens and the like of residences and the like, of grounds and the like of schools, parks, large facilities, etc. and the unpaved road surface (soil) shall be scraped off in the following procedures, (i) Scraping off surface soil (ii) Packing scraped soil
Decontamination processes	■When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4), ● The garden topsoil shall be uniformly scraped away (about 5 cm deep) by using bamboo rakes or similar instruments, and packed in large sandbags. ● Work breakdown shall be standardized and workers shall be instructed prior to the work in order to avoid non-uniformity of scraping thicknesses among workers. ■When working on the soil of grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4), ● The surface soil shall be uniformly scraped (about 5 cm deep) with backhoes and the like, and packed in large sandbags. ■When working on the soil of unpaved road surfaces (6.2.1), ● The surface soil shall be uniformly scraped (about 5 cm deep) with backhoes and the like, and packed in large sandbags.
Tools, equipment and the like for decontamination work	■When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4),

Tools, equipment to use	Quantity
Bamboo rakes and the like	-
Large sandbags	-

■When working on the soil of grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4),

(per 1,000 m^2)

Tools, equipment to use	Quantity
Shovels and the like	-
Backhoe (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.45 m^3 when heaped (0.35 m^3 when flatly filled))	2.7 service days
Backhoe (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.28 m^3 when heaped (0.20 m^3 when flatly filled))	2.0 service days
Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.13 m^3 when heaped (0.10 m^3 when flatly filled))	0.2 service days
Light oil	360.1 L
Large sandbags	-

■When working on the soil of unpaved road surfaces (6.2.1),

(per 1,300 m^2)

Tools, equipment to use	Quantity
Shovels and the like	-
Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.28 m^3 when heaped (0.2 m^3 when flatly filled))	8.0 service days
Light oil	362.9 L
Large sandbags	-

Workforce needed

■When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4),

(per 1,300 m^2)

Workforce needed	Quantity
Operation leaders	5.0 worker-days
Decontamination workers	33.4 worker-days

■When working on the soil of grounds and the

<table>
<tr><td colspan="2"></td><td>like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4),
(per 1,000 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>1.0 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>6.5 worker-days</td></tr>
<tr><td>Drivers (special decontamination)</td><td>4.9 worker-days</td></tr>
</table>
■When working on the soil of unpaved road surfaces (soil) (6.2.1),
(per 1,300 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>1.8 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>11.8 worker-days</td></tr>
<tr><td>Drivers (special decontamination)</td><td>8.0 worker-days</td></tr>
</table></td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● The scraping thickness shall be set before the work. During the work, the scraping thickness shall be properly confirmed for sure dose reduction.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Masks and hand gloves shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● Safety measures shall be taken for the work with heavy machinery (proper arrangement for preventing minor collisions of adjacently working heavy machinery, and adequate instructions and supervision, as well as thorough control for preventing access to the machinery)</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>−</td></tr>
<tr><td></td><td>Others</td><td>−</td></tr>
</table>

3）Soil surface covering

Locations to be decontaminated	"1.4.1. Unpaved surfaces" of "1.4. Gardens and the like" in "1. Residential areas and the like" "2.4.4. Soil" of "2.4. Grounds and the like" at "2. Schools" "3.4.4. Soil" of "3.4. Grounds and the like" in "3. Parks (small)" "4.4.4. Soil" of "4.4. Grounds and the like" in "4. Parks (large)" "5.4.4. Soil" of "5.4. Grounds and the like" of "5. Large facilities" "6.2.1. Road surfaces (soil)" of "6.2. Unpaved roads" of "6. Roads"
Decontamination methods	Soil surface covering

Outline	Soil of unpaved gardens and the like of residences and the like, of grounds and the like of schools, parks, large facilities, etc. and the unpaved road surface (soil) shall be covered in the following procedures, (i) Covering of surface soil uniformly with fresh uncontaminated soil, ((ii) Short distance transfer of fresh soil to small places for spreading) (iii) Compacting
Decontamination processes	■ When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4), ● The surface, if its topsoil is scraped away, shall be covered by fresh soil of similar quality as before to a similar height. ● The new topsoil shall be spread, leveled and compacted back to the original height and similar porosity. ■When working on the grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4), ● The surface, if its topsoil is scraped away, shall be covered by fresh soil of similar quality as before to a similar height by using backhoes and the like. ● The new topsoil shall be spread, leveled and compacted back to the original height and similar porosities. ■When working on the unpaved road surfaces (soil) (6.2.1), ● The surface, if its topsoil is scraped away, shall be covered by fresh soil of similar quality as before to a similar height using backhoes and the like.

<table>
<tr><td></td><td>

- The new topsoil shall be spread, leveled and compacted back to the original maximum height and similar porosity.

</td></tr>
<tr><td>Tools, equipment and the like for decontamination work</td><td>

■ When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4),

(per 1,300 m^2)

Tools, equipment to use	Quantity
Shovels and the like.	-
Vibratory rollers (hand guide type, 0.8 – 1.1 t weight)	15.8 service days
Light oil	56 L
Fresh soil for covering	72.2 m^3

■When working on the grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4),

(per 1,000 m^2)

Tools, equipment to use	Quantity
Shovels and the like	-
Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.28 m^3 when heaped (0.20 m^3 when flatly filled))	1.1 service days
Vibratory roller (Exhaust gas suppression type (primary), Combined type, 3 – 4 t)	1.5 service days
Vibratory rollers (Exhaust gas suppression type, manually-guided type, 0.5 – 0.6 t)	0.4 service days
Dump trucks (load capacity 2 t)	1.8 service days
Light oil	106.6 L
Fresh soil for covering	55.5 m^3

■When working on the unpaved road surfaces (soil) (6.2.1),

(per 1,300 m^2)

Tools, equipment to use	Quantity
Shovels and the like	-
Backhoes (Crawler type, Exhaust gas suppression type (secondary), 0.28 m^3 when heaped (0.20 m^3 when flat))	19.0 service hours
Vibratory rollers (Exhaust gas suppression type (primary), Combined type, 3 – 4 t)	2.0 rollers per day

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</table>

<table>
<tr><td></td><td colspan="2">
<table>
<tr><td>Light oil</td><td>156.0 L</td></tr>
<tr><td>Fresh soil for covering</td><td>72.2 m^3</td></tr>
</table>
</td></tr>
<tr><td>Workforce needed</td><td colspan="2">■ When working on the unpaved surfaces of gardens and the like, of residences and the like (1.4.1) and of grounds and the like of parks (3.4.4),
(per 1,300m^2)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>3.3 worker-days</td></tr>
<tr><td>Specialized decontamination workers</td><td>11.5 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>10.7 worker-days</td></tr>
</table>
■When working on the grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4),
(per 1,000 m^2)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.7 worker-days</td></tr>
<tr><td>Specialized decontamination workers</td><td>0.4 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>4.7 worker-days</td></tr>
<tr><td>Drivers (special decontamination)</td><td>2.6 worker-days</td></tr>
<tr><td>Drivers (ordinary decontamination)</td><td>1.5 worker-days</td></tr>
</table>
■When working on the unpaved road surfaces (soil) (6.2.1),
(per 1,300 m^2)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>3.5 worker-days</td></tr>
<tr><td>Specialized decontamination workers</td><td>6.9 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>1.4 worker-days</td></tr>
<tr><td>Drivers (special decontamination)</td><td>3.0 worker-days</td></tr>
</table>
</td></tr>
<tr><td rowspan="2">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● It was hard to secure similar soil/stones as the original ones for the gardens of private residences. Occasionally, it was difficult to obtain their consent to the materials even when similar ones were offered.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● The work is often done combined with scraping work. Protective gear such as masks shall be worn even though the dose decreases</td></tr>
</table>

		once fresh soil is spread.
	General labor safety of workers	● Safety measures shall be taken for the work with heavy machinery (proper arrangement for preventing minor collisions of adjacently working heavy machinery, and adequate instructions and supervision, as well as thorough control for preventing access to the machinery)
	Measures to prevent secondary wastes	−
	Others	−

4）Deep plowing

Locations to be decontaminated	“1.4.1. Unpaved surfaces” of “1.4. Gardens and the like” in “1. Residential areas and the like” “2.4.4. Soil” of “2.4. Grounds and the like” at “2. Schools” “3.4.4. Soil” of “3.4. Grounds and the like” in “3. Parks (small)” “4.4.4. Soil” of “4.4. Grounds and the like” in “4. Parks (large)” “5.4.4. Soil” of “5.4. Grounds and the like” of “5. Large facilities” “6.2.1. Road surfaces (soil)” of “6.2. Unpaved roads” of “6. Roads”
Decontamination methods	Deep plowing

Outline	Soil of unpaved gardens and the like of residences and the like, of grounds and the like of schools, parks, large facilities, etc. and the unpaved road surface (soil) shall be plowed deeply in the following procedures, (i) Excavating surface soil for temporary storage, (ii) Excavating sub-surface soil for temporary storage, (iii) Spreading and compacting of surface soil (in the sub-surface layer) (iv) Spreading and compacting of sub-surface soil (in the surface layer) (v) Leveling the top surface
Decontamination processes	■When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4), ● The surface soil to about 10 cm depth shall be uniformly scraped away by hand using shovels and the like and be placed temporarily on plastic sheets and the like. ● The sub-surface soil to about 20 cm depth shall be uniformly scraped away and be placed temporarily apart from the surface soil storage. ● The surface soil shall be spread in the sub-surface layer using shovels. The sub-surface soil shall be spread over it, leveled and compacted to the original level with similar porosity. ■When working on the grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4), and the unpaved road surfaces (soil) (6.2.1), ● The surface soil to about 10 cm depth shall be uniformly scraped away by using backhoes and be placed temporarily on plastic sheets and the like. ● The sub-surface soil to about 20 cm depth shall be uniformly scraped away and be placed

<table>
<tr><td></td><td>temporarily apart from the surface soil storage.
● The surface soil shall be spread with shovels by hand or using backhoes. The sub-surface soil shall be spread over it, leveled and compacted to the original level with similar porosity</td></tr>
<tr><td>Tools, equipment and the like for decontamination work</td><td>■When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4),
<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Shovels and the like</td><td>-</td></tr><tr><td>Compactors (Dumpers)</td><td>-</td></tr><tr><td>Plastic sheets</td><td>-</td></tr></table>
■When working on the grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4), and the unpaved road surfaces (soil) (6.2.1),
(per 1,300 m^2)
<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Shovels and the like</td><td>-</td></tr><tr><td>Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.28 m^3 when heaped (0.20 m^3 when flat))</td><td>7.9 service days</td></tr><tr><td>Backhoes (Crawler type, Exhaust gas suppression type (secondary), Bucket capacity 0.45 m^3 when heaped (0.35 m^3 when flat))</td><td>6.1 service days</td></tr><tr><td>Vibratory rollers (Exhaust gas suppression type (primary), combined type, 3 – 4 t)</td><td>7.9 service days</td></tr><tr><td>Light oil</td><td>549.9 L</td></tr><tr><td>Plastic sheet</td><td>-</td></tr></table></td></tr>
<tr><td>Workforce needed</td><td>■When working on the unpaved surfaces of gardens and the like of residences and the like (1.4.1), and of grounds and the like of parks (3.4.4),
(per 1,300 m^2)
<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>26.0 worker-days</td></tr><tr><td>Decontamination workers</td><td>173.0 worker-days</td></tr></table>
■When working on the grounds and the like of schools, parks (large), large facilities, etc. (2.4.4, 4.4.4, 5.4.4), and the unpaved road surfaces (soil) (6.2.1),</td></tr>
</table>

<table>
<tr><td colspan="2"></td><td>(per 1,300 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>1.3 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>6.2 worker-days</td></tr><tr><td>Decontamination workers</td><td>8.5 worker-days</td></tr></table></td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● In many cases, especially in residential areas, this method is often not accepted because the contaminated soil is not removed.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Dust masks and rubber gloves shall be worn when working by hands using shovels and the like.
● Contaminated surface soil collected and piled up forms temporary hot spots. Early backfill is desirable before the radiation dose becomes high.</td></tr>
<tr><td>General labor safety of workers</td><td>● Safety measures shall be taken for the work with heavy machinery (proper arrangement for preventing minor collisions of adjacently working heavy machinery, and adequate instructions and supervision, as well as thorough control for preventing access to the machinery)</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>－</td></tr>
<tr><td></td><td>Others</td><td>－</td></tr>
</table>

（6） Garden trees, planted vegetation, roadside trees

1）Surface soil removal from bases of trees and the like

The same as the soil sediment removal from rainwater gutter drains, under-eaves, etc. in the residential areas, schools, parks, large facilities, roads, etc. explained in (5) 1).

2）Delimbing of garden trees, planted vegetation and roadside trees

Locations to be decontaminated	■Delimbing of garden trees "1.4.1. Unpaved surfaces" of "1.4. Gardens and the like" in "1. Residential areas and the like" ■Delimbing of planted vegetation "2.4.5. Planted vegetation" of "2.4. Grounds and the like" at "2. Schools" "3.4.5. Planted vegetation" of "3.4. Grounds and the like" in "3. Parks (small)" "4.4.5. Planted vegetation" of "4.4. Grounds and the like" in "4. Parks (large)" "5.4.5. Soil Planted vegetation" of "5.4. Grounds and the like" of "5. Large facilities" ■Delimbing of roadside trees "6.6.3. Roadside trees" of "6.6. Roadside trees" of "6. Roads"
Decontamination methods	Delimbing of garden trees, planted vegetation and roadside trees

Outline	Garden trees of residences and the like, planted vegetation of the grounds of schools, parks, large facilities, etc., and roadside trees shall be delimbed in the following procedures. (i) Delimbing of garden trees, hedges, planted vegetation ((ii) Collecting fallen leaves and the like and small amount transfer of collected materials) (iii) Packing collected materials
Decontamination processes	● Garden trees, hedges, planted vegetation and roadside trees shall be delimbed or pruned by using pruners and branch cutters, to an extent that does not cause significant harm to their growth according to the tree species and their delimbing period. ● Branches trimmed off shall be packed in large sandbags. Too long branches for large sandbags shall be chopped into short lengths for packing
Tools, equipment and the like for decontamination work	■When working on garden trees of unpaved surfaces of gardens and the like of residences and the like (1.4.1), planted vegetation of the grounds

and the like of schools, parks, large facilities, etc. ‘2.4.5, 3.4.5, 4.4.5, 5.4.5),

Tools, equipment to use	Quantity
Rakes and the like	-
Chain saws (Edge length 350 mm, exhaust 34 cc))	6.5 service days
Gasoline	7.0 L
Large sandbags	-

■When working on roadside trees (6.6.3),

(per 1,300 m²)

Tools, equipment to use	Quantity
Bamboo rakes and the like	-
Aerial lift work vehicles (Lift-mounted truck, beam-type, work floor elevation 9.7 m)	11.2 service days
Chain saws (Edge length 350 mm, exhaust 34 cc))	20.0 service days
Crane trucks (Load capacity 4 t, Suspension weight 2.9 t)	3.3 service days
Light oil	259.9 L
Gasoline	21.6 L
Large sandbags	-

Workforce needed

■When working on garden trees of unpaved surfaces of gardens and the like of residences and the like (1.4.1), planted vegetation of the grounds and the like of schools, parks, large facilities, etc. ‘2.4.5, 3.4.5, 4.4.5, 5.4.5),

(per 1,300 m²)

Workforce needed	Quantity
Operation leaders	2.1 worker-days
Plant decontamination workers	11.5 worker-days

■When working on roadside trees (6.6.3),

(per 1,300m²)

Workforce needed	Quantity
Operation leaders	4.2 worker-days
Specialized decontamination workers	9.0 worker-days
Decontamination workers	8.0 worker-days
Drivers (special decontamination)	10.7 worker-days

Idea development, lessons,	Prerequisites and constraints regarding objects and locations	● Subject to the heights of garden trees, planted vegetation and roadside trees the delimbing work becomes the same as the

points to keep in mind, etc.	to be decontaminated	pruning work of coniferous trees (11.1.3.1). ● Some municipalities set rules to unify the pruning heights. Such cases shall be checked in advance, and preparatory consultation shall be carried out as needed.
	Radiation exposure protection of workers	● Safety glasses, dust masks, hand gloves, etc. shall be worn.
	General labor safety of workers	● Workers shall wear safety glasses, when delimbing and pruning, to prevent chips/dust from getting into their eyes. ● Work areas shall be clearly indicated and a no-access area shall be set. ● Pruning with chain saws shall be done in a standing and stable posture. ● When carrying a chain saw in the hands, the engine shall be switched off, braked, and carried using both hands. ● Allowable time for use shall be indicated on each chain saw on a sticky tape and the like (to prevent vibration hazard) ● For delimbing higher branches by using branch-cutters and the like, working positions shall be appropriately chosen to prevent the cut branches from hitting the workers.
	Measures to prevent secondary wastes	−
	Others	● Requests from some municipalities shall be considered to shake down twigs and leaves stuck on the branches around the pruning area.

3）Cutting of garden trees and planted vegetation

Locations to be decontaminated	■Cutting of garden trees "1.4.1. Unpaved surfaces" of "1.4. Gardens and the like" in "1. Residential areas and the like" ■Cutting of planted vegetation "2.4.5. Planted vegetation" of "2.4. Grounds and the like" at "2. Schools" "3.4.5. Planted vegetation" of "3.4. Grounds and the like" in "3. Parks (small)" "4.4.5. Planted vegetation" of "4.4. Grounds and the like" in "4. Parks (large)" "5.4.5. Soil Planted vegetation" of "5.4. Grounds and the like" of "5. Large facilities"
Decontamination methods	Cutting of garden trees and planted vegetation

Outline	Garden trees of residences and the like and planted vegetation of the grounds of schools, parks, large facilities, etc. shall be cut in the following procedures. (i) Cutting garden trees and hedges (ii) Pruning and cross-cutting (iii) Packing collected materials
Decontamination processes	● Garden trees, hedges and planted vegetation shall be cut using chain saws and the like. ● Branches pruned and the like shall be packed in large sandbags. Too long branches for large sandbags shall be chopped into short lengths for packing.
Tools, equipment and the like for decontamination work	(per 13 trees) Tools, equipment to use / Quantity Chain saws (Edge length 350 mm, exhaust 34 cc) / 2.5 service days Gasoline / 2.7 L Large sandbags / - *Applicable when the diameter at the chest level exceeds 6 cm. *Rough terrain cranes, if needed, shall be selected which meet the codes for field conditions.
Workforce needed	(per 13 pieces) Workforce needed / Quantity Operation leaders / 0.9 worker-days Plant decontamination workers / 1.0 worker-day

		Decontamination workers: 4.9 worker-days *Applicable when the diameter at the chest level exceeds 6 cm.
Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● Trees to be cut shall be confirmed with stakeholders in presence and duly marked for preventing possible trouble.
	Radiation exposure protection of workers	● Safety glasses, masks, rubber gloves, etc. shall be worn.
	General labor safety of workers	● Workers shall wear safety glasses, when delimbing and pruning, to prevent chips/dust from getting into their eyes. ● Work areas shall be clearly indicated and a no-access area shall be set. ● Commencement of the cutting work shall be signaled to nearby workers in the pre-arranged method. ● Chain saws shall be operated in a stable posture. ● When carrying a chain saw in the hands, the engine shall be switched off, braked and carried using both hands. ● Allowable time for use shall be indicated on each chain saw on a sticky tape and the like (to prevent vibration hazard).
	Measures to prevent secondary wastes	−
	Others	−

（7） Other objects to be decontaminated

1）Wiping, cleaning and scraping of playground equipment

Locations to be decontaminated	"2.5.1. Playground equipment and the like" of "2.5. Playground equipment and the like" at "2. Schools" "3.5.1. Playground equipment and the like" of "3.5. Playground equipment and the like" in "3. Parks (small)" "4.5.1. Playground equipment and the like" of "4.5. Playground equipment and the like" in "4. Parks (large)" "5.5.1. Playground equipment and the like" of "5.5. Playground equipment and the like" of "5. Large facilities"
Decontamination methods	Wiping, cleaning and scraping of playground equipment and the like

Outline	Playground equipment and the like of schools, parks, large facilities, etc. shall be wiped, cleaned or scraped.
Decontamination processes	● Surfaces of playground equipment shall be cleaned with water by using brushes, cleaning cloths and the like. Neutral detergents, vinegar (diluted acetic acid), etc. shall be used as needed. ● In wiping, cleaning cloths and the like moistened with water and the like (including neutral detergents, vinegar) shall be used with each face of the folded cloths used until repeated wiping gives hardly any further reduction in the surface contamination density.
Tools, equipment and the like for decontamination work	Tools, equipment to use / Quantity Cleaning cloths and the like: - High-pressure water cleaners: - Sand paper, grinders, etc.: - Brushes, sand paper, electric tools, etc.: - Large sandbags: -
Workforce needed	(per piece of playground equipment) Workforce needed / Quantity Operation leaders: 0.1 worker-days Decontamination workers: 0.4 worker-days * Applicable to two-seat swings (2.0 m high, 3.0 m wide), one way slides (2.0 m high, 40 cm wide x 4.0 m long slide face), etc.

Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● A fresh wiping face of the cloth shall be used for each wiping step, in order to prevent contaminants being reattached to the equipment. ● Paper towels and the like shall be used for wiping of flat surfaces of painted equipment (horizontal bars, jungle gyms, etc.). Dry brushes shall be used on uneven surfaces such as monuments at schools and the like. ● Possibilities of paint stripping upon wiping and brushing of playground equipment at schools shall be discussed with the educational committee in advance.
	Radiation exposure protection of workers	● Paper towels used for wiping shall not be touched with the bare hands, because they may be contaminated with radiocesium. ● The air dose rate in the working area shall be clearly indicated and the workers notified. ● The dose rates in the decontamination working area shall be measured in advance and, if the dose rate is high, the area shall be clearly indicated by color cones, color cone bars, etc. ● Daily and accumulated exposure doses of individual workers shall be indicated in an easily understandable way and kept under control. ● Unnecessary access to large packed sandbags shall be restricted because of high dose rate risk. ● Protective equipment such as disposable masks, rubber gloves, etc. shall be disposed of at the pre-designated spots when the work is finished.
	General labor safety of workers	● Protective equipment (masks, gloves, etc.) shall be properly worn. ● Stability and safety of work floors shall be ensured for the work in high places such as 2 m high swings.
	Measures to prevent secondary wastes	● For volume reduction of secondary wastes, paper towels and other disposable items used in wiping work shall be pressed, or suction-compressed by vacuum cleaners into sealed storage bags.
	Others	● When leaving the working areas, contamination on body surfaces shall be checked as lower than 1,300 cpm by screening, which is stricter than the allowable limit of 13,000 cpm.

2）Removal of bottom sediment from street drains and the like of roads

Locations to be decontaminated	"6.4.1. Street drains and the like" of "6.4. Street drains and the like" of "6. Roads"
Decontamination methods	Removal of bottom sediment from street drains and the like of roads

Outline		Bottom sediment of street drains and the like of roads shall be removed in the following procedures: (i) High-pressure water cleaning of bottom sediment (ii) Suctioning up sediment (iii) Transfer of wastewater to a wastewater treatment facility
Decontamination processes		● High-pressure water of about 14 MPa from drainage pipe cleaners and the like shall be used for cleaning in about 20 L/m^3. The wastewater shall be collected. ● Sediment removed shall be packed in large sandbags. The wastewater collected shall be transported to an on-site or nearby wastewater treatment facility.
Tools, equipment and the like for decontamination work		(per 1,300 m)

Tools, equipment to use	Quantity
Shovels, brooms, etc.	-
Drainage pipe cleaners (Floor-type, hopper capacity 10.3m^3, air-flow 40m^3/min)	4.0 service days
Drainage pipe cleaners (Floor-type, hopper capacity 3.1 m^3, air-flow 40 m^3/min)	1.2 service days
Drainage pipe cleaner (Tank capacity 2m^3, pressure 14MPa)	5.3 service days
Light oil	457.6 L
Water	9.0 m^3

Workforce needed		(per 1,300 m)

Workforce needed	Quantity
Operation leaders	4.1 worker-days
Decontamination workers	19.2 worker-days
Drivers (ordinary decontamination)	8.1 worker-days

Idea development,	Prerequisites and constraints regarding	● Sediment easily removable such as fallen leaves, moss or mud shall be removed in

lessons, points to keep in mind, etc.	objects and locations to be decontaminated	advance by shovels and the like. ● When the concrete joint gaps of street drains are deep, a spatula or the like shall be used to remove the sediment from the joint gaps. ● The cleaning shall be done under covers to avoid water scattering when buildings stand closely next to each other. ● When cleaning covered street drains by using high-pressure water, the cleaner shall be equipped with a spray nozzle for high-pressure water that is inserted in the street drains of the roads in order to clean the bottom, sides and top (backside of the cover) of the covered drains. ● When a spray nozzle cannot be equipped on the high-pressure water cleaner for covered street drains, for instance when much sand has flowed from mountains and slopes into the street drains, the cover shall be removed temporarily and cleaning shall be done by hand. ● When removing sediment with hand by using shovels and the like from street drains without a cover, wheelbarrows shall be used for transferring sediment removed to a nearby spot for collection, as the road surface is smooth. ● Before commencing the high-pressure water cleaning of street drains, the wastewater discharge lines shall be checked, and small sandbags shall be lined up to dam the street drains downstream. The wastewater shall be collected by a street drain cleaner. Small sandbags containing zeolites shall be placed downstream to prepare for possible overflow incidents.
	Radiation exposure protection of workers	● The dose rates in the working area shall be indicated clearly and the workers notified. ● The dose rates in the decontamination working area shall be measured in advance and, if the dose rate is high, the area shall be clearly indicated by color cones, color cone bars, etc. ● Daily and accumulated exposure doses of individual workers shall be indicated in an easily understandable way and kept under control. ● Unnecessary access to large packed sandbags shall be restricted because of their high dose rate risk. ● Protective equipment such as disposable masks, rubber gloves, etc. shall be disposed of

		at the pre-designated spots when the work is finished.
	General labor safety of workers	● Protective equipment (masks, gloves, etc.) shall be properly worn. ● No one shall stand in the water jet zones at the time of high-pressure water cleaning. ● Attention shall be paid not to cut the fingers when cleaning street drains by hand using spatulas or the like.
	Measures to prevent secondary wastes	−
	Others	● When leaving the working area, contamination on body surfaces shall be checked as lower than 1,300 cpm by screening, which is stricter than the allowable limit of 13,000 cpm.

6.1.2. Slopes

1）Removal of weeds, fallen leaves and sediment on slopes

Locations to be decontaminated	"7.1.1. Weeds, fallen leaves, sediment" of "7.1. Slopes" of "7. Slopes"
Decontamination methods	Removal of weeds, fallen leaves and sediment on slopes

<table>
<tr><td colspan="2">Outline</td><td>Weeds, fallen leaves and sediment on slopes shall be removed in the following procedures:
(i) Branches and leaves, shrubs, weeds, etc. which can impede decontamination work shall be removed (weeding, cutting) with shoulder-type mowers, sickles, etc.
(ii) Weeds, fallen leaves and sediment shall be removed.
(iii) Transferring removed materials
(iv) Packing removed materials</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Sediment such as fallen leaves, moss, mud, etc. shall be removed by rakes and other tools and packed in large sandbags.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 1,300 m²)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Mowers (shoulder-type, cutter diameter 255 mm)</td><td>6.5 service days</td></tr><tr><td>Light oil</td><td>0.2 service days</td></tr><tr><td>Sand paper, grinder, etc.</td><td>7.4 L</td></tr><tr><td>Gasoline</td><td>18.6 L</td></tr><tr><td>Large sandbags</td><td>-</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 1,300 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>1.8 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>3.5 worker-days</td></tr><tr><td>Decontamination workers</td><td>8.2 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>0.2 worker-days</td></tr></table></td></tr>
<tr><td>Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Before sediment removal, weeds, which can impede the work, shall be removed by using a shoulder-type mower or by hand.
● The amount of sediment removal (depth to be removed) shall be determined by test trials.
● When decontaminating slopes with a cut</td></tr>
</table>

		surface, the conditions of any nets shall be checked before the work. ● When working on long and big slopes, the area within about 20 m from the living space shall be covered with due attention to the usage status and other conditions of surrounding areas. ● When the slopes need protective measures of vegetation, appropriate construction methods shall be chosen in accordance with the "Guidelines of road construction methods for slope protection and stabilization (June 2009, Japan Road Association)
	Radiation exposure protection of workers	● Safety glasses, dust masks, gloves, etc. shall be worn.
	General labor safety of workers	● When working on steep slopes and bad footing slopes, slip prevention measures shall be ensured by using fixed ropes, safety belts, sliding devices on fixed ropes, etc. ● For work on roadside slopes, barricades and traffic controllers shall be arranged.
	Measures to prevent secondary wastes	−
	Others	The following points shall be noted when collecting contaminated objects on slopes: ● Transfer methods of large sandbags containing contaminated materials removed on the slopes (especially transfer upward) ● Crossing methods of rivers, brooks and the like ● Necessary consultations with supervisors on these collection methods

6.1.3. Rice Fields, Dry Fields, Pastures, etc.

（1） Weeds

1）Weeding by hand in rice fields and dry fields

Locations to be decontaminated	“8.1.1. Weeds” of “8.1. Rice fields” in “8. Farmland” “8.2.1. Weeds” of “8.2. Dry fields” in “8. Farmland”
Decontamination methods	Weed removal in rice fields and dry fields

<table>
<tr><td colspan="2">Outline</td><td>Rice fields and dry fields shall be weeded using shoulder-type mowers or the like</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Weeds in rice fields and dry fields shall be removed by using shoulder-type mowers or the like</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td><table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Mowers (Shoulder-type, cutter diameter 255 mm)</td><td>-</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 100 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.02 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>0.23 worker-days</td></tr></table></td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Weeds in narrow places, slopes and the like where large mechanized weeding equipment is not applicable.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Protective equipment such as dust masks shall be properly worn to protect against dust blown up by mowers.</td></tr>
<tr><td>作業員の一般労働安全対策</td><td>● Non-associated personnel shall be kept from the working place, as accidents often occur due to insufficient education on machinery use or kickbacks by mowers.
● To prepare for flying stones, protective equipment shall be properly worn, for example, wearing safety goggles and the like, or placing protective nets.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>－</td></tr>
<tr><td></td><td>Others</td><td>－</td></tr>
</table>

2）Weeding by machines in rice fields and dry fields

Locations to be decontaminated	“8.1.1. Weeds” of “8.1. Rice fields” in “8. Farmland” “8.2.1. Weeds” of “8.2. Dry fields” in “8. Farmland”
Decontamination methods	Weeding by machines in rice fields and dry fields

<table>
<tr><td colspan="2">Outline</td><td>Weeding by machines in rice fields and dry fields</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Weeds in rice fields and dry fields shall be removed using farm tractors or the like.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 1,000 m²)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Farm tractors (110PS, wheel-type)</td><td>0.27 service hours</td></tr><tr><td>Off-set shredders (working width 200 cm)</td><td>0.04 service days</td></tr><tr><td>Light oil</td><td>3.0 L</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 1,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.01 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>0.05 worker-days</td></tr></table></td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● The work shall be done in areas which exceed a certain size (more than 1,000 m²) and where machinery has no risks of overturning.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Protective equipment such as dust masks shall be properly worn to protect against dust blown up.</td></tr>
<tr><td>General labor safety of workers</td><td>● Safety measures shall be taken for the work with heavy machinery (proper arrangement for preventing minor collisions of adjacently working heavy machinery, and adequate instructions and supervision, as well as thorough control for preventing access to the machinery)</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>−</td></tr>
<tr><td></td><td>Others</td><td>−</td></tr>
</table>

3）Collection of weeds removed from rice fields and dry fields

Locations to be decontaminated	"8.1.1. Weeds" of "8.1. Rice fields" in "8. Farmland" "8.2.1. Weeds" of "8.2. Dry fields" in "8. Farmland"
Decontamination methods	Collection of contaminated weeds removed from rice fields and dry fields

<table>
<tr><td colspan="2">Outline</td><td>Weeds removed from rice fields and dry fields shall be collected</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Weeds removed shall be collected by using hay collectors, packing machines for weeding, and other machines.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 1,000 m²)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Hay collectors (Hand guided-type, 120cm)</td><td>0.63 service days</td></tr><tr><td>Packing machines for weeding (Hand guided-type, ϕ 500x700))</td><td>0.59 service days</td></tr><tr><td>Gasoline</td><td>21.3 L</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 1,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.06 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>1.16 worker-days</td></tr></table></td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● The work shall be done in areas exceeding a certain size (more than 1,000 m²) and where machinery has no risks of overturning.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Protective equipment such as dust masks shall be properly worn to protect against dust blown up.</td></tr>
<tr><td>General labor safety of workers</td><td>● Safety measures shall be taken for work with heavy machinery (proper arrangement for preventing minor collisions of adjacently working heavy machinery, adequate instructions and supervision, as well as thorough control for preventing access to the machinery)</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>−</td></tr>
<tr><td></td><td>Others</td><td>−</td></tr>
</table>

4）Weeding of grassland

Locations to be decontaminated	"8.3.1. Weeds" of "8.3. Grassland" in "8. Farmland"
Decontamination methods	Weeding of grassland

<table>
<tr><td colspan="2">Outline</td><td>Weeding of grassland</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Weeds in grassland shall be removed by using farm tractors or the like.
● Weeds removed shall be formed in roll bales.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per ha)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Farm tractors (Riding-type, wheel-type, four-wheel drive, 52 -59kw class (70 – 80PS))</td><td>5.3 service hours</td></tr><tr><td>Flail mowers (Direct mount type) (1.5 m wide)</td><td>0.5 service days</td></tr><tr><td>Roll balers (1.0 m wide, 1.0 m tall)</td><td>0.1 service days</td></tr><tr><td>Rake (3.6 m wide)</td><td>0.1 service days</td></tr><tr><td>Beam sprayers (600 L, 12.3m Wide)</td><td>0.1 service days</td></tr><tr><td>Trucks (Load capacity 4.0 – 4.5 t)</td><td>0.3 service hours</td></tr><tr><td>Light oil</td><td>39.7L</td></tr><tr><td>Herbicide</td><td>5.0L</td></tr><tr><td>Water</td><td>0.6m^3</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per ha)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.17 worker-days</td></tr><tr><td>Drivers (ordinary decontamination)</td><td>1.1 worker-days</td></tr></table></td></tr>
<tr><td rowspan="3">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● The work shall be done in areas exceeding a certain size (more than 1,000 m^2) and where machinery has no risks of overturning.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Protective equipment such as dust masks shall be properly worn to protect against dust blown up from weeding and roll discharging.</td></tr>
<tr><td>General labor safety of workers</td><td>● Safety measures shall be taken for the work with heavy machinery (proper arrangement for preventing minor collisions of adjacently</td></tr>
</table>

		working heavy machinery, and adequate instructions and supervision, as well as thorough control for preventing access to the machinery)
	Measures to prevent secondary wastes	–
	Others	–

（2） Soil

1）Leveling of unevenness

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland”
Decontamination methods	Leveling of unevenness in rice fields and dry fields

<table>
<tr><td colspan="2">Outline</td><td>Unevenness of soil in rice fields and dry fields shall be leveled.</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Unevenness of surface soil shall be leveled by using vibratory rollers or the like.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 1,000 m²)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Vibratory rollers (Riding-type combined roller 3 t, Exhaust gas suppression type (primary))</td><td>1.25 service hours</td></tr><tr><td>Light oil</td><td>3.8 L</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 1,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.02 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>0.29 worker-days</td></tr></table></td></tr>
<tr><td rowspan="3">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Combined rollers shall not be used in flooded rice fields, because rollers sink in the fields and lose mobility
● Mobility of combined rollers shall be checked in advance.
● Basically no decontamination work shall be done during rain storms or in pooled water areas, because the surface layer of the arable land will be kneaded.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Dust masks, gloves, etc. shall be worn</td></tr>
<tr><td>General labor safety of workers</td><td>● No one other than the operation leader and the designated driver is allowed to enter the fields to level the unevenness with combined rollers.
● Existing access routes, if suitable, shall be used for entering the field for leveling the unevenness.
● If no access route is available, the combined</td></tr>
</table>

		roller shall enter the field slowly at a right angle to the ridge along the field. This is to avoid the roller overturning. ● If the slope of the entry route crossing the ridge along the field is too steep, a new entry route shall be constructed in order to prevent the roller from overturning. ● It shall be checked that no new big holes were made by wild bores or the like after weeds were removed and collected.
	Measures to prevent secondary wastes	−
	Others	−

2）Spreading surface solidifiers

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland”
Decontamination methods	Spreading surface solidifiers

Outline	Surface solidifiers shall be spread on the soil of rice fields and dry fields
Decontamination processes	● Solidifier solution shall be spread on the soil by using a seed scatterer or the like. The surface soil shall be checked as firmly solidified. ● The following conditions are assumed for surface soil solidification: the amount of solidifier 15 t/ha, the depth of solidification 2 – 3 cm, solidification time required 7 days (consecutive dry days). ● The water to prepare the solidifier solution (solvent) shall be checked in advance that no radioactive materials can be detected in it.
Tools, equipment and the like for decontamination work	(per 1,000 m²)

Tools, equipment to use	Quantity
Seeders (Riding-type , 1.0 m³)	2.14 service hours
Air compressors (25PS, 0.7 MPa, 2.5 m³/min)	0.36 service days
Crane truck (Load capacity 4 t, suspension weight 2.9 t)	3.25 service hours
Sprinkler truck (Tank capacity 3,800 L)	1.11 service hours
Light oil	36.9 L
Surface solidifier (neutral)	1.5 t

Workforce needed

(per 1,000 m²)

Workforce needed	Quantity
Operation leaders	0.26 worker-days
Specialized decontamination workers	0.62 worker-days
Decontamination workers	0.31 worker-days
Drivers (special decontamination)	0.56 worker-days
Drivers (ordinary decontamination)	0.22 worker-days

Idea	Prerequisites and	● No work shall be done in winter, as the

development, lessons, points to keep in mind, etc.	constraints regarding objects and locations to be decontaminated	solidifier does not work. ● Weather conditions affect the time required for solidification. ● No spreading of solidifier shall be allowed on water retaining spots.
	Radiation exposure protection of workers	● Safety glasses, dust masks, etc. shall be worn.
	General labor safety of workers	● The worker controlling the nozzle and the assistant must wear safety glasses to prevent solidifiers from entering the eyes. ● The nozzle shall be firmly held so as not to be whipped about by the hose pressure. ● After the hose is firmly held, the signal shall be given to start spreading of solidifiers. ● The moving parts of the seed scatterer shall be covered to prevent the operator from being caught in them.
	Measures to prevent secondary wastes	● The solidifiers shall be procured in flexible containers.
	Others	−

3）Scraping the surface soil

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland” “8.3.2. Soil” of “8.3. Grassland” in “8. Farmland”
Decontamination methods	Scraping of surface soil (standard transfer method)

Outline	Surface soil of rice fields, dry fields and grassland shall be scraped away (standard transfer method)
Decontamination processes	● The surface soil shall be scraped away by using backhoes or the like (to about 5 cm depth)
Tools, equipment and the like for decontamination work	When scraping the surface soil in big areas of more than 30a, (per 100 m^2) Tools, equipment to use: Backhoes (Crawler-type, exhaust gas suppression (primary), Bucket capacity 0.45 m^3 when heaped (0.35 m^3, when flatly filled)) — Quantity: 0.48 service hours Light oil — 5.3 L *This applies when topography and field conditions are relatively favorable and the area has about 30a in regular shape. ■When scraping the surface soil in small areas of less than 30a, (per 100 m^2) Tools, equipment to use: Backhoe (Crawler-type, exhaust gas suppression (primary), Bucket capacity 0.45 m^3 when heaped (0.35 m^3, when flatly filled)) — Quantity: 0.56 service hours Light oil — 6.2 L *This applies when the field conditions are not favorable, e.g., the field is not regular in shape.
Workforce needed	■When scraping the surface soil in big areas of more than 30a, (per 100 m^2) Workforce needed: Operation leaders — Quantity: 0.03 worker-days Decontamination workers — 0.18 worker-days

<table>
<tr><td colspan="2"></td><td>
<table>
<tr><td>Drivers (special decontamination)</td><td>0.08 worker-days</td></tr>
</table>
*This applies when topography and field conditions are relatively favorable and the area is about 30a in regular shape.

■When scraping the surface soil in small areas of less than 30a,
(per 100 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.09 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>0.26 worker-days</td></tr>
<tr><td>Driver (special decontamination)</td><td>0.09 worker-days</td></tr>
</table>
*This applies when the field conditions are not favorable, e.g., the field is not regular in shape.
</td></tr>
<tr><td rowspan="5">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● No work shall be done in flooded rice fields.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Masks, gloves, etc. shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● The working areas shall be marked with color cones, color cone bars, etc. for access control in order to prevent minor collisions between backhoes.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>－</td></tr>
<tr><td>Others</td><td>● Banners or the like shall indicate where aerial wires run above farm roads or farmland, and a traffic controller shall be arranged in order to prevent damaging aerial wires when passing under them.</td></tr>
</table>

4）Deep plowing

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland” “8.3.2. Soil” of “8.3. Grassland” in “8. Farmland”
Decontamination methods	Deep plowing

Outline		Soil in rice fields and grassland shall be plowed deeply
Decontamination processes		● The base mat shall be flattened by double plowing of surface soil by rotary tillers or the like.
Tools, equipment and the like for decontamination work		(per 10,000 m²) Tools, equipment to use: Quantity Farm tractors (Riding-type, wheel-type, four wheel driven 22kW-class (30PS): 26.0 service hours Light oil: 67.6 L
Workforce needed		(per 10,000 m²) Workforce needed: Quantity Drivers (ordinary decontamination): 5.0 worker-days
Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● No work shall be done in flooded rice fields where the tractors may not be operable. ● Mobility of wheel-type tractors shall be checked in advance.
	Radiation exposure protection of workers	● Masks, gloves, etc. shall be worn.
	General labor safety of workers	● No one other than the designated driver shall be allowed to enter the fields to plow deeply. ● Existing access routes, if suitable, shall be used for entering the fields. ● If no access route is available, the tractor shall enter the field slowly moving forward at a right angle to the ridge along the field. This is to avoid the tractor overturning. ● If the slope of the entry route crossing the ridge along the field is too steep, a new entry route shall be constructed in order to prevent the tractor from overturning. ● It shall be checked that no new big holes were made by wild bores or the like after weeds

		were removed and collected. ● Counter weights shall be attached to the tractor with a mounted rotary tiller, as appropriate, according to the instruction manual of the tractor when it enters or leaves the field (ascends or descends a ridge along the field), because the center of gravity of the tractor moves backward and the tractor is susceptible to overturning. ● A rotary tiller shall be mounted or demounted on a flat place such as a farm road with the tractor engine switched off. ● When doing maintenance on the rotary tiller, for example its cutting edges, not only the engine shall be switched off, but the rotary shall be locked and held from below by a table or the like to avoid its dropping suddenly.
	Measures to prevent secondary wastes	−
	Others	−

5）Deep tillage

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland” “8.3.2. Soil” of “8.3. Grassland” in “8. Farmland”
Decontamination methods	Deep tillage

<table>
<tr><td colspan="2">Outline</td><td>Surface soil of rice fields, dry fields and grassland shall be tilled deeply.</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● The fields shall be tilled twice (tillage depth of about 30 cm) by using a deep tilling rotary tiller.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 10,000 m²)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Farm tractors (Riding-type, wheel-type four wheel driven 52 - 59kw-class (70 - 80PS), 22kw-class (30PS)</td><td>4.3 service days</td></tr><tr><td>Light oil</td><td>60.0 L</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 10,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Drivers (ordinary decontamination)</td><td>4.0 worker-days</td></tr></table></td></tr>
<tr><td rowspan="3">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● The farmland where the soil was stirred by plowing after the accident shall be tilled in reverse or deeply.
● Deep tillage may damage the roots in orchards, tea plantations and other farmland where perennial produce is planted.
● If the ground below the tilling depth is rudaceous, precautions shall be taken, for example, to remove the gravel beforehand because the gravel may come up in the tilling layer by deep tillage.
● The underground water level shall be measured, if required, so necessary precautions may be taken in deep tilling.
● When the surface soil is frozen due to low temperatures, small-size tractors may not be sufficient for deep tilling.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Safety glasses, dust masks, rubber gloves, etc. shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● No one other than the designated driver shall be allowed to enter the fields to till deeply.</td></tr>
</table>

		● Existing access routes, if suitable, shall be used for entering fields. ● If no access route is available, the tractor shall enter the field slowly moving forward at a right angle to the ridge along the field. This is to avoid the tractor overturning. ● If the slope of the entry route crossing the ridge along the field is too steep, a new entry route shall be constructed in order to prevent the tractor from overturning. ● It shall be checked that no new big holes were made by wild bores or the like after weeds were removed and collected. ● Counter weights shall be attached to the tractor with a mounted rotary tiller, as appropriate, according to the instruction manual of the tractor when it enters or leaves the field (ascends or descends a ridge along the field), because the center of gravity of the tractor moves backward and the tractor is susceptible to overturning. ● A rotary tiller shall be mounted or demounted on a flat place such as a farm road with the tractor engine switched off. ● When doing maintenance on the rotary tiller, for example its cutting edges, not only the engine shall be switched off, but the rotary shall be locked and held from below by a table or the like to avoid its dropping suddenly.
	Measures to prevent secondary wastes	−
	Others	−

6）Soil replacement

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland” “8.3.2. Soil” of “8.3. Grassland” in “8. Farmland”
Decontamination methods	Soil replacement

Outline	Surface soil of rice fields, dry fields and the like shall be replaced with fresh soil in the following procedures. (i) Bringing in and spreading fresh soil (ii) Short transferring of fresh soil to narrow places and spreading. (iii) Compacting
Decontamination processes	● After scraping the soil off the surface, heavy machinery shall be used for replacing, spreading and leveling the fresh soil back to the original elevation. ● The MOE supervisory personnel shall be consulted for determining the quality of replacing fresh soil. ● Results of soil tests including grain sizes and radioactive material concentration measurement in the replacement fresh soil shall be reviewed and approved before use by the MOE supervisory personnel.
Tools, equipment and the like for decontamination work	(per 1,000 m^2)

Tools, equipment to use	Quantity
Shovels and the like	-
Backhoes (Crawler-type, exhaust gas suppression (secondary), Bucket capacity 0.28 m^3 when heaped (0.20m^3, when flatly filled))	1.1 service days
Vibratory rollers (Exhaust gas suppression (primary), combined type 3 – 4 t)	1.5 service days
Vibratory rollers (Exhaust gas suppression (primary), combined type 3 – 4 t)	0.4 service day
Dump trucks (Load capacity 2 t)	1.8 service days
Light oil	106.6 L
Fresh soil	55.5 m^3

<table>
<tr><td colspan="2">Workforce needed</td><td>(per 1,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.7 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>0.4 worker-days</td></tr><tr><td>Decontamination workers</td><td>4.7 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>2.6 worker-days</td></tr><tr><td>Drivers (ordinary decontamination)</td><td>1.5 worker-days</td></tr></table></td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Differences shall be noted between the surface soil stirred by plowing and that not plowed after the accident. Even if the radioactive concentration is equal, the air dose rate is higher above the unplowed soil which keeps the surface as it was.
● The soil replacement and other measures needed shall be implemented after decontamination, soil analysis and diagnosis.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Safety glasses, dust masks, rubber gloves, etc. shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● Existing access routes, if suitable, shall be used for entering the fields.
● If no access route is available, the heavy machinery shall enter the field slowly moving forward at a right angle to the ridge along the field. This is to avoid the heavy machinery overturning.
● If the slope of the entry route crossing the ridge along the field is too steep, a new entry route shall be constructed in order to prevent the heavy machinery from overturning.
● It shall be checked that no new big holes were made by wild bores or the like by which the heavy machinery might be overturned.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>−</td></tr>
<tr><td></td><td>Others</td><td>−</td></tr>
</table>

7）Restoration of soil fertility

Locations to be decontaminated	"8.1.2. Soil" of "8.1. Rice fields" in "8. Farmland" "8.2.2. Soil" of "8.2. Dry fields" in "8. Farmland" "8.3.2. Soil" of "8.3. Grassland" in "8. Farmland"
Decontamination methods	Restoration of soil fertility

Outline	Soil fertility of rice fields, dry fields and grassland shall be restored by spreading soil conditioners or zeolite.
Decontamination processes	● Soil conditioners shall be sprayed by a sprinkler mounted on a tractor. ● Soil conditioners shall be those reported to the Governor of Fukushima Prefecture as special fertilizers pursuant to the Fertilizer Control Law (Law No. 127, 1950) and those which can increase soil fertility by integrated improvement of physicochemical and biological properties of the soil. ● The soil conditioners shall be approved by the supervisory MOE personnel in advance through test results. ● Zeolite may be used in place of the soil conditioners.
Tools, equipment and the like for decontamination work	■ When spraying soil conditioners, (per 10,000 m^2) Tools, equipment to use / Quantity Construction tractors (Ordinary type, load capacity 9 t) / 1.1 service hours Lime spreaders [138] (Towing capacity 800 L, spray span 3 m class) / 1.1 service hours Light oil / 13.0 L Soil conditioner (calcium carbonate) / Depending on soil properties Soil conditioner (potassium silicate) / 0.8 t *Machinery for spraying soil conditioners ■ When spraying zeolite, (per 1,000 m^2) Tools, equipment to use / Quantity Farm tractor (Crawler-type, 40PS) / 0.56 service hours

[138] Machines for dispersion of fertilizer and soil improving agent

<table>
<tr><td colspan="2"></td><td>
<table>
<tr><td>Lime spreaders (Spray span 1.8 m class)</td><td>0.1 service days</td></tr>
<tr><td>Light oil</td><td>4.3 L</td></tr>
<tr><td>Zeolite</td><td>0.5 t</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Workforce needed</td><td>■ When spraying soil conditioners,
(per 10,000 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.2 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>0.77 worker-days</td></tr>
<tr><td>Drivers (special decontamination)</td><td>0.17 worker-days</td></tr>
</table>
■ When spraying zeolite,
(per 1,000 m²)
<table>
<tr><th>Workforce needed</th><th>Quantity</th></tr>
<tr><td>Operation leaders</td><td>0.15 worker-days</td></tr>
<tr><td>Specialized decontamination workers</td><td>0.09 worker-days</td></tr>
</table>
</td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Upon completion of decontamination and analysis, the amount of soil conditioners or zeolite shall be determined.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Safety glasses, dust masks, rubber gloves, etc. shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● Existing access routes, if suitable, shall be used for entering the farmland.
● If no access route is available, the heavy machinery shall enter the field slowly moving forward at a right angle to the ridge along the field.
● If the slope of the entry route crossing the ridge along the field is too steep, a new entry route shall be constructed in order to prevent the heavy machinery from overturning.
● It shall be checked that no new big holes were made by wild bores or the like by which the heavy machinery might be overturned.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>−</td></tr>
<tr><td></td><td>Others</td><td>−</td></tr>
</table>

（3） Waterways

1）Removal of bottom sediment (soil suctioning)

Locations to be decontaminated	“8.4.1. Waterways” of “8.4. Waterways” in “8. Farmland”
Decontamination methods	Removal of bottom sediment (soil suctioning) from waterways in farmland

Outline		Bottom sediment in waterways of farmland shall be removed (soil suctioning)
Decontamination processes		● Sediment easily removable such as fallen leaves, moss, mud, etc. shall be removed by using shovels and the like.
Tools, equipment and the like for decontamination work		Tools, equipment to use: Shovels and the like — Quantity: -
Workforce needed		(per 10 m^3) Operation leaders: 0.21 worker-days Decontamination workers: 8.37 worker-days
Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● Most work for removing bottom sediment in waterways of farmland is done in narrow spaces and shall be done by hand. The bottom sediment collected shall be immediately packed in small bags nearby and transferred by hand. The small bags shall be such that hand-carry belts may be used for easy transfer in bad footing spaces (570×530×H550). ● If the waterway has flow, the working zone shall be dammed upstream and downstream to block the flow. A hand-carry water-immersed pump (2B, discharge amount 0.1 – 0.12 m^3/min) shall be used so that the removal work can be done in no-flow conditions.
	Radiation exposure protection of workers	● The air dose rate in working areas shall be clearly indicated to the workers. ● The air dose rate in the working areas for decontamination shall be measured in advance, and if the dose rate is high, the area shall be so indicated by using color cones, color cone bars and the like.

		● Daily and accumulated exposure doses of individual workers shall be indicated in an easily understandable way and kept under control. ● Unnecessary access to places with large packed sandbags shall be restricted because of their high dose rate risk. ● Protective equipment such as disposable masks, rubber gloves, etc. shall be disposed of at the pre-designated spots when the work is finished.
	General labor safety of workers	● Protective equipment (masks, gloves and the like) shall be appropriately worn. ● Special attention shall be paid to footwear of workers transferring packed bags and the like, since the waterways in farmland are muddy and there are slopes or ridges along fields where workers may slip.
	Measures to prevent secondary wastes	−
	Others	● When leaving the working areas, contamination on body surfaces shall be checked as lower than 1,300 cpm by screening, which is stricter than the allowable limit of 13,000 cpm.

2）Removal and the like of bottom sediment (Packing)

Locations to be decontaminated	"8.4.1. Waterways" of "8.4. Waterways" in "8. Farmland"
Decontamination methods	Removal of bottom sediment in waterways of farmland (Packing)

<table>
<tr><td colspan="2">Outline</td><td>Bottom sediment in waterways in farmland shall be removed (and packed).</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Bottom sediment collected shall be packed in large sandbags by hand.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td><table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Large sandbags</td><td>-</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 10 bags)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.11 worker-days</td></tr><tr><td>Decontamination workers</td><td>1.68 worker-days</td></tr></table></td></tr>
<tr><td rowspan="2">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Large sandbags may lose their shape, when being packed with collected sediment, due to difficulty of uniform filling. For shape keeping and easy packing, large sandbags shall be filled on a dedicated table.
● Bottom sediment has high water content. In order to prevent contaminated water from leaking, an inner bag shall be placed in the large sandbags, or water-proof flexible containers shall be used.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● The air dose rate in working areas shall be clearly indicated to the workers.
● The air dose rate in the area for decontamination shall be measured in advance, and if the dose rate is high, the area shall be so indicated by using color cones, color cone bars and the like.
● Daily and accumulated exposure doses of individual workers shall be indicated in an easily understandable way and kept under control.
● Whenever sand or the like is attached (deposited) on workers' clothing or protective equipment, sand or the like shall be wiped away immediately in order to prevent contamination from spreading.
● Unnecessary access to places with large</td></tr>
</table>

		packed sandbags shall be restricted because of their high dose rate risk. ● Protective equipment such as disposable masks, rubber gloves, etc. shall be disposed of at the pre-designated spots when the work is finished.
	General labor safety of workers	● Protective equipment (masks, gloves and the like) shall be appropriately worn. ● Special attention shall be paid to footwear of workers transferring packed bags and the like, since the waterways in farmland are muddy and there are slopes or ridges along fields where workers may slip. ● Safety systems and equipment shall be checked before commencing the day's work. ● When using backhoes for packing, access to the rotating range shall be prohibited in order to prevent minor collisions.
	Measures to prevent secondary wastes	−
	Others	● When leaving the working areas, contamination on body surfaces shall be checked as lower than 1,300 cpm by screening, which is stricter than the allowable limit of 13,000 cpm.

（4） Others

1）Packing (standard transfer process)

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland” “8.3.2. Soil” of “8.3. Grassland” in “8. Farmland”
Decontamination methods	Packing (standard transfer process)

<table>
<tr><td colspan="2">Outline</td><td>Soil removed from rice fields, dry fields or grassland in farmland shall be packed for transfer (standard transfer process)</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● The soil removed shall be collected and packed in large sandbags by using backhoes or the like.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 10 bags)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Backhoes (Exhaust gas suppression (primary), crawler type, Bucket capacity 0.45 m^3 when heaped up, 0.35 m^3 when flatly filled)</td><td>1.42 service hours</td></tr><tr><td>Light oil</td><td>16.0 L</td></tr><tr><td>Large sandbags</td><td>-</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 10 bags)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.06 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>0.21 worker-days</td></tr><tr><td>Decontamination workers</td><td>0.24 worker-days</td></tr><tr><td>Driver (special decontamination)</td><td>0.23 worker-days</td></tr></table></td></tr>
<tr><td rowspan="3">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Special attachments shall be fabricated for packing into large sandbags.
● Lined up heights of large sandbags after being filled shall be leveled.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Safety glasses, dust masks, gloves, etc. shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● The work proceeds next to heavy machinery. The working range of the heavy machinery shall be clearly indicated and supervising personnel shall be arranged.</td></tr>
</table>

		● Safety education shall be provided to the workers on nearby parallel work with heavy machinery.
	Measures to prevent secondary wastes	● Twigs, protrusions or the like in the sediment collected shall be removed before being packed in large sandbags to prevent bag breaks.
	Others	−

2）Small transfer within the working fields (standard transfer process)

Locations to be decontaminated	“8.1.2. Soil” of “8.1. Rice fields” in “8. Farmland” “8.2.2. Soil” of “8.2. Dry fields” in “8. Farmland” “8.3.2. Soil” of “8.3. Grassland” in “8. Farmland”
Decontamination methods	Small transfer (standard transfer process)

<table>
<tr><td colspan="2">Outline</td><td>Contaminated soil removed from farmland (rice fields, dry fields and grassland) shall be transferred short distances in small amounts (standard transfer process) within the working fields.</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Crane backhoes, rough terrain haulers or the like shall be used for small and short transfers in the working fields (loading, unloading)</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 10 bags)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Crane backhoes (Exhaust gas suppression (primary), crawler type, Bucket capacity 0.28 m³ when heaped up (0.25 m³ when flatly filled))</td><td>1.3 service hours</td></tr><tr><td>Crane backhoes (Exhaust gas suppression (primary), crawler type, Bucket capacity 0.45 m³ when heaped up (0.35 m³ when flatly filled))</td><td>0.28 service hours</td></tr><tr><td>Rough terrain haulers (Exhaust gas suppression (primary), crawler type, load capacity 4 t)</td><td>0.18 service days</td></tr><tr><td>Light oil</td><td>31.5 L</td></tr></table>* per short transfer distance L=100 m (round trip)</td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 10 Bags)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.06 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>0.23 worker-days</td></tr><tr><td>Drivers (special decontamination)</td><td>0.44 worker-days</td></tr></table>* per short transfer distance L=100 m (round trip)</td></tr>
<tr><td>Idea development,</td><td>Prerequisites and constraints regarding</td><td>● Transfer paths easily get muddy in rain. Iron sheets or the like shall be needed to cover the</td></tr>
</table>

lessons, points to keep in mind, etc.	objects and locations to be decontaminated	muddy paths used for transfer.
	Radiation exposure protection of workers	● Safety glasses, dust masks, gloves, etc. shall be worn.
	General labor safety of workers	● Clear indication of transfer paths. ● The work proceeds next to heavy machinery or vehicles. The working range of the heavy machinery shall be clearly indicated and supervising personnel shall be arranged. ● Safety education shall be provided to the workers on nearby parallel work with heavy machinery and vehicles.
	Measures to prevent secondary wastes	−
	Others	−

6.1.4. Grassland, Lawns

1）Cutting down shrubs (dense)

Locations to be decontaminated	"9.1.1. Shrubs (dense)" of "9.1. Shrubs (dense)" in "9. Grassland, lawns"
Decontamination methods	Cutting down shrubs (dense)

<table>
<tr><td colspan="2">Outline</td><td>Shrubs (dense) in grassland and lawns shall be cut down in the following procedures.
(i) Cutting down shrubs
(ii) Small amount and short distance transfer in the working fields
(iii) Packing of cut shrubs</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Large weeds, shrubs and the like shall be cut down by chainsaws and the like and be packed in large sandbags.
● Cut shrubs and the like too large to pack in large sandbags shall be chopped into packable sizes, or cut in about 2 m long pieces after removing leaves with a hatchet and tied using strings or the like in about 30 cm diameter bundles. The removed leaves shall be packed in large sandbags.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 1,000 m²)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Cutters (Chainsaw, edge 600 mm long (80 cc))</td><td>13.3 service days</td></tr><tr><td>Gasoline</td><td>16.8 L</td></tr><tr><td>Large sandbags</td><td>-</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 1,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>3.6 worker-days</td></tr><tr><td>Specialized decontamination workers</td><td>5.3 worker-days</td></tr><tr><td>Decontamination workers</td><td>16.7 worker-days</td></tr></table></td></tr>
<tr><td>Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● The geometry of grassland and lawns is diverse. Depending on the work site situation, the spot for packing into large sandbags, transfer paths, loading stations, etc. shall be chosen and designated. Flat spaces shall be chosen for packing and temporary storage in order to ensure working safety.
● Worker safety shall be ensured before</td></tr>
</table>

		starting cutting by designating safe working and transfer paths. ● Basically chainsaws shall be used for cutting in dense shrub areas. Shrubs cut down shall be pruned to carriable sizes and be carried out for collection after removing branches. ● When cutting down tall bamboo trees, the cut bamboo may be impediments to working. The cut bamboo trees shall be carried out as they are and be pruned elsewhere. ● When packing, branches or the like may damage the large sandbags. To prevent sandbags being damaged, shrubs shall be cut so that no sharp cut ends are left. ● Large sandbags may lose shape, when being packed with collected cut materials, due to difficulty of uniform filling. For shape keeping and easy packing, the large sandbags shall be filled on a dedicated table.
	Radiation exposure protection of workers	● The air dose rate in working areas shall be clearly indicated to the workers. ● The air dose rate in the area for decontamination shall be measured in advance, and if the dose rate is high, the area shall be indicated by using color cones, color cone bars and the like. ● Daily and accumulated exposure doses of individual workers shall be indicated in an easily understandable way and kept under control. ● When collecting cut branches and leaves, rakes or the like shall be used in order to prevent direct handling to the extent possible. ● Unnecessary access to places with large packed sandbags shall be restricted because of their high dose rate risk. ● Protective equipment such as disposable masks, rubber gloves, etc. shall be disposed of at the pre-designated spots when the work is finished.
	General labor safety of workers	● Protective equipment (masks, gloves and the like) shall be appropriately worn. ● Safety systems and equipment shall be checked before commencing the day's work. ● When using backhoes for packing, the access to the rotating range shall be prohibited in order to prevent minor collisions. ● Safety glasses shall be properly worn, when packing, to prevent branches from poking the eyes.

		● When cutting, flying stones or rotating edges may hurt nearby workers. To prevent the, the working zones shall be set apart with an interval of about 10 to 15 m, and the work shall be done under a foreman's supervision. ● When working on vibratory machines such as chain saws and weed cutters, a rest of more than 5 min shall be taken each 30 min in order to prevent vibration hazard. ● When working with hatchets for cutting, a suitable distance shall be kept from neighboring workers.
	Measures to prevent secondary wastes	−
	Others	● When leaving the working areas, contamination on body surfaces shall be checked as lower than 1,300 cpm by screening, which is stricter than the allowable limit of 13,000 cpm.

2）Cutting down shrubs (sparse)

Locations to be decontaminated	"9.2.1. Shrubs (sparse)" of "9.1. Shrubs (sparse)" in "9. Grassland, lawns"
Decontamination methods	Cutting down shrubs (sparse) in grassland, lawns

Outline		Shrubs (sparse) in grassland and lawns shall be cut in the following procedures. (i) Cutting down shrubs (ii) Small amount and short distance transfer in the working fields (iii) Packing cut shrubs
Decontamination processes		● Weeds, shrubs and the like shall be cut down by shoulder-type mowers and the like and be packed in large sandbags.
Tools, equipment and the like for decontamination work		(per 1,000 m²) Tools, equipment to use: Quantity Mowers (Shoulder-type, cutter 255 mm, 1.3 kW class): 2.0 service days Gasoline: 5.7L Large sandbags: -
Workforce needed		(per 1,000 m²) Workforce needed: Quantity Operation leaders: 3.1 worker-days Specialized decontamination workers: 1.1 worker-days Decontamination workers: 7.0 worker-days
Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● The geometry of grassland and lawns is diverse. Depending on the field situation, the spot for packing into large sandbags, transfer paths, loading stations, etc. shall be chosen and designated. Flat spaces shall be chosen for packing and temporary storage in order to ensure working safety. ● Work safety shall be ensured before starting cutting by designating safe working and transfer paths. ● Shoulder-type mowers shall be used for cutting in sparse shrub areas. Too large shrubs to cut by mowers shall be cut by chainsaws. ● When cutting down tall bamboo trees, the cut bamboo may be impediments to working. The

		cut bamboo trees shall be carried out as they are and be pruned elsewhere. ● When packing, branches or the like may damage the large sandbags. To prevent this, shrubs shall be cut so that no sharp cut ends are left. ● Large sandbags may lose their shape, when being packed with collected scrubs, due to difficulty of uniform filling. For shape keeping and easy packing, the large sandbags shall be filled on a dedicated table.
	Radiation exposure protection of workers	● The air dose rate in working areas shall be clearly indicated to the workers. ● The air dose rate in the area for decontamination shall be measured in advance, and if the dose rate is high, the areas shall be so indicated by using color cones, color cone bars and the like. ● Daily and accumulated exposure doses of individual workers shall be indicated in an easily understandable way and kept under control. ● When collecting cut branches and leaves, rakes or the like shall be used in order to prevent direct handling to the extent possible. ● Unnecessary access to places with large packed sandbags shall be restricted because of their high dose rate risk. ● Protective equipment such as disposable masks, rubber gloves, etc. shall be disposed of at the pre-designated spots when the work is finished.
	General labor safety of workers	● Protective equipment (masks, gloves and the like) shall be appropriately worn. ● Safety systems and equipment shall be checked before commencing the day's work. ● When using backhoes for packing, the access to the rotating range shall be prohibited in order to prevent minor collisions. ● Safety glasses shall be properly worn, when packing, to prevent branches from poking the eyes. ● When cutting, flying stones or rotating edges may hurt nearby workers. To prevent this, the working zones shall be set apart with an interval of about 10 to 15 m, and the work shall be done under a foreman's supervision. ● When working on vibratory machines such as mowers and weed cutters, a rest of more than 5 min shall be taken each 30 min in order to prevent vibration hazard.

		● When working with hatchets for cutting, a suitable distance shall be kept from neighboring workers.
	Measures to prevent secondary wastes	−
	Others	● When leaving the working areas, contamination on body surfaces shall be checked as lower than 1,300 cpm by screening, which is stricter than the allowable limit of 13,000 cpm.

6.1.5. Forests

（1） Items common to the forests with mixed trees of coniferous evergreen trees, deciduous broad-leaf trees and others

1）Removal of sediment (organic materials)

Locations to be decontaminated	“11.1.1. Sediment (organic materials)” of “11.1. Coniferous evergreen trees” in “11. Forests” “11.2.1. Sediment (organic materials)” of “11.2. Deciduous broad-leaf trees” in “11. Forests” “11.3.1. Sediment (organic materials)” of “11.3. Forests with mixed trees” in “11. Forests”
Decontamination methods	Removal of Sediment (organic materials)

Outline	Sediment (organic materials) of forests (coniferous evergreen trees, deciduous broad-leaf trees, other mixed trees, etc.) shall be removed in the following procedures. (i) Removing organic materials such as fallen leaves (ii) Small and short transfer in working fields (iii) Packing removed organic materials
Decontamination processes	● Fallen leaves, fallen branches and the like in a layer about 5 cm deep from the surface shall be collected and carried by rakes or the like to the bottom edge of slopes and be packed in large sandbags. The removal should not be as deep as to reach the mineral soil layer. ● Fallen branches or the like too big to pack in large sandbags as they are shall be chopped into packable sizes, or cut into about 2 m long pieces and bundled using strings or the like in about 30 cm diameter bundles.
Tools, equipment and the like for decontamination work	Tools, equipment to use: Quantity Rakes or the like: - Large sandbags: -
Workforce needed	■ ■ When working on cedar trees among coniferous evergreen trees, (per 10,000 m²) Workforce needed: Quantity Operation leader: 21.1 worker-days Decontamination workers (for removing organic materials): 86.1 worker-days Decontamination workers (small transfer): 31.6 worker-days

Decontamination workers (packing into large sandbags)	22.8 worker-days

■ When working on Japanese cypress among coniferous evergreen trees

(per 10,000 m²)

Workforce needed	Quantity
Operation leaders	15.6 worker-days
Decontamination workers (for removing organic materials)	57.4 worker-days
Decontamination workers (small transfer)	31.6 worker-days
Decontamination workers (packing into large sandbags)	15.2 worker-days

■ When working on Japanese red pine and the like among coniferous evergreen trees, and other mixed trees,

(per 10,000 m²)

Workforce needed	Quantity
Operation leaders	20.5 worker-days
Decontamination workers (for removing organic materials)	83.2 worker-days
Decontamination workers (small transfer)	31.6 worker-days
Decontamination workers (packing into large sandbags)	22.0 worker-days

■ When working on Japanese emperor oak and the like among coniferous evergreen trees,

(per 10,000 m²)

Workforce needed	Quantity
Operation leaders	21.5 worker-days
Decontamination workers (for removing organic materials)	88.1 worker-days
Decontamination workers (small transfer)	31.6 worker-days
Decontamination workers (packing into large sandbags)	23.3 worker-days

Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● Safety measures are occasionally difficult to take on steep slopes and the like. In such cases, decontamination work has been implemented, upon consultation with the ordering party, for individual working areas (for example, 2 m from the top of slopes or 2 m from the bottom of slopes).
	Radiation exposure protection of workers	● Safety glasses, masks and gloves shall be worn.

	General labor safety of workers	● In case general safety measures are insufficient to secure working safety, for example, on steep slopes, safety measures shall be strengthened depending on individual working conditions. ● Where risks of falling down or sliding down are present, safety measures shall be needed, for instance, installing fixed ropes and using fall arresting devices. ● If there are roads along the forest edge, barricades and traffic controllers shall be arranged.
	Measures to prevent secondary wastes	−
	Others	● As a preparatory measure for small transfer, workers shall be instructed to carry small empty sandbags when collecting organic materials.

2）Removal of Sediment (organic materials) (non-control areas)

Locations to be decontaminated	"11.1.1. Sediment (organic materials)" of "11.1. Coniferous evergreen trees" in "11. Forests" "11.2.1. Sediment (organic materials)" of "11.2. Deciduous broad-leaf trees" in "11. Forests" "11.3.1. Sediment (organic materials)" of "11.3. Forests with mixed trees" in "11. Forests"
Decontamination methods	Removal of Sediment (organic materials) (non-control areas)

Outline	Sediment (organic materials) of forests (coniferous evergreen trees, deciduous broad-leaf trees, forests with mixed trees, etc.) in non-control areas shall be removed in the following procedures. (i) Removing organic materials such as fallen leaves (ii) Small amount and short-distance transfer in working fields (iii) Packing removed organic materials
Decontamination processes	● Fallen leaves, fallen branches and the like in a layer about 10 cm deep from the surface shall be collected and carried using rakes or the like to the bottom edge of slopes and be packed in large sandbags. The removal should not be so deep as to reach the mineral soil layer. ● Fallen branches or the like too large to pack in large sandbags shall be chopped into packable sizes, or cut in about 2 m long pieces and bundled using strings or the like in about 30 cm diameter bundles
Tools, equipment and the like for decontamination work	Tools, equipment to use: Quantity Rakes or the like: - Large sandbags: -
Workforce needed	(per 10,000 m²) Workforce needed: Quantity Operation leaders: 28.2 worker-days Decontamination workers (for removing organic materials): 133.3 worker-days Decontamination workers (small transfer): 31.6 worker-days Decontamination workers (packing into large sandbags): 22.8 worker-days *This applies when the organic material layer

		thickness exceeds 10 cm, irrespective of the tree types.
Idea development, lessons, points to keep in mind, etc.	Prerequisites and constraints regarding objects and locations to be decontaminated	● Safety measures are occasionally difficult to take on steep slopes and the like. In such cases, decontamination work has been implemented, upon consultation with the ordering party, for individual working areas (for example, 2 m from the top of slopes or 2 m from the bottom of slopes).
	Radiation exposure protection of workers	● Safety glasses, masks and gloves shall be worn.
	General labor safety of workers	● In case general safety measures are insufficient to secure working safety, for example, on steep slopes, safety measures shall be strengthened depending on individual working conditions. ● Where risks of falling down or sliding down are present, safety measures shall be needed, for instance, installing fixed ropes and using fall arresting devices. ● If there are roads along the forest edge, barricades and traffic controllers shall be arranged.
	Measures to prevent secondary wastes	−
	Others	● As a preparatory measure for small transfer, workers shall be instructed to carry small empty sandbags when collecting sediment.

3）Prevention of secondary dispersion of contaminated soil (lining up of sandbags)

Locations to be decontaminated	"11.1.2. Soil" of "11.1. Coniferous evergreen trees" in "11. Forests" "11.2.2. Soil" of "11.2. Deciduous broad-leaf trees" in "11. Forests" "11.3.2. Soil" of "11.3. Forests with mixed trees" in "11. Forests"
Decontamination methods	Prevention of secondary dispersion of contaminated soil (lining up of sandbags)

<table>
<tr><td colspan="2">Outline</td><td>Secondary dispersion of contaminated soil in forests (coniferous evergreen trees, deciduous broad-leaf trees, other mixed trees, etc.) shall be prevented by lining up sandbags.</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● When removing fallen leaves from steep slopes, sandbags shall be lined up at the forest edges in order to prevent soil from being eroded.
● Sandbags shall be lined up with their small tied end in front unless otherwise instructed.
● Sandbags of 48cm x 62cm (No. 2) shall be used and when packed shall measure approximately about 50cm x 40cm x 10cm.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 50 spots)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Shovels and the like</td><td>-</td></tr><tr><td>Sandbags (jute, 48 x 62 cm)</td><td>200 bags</td></tr><tr><td>mountain sand</td><td>4.0 m^3</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 50 spots)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>0.2 worker-days</td></tr><tr><td>Decontamination workers</td><td>1.5 worker-days</td></tr></table></td></tr>
<tr><td rowspan="3">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Sandbags shall be lined up at the forest edge in order to prevent soil from eroding, when organic materials such as fallen leaves are removed from steep slopes in forests, or when soil erosion by rainfall is possible after the removal of sediment organic materials</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Dust masks, rubber gloves and the like shall be worn.</td></tr>
<tr><td>General labor safety of workers</td><td>● Protective measures shall be taken to prevent sliding down, such as fixed ropes, safety belts and sliding devices on fixed ropes.</td></tr>
</table>

	Measures to prevent secondary wastes	−
	Others	−

4）Cutting down underbrush and shrubs

Locations to be decontaminated	"11.1.4. Underbrush cutting" of "11.1. Coniferous evergreen trees" in "11. Forests" "11.2.4. Underbrush cutting" of "11.2. Deciduous broad-leaf trees" in "11. Forests" "11.3.4. Underbrush cutting" of "11.3. Forests with mixed trees" in "11. Forests"
Decontamination methods	Cutting down underbrush and shrubs

Outline	Underbrush and shrubs in forests (coniferous evergreen trees, deciduous broad-leaf trees, other mixed trees, etc.) shall be cut down.
Decontamination processes	● Underbrush and shrubs shall be cut down by using shoulder-type mowers and the like. The cut materials shall be collected at the forest edge and packed in large sandbags. ● Pieces too big to pack in large sandbags as they are shall be chopped into packable sizes, or cut into less than 2 m long pieces and tied using strings or the like in about 30 cm diameter bundles. The bundles shall be collected and piled up at the forest edge for subsequent processes (transfer to volume reduction facilities or volume reduction by wood crushers).
Tools, equipment and the like for decontamination work	<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Sandbags</td><td>-</td></tr></table>
Workforce needed	■ When the objects to be cut down are sparsely distributed, less than 17,000 pieces/ha (good visibility in the forests and easy to walk around), (per 10,000 m^2) <table><tr><th rowspan="2">Workforce needed</th><th colspan="3">Quantity</th></tr><tr><th>Slope 0 to 20°</th><th>Slope 21 to 30°</th><th>Slope > 31°</th></tr><tr><td>Operation leaders</td><td>1.1 worker-days</td><td>1.2 worker-days</td><td>1.3 worker-days</td></tr><tr><td>Decontamination workers</td><td>7.1 worker-days</td><td>7.7 worker-days</td><td>8.6 worker-days</td></tr></table>

<table>
<tr><td colspan="2"></td><td>
■ When the objects to be cut down are intermediate in distribution, between 17,000 and 28,000 pieces/ha,
(per 10,000 m²)
<table>
<tr><th rowspan="2">Workforce needed</th><th colspan="3">Quantity</th></tr>
<tr><th>Slope
0 to 20°</th><th>Slope
21to 30°</th><th>Slope
> 31°</th></tr>
<tr><td>Operation leaders</td><td>1.5 worker-days</td><td>1.6 worker-days</td><td>1.6 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>10.0 worker-days</td><td>10.4 worker-days</td><td>10.9 worker-days</td></tr>
</table>
■ When the objects to weed are densely distributed, more than 28,000 pieces/ha (lots of underbrush, poor visibility in the forests and hard to walk around),
(per 10,000 m²)
<table>
<tr><th rowspan="2">Workforce needed</th><th colspan="3">Quantity</th></tr>
<tr><th>Slope
0 to 20°</th><th>Slope
21 to 30°</th><th>Slope
> 31°</th></tr>
<tr><td>Operation leaders</td><td>1.9 worker-days</td><td>2.1 worker-days</td><td>2.2 worker-days</td></tr>
<tr><td>Decontamination workers</td><td>12.9 worker-days</td><td>13.7 worker-days</td><td>14.5 worker-days</td></tr>
</table>
</td></tr>
<tr><td rowspan="5">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● This work is to improve visibility at the bases of trees in forests.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Dust masks, rubber gloves and the like shall be worn.
● The underbrush and shrubs are likely to have grown after the accident. The spot to place the cut materials collected shall be chosen carefully, because the air dose rate may increase after the cutting work</td></tr>
<tr><td>General labor safety of workers</td><td>● The mower edge may be hidden in the underbrush during cutting. Due attention shall be paid to the feet so as not to get cuts or injuries from the blade edges</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>－</td></tr>
<tr><td>Others</td><td>－</td></tr>
</table>

5）Removal of residual sediment (organic material)

Locations to be decontaminated	"11.1.5. Removal of residual sediment (organic materials)" of "11.1. Coniferous evergreen trees" in "11. Forests" "11.2.5. Removal of residual sediment (organic materials)" of "11.2. Deciduous broad-leaf trees" in "11. Forests" "11.3.5. Removal of residual sediment (organic materials)" of "11.3. Forests with mixed trees" in "11. Forests"
Decontamination methods	Removal of residual leaf litter and woody materials (organic materials)

<table>
<tr><td colspan="2">Outline</td><td>Residual sediment (organic materials) in forests (coniferous evergreen trees, deciduous broad-leaf trees, other mixed trees, etc.) shall be removed.</td></tr>
<tr><td colspan="2">Decontamination processes</td><td>● Where residual organic materials are left behind after removal work, they shall be collected by rakes or the like and be packed in large sandbags after being transferred to the bottom of the slope.
● The removal of residual organic materials should not be so deep as to reach the mineral soil layer, the same as in removing the organic materials originally.</td></tr>
<tr><td colspan="2">Tools, equipment and the like for decontamination work</td><td>(per 10,000 m²)<table><tr><th>Tools, equipment to use</th><th>Quantity</th></tr><tr><td>Rakes or the like</td><td>-</td></tr><tr><td>Large sandbags</td><td>-</td></tr></table></td></tr>
<tr><td colspan="2">Workforce needed</td><td>(per 10,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>3.6 worker-days</td></tr><tr><td>Decontamination workers</td><td>24.0 worker-days</td></tr></table></td></tr>
<tr><td rowspan="2">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● Exposed roots of trees and low areas on the slopes may induce surface water streams, causing deterioration of forests. Prior to commencing the work of removing organic materials, the forest manager and supervisory personnel shall be closely consulted on designating the area of work.</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Dust masks, rubber gloves and the like shall be worn.
● Precautions shall be taken to prevent inhaling fine organic materials scattered when the residue is being collected</td></tr>
</table>

	General labor safety of workers	● Safety measures shall be taken for the work with heavy machinery (proper arrangement for preventing minor collisions of adjacently working heavy machinery, and adequate instructions and supervision, as well as thorough control for preventing access to the machinery)
	Measures to prevent secondary wastes	−
	Others	−

（2） Coniferous evergreen trees

1）Pruning coniferous trees and collecting pruned branches

Locations to be decontaminated	“11.1.3. Trees” of “11.1. Coniferous evergreen trees” in “11. Forests”
Decontamination methods	Pruning coniferous trees and collecting pruned branches

Outline	Coniferous evergreen trees in the forests shall be pruned and the pruned branches shall be collected in the following procedure. (i) Pruning (ii) Collecting pruned branches
Decontamination processes	● Branches of living coniferous evergreen trees (cedar, Japanese cypress, and the like) of more than 3 year old class shall be cut off using saws or the like up to the height of about 4 m from the ground, if they stand within about 5 m from the forest edge (about 1 or 2 rows). But the tree canopies of more than half of their original size shall be left. If branches and leaves of living trees considerably hang above buildings, they shall be cut off using saws and the like. ● Branches too long to pack in large sandbags as they are shall be chopped into packable sizes, or cut into less than 2 m long pieces and tied using strings or the like in about 30 cm diameter bundles. The bundles shall be collected and piled up at the forest edge for subsequent processes (transfer to volume reduction facilities or volume reduction by wood crushers).
Tools, equipment and the like for decontamination work	Tools, equipment to use: Saws or the like (Quantity: -); Large sandbags (Quantity: -)
Workforce needed	■ ■When cutting cedars, (per 10,000 m²) Operation leaders: 16.1 worker-days Decontamination workers (for pruning): 77.5 worker-days Decontamination workers (for bundling): 29.7 worker-days *In cases pruned branches and fallen leaves are bundled and transferred to the bottom of slopes.

<table>
<tr><td colspan="2"></td><td>■ When cutting Japanese cypress,
(per 10,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>19.4 worker-days</td></tr><tr><td>Decontamination workers (for pruning)</td><td>99.3 worker-days</td></tr><tr><td>Decontamination workers (for bundling)</td><td>29.7 worker-days</td></tr></table>*In cases pruned branches and fallen leaves are bundled and transferred to the bottom of slopes.

■ When cutting Japanese red pine and the like,
(per 10,000 m²)<table><tr><th>Workforce needed</th><th>Quantity</th></tr><tr><td>Operation leaders</td><td>16.9 worker-days</td></tr><tr><td>Decontamination workers (for pruning)</td><td>99.3 worker-days</td></tr><tr><td>Decontamination workers (for bundling)</td><td>13.2 worker-days</td></tr></table>*In cases pruned branches and fallen leaves are bundled and transferred to the bottom of slopes.</td></tr>
<tr><td rowspan="4">Idea development, lessons, points to keep in mind, etc.</td><td>Prerequisites and constraints regarding objects and locations to be decontaminated</td><td>● This method may be applied to windbreak trees around housing areas</td></tr>
<tr><td>Radiation exposure protection of workers</td><td>● Dust masks, rubber gloves and the like shall be worn.
● At the top of untreated trees, radioactive materials are likely to have attached. Maximum attention shall be paid not to touch materials falling from above (branches, leaves, dust, etc.)</td></tr>
<tr><td>General labor safety of workers</td><td>● Cautions shall be taken to prevent workers being hit with objects dropped during pruning.</td></tr>
<tr><td>Measures to prevent secondary wastes</td><td>－</td></tr>
<tr><td></td><td>Others</td><td>－</td></tr>
</table>

6.2. Verification of Decontamination Effects

Chapter 6.2 shows some of the verification results of decontamination effects in the decontamination works done under various test conditions in the Special Decontamination Areas as arranged by the MOE.

It should be noted that the decontamination effects depend on various environmental conditions such as material properties or surface conditions of the objects subject to decontamination, or their aging variation with time, and therefore, the same decontamination effects cannot be necessarily expected even if the same decontamination methods for a particular item are applied. There are also some cases which showed different results from those of model projects conducted by the Cabinet Office and Japan Atomic Energy Agency (JAEA) or those experienced in the first stage decontamination work in relatively high dose areas in Fukushima Prefecture (mainly in JFY 2011).

It should be also noted that the decontamination methods and application conditions cannot be decided solely by the test decontamination results. The specific decontamination methods and application conditions have been decided for individual communities upon the residents' consent with consideration to workability, preservation of functions of the item to be decontaminated, and the like.

The verification results are shown below for individual decontamination methods tested in two groups of Special Decontamination Areas, i.e., relatively low dose areas of residing-restricted areas (the areas in which residing is restricted) and the evacuation order lifting preparation areas (the areas in which the evacuation orders are being prepared for lifting), and relatively high dose areas of difficult-to-return areas (the areas where it is expected that the residents have difficulties in returning for a long time).

The decontamination effects are shown basically in terms of the changes in surface contamination densities (cpm). But for farmland, where penetrated contamination is likely, rather than surface contamination, the decontamination effects are expressed in terms of the change in dose equivalent (μSv/h).

6.2.1. Residing-restricted Areas (Areas in Which Residing is Restricted) or Evacuation Orders Lifting Preparation Areas (Areas in Which Evacuation Orders are Being Prepared for Lifting)

The following are the results of decontamination effects under various test conditions obtained from the decontamination work model projects authorized by the MOE in the residing-restricted areas and the evacuation order lifting preparation areas.

（1） Residential areas and the like

1）Roofs/rooftops

A) Wiping

- After removing sediment on roofs when present, one to three wiping operations were conducted using disposable paper wipes.
- The test decontamination was conducted on roofs facing east, south, west and north. Roofs facing east had mostly higher values of air dose rates and surface contamination densities than the other roofs. This will be attributed to the wind direction and the source of radioactive materials.
- Higher surface contamination densities (3,000 to 5,000 cpm) have been experienced on roofs with seams such as batten-seamed roofs and folded-plate roofs or metallic roofs with rust such as galvanized steel sheets, while lower densities have been experienced on roofs with flat surface materials or fewer seams. This indicates that radioactive materials tend to be attached and remained on roof surfaces with uneven configurations, while from flat surface roofs radioactive materials may be washed away by rainfall even if attached once.
- The air dose rate was reduced by about -13 to +28% (about 9 to 11% on the average) by wiping the roofs after removing sediment, and the surface contamination densities were reduced by about -13 to +79% (average about 27 to 39%).
- There were variations in the radiation reduction effects by wiping. Even 10 wiping operations did not lower the dose to the lowest level. Once the contamination is reduced to several hundred [cpm], the data variation becomes big. The radiation reduction effects at a particular place remained almost unchanged even if wiping operations were repeated (once, twice, three times and ten times).

Table 6-2 Example results in residential areas, etc. of wiping roofs and rooftops

Work Schedule	Air dose rate[139] at 1 cm away from the surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Before wiping	1.2	1.32×10^3	–	–
After first wiping	1.0	6.00×10^2	11	33
After second wiping	1.1	5.57×10^2	9	36
After third wiping	1.0	5.00×10^2	11	39
After tenth wiping	1.0	5.20×10^2	10	27

※ Dose equivalent rate, surface contamination density and reduction rate are the average of their measurements.
※ Even if the reduction rate was negative at a measuring point, the reduction rate of the concerned point was not considered to be zero, and was calculated using the raw value (negative value).
※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method

2) Exterior walls/outside walls

A) Wiping, brushing

- Glass surfaces, siding walls, wooden walls, mortar walls, earthen walls, and galvanized steel sheet walls, corrugated sheet walls and metal walls were wiped or brushed once to three times (both for mortar walls, but only brushing for earthen walls and only wiping for others).
- Whatever the material was, the surface contamination densities were confirmed to be lower than those on the roofs or in the rainwater gutters.
- The dose rate was basically low, and the dose rate change was minimal even when wiped or brushed, irrespective of moss presence, the wall materials, and the numbers of wiping and brushing operations.

3) Rainwater gutters

A) Sediment removal, wiping

- Sediment causes high dose rates. There is a case in which the maximum dose rate before decontamination was 10 μSv/h and the surface contamination density was 17,000 cpm.
- The reduction effects by removing sediment was about 3 to 78% (average 42%) for air dose rates and about 20 to 59% (average 35%) for surface contamination densities. The effects by wiping were about –11 to +18% (average about 7 to 11%) for air dose rates and about –30 to +52% (average about –1 to +11%) for surface contamination densities.
- In decontaminating rainwater gutters, sediment removal is most effective. This is because the sediment includes most of the radioactive contaminants.

[139] Air dose rate measured 1 cm away from the ground or 1 cm away from the surface of target.

Table 6-3 Example results in residential areas, etc. of removing sediment from rainwater gutters followed by wiping

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%)	Decontamination rate of Surface contamination density (%)
Before removing sediments	5.2	1.03×10^4	—	—
After removing sediments	2.0	5.87×10^3	42	35
After first wiping	1.9	6.07×10^3	7	(-1)
After second wiping	1.8	5.27×10^3	9	11
After third wiping	1.8	5.27×10^3	11	6

※ The effect of decontamination depends on the various factor such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

4） Street drains

A) Sediment removal

- In street drains the maximum air dose rate of 2.4 μSv/h and surface contamination density of 1,310 cpm were observed before decontamination.
- The reduction in the surface contamination density reached as high as 47%. The concrete covers of street drains lowered the surface contamination density to as low as 290 cpm.

Table 6-4 Example results in residential areas, etc. of removing sediment from side ditches

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%)	Decontamination rate of surface contamination density (%)
With cover (before work)	1.4	4.10×10^2	－	－
Without cover (before work)	2.4	1.31×10^3	－	－
After removing sediments	1.4	6.90×10^2	42	47
After cleaning side ditches	1.4	5.10×10^2	42	61
With cover (after work)	1.1	2.90×10^2	54	78

※ The reducing rate is the value after the cover was removed.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and etc.The results shown above are the results which have been examined for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by using the same decontamination method.

5） Outdoor equipment and the like

A) Wiping

- Wiping operation was done one to three times.
- The maximum air dose rate and surface contamination density of outdoor equipment and the like have been measured as 0.80 μSv/h and 920 cpm, respectively.
- The reduction rate of air dose rates was about -6 to +6% on the average and that of surface contamination densities was about 44 to 85% on the average.
- By repeating the wiping operation, the surface contamination densities decreased

Table 6-5 Example results in residential areas, etc. by wiping outdoor equipment and the like

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%)	Decontamination rate of surface contamination density (%)
Before wiping	8.0×10^{-1}	9.20×10^{2}	–	–
After first wiping	8.5×10^{-1}	5.20×10^{2}	(-6)	44
After second wiping	7.5×10^{-1}	2.10×10^{2}	6	77
After third wiping	7.5×10^{-1}	1.40×10^{2}	6	85

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

（2） Schools

1）Roofs of a swimming pool

A) Wiping

- The top part and the lower part of the roofs of a swimming pool were wiped.
- The surface contamination density at the top was 340 to 440 cpm (average 400 cpm) before decontamination. At the lower part it was 560 to 630 cpm (average 600 cpm). The surface contamination density at the lower part was slightly higher than that at the top.
- The reduction rate of air dose rates by wiping was –4 to +4% on the average, while that of surface contamination densities was about 27% to 36% on the average.

Table 6-6 Example results in schools of wiping swimming pool roofs

Work Schedule		Air dose rate at 1 cm away from surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%)	Decontamination rate of surface contamination density (%)
Upper	Before wiping	1.2	4.00×10^2	－	－
	After wiping	1.2	2.60×10^2	4	36
Lower	Before wiping	1.8	6.00×10^2	－	－
	After wiping	1.9	4.30×10^2	(-4)	27

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore、it does not assure that the equivalent effect can be attained by the same decontamination method.

2) **Pool sides**

A) **High-pressure water cleaning**

- High-pressure cleaning (vacuum collection 15 MPa, discharge flow rate of 12.7 L/min and 20 L/m^2) were done one to three times.
- The surface contamination density was 6,550 to 11,000 cpm, and the average was 9,330 cpm before decontamination. The pool side surface material was rubbery and black dirt was recognized on the surface and roughness was locally observed in the area to be decontaminated.
- After the first high pressure cleaning, unevenness of the cleaning was visually observed on the pool side surfaces. After the second high pressure cleaning, hardly any cleaning unevenness was visible on the surface. After the third high pressure cleaning, it was visually confirmed that the dirt was almost uniformly removed from the surface.
- As a result of implementing high-pressure water cleaning, the rate of reduction in the air dose rate was approximately 76 to 79% on average, and the percent decrease in surface contamination density was approximately 93 to 98% on average.

Table 6-7 Example results in schools for high-pressure water cleaning of swimming pool sides

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%)	Decontamination rate of surface contamination density (%)
Before high pressure cleaning	3.4	9.33×10^{3}	–	–
After first cleaning	8.1×10^{-1}	6.50×10^{2}	76	93
After second cleaning	6.9×10^{-1}	2.70×10^{2}	79	97
After third cleaning	7.0×10^{-1}	1.90×10^{2}	79	98

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

3) **Exterior walls (with minor staining)**

A) **Brushing (dry)**

- The decontamination effect by brushing in dry conditions was checked on the test target portion of the exterior wall surface with minor staining.
- When shielding was used for more reliable measurement, the surface contamination density was 100 to 110 cpm and the average was 100 cpm before decontamination.
- The surface contamination density after dry brushing was 90 to 150 cpm and the average was 130 cpm.
- Little change was observed, since the contamination before decontamination was low enough.

Table 6-8 Example results of (dry) brushing school external walls (with minor staining)

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%)	Decontamination rate of surface contamination density (%)
Before brushing	9.1×10^{-1}	1.00×10^{2}	–	–
After brushing	8.6×10^{-1}	1.30×10^{2}	6	(-24)

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore、it does not assure that the equivalent effect can be attained by the same decontamination method.

4) **Exterior Wall (with major staining)**

A) **Brushing (wet)**

- The decontamination effect by one-time brushing or twice brushing in wet conditions was checked on the test target portion of the exterior wall surface with major staining.
- When shielding was used for more reliable measurement, the surface contamination density was 310 to 620 cpm and the average was 430 cpm before decontamination.
- The surface contamination density after the first brushing was 180 to 430 cpm and the average was 280 cpm. The surface contamination rate after the second brushing was 230 to 420 cpm and the average was 320 cpm, slightly higher than those after the first brushing. It was interpreted that uncertainties were included in the data due to low contamination. Because of the low values before decontamination for the wall, the average reduction rate in the second brushing was 24 %.

Table 6-9　Example results of (wet) brushing school external walls (major staining)

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%)	Decontamination rate of surface contamination density (%)
Before brushing	1.2	4.30×10^2	－	－
After first brushing	1.1	2.80×10^2	6	35
After second brushing	1.2	3.20×10^2	(-5)	24

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and etc.The results shown above are the results which have been examined for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by using the same decontamination method.

5) Slopes in School Playground

A) Weeding and lawn scraping

- Slopes in a school playground were weeded and the lawns were scraped away.
- The surface contamination density was 1,490 to 1,970 cpm, and the average was 1,580 cpm before decontamination.
- The surface contamination density was 1,920 to 2,710 cpm and the average was 2,380 cpm after weeding, higher than that before weeding. After scraping lawns away by a backhoe, the surface contamination density dropped to 170 to 280 cpm and the average to 230 cpm. (The average reduction rate of surface contamination densities was about 85%).

Table 6-10 Example results of implementing weeding and lawn scraping on slopes in a school playground

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Air dose rate at 1 m away from surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%))	Decontamination rate of Air dose rate at 1 m away from surface (%)	Decontamination rate of surface contamination density (%)
Before weeding	4.8	3.2	1.58×10^3	−	−	−
After weeding	4.5	2.8	2.38×10^3	6	12	(-53)
After scrapping lawn	1.4	2.1	2.30×10^2	72	35	85

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

6) Pavement (berm[140] concrete)

A) Abrasive vacuum blasting

- The abrasive vacuum blasting effect for berm concrete was checked. The blasting speed was set at 4 min/m^2.
- Berm concrete surfaces are often found under the eaves at schools or large size facilities. Hot spots were frequently generated there caused by rain dripping from roofs.
- The reduction rate of surface contamination densities by abrasive vacuum blasting was about 81% on the average.

[140]Berm concrete is an earthen-based concrete surface often found on the ground under eaves in order to prevent water intrusion into buildings.

Table 6-11 Example results of implementing abrasive vacuum blasting of pavement surfaces (berm concrete) in schools

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Air dose rate at 1 m away from surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%))	Decontamination rate of Air dose rate at 1 m away from surface (%)	Decontamination rate of surface contamination density (%)
Before blasting	－	－	2.00×10^{3}	－	－	－
After blasting	－	－	3.80×10^{2}	－	－	81

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

（3） **Roads**

1）**Paved surfaces**

A) **High-pressure water cleaning**.

- Test cleaning was executed on a paved road at three different flow rates of 10 L/m^2, 15 L/m^2 and 20 L/m^2. The discharge pressure of high pressure water cleaning was set at 15 MPa.
- The dose rates before decontamination were 1.0 to 1.1 μSv/h at 1 cm from the surface and 1.1 to 1.2 μSv/h at 1m above the ground, and the surface contamination density was 310 to 530 cpm.
- The reduction rates of doses rate in all cases were 26 to 29% at 1cm from the surface and 9 to 11% at 1m above ground, and those of surface contamination densities were 55 to 66%. The decontamination effect was evident. Concerning the effect of cleaning water flow rates, no significant difference was observed.

Table 6-12　Example results of implementing high-pressure water cleaning of road pavement surfaces

Water flow rate		Air dose rate at 1 cm away from surface (μSv/h)	Air dose rate at 1 m away from surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%))	Decontamination rate of Air dose rate at 1 m away from surface (%)	Decontamination rate of surface contamination density (%)
10L/m^2	Before cleaning	1.1	1.1	1.18×10^{3}	－	－	－
	After cleaning	7.8×10^{-1}	1.0	5.30×10^{2}	29	11	55
15L/m^2	Before cleaning	1.0	1.1	9.90×10^{2}	－	－	－
	After cleaning	7.2×10^{-1}	9.8×10^{-1}	4.50×10^{2}	29	9	55
20L/m^2	Before cleaning	1.0	1.2	9.10×10^{2}	－	－	－
	After cleaning	7.4×10^{-1}	1.0	3.10×10^{2}	26	11	66

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

2) Street drains

A) High-pressure cleaning

- Decontamination effects of the air dose rate and surface contamination density were measured at the two removable grating covers.
- The reduction rates were about 64% for both of dose rates (at 1 cm from the surface) and surface contamination densities, while the reduction rate for the dose rates at 1 m above the ground was about 14%.

Table 6-13 Example results of implementing high-pressure water cleaning of road side ditches

Work Schedule	Air dose rate at 1 cm away from the surface (μSv/h)	Air dose rate at 1 m away from the surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
Before cleaning(※)	1.7	1.0	5.30×10^{2}	−	−	−
After cleaning(※)	6.1×10^{-1}	9.0×10^{-1}	1.90×10^{2}	64	14	64

※ The measurement which was measured using a collimator.at one location.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

(4) Farmland

1) Rice fields

A) Leveling unevenness

- The uneven topsoil was leveled by using a vibratory roller (combined roller). After leveling the unevenness, irregularity of the test area was checked for the measurements.
- The maximum difference in elevation of unevenness in rice fields was 40 to 60 mm before leveling. In areas with many wild boars, it was confirmed that the difference had increased to 95 to 110 mm.
- It could be seen that the unevenness was reduced to 20 to 43 mm by leveling and the ground surface looked generally smooth. In the rice fields of areas with many wild boars, the unevenness was 57 to 97mm after leveling. It was visually confirmed that leveling by vibratory rollers could reduce the unevenness. The big unevenness caused by wild boars could have been certainly reduced, but the change was minimal.
- If the surface soil hardness was more than approximately 10 mm (by Yamanaka' durometer), leveling work was possible. If there were many consecutive rainy days, the soil hardness was less than 10 mm, and the leveling work was hard to do. The access conditions (the access route, road widths or other conditions) of heavy machinery should be checked in advance. Only roads with the gradient of 20 degrees or less were accessible by heavy machinery.

2) **Dry fields**

A) **Off-scraping of topsoil**

- Topsoil was scraped off, after spraying surface solidifiers, by soil skimmers[141].
- The reduction rate of dose rates at 1 cm from the surface and at 1 m above the ground was about 36 to 37% and the reduction rate of surface contamination densities was about 47%.
- The amount of soil carried out from dry fields by skimmers was 41 flexible container bags, weighing 37.2 tons. When the area of 400 m^2 was scraped uniformly to the depth of 5 cm, the theoretical amount should have been 30 tons (specific gravity: 1.5). Actually, 7.2 tons (about 24%) more topsoil was scraped off than the planned amount.
- Skimmers with rubber caterpillars could run smoothly for scraping. The surface finish after scrapping topsoil was also good. The topsoil scraping approach by skimmers is appropriate for application in large flat fields.

Table 6-14 Example results of scraping topsoil in fields

Work Schedule	Air dose rate at 1 cm away from surface (μSv/h)	Air dose rate at 1 m away from surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from surface (%))	Decontamination rate of Air dose rate at 1 m away from surface (%)	Decontamination rate of surface contamination density (%)
Before scrapping	2.1	2.4	5.70×10^2	−	−	−
After scrapping	1.3	1.5	2.70×10^2	37	36	47

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

[141] Topsoil scrapping and recovering machine

(5) Forests

A) Surface layer removal and topsoil scraping

- The air dose rate was measured before weeding and surface layer (dry leaves) removal. After weeding and removing dry leaves, the level obtained was defined as the reference level (DL-0cm). The dose rate and the surface contamination density were measured at 1cm intervals in the depth direction from the reference level. The measurement was terminated when hard soil layers appeared at the depth of DL-3cm to DL-4cm.
- Measurements were implemented at three locations; on the southern slope of a forest of deciduous trees, on the southern slope of a forest of evergreen trees, and on the western slope of a forest of deciduous trees.
- Occasionally the dose rate increased by weeding and dry leaf removal. The surface contamination density decreased by removing the surface topsoil as seem in the measurements made at 1cm intervals. By removing the surface topsoil by about DL-2 to DL-3cm from the reference level, the surface contamination density decreased to about 200 to 950 cpm. The reduction rate of surface contamination densities reached about 25 to 63% (about 36 to 53% on the average). The higher the initial surface contamination density was, the higher the reduction rate was achieved.
- It was understood that removing surface soil as deep as DL-2 to -3cm was appropriate for the site conditions and the viewpoints of radiation reduction and soil erosion.

Table 6-15 Example results in a forest for surface layer removal and topsoil scraping

Work Schedule	Air dose rate at 1 cm away from the surface (μSv/h)	Air dose rate at 1 m away from the surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
Before removing surface layer	2.5	2.3	9.2×10^2	–	–	–
After removing surface layer	2.5	2.0	9.7×10^2	(-1)	10	(-2)
DL-1 cm	2.4	2.0	9.9×10^2	5	12	(-5)
DL-2 cm	1.9	2.0	6.1×10^2	25	12	36
DL-3 cm	1.5	1.9	4.4×10^2	39	14	53
DL-4 cm(※)	1.8	2.9	4.0×10^2	53	26	68

※ DL-4cm was measured at one location.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which habe been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

6.2.2. Difficult-to-return Area (Areas Where It Is Expected That the Residents Have Difficulties in Returning for a Long Time)

The following are the results of decontamination effects under various test conditions obtained from the decontamination work model projects authorized by the MOE in the difficult-to-return area.

The surface contamination densities were always measured in terms of the radiation dose at 1cm from the surface. Beta rays from the surface contamination were measured as the difference between the values with a collimator and the acrylic shielding plate and with only a collimator.

（1） **Residential areas and the like**

1）**Roofs**

A) **Wiping**

- Test decontamination was executed for two types of roofing materials (ceramic tiles and galvanized steel sheets) in District A and only ceramic tiles in District B.
- In District A, the surface contamination densities showed big variation in data, probably due to different surface configurations. The decontamination effect was evaluated in terms of the dose equivalent rate.
- The reduction rate of air dose rates (at 1cm from the surface, with a collimator) in District A was 0 to 12%, showing no visible decontamination effects. Such results were also found at other test cases. Significant reduction effects could not be confirmed even for different wiping methods.
- In District B, no significant reduction effects could be confirmed in evaluating the air dose rates (at 1cm, with a collimator). On the other hand, in the evaluation of surface contamination densities, some reduction effects could be confirmed by the first wiping, but no further effects were confirmed by further wiping.
- Wiping by disposable paper towels was chosen as the standard method, by which improvement in decontamination workability could be expected.
- In consideration of workability, wiping more than once, and finishing work by the second wiping operation was chosen as the standard decontamination method for roofs.

Table 6-16 Example results of wiping roofs on residential land, etc. (District A residences, ceramic tiles)

Work Schedule		Air dose rate at 1 cm away from the surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Dry paper towel	Before wiping	7.7×10^{-1}	–	–	–
	After wiping	7.8×10^{-1}	–	(-2)	–
Wet paper towel	Before wiping	7.5×10^{-1}	–	–	–
	After wiping	7.7×10^{-1}	–	(-3)	–

※ The value shown in the table is the average of the value (s) measured at 3 locations.
※ The decontamination rate is the average value of decontamination rate at each measurement point.
※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

Table 6-17 Example results of wiping roofs on residential land, etc. (District A residences, galvanized steel sheet plate roofs)

Work Schedule		Air dose rate at 1 cm away from the surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Dry paper towels	Before wiping	1.1	–	–	–
	After wiping	1.1	–	6	–
Wet paper towels	Before wiping	1.2	–	–	–
	After wiping	1.1	–	7	–

※ The value shown in the table is the average of the value (s) measured at 3 locations.
※ The decontamination rate is the average value of decontamination rate measured at each point.
※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been executed in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

Table 6-18 Example results of wiping roofs on residential land, etc. (District B, ceramic tiles)

Work Schedule	Air dose rate at 1 cm away from the surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Before wiping	1.1	1.41×10^3	－	－
After first wiping	1.2	1.25×10^3	(-3)	11
After second wiping	1.1	1.23×10^3	4	12
After third wiping	1.1	1.20×10^3	2	15

※ The value shown in the table is the average of the value (s) measured at 5 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

B) **Brushing**

- Test decontamination of cement tile roofs in District A was conducted by using a deck brush.
- Generally decontamination is believed to be ineffective on cement tiles.
- The decontamination effect was checked by two ways of brushing, in one direction or back-and-forth directions ten times. However, it was confirmed that the reduction rate of surface contamination densities was 0%, showing no decontamination effects.
- The poor decontamination effect was understood to be due to rough surfaces of cement tiles, on which fine grains containing radioactive materials were easily deposited into the porous structure of the surface layer.
- It was found that brushing had no decontamination effects at all.

Table 6-19 Example results of brushing cement tile roofs on residential land, etc.

Work Schedule		Air dose rate at 1 cm away from the surface (μSv/h)	Surface contamination density (without shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
One way brushing	Before wiping	–	1.12×10^4	–	–
	After two times wiping	–	1.12×10^4	0	–
	After four times wiping	–	1.12×10^4	0	–
Round brushing	Before wiping	–	1.00×10^4	–	–
	After ten times wiping	–	1.00×10^4	0	–

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

2) **Exterior Walls**

A) **Wiping**

- For exterior walls, wiping effects were tested on the wall materials such as soft lysine-sprayed walls, pea gravel-washed walls and metallic siding. In many cases the decontamination effect had little correlation with the wall materials.
- Although no big difference was recognized depending on different wiping methods, wiping by wet paper towels was chosen as the standard decontamination method for external walls, in consideration of the test results on the roofs and workability.
- The decontamination rate of the third wiping from the second wiping was -1% in District C and +12% in District D. The improvement of decontamination in the third wiping was not significant when compared with those of the first two wiping steps.
- For the exterior wall decontamination, twice wiping (finishing work by the second wiping) was chosen as the standard decontamination method.

Table 6-20 Example results of wiping external walls on residential land, etc.

Work Schedule		Air dose rate at 1 cm away from the surface (with shielding, μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Ceramic siding, wiping by dry paper towel	Before wiping	−	7.84×10^2	−	−
	After first wiping	−	6.43×10^2	−	18
	After second wiping	−	5.52×10^2	−	30
	After third wiping		5.60×10^2		29
Metallic siding, [wiping by wet paper towel	Before wiping	2.2	−	−	−
	After first wiping	1.8	−	18	−
	After second wiping	1.7	−	25	
	After third wiping	1.5		35	

※ For metallic siding, many discrepancies due to impact to be considered that surface shape affected on surface contamination density were confirmed. Therefore, the effect was evaluated by dose equivalent rate.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

3) **Gutters**

A) Sediment removal and wiping

- Test decontamination of gutters were done by wiping, the standard method, changing the number of wiping operations under two conditions of wet wiping and dry wiping.
- Collimators could not be used for the air dose rate measurements due to narrow gutter openings.
- For the surface contamination density, the first wiping after removing sediment gave a high decontamination rate. No further big decrease could be observed even if wiping was repeated. Wet wiping gave a higher decontamination rate than dry wiping.
- A combination of wiping by wet paper towels and wiping once or more after removing sediment was chosen as the standard decontamination method for gutters.

Table 6-21 Example results in residential areas of removing sediment from roof gutters followed by wiping

Work Schedule		Air dose rate at 1 cm away from the surface (with shielding, μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Dry wiping (wiping by dry paper towel)	Before wiping	3.0×10	–	–	–
	After removing sediments	1.2×10	2.25×10^4	61	–
	After first wiping	9.2	2.31×10^4	69	(-3)
	After second wiping	8.7	1.74×10^4	71	23
	After third wiping	9.0	1.26×10^4	70	44
	After fourth wiping	8.9	1.55×10^4	70	31
	After fifth wiping	8.8	1.35×10^4	71	40
	After sixth wiping	8.8	1.35×10^4	71	40
Wet wiping (wiping by wet paper towel)	Before wiping	3.0×10	–	–	–
	After removing sediments	1.2×10	2.25×10^4	61	–
	After first wiping	1.0×10	9.75×10^3	66	56
	After second wiping	1.0×10	7.30×10^3	66	67
	After third wiping	1.0×10	5.60×10^3	66	74
	After fourth wiping	1.0×10	7.20×10^3	66	67
	After fifth wiping	1.0×10	7.00×10^3	66	68
	After sixth wiping.	1.0×10	7.00×10^3	66	68

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

4) **Paved surfaces**

A) **High-pressure water cleaning and shot-blasting**

- Test decontamination of paved surfaces were executed by the following three methods; i) high-pressure water cleaning with vacuum collection of water (water pressure of 20 MPa, 2 times cleaning), ii) shot-blasting (discharge pressure of steel shot, 5M Pa by the standard decontamination method in accordance with the decontamination guidelines) and iii) shot-blasting (discharge pressure of steel shot, 7M Pa). The decontamination rates were compared, the damaged condition of paved surfaces was checked and the applicable scope of each decontamination method was verified.
- The highest decontamination rate was obtained by the standard method of shot-blasting (discharge pressure of steel shot 7 MPa), but shot-blasting marks remained on the paved surface and the road surface markings were even erased.
- The high-pressure water cleaning with vacuum collection of water was appropriate to apply in narrow gaps and on the paved surfaces where damage should be avoided. The shot-blasting at 7 MPa could basically be applied to flat places over a certain distance for continuous working. The lines on the roads and the locations vulnerable to damage should be blasted at 5 MPa.

Table 6-22 Example results in residential areas, etc. of implementing high-pressure water cleaning and shot-blasting of pavement surface (Asphalt pavement)

Work Schedule		Air dose rate at 1 cm away from the surface (μSv/h)	Air dose rate at 1 m away from the surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
Suction type high pressure water	Before cleaning	–	–	7.51×10^3	–	–	–
	After cleaning	–	–	3.45×10^3	–	–	53
Shot blasting 5mpa	Before blasting	–	–	6.16×10^3	–	–	–
	After blasting	–	–	3.89×10^3	–	–	37
Shot blasting 7mpa	Before blasting	–	–	8.08×10^3	–	–	–
	After blasting	–	–	1.25×10^3	–	–	84

※ The value shown in the table is the average of the value (s) measured at 5 locations.
※ The decontamination rate is the average value of decontamination rate at each measurement point.
※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

Table 6-23 Example results in residential areas, etc. of implementing high-pressure water cleaning and shot-blasting of pavement surface (Concrete pavement)

Work Schedule		Air dose rate at 1 cm away from the surface (μSv/h)	Air dose rate at 1 m away from the surface (μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
Suction type high pressure water	Before cleaning	–	–	2.45×10^4	–	–	–
	After cleaning	–	–	1.06×10^4	–	–	56
Shot blasting 7 MPa	Before blasting	–	–	2.08×10^4	–	–	–
	After blasting	–	–	7.92×10^3	–	–	63

※ The value shown in the table is the average of the value (s) measured at 5 locations.
※ The decontamination rate is the average value of decontamination rate at each measurement point.
※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

（2） Schools

1）Rooftops

A) High-pressure water cleaning.

- Test decontamination was conducted on the rooftop of a kindergarten building covered by water proof sheets using high-pressure water cleaning with vacuum water collection. The discharge flow rate of 20 Lm^3/m^2 was used at two water pressure conditions of 10 MPa and 15 MPa in the test.
- No big difference in decontamination rates was observed for the two pressure conditions, 10 MPa and 15 MPa. No further significant decrease of decontamination rates was found by the second and further cleaning, regardless of the cleaning pressure.
- The standard cleaning method for rooftops was set as “one time cleaning at 15MPa.

Table 6-24 Example results of implementing high-pressure water cleaning of school roofs

Work Schedule		Air dose rate at 1 cm away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Cleaning water pressure (10mpa)	Before cleaning	－	3.12×10^2	－	－
	After first cleaning	－	5.80×10	－	81
	After second cleaning	－	3.40×10	－	89
	After third cleaning	－	9.00×10	－	71
Cleaning water pressure (15mpa)	Before cleaning	－	3.90×10^2	－	－
	After first cleaning	－	7.80×10	－	80
	After second cleaning	－	7.80×10	－	80
	After third cleaning	－	5.80×10	－	85

※ The value shown in the table is the average of the value (s) measured at 5 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

（3） Parks

1）Playgrounds and the like

A) Scraping topsoil and earth covering

- Topsoil in a playground in a kindergarten facility was scraped and the scraped surface was covered afterward with fresh soil. Two scraping depths of 5 cm and 10 cm were used.
- It was found that even 5 cm scraping could obtain a decontamination rate of more than 90%.
- The standard decontamination method for parks (playgrounds) was set as scrapping topsoil by 5 cm and earth covering by 5 cm.

Table 6-25 Example results of scraping topsoil followed by earth covering on park playgrounds, etc.

Work schedule		Air dose rate at 1 cm away from the surface (with shielding ,μSv/h)	Air dose rate at 1 m away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
Scraping depth (5cm)	Before scraping	－	－	8.76×10^{2}	－	－	－
	After scraping	－	－	4.00×10	－	－	95
	After covering	－	－	2.80×10	－	－	97
Scraping depth (10cm)	Before scraping	－	－	1.10×10^{3}	－	－	－
	After scraping	－	－	1.40×10	－	－	99
	After covering	－	－	3.40×10	－	－	97

※ The value shown in the table is the average of the value (s) measured at 5 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

（4） Large size facilities

1）Rooftops

A) High-pressure water cleaning

- The standard method of high-pressure water cleaning was tested for the rooftop of a hospital covered by waterproof sheets and cinder concrete. The discharge flow rate of 20 Lm^3/m^2 was used at two water pressure conditions of 10 MPa and 15 MPa in the test.
- Higher decontamination rates were obtained by 15 MPa cleaning than 10 MPa cleaning.
- For the waterproof sheet rooftops, the decontamination rate of 3% was obtained by the second cleaning. Therefore, the most effective decontamination method was twice cleaning at 15MPa water pressure. For the cinder concrete rooftops, no significant decontamination rate could be observed regardless of the number of cleaning times and water pressure.
- The standard decontamination method was set as one-time cleaning at 15MPa water pressure for both types of rooftops of large size facilities, in due consideration of workability and overlapping of work areas.

Table 6-26 Example results of implementing high-pressure water cleaning of roofs on large-size facilities (waterproof sheeting)

Work Schedule		Air dose rate at 1 cm away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Cleaning water pressure (10mpa)	Before cleaning	－	2.98×10^2	－	－
	After first cleaning	－	1.48×10^2	－	50
	After second cleaning	－	1.34×10^2	－	55
Cleaning water pressure (15mpa)	Before cleaning	－	2.04×10^2	－	－
	After first cleaning	－	1.10×10^2	－	46
	After second cleaning	－	6.80×10	－	67
	After third cleaning	－	6.20×10	－	70

※ The value shown in the table is the average of the value (s) measured at 5 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

Table 6-27 Example results of implementing high-pressure water cleaning of roofs on large-size facilities (cinder concrete)

Work Schedule		Air dose rate at 1 cm away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Surface contamination density (%)
Cleaning water pressure (10mpa)	Before cleaning	–	5.77×10^3	–	–
	After first cleaning	–	2.54×10^3	–	56
	After second cleaning	–	2.33×10^3	–	60
Cleaning water pressure (15mpa)	Before cleaning	–	6.50×10^3	–	–
	After first cleaning	–	2.32×10^3	–	64
	After second cleaning	–	1.98×10^3	–	70

※ The value shown in the table is the average of the value (s) measured at 5 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

2) **Paved surfaces**

A) **Shot-blasting**

- The shot-blasting for paved surfaces in a hospital premise was tested with different discharge pressures of steel shot, 7 MPa (the standard decontamination method) and 5 MPa. The low discharge pressure was tested in order to consider preventing the paved surface from being damaged. The decontamination effect was also tested on the asphalt surface and road surface markings (drawn by the thermoplastic method). Decontamination rates and the degree of damage were compared between decontamination methods.
- The highest decontamination rate was obtained by the standard decontamination method of shot-blasting (7 MPa discharge pressure of steel shot). But marks due to steel shot remained on the paved surfaces and the white surface marking were erased.
- It is necessary to lower the discharge pressure to about 5 MPa or to consider an alternative method for places with road surface markings.

Table 6-28 Example results of implementing shot-blasting on pavement surface (conventional pavement surface) of large-size facilities

Work schedule		Air dose rate at 1 cm away from the surface (with shielding ,μSv/h)	Air dose rate at 1 m away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
7MPa with lap	Before blasting	–	–	5.86×10^{3}	–	–	–
	After blasting	–	–	5.02×10^{2} ※1	–	–	91 ※1
7MPa without lap	Before blasting	–	–	5.86×10^{3} ※2	–	–	–
	After blasting	–	–	6.15×10^{2} ※3	–	–	90 ※3

※1 The average of the values of measured at 5 locations

※2 Since the value before decontamination was not consistent with the value after decontamination, it was compared using the average of measurements in a decontamination targets.

※3 The average of the values of measured at 4 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

Table 6-29 Example results of implementing shot-blasting on pavement surface (white surface markings) of large-size facilities

Work schedule		Air dose rate at 1 cm away from the surface (with shielding ,μSv/h)	Air dose rate at 1 m away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
5MPa without lap	Before blasting	－	－	7.83×10^{3} ※1	－	－	－
	After blasting	－	－	4.50×10^{3} ※1	－	－	43 ※1
7MPa without lap	Before blasting	－	－	2.68×10^{3} ※2	－	－	－
	After blasting	－	－	3.83×10^{2} ※2	－	－	84 ※2

※1 The measurement were implemented at 3 locations. But, these data was abandoned, due to widely discrepancies.

※2 The average of 3 measurements. The decontamination rate is the average of the decontamination rate which was calculated in every location.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

3) Wood decks

A) Wiping, high-pressure water cleaning and superhigh-pressure water cleaning

- Wood decks of large facilities were decontaminated by wiping, high-pressure water cleaning and superhigh-pressure cleaning for tests.
- The decontamination rate by wiping with wet cleaning cloths was about 10%. Both the decontamination rates by superhigh-pressure water cleaning and high-pressure water cleaning were about 95%.
- The superhigh-pressure water cleaning caused splinters on the wood deck surfaces due to the high water pressure. Therefore, the high-pressure water cleaning was chosen as the standard decontamination method for wood decks.

Table 6-30 Example results of implementing high-pressure water cleaning and superhigh-pressure water cleaning of wood decks of large-size facilities

Work schedule		Air dose rate at 1 cm away from the surface (with shielding, ,μSv/h)	Air dose rate at 1 m away from the surface (with shielding, μSv/h)	Surface contamination density (with shielding, cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%)	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
Wiping by wet rag	Before wiping	–	–	3.89×10^{3}	–	–	–
	After wiping	–	–	3.29×10^{3}	–	–	15
High pressure 15 mpa	Before cleaning	–	–	8.99×10^{3}	–	–	–
	After cleaning	–	–	4.32×10^{2}	–	–	95
Superhigh pressure 70mpa	Before cleaning	–	–	7.70×10^{3}	–	–	–
	After cleaning	–	–	4.32×10^{2}	–	–	94

※ The value shown in the table is the average of the value (s) measured at 5 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

（4） Roads

1）Paved surfaces

A) Superhigh-pressure water cleaning

- Decontamination by the superhigh-pressure water at the standard water pressure of 150 MPa may damage the road surface and erase road surface markings on it (center lines, outer lines), just as occurred by the shot-blasting. To set the appropriate cleaning pressure, test decontamination was conducted by changing the water pressures as 15, 30, 50, 100 and 150 MPa, while observing damage conditions of the road surface and the decontamination effect.
- The standard pressure for superhigh-pressure water cleaning is 150 MPa. The working pressure of 100 MPa does not show significant deterioration of decontamination rates.
- Concerning the damage on the surface, no big damage was observed below 30 MPa. But at 50 MPa, loosened materials were blown out and above 100 MPa, the lines (center lines and outer lines) were erased.
- It is necessary to consider lowering the water pressure below 100 MPa when working on road marking areas and portions where noticeable damage was found on the pavement.

Table 6-31 Example results of implementing superhigh-pressure water cleaning of road pavement surfaces

cleaning water pressure of superhigh pressure water cleaning		Air dose rate at 1 cm away from the surface (with shielding ,μSv/h)	Air dose rate at 1 m away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
15 MPa	Before cleaning	－	－	4.09×10^3	－	－	－
	After cleaning	－	－	1.99×10^3	－	－	51
30 MPa	Before cleaning	－	－	5.11×10^3	－	－	－
	After cleaning	－	－	2.08×10^3	－	－	60
50 MPa	Before cleaning	－	－	4.32×10^3	－	－	－
	After cleaning	－	－	1.21×10^3	－	－	72
100 MPa	Before cleaning	－	－	4.58×10^3	－	－	－
	After cleaning	－	－	7.20×10^2	－	－	83
150 MPa	Before cleaning	－	－	3.10×10^3	－	－	－
	After cleaning	－	－	6.30×10^2	－	－	80

※ The value shown in the table is the average of the value (s) measured at 3 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.

（5） Farmland

1）Rice fields

A) Scraping topsoil, covering by fresh soil, leveling of unevenness and double plowing

- Topsoil of rice fields in relatively high dose areas in the target area was scraped off by soil skimmers[142], and plowed after being covered by fresh soil. Prior to the scraping, the field was mowed, the cut materials were removed, the top soil was scraped and the unevenness was leveled by rolling compaction followed by double plowing to a depth of 3 cm.
- According to present knowledge, the radiocesium concentration in the layer below 5 cm from the surface is less than 5,000 Bq/kg in most farmland, even if the radiocesium concentration in the surface layer of about 5 cm exceeds 5,000 Bq/kg. The scraping thickness is set as 5 cm. But according to the sampling survey of the radiocesium concentration as a function of depth, there were cases in District D in which the concentration below 5 cm from the surface still exceeded 5,000 Bq/kg. Therefore, three scraping depths of 5 cm, 7 cm and 10 cm were applied in this test decontamination.
- The cases in which decontamination rates of 7 cm scraping were lower (higher contamination densities) than those of 5 cm scraping were considered to be due to localized conditions (a similar trend was noticed in the radiocesium concentration analysis in the layer, i.e. higher radiocesium concentrations when scraped by 7 cm than by 5 cm).
- The evaluation based on decontamination rates using surface contamination densities is generally considered appropriate for surface contamination. But such results were not always obtained in farmland. Contamination in farmland may not be surface contamination, but penetration contamination. In this case, the evaluation using dose equivalent rates would be more appropriate.
- Based on a proposal by the decontamination business operator, test measurements in a high dose area were conducted using a collimator and placing lead blocks on the ground, in order to shield from the surrounding radiation and preclude the influence of radiation sources other than those on the surface. The difference of air dose rates between the cases with shielding and without shielding is equivalent to the dose rate due to only gamma rays. This approach gave better (more accurate) values. But the difference was just a few percent and lead blocks are needed for measurement. In view of the workload required, ordinary measurements using a collimator of air dose rate at 1 cm from the surface is considered appropriate for measurements related to decontaminating farmland.
- Even with the scraping depth of 5 cm, the decontamination rate of more than 90% after plowing was obtained in the air dose rates as well as in the surface contamination densities.

[142] Topsoil scrapping and recovering machine

Table 6-32 Example results of scraping topsoil, bringing topsoil from another place, leveling unevenness, and implementing double plowing of rice fields

Work Schedule, Scraping depth		Air dose rate at 1 cm away from the surface (with shielding ,μSv/h)	Air dose rate at 1 m away from the surface (with shielding μSv/h)	Surface contamination density (with shielding cpm)	Decontamination rate of Air dose rate at 1 cm away from the surface (%))	Decontamination rate of Air dose rate at 1 m away from the surface (%)	Decontamination rate of surface contamination density (%)
Scraping 5 cm	Before scraping	8.1	－	－	－	－	－
	After scrapping	1.6	－	－	77		73
	After bringing topsoil from another place	5.6×10^{-1}	－	－	90	－	92
	After plowing	6.0×10^{-1}	－	－	89	－	91
Scraping 7cm	Before scraping	6.4	－	－	－	－	－
	After scraping	1.6	－	－	71	－	70
	After bringing topsoil from another place	6.0×10^{-1}	－	－	88		91
	After plowing	7.6×10^{-1}	－	－	87	－	88
Scraping 10 cm	Before scraping	8.1	－	－	－	－	－
	After scraping	2.6×10^{-1}	－	－	92	－	91
	After bringing topsoil from another place	2.0×10^{-1}	－	－	95		94
	After plowing	1.0×10^{-1}	－	－	96	－	95

※ The value shown in the table is the average of the value (s) measured at 3 locations.

※ The effect of decontamination depends on the various factors such as the material and the surface condition of decontamination target, their deterioration status and so on. The results shown above are the results which have been implemented in a tentative way for the specific target to be decontaminated. Therefore, it does not assure that the equivalent effect can be attained by the same decontamination method.