# Guidelines on Prevention of Radiation Hazards for Workers Engaged in Decontamination Work

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## Section 1 Objectives

These guidelines are established for the purpose of preventing radiation-related health hazards to workers engaged in decontamination work of objects contaminated with radioactive materials discharged by the accident at the Fukushima Daiichi Nuclear Power Plant of Tokyo Electric Power Company (TEPCO) associated with the Great East Japan Earthquake on 11 March 2011, in conjunction with the enforcement of the "Ordinance on Prevention of Ionizing Radiation Hazards at Work to Decontaminate Soil and Waste Contaminated by Radioactive Materials Resulting from the Great East Japan Earthquake and Related Work" (Ordinance of the Ministry of Health, Labour and Welfare No. 152 of 2011; hereinafter referred to as the "Ionizing Radiation Ordinance for Decontamination")

Together with the Ionizing Radiation Ordinance for Decontamination, these guidelines aim at proper efforts to help further promote measures for the prevention of radiation hazards during decontamination work and a collective provision of the essence of the actions that employers should take including the provisions specified in the Industrial Safety and Health Act (Act No. 57, 1972) and other relevant laws and regulations, in addition to the provisions specified in the Ionizing Radiation Ordinance for Decontamination.

The intention of these guidelines is to protect workers from radiation hazards. However, it also has the purpose of being used for individual proprietors, self-employed workers, and volunteers.

The employers should make efforts to implement the matters described in these guidelines appropriately and take measures to prevent the radiation hazards corresponding to actual situations in their workplaces.

## Section 2 Scope

- These guidelines shall be applied to employers engaged in the operation of decontamination-related work (hereinafter referred to as "employers of decontamination work, etc.") in the special decontamination areas specified in Article 25, paragraph (1) of the "Act on Special Measures Concerning the Handling of Environmental Pollution by Radioactive Materials Discharged by the Nuclear Power Station Accident Associated with the Tohoku District - Off the Pacific Ocean Earthquake That Occurred on 11 March 2011" (Act No. 110 of 2011) or in the intensive contamination survey areas specified in Article 32, paragraph (1) of the same Act (hereinafter referred to as "special decontamination areas, etc."; refer to Attachment 1), with due attention being paid to the following:
  - (1) "Decontamination work" refers to work to perform decontamination of soil, etc., handling of designated contaminated soil and waste, and collecting waste, etc. However in the case of work other than the decontamination work in the special decontamination areas, etc. where the average ambient dose rate exceeds 2.5  $\mu$ Sv/h, (hereinafter referred to as the "work under a designated dose rate") being carried out, relevant provisions in the Ionizing Radiation Ordinance for Decontamination and "Guidelines on Prevention of Radiation Hazards for Workers Engaged in Works under a Designated Dose Rate" (Labour Standards Bureau Notification No. 0615-6 of 15 June 2012) shall be applied.
- (2) "Work for decontamination, etc." refers to work to remove soil, grass, and trees, soil generated in association with the decontamination of structures, etc., fallen leaves and branches and sludge, etc. deposited in dikes, etc. (hereinafter referred to as "contaminated soil, etc.)" contaminated with radioactive materials released due to the accident of the nuclear power plant (hereinafter referred to as "radioactive materials discharged by the accident" as defined under provisions of Article 2, paragraph 2 in the Ordinance on Prevention of Ionizing Radiation Hazards (Ministry of Labour Ordinance No. 41 of 1972; hereinafter referred to as the "Ionizing Radiation Ordinance") and to prevent contamination from spreading, and to take other measures.

- (3) "Work for handling of designated contaminated soil and waste" refers to work to handle contaminated soil, etc. whose radioactivity concentration of Cs-134 and Cs-137, among radioactive materials discharged by the accident, exceed 10,000 Bq/kg (hereinafter referred to as "designated contaminated soil and waste"), but excludes the work for decontaminating soil, etc. and collecting waste, etc. It should be noted that "work for handling of designated contaminated soil and waste" includes work in special decontamination areas, etc., of construction work for restoring local infrastructure (construction preparation, excavation and transportation, banking and compaction, leveling and shaping of land and slope protection), and related work such as foundation work, temporary construction, road construction, water supply and sewage construction, service water and drainage construction, and earth work associated with farmland maintenance work, work involving soil such as turning and plowing the soil, weeding, digging the soil, etc. for commercial farming and forestry, etc., and work handling soil, etc. associated with fertilization (mixing into the soil), rice planting, seeding, raising and harvesting, etc. of root crops. It should be noted, however, that such work mentioned above that could be completed in a short time as temporary work should be excluded from "work for handling of designated contaminated soil and waste."
- (4) "Work for collecting waste, etc." refers to the work to collect, transport, or store removed soil or waste contaminated with radioactive materials discharged due to the accident (limited to waste that contains radioactivity concentration of Cs-134 and Cs-137, among radioactive materials discharged by the accident, exceeding 10,000 Bq/kg; hereinafter referred to as "contaminated waste"). It should be noted that, for the disposal work of removed soil or contaminated waste such as work at water/sewage facilities, incineration facilities, intermediate treatment facilities, landfill facilities, etc. in special decontamination areas, etc., significant radiation exposure from the administrated radiation source such as sludge from sewage or incineration ash, etc. is expected, and therefore the Ionizing Radiation Ordinance should be applied to those work instead of the Ionizing Radiation Ordinance for Decontamination or these guidelines.
- (5) "Work for handling designated contaminated soil and waste" refers to work to handle contaminated soil, etc. whose radioactivity concentration of Cs-134 and Cs-137, among radioactive materials discharged by the accident, exceeds 10,000 Bq/kg (hereinafter referred to as "designated contaminated soil and waste"), but excludes work for decontaminating soil, etc. and collecting waste, etc. In addition, "work for handling designated contaminated soil and waste" includes construction work for restoring local infrastructure (construction preparation, excavation and transportation, banking and compaction, leveling and shaping of land and slope protection), and

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related work such as foundation work, temporary construction, road construction, water supply and sewage construction, service water and drainage construction, and earth work associated with farmland maintenance work, work involving soil such as turning and plowing the soil, weeding, digging the soil, etc. for commercial farming and forestry, etc., and work handling soil, etc. associated with fertilization (mixing into the soil), rice planting, seedling, raising and harvesting, etc. of root crops in special decontamination areas, etc. It should be noted, however, that such work mentioned above that could be completed in a short time as temporary work should be excluded from "work for handling of designated contaminated soil and waste."

- (6) For decontamination work conducted under the Ionizing Radiation Ordinance in the radiation control area (solely limited to nuclear reactor facilities and facilities belonging to the steam turbine or surrounding areas where the dose rate might exceed 0.1 mSv/h (hereinafter referred to as "designated facility, etc.") of TEPCO Fukushima Daiichi Nuclear Power Plant) under the provisions of Article 3, Paragraph 1 in the Ionizing Radiation Ordinance at the time of enforcement of the Ionizing Radiation Ordinance for Decontamination, the Ionizing Radiation Ordinance should be applied in succession instead of the Ionizing Radiation Ordinance for Decontamination or these guidelines. Work handling unsealed radioactive materials in the designated facilities is subject to the contamination screening described in Section 5-3 in these guidelines.
- (7) Since decontamination work falls under Article 8, item 35 in the Ordinance on Child Labour Standard (Ministry of Labour Ordinance No. 13 of 1954), employers should not engage persons who are under 18 years old in such decontamination work.
- 2. Employers other than "employers of decontamination-related workers, etc." who carry out decontamination work, etc. at their own site or facilities, etc. should implement applicable matters from Section 3 "Targets and Methods for Radiation Exposure Dose Control," Section 5 "Measures for Preventions of Contamination Spreading and Internal Exposure" and Section 6 "Education for Workers," as needed. It is also recommended that self-employed workers, residents, and volunteers who perform decontamination work follow the said matters.

#### Section 3 Targets and Methods for Radiation Exposure Dose Control

- 1. General Principles
  - (1) Employers of decontamination work, etc. should make efforts to minimize exposure to ionizing radiation for workers to the fullest extent possible.
  - (2) When employers of decontamination work, etc. implement work for handling designated contaminated soil and waste, they should prioritize minimizing the radiation exposure received by the workers engaged in handling designated contaminated soil and waste (hereinafter referred to as "workers engaged in handling designated contaminated soil and waste"), and they also should make efforts to take measures such as decontamination of workplaces in advance.
    - (a) Principle (1) above states that employers should keep radiation exposure of their workers as low as reasonably achievable based on the principles of optimization by the International Commission on Radiological Protection (ICRP) when they perform their work.
    - (b) Principle (2) above states that when work is expected to have a certain level of radiation exposure, it is necessary to prioritize minimizing such dose received by the workers engaged in handling designated contaminated soil and waste, and make efforts to implement decontamination measures, prior to starting the work, based on the ICRP principle of justification. This is because the public interest and the necessity of the work should outweigh any demerits.
    - (c) However, among work for handling designated contaminated soil and waste, it may not be possible to implement measures of decontamination, etc. in advance for the minimum requirements such as restoration of roads and water supply, etc., in light of the high public interest and necessity. In addition, work such as soil covering, paving roads, turning and plowing of farmland, etc. are expected to have equal to or greater effects than the measures of decontamination, etc. for reducing radiation dose, and therefore such work may be regarded as being implemented concurrently with decontamination.
    - (d) Farming employers, etc. are required to decontaminate working areas in advance to reduce radiation exposure to the lowest level possible, and, in principle, assign workers in areas where the average ambient dose rate is less than  $2.5 \,\mu$ Sv/h, so that there is no need to control exposure dose.
- 2. Measurement of radiation exposure doses
  - Employers of decontamination work, etc. should conduct effective exposure dose measuring during decontamination work in each case described in the following (a) and (b) by the pre-defined methods of measuring the equivalent exposure doses for workers (including fixed-term contract workers and temporary workers, hereinafter

referred to as "workers engaged in decontamination work, etc.") who are engaged in decontamination-related work in special decontamination areas, etc. (work among decontamination work that temporary workers are not allowed to engage in is listed in Attachment 2.)

- (a) In the case where the employer has workers engage in any work for decontamination and related work in a workplace for which the average ambient dose rate exceeds 2.5  $\mu$ Sv/h (equivalent to 5 mSv/year based on 40 h/week and 52 weeks/year), such employers shall conduct internal exposure dose measurements, which shall be appropriate according to the specifics of the work and concentration of radioactive materials contained in contaminated soil, etc. to be handled, in addition to external exposure dose measurements by personal dosimeters. Among the work related to designated contaminated soil and waste, restoration work, etc. of local infrastructure, for which workplaces cannot be confined by the nature of the work, shall require measurements of both external and internal exposure doses, only when workers are expected to perform such work in a place of which average ambient dose rate exceeds 2.5  $\mu$ Sv/h.
- (b) In the case where workers are engaged in any work for decontamination and related work (except any work that involves handling of designated contaminated soil and waste) in a workplace for which the average ambient dose rate is 2.5 μSv/h or less, either of the following may also be deemed as the external exposure dose, as well as the external exposure dose measured by personal dosimeters:
  - The "average ambient dose rate" multiplied by "daily working hours of each worker engaged in decontamination-related work," or
  - The measurement result for a typical individual assumed to represent the average external exposure dose from decontamination-related work.
- (2) When an employer of decontamination work, etc. contracts a portion of decontamination-related work to a contractor, the employer should direct the contractor to inform its workers that for each of the cases (a) and (b) in (1), the effective exposure dose to those who engaged in decontamination-related work should be measured in the way specified in each case; provided, however, that the contractor does not need to do so when the employer measures the effective exposure dose to the contractor and its workers, etc. due to decontamination-related work.
- (3) In the case that employers other than "those of decontamination work, etc." who conduct decontamination work, etc. of their own premises or facilities, etc., they should make sure that the effective dose due to the work does not exceed 1mSv/y, by assigning their workers to conduct decontamination, etc. in workplaces with an

average ambient dose rate of 2.5  $\mu$ Sv/h or less as well as the frequency of work being within dozens of times (days) per year. Self-employed workers, residents, and volunteers who conduct decontamination work, etc., should do likewise, by taking note of the following matters.

- (a) Residents and self-employed workers are expected to conduct decontamination work, etc. as a community unit when they need to decontaminate soil of their own residences, offices, farmland, and so forth in areas where the average ambient dose rate might exceed 2.5  $\mu$ Sv/h. In such cases, the frequency of the work should be less than dozens of times (days) per year, to prevent them from receiving effective doses higher than 1 mSv/y through the work.
- (b) In the case of recruiting volunteers in an area not classified as a special decontamination area, volunteer organizers should note that the exposure dose limit of the public to radiation sources is specified as 1 mSv/y as recommended by the ICRP under the planned exposure situation.
- (4) Since it is difficult for self-employed and individual proprietors to manage their exposure doses, etc. by themselves, it is desirable not to conduct work for handling designated contaminated soil and waste by taking appropriate measures in advance such as decontamination of workplaces.
  - (a) In the case that individual proprietors and self-employed workers need to do work for handling designated contaminated soil and waste, they should be regarded as employers of workers for handling designated contaminated soil and waste, and thus these guidelines should be applied to them.
  - (b) For volunteers, it is necessary to make sure that the average ambient dose rate at the workplaces does not exceed 2.5  $\mu$ Sv/h (equivalent to 5 mSv/y calculated on the basis of 40 hours/week and 52 weeks/y), and the frequency of work should be less than dozens of times (days) per year so that they do not get an effective exposure dose greater than 1 mSv/y.
- (5) For measuring internal exposure doses stated in (1)-(a) above, it should be carried out by the methods given in the table below according to the concentration of radioactive materials discharged by the accident in contaminated soil, etc. to handle and to dust concentration during decontamination-related work. In the case that no highly radioactive contaminated soil and waste is handled and dust concentration is not high, it is sufficient to conduct screening tests only when incidentally exposed to a high concentration of dust.

	Concentration of radioactive	
	materials in contaminated soil,	Other than highly
	etc. exceeding 500,000 Bq/kg	radioactive contaminated
	(highly radioactive contaminated	soil and waste
	soil and waste)	
Work under dust concentration greater than 10 mg/m3 (work under high dust concentration)	Measurement of internal exposure dose once every three months	Screening test
Work other than under high dust concentration	Screening test	Screening test (only when incidentally exposed to high concentration of dust)

(6) To determine whether the work falls under high dust concentration or not, the following matters should be referred to:

- (a) Work such as stripping of soil, etc., surface grinding or chipping of asphalt or concrete, weeding, collection and packing of removed soil, etc., dismantling of buildings or structures, etc. in a dry condition are considered as work under dust concentration greater than 10 mg/m<sup>3</sup>, and measures should be taken as defined in Paragraph 2, Item (5) above and Section 5, Paragraph 5.
- (b) When dust concentration is measured during the work regardless of the definition in (a) above, it should be judged whether or not the work falls under high dust concentration according to the measurement results. Refer to Attachment 3 for judgment by the measurement results.
- (7) The screening test method of internal exposure shall follow the method shown in Attachment 4.

The calculation method of internal exposure dose shall be in accordance with the stipulations of Article 6 of the "Methods, standards and classification defined by the Minister of Health, Labour and Welfare as specified pursuant to Article 2, Paragraph 7, etc. of the Ordinance on Prevention of Ionizing Radiation Hazards at Work to Decontaminate Soil and Waste Contaminated by Radioactive Materials Resulting from the Great East Japan Earthquake and Related Work" (Ministry of Health, Labour and Welfare Notification No. 468 of 2011).

- 3. Exposure dose limits
  - (1) Employers of decontamination work, etc. should measure the effective dose by the methods defined in 2-(1) (a) and (1) (b) above respectively, and ensure that the

individual total effective dose that a worker may receive during engaging in the decontamination work, etc. does not exceed the following limits:

- (a) For male workers and non-expectant female workers: Effective doses as 100 mSv per five years and 50 mSv per one year.
- (b) For female workers (except those who are not expectant, or those who fall into category (c) below): Effective doses as 5 mSv per three months.
- (c) For pregnant female workers: Effective doses by internal exposure as 1 mSv and equivalent doses as 2 mSv on the abdominal surface for the period from when confirmed as pregnant to delivery (hereinafter referred to as "during pregnancy").
- (2) When employers of decontamination work, etc. assign their workers who have engaged in radiation work in the radiation control area defined in Article 3 of the Ionizing Radiation Ordinance or who engaged in the work under a designated dose rate to decontamination work, it is necessary to ensure that the sum of effective dose for individual workers during radiation work or work under a designated dose rate and the effective dose measured according to 2-(1) above should not exceed the limits specified in (1) above.
- (3) When an employer of decontamination work, etc. contracts a portion of decontamination-related work to a contractor, the employer should direct the contractor to inform its workers that for each of the cases (a) and (b) of 2-(1), the effective dose, measured in the way specified in each case, to those who are engaged in decontamination-related work should not exceed the limit specified in (1).
- (4) When an employer of decontamination work, etc. directs a contractor to inform its workers of the information in (3), the employer should also direct the contractor to inform its workers that when those who are engaged in decontamination-related work carry out radiation work or work under a designated dose rate in controlled areas defined in Article 3 of the Ionizing Radiation Ordinance, the sum of the effective dose to which they are subject during such work and the effective dose measured according to 2-(1) should not exceed the limit specified in (1).
- (5) To properly control the radiation exposure dose of workers engaged in decontamination and related work in multiple different workplaces, the period of "five years" prescribed in (1) (a) above shall be quinquennial periods of which the first period starts on 1 January 2012 uniformly for all workplaces where decontamination work, etc. is performed. The same shall apply to employers that newly start decontamination and related work as their business in the middle of any of such quinquennial periods. In such cases, the value of 20 mSv multiplied by the number of years from the commencement date of such decontamination work until the end of the

corresponding quinquennial period shall be deemed as the exposure dose limit for the period ending at the end of such a quinquennial period and shall be used for application of relevant regulations.

- (6) The periods of "one year" prescribed in (1) (a) above shall be yearly periods of which the first period starts on the first date of "five years." The radiation dose received during the period from 11 March 2011 until 31 December 2011 shall be deemed as the dose received on 1 January 2012 and shall be included therein.
- (7) For work for handling designated contaminated soil and waste, the exposure doses received during the period from 1 January 2012 to 30 June 2012, if known, should be added to the dose on or after 1 July 2012 for the exposure dose control purpose.
- (8) If an employer of decontamination work, etc. newly employs workers for engaging in decontamination work in the midst of the period of "one year" or "five years," they should check the exposure dose history of each worker, at a special medical examination at the time of employment, received from the corresponding first date of the "one year" or the "five years" until the date prior to engaging in the decontamination work by using their record issued by their previous employer (if no records are available, records should be reissued by the previous duty station).
- (9) The starting dates described in (5) and (6) should be known to the workers for decontamination work.
- (10) The starting dates should be made known to the workers for decontamination and related work .
- 4. Records of dose measurements, etc.
  - (1) Employers of decontamination work, etc. should determine the exposure dose of workers for decontamination work as described below based on measurements made or by calculations according to the description in 2 above, record the results, and keep those records for 30 years. However, this provision shall not be applicable to records that are transferred to the organization designated by the Minister of Health, Labour and Welfare (Radiation Effects Association, a public interest incorporated foundation) after such records have been kept for five years or after the workers for decontamination work recorded therein have left the job. In these cases, Form 1 (as an example) may be filled in for recording.

Among the workers for decontamination work, those who were radiation workers specified in Article 4, Paragraph 1 of the Ionizing Radiation Ordinance or those who engaged in work under a designated dose rate, the exposure doses received during the period of engaging in radiation work or the period of engaging in work under a designated dose rate should be added to those received while engaging in decontamination work and the results should be recorded and kept accordingly.

- (a) For male workers and non-expectant female workers, the effective dose should be summed up for every three months, for every one year, and for every five years. (For those whose effective dose has never exceeded 20 mSv/y for five years, the effective dose to be summed up for every three months and for every one year.)
- (b) For female workers who may become pregnant, the effective dose should be summed up for every month, for every three months, and for one year. (For those who expect not to receive effective dose higher than 1.7 mSv/month, the effective dose should be summed up for every three months and for one year.)
- (c) For pregnant female workers, the effective dose of internal exposure and equivalent dose received on their abdominal surface should be summed up for one month and during pregnancy.
- (2) Employers of decontamination work, etc. should notify workers for decontamination work of the record of the exposure dose defined (1) above without delay.
- (3) When any employer of decontamination work, etc. intends to discontinue its operation, the employer shall transfer the records referred to in (1) above to the organization designated by the Minister of Health, Labour and Welfare (Radiation Effects Association, a public interest incorporated foundation).
- (4) Employers of decontamination work, etc. should issue copies of the records defined in(1) above to the worker who is going to leave the job or to all of the workers if they terminate their business.
- (5) When employers of decontamination work, etc. employ fixed-term contract workers or temporary workers, they should take note of the following matters in order to control their exposure doses appropriately.
  - (a) When employing fixed-term contract workers or temporary workers for a predefined period of less than three months, the exposure dose should be determined and recorded every month.
  - (b) At the end of the contract period, the employer should sum up the effective dose that the contractor received during the contract period and determine the exposure dose from the results, record them, and issue a copy of the records to that person.

## Section 4 Measures to Reduce Radiation Exposure

- 1. Prior radiological evaluation
  - (1) When employers of decontamination work, etc. carry out decontamination work, they should make surveys of workplaces in advance with respect to the items described below and record the results.

When the work for handling designated contaminated soil and waste is conducted continuously in one area, the survey at the said area is to be conducted with respect to the items described below once every two weeks during the period of the work and the results are to be recorded. However, if the results show that the average ambient dose rate and the concentration of radioactive material are consistently lower than 2.5  $\mu$ Sv/h and 10,000 Bq/kg, respectively, there is no need for further routine survey.

- (a) Conditions of the area for decontamination-related work
- (b) Average ambient dose rate ( $\mu$ Sv/h) for the area for decontamination-related work
- (c) Radioactivity concentration (Bq/kg) of Cs-134 and Cs-137 in contaminated soil and waste, removed soil, or contaminated waste.
- (2) Employers of decontamination work, etc. should clearly disclose in advance the date of the survey completion in (1) above, methods of the survey and the summary of results in a written form, etc. to the workers (when a portion of the decontamination work is contracted out to a contractor, the workers and the contractor) who will be engaged in the decontamination work.

When work for handling designated contaminated soil and waste is continued in the same place, the employer should clearly disclose the date of completion of the survey in (1), methods of survey, and the summary of results regarding this place in a written form, etc. once every two weeks to the workers (when a portion of the decontamination work is contracted out to a contractor, the workers and the contractor) who will be engaged in the decontamination work.

- (3) When measuring average ambient dose rates, the following matters should be noted:
  - (a) Average ambient dose rates should be measured and evaluated in accordance with Attachment 5.
  - (b) The purpose of the prior radiological evaluation for the average ambient dose rate regarding work for handling designated contaminated soil and waste is to determine if the average ambient dose rate at the workplace exceeds 2.5  $\mu$ Sv/h, and accordingly to judge whether or not the exposure dose control is required. Therefore, if the employer judges that the average ambient dose rate at the workplace clearly exceeds 2.5  $\mu$ Sv/h based on the results of the airborne monitoring survey, etc. published by the Nuclear Regulation Authority, the results of the airborne monitoring survey, etc. for the specific workplace

concerned may be used instead of actual measurements of average ambient dose rates in those individual workplaces.

- (4) When measuring concentration of radioactive materials, the following matters should be noted:
  - (a) Concentration of radioactive materials discharged by the accident in contaminated soil and waste, removed soil or contaminated waste should be measured in accordance with the procedures shown in Attachment 6.
  - (b) Measurement of radioactivity of soil in farmlands, fallen leaf layers, and soil in forests that are deemed to be an objective of the work for handling designated contaminated soil and waste in areas where the average ambient dose rate is 2.5 μSv/h or less, may be substituted by estimation of radioactivity of contaminated soil and waste from the average ambient dose rate shown in Attachments 6-2 and 6-3. If the estimates are less than 10,000 Bq/kg, the work there may be regarded as not falling under work for handling designated contaminated soil and waste. However, when handling only soil near the surface of unplowed farmlands, or handling the fallen leaf layer or soil near the surface in forests, it is necessary to use a simple measurement method to determine the concentration of radioactive materials in accordance with the procedures shown in Attachment 6-1 in order to determine whether or not the work fall under work for handling designated contaminated soil and waste.
  - (c) The work in living zones (around buildings, structures, and roads, etc.) may be regarded as not falling under work for handling designated contaminated soil and waste, regardless of the concentration of radioactive material in the soil near the surface, if simple measurement by the procedures shown in Attachment 6-1 shows the concentration of radioactive material in the soil to be handled down to the digging depth is less than 10,000 Bq/kg. However, in case the work involves handling soil near the surface only without

digging, it is necessary to determine, based on measurement of the radioactivity concentration of soil near the surface, whether or not the work falls under work for handling designated contaminated soil and waste.

(d) The purpose of prior radiological evaluation for the concentration measurement of radioactive materials in contaminated soil and waste regarding work for handling designated contaminated soil and waste is to determine whether the concentration of radioactive materials in the contaminated soil and waste to be handled exceeds 10,000 Bq/kg or 500,000 Bq/kg. Therefore, if the employer of decontamination work, etc. judges that the concentration of radioactive materials in the contaminated soil and waste to be handled clearly exceeds 10,000 Bq/kg based on the results of the airborne monitoring survey, etc. published by the Nuclear Regulation Authority, the results of the airborne monitoring survey, etc. may be used instead of actual measurement of radioactivity concentration of the contaminated soil and waste at the workplace. Furthermore, measurement of concentration of radioactive materials is not required if that of the contaminated soil and waste to be handled is clearly known as less than 10,000 Bq/kg and therefore not subject to work for handling designated contaminated soil and waste, based on the lookup table in Attachment 6-2 or 6-3 and other information as well as considering the digging depth of soil and average ambient dose rate at the workplace

- 2. Formulation of the working plan and work based on the plan
  - (1) When carrying out decontamination work, the employers of decontamination work, etc. should formulate a work plan based on the information from the preparatory survey, and the work should be conducted based on the plan (when handling designated contaminated soil and waste, the work is limited to that in workplaces where the average ambient dose rate exceeds 2.5 µSv/h).
  - (2) The following items should be defined in the work plan.
    - (a) Workplaces of decontamination-related work
    - (b) Methods of decontamination-related work
    - (c) Monitoring methods of exposure dose of workers for decontamination work
    - (d) Measures for reducing radiation exposure of workers for decontamination work
    - (e) Types and performance of machines, instruments, and other equipment (hereinafter referred to as "machinery") to be used for decontamination-related work
    - (f) Emergency measures when work-related accidents occur
  - (3) Employers of decontamination work, etc. should inform relevant workers of the details of the plan when the work plan has been established.
  - (4) Employers of decontamination work, etc. should take note of the following matters when establishing the work plan.
    - (a) The workplace should include a description of:

1) Resting areas where eating, drinking, or smoking is allowed.

2) Contamination screening areas for a person leaving the area and for objects to be taken out.

(b) Methods of work should include a description of:

Organization of workers, instructions for handling machinery, work procedures, working environment, etc.

(c) Measures for reducing radiation exposure should include a description of:1) Methods for measuring average ambient dose rate.

2) Methods for reducing radiation exposure such as reduction of working hours, etc.

3) Setting target values for exposure dose control based on estimates of the exposure dose.

- (5) Principles for establishing resting areas where eating, drinking, or smoking is allowed
  - (a) The areas for eating and drinking should be basically isolated from the open air such as inside vehicles, etc. If it is difficult to find such a place, eating and drinking should be allowed in the area where the following requirements are met. Smoking should also be allowed outside where the following requirements are met:

1) Soil with high radioactivity does not exist in the vicinity.

2) All workers should take a break simultaneously to prevent the inhalation of dust, and wait for about 20 min after interruption of the work, before eating, drinking, or smoking.

3) Workers should stay on the windward side of the workplace. If that is not possible, workers should at least not stay in the downwind direction of the workplace.

- (b) All workers should remove contaminated gear such as gloves, dust masks, etc. before eating, drinking, or smoking, and decontaminate their hands by washing, etc. Workers should check for their own contamination before eating and drinking when they have handled highly radioactive contaminated soil and waste.
- (c) Used dust masks should be stored properly so that radioactive particles do not migrate to the inner side of the masks or they should be discarded (in the case of a screening test, the surface density of radioactive materials discharged by the accident on the surface of the mask should be measured before discarding it).
- (d) Drinking water is allowed only in an unavoidable case to prevent heatstroke, etc. It is necessary to move to the windward side of the workplace and to take preventive measures for contamination before drinking by taking off gloves, etc.
- (6) Principles for setting contamination screening areas
  - (a) Employers of decontamination work, etc. should set a contamination screening area in the workplace or nearby for decontamination. The location of the

contamination screening area should be on the boundary of the workplace, where they are responsible for decontamination. However, if it is difficult to choose such a place for geographical or other reasons, it should be near the boundary.

- (b) Regardless of the above, it is allowed to place, at a certain location, a unified contamination screening area for multiple workplaces, if one employer of decontamination work, etc. undertakes decontamination work in several workplaces, and takes measures to prevent contamination by potentially contaminated workers or goods from spreading during moving from workplaces to the contamination screening area such as moving using air-tight vehicles, etc. This applies to the case that several employers of decontamination work, etc. set and use a unified contamination screening area is set by the contractee.
- (c) The contamination screening area should be equipped with radiation measurement equipment, facilities for decontamination such as cleaning and washing, installation of temporary storage for contaminated soil and waste, or removed soil or contaminated waste. The screening area can be outside as long as preventive measures are taken for contamination spreading, for example, covering the spot with a tent, etc.
- 3. Operation leaders
  - (1) When carrying out decontamination work, employers of decontamination work, etc. should appoint an operation leader among workers who is recognized to be competent to direct the work, and delegate them to direct the work according to the work plan (when handling designated contaminated soil and waste, the work is limited to those in the workplaces where the average ambient dose rate exceeds  $2.5 \,\mu$ Sv/h). The operation leader should conduct the following matters, too.
    - (a) Determine the work procedures appropriate for the work plan and distribute decontamination workers accordingly.
    - (b) Arrange a meeting on the work procedures with workers for decontamination work prior to undertaking the work.
    - (c) Check the machinery and equipment and remove defective pieces before starting the work.
    - (d) Supervise how radiation detectors and protective equipment are used.
    - (e) Prevent unauthorized people from entering the workplace.
  - (2) The work procedure should include a description of:

- (a) The method of each task in the work procedure.
- (b) The workplace, waiting area, and resting area.
- (c) The working hour control method.
- 4. Submission of work notice
  - (1) The employer of decontamination work, etc. who has received an order directly from a contractee (hereinafter referred to as "the primary contractor") should, when starting operation of work for decontamination, etc. or handling of designated contaminated soil and waste at a workplace where the average ambient dose rate exceeds  $2.5 \mu$ Sv/h, submit a "Notice for Work of Decontamination, etc. / Work for Handling Designated Contaminated Soil and Waste" (Form 2) in advance, to the Labour Standard Inspection Office within the jurisdiction of the workplace of the primary contractor (hereinafter referred to as "the Head of the relevant Labour Standard Inspection Office"). The work notice should be submitted basically for each contract of the work. However, if several discrete workplaces are included in one work contract, the work notice needs to be submitted for each workplace.
  - (2) The work notice should include the description of:
    - (a) Title of the work (Title of the contract of the work).
    - (b) Location of the workplace.
    - (c) Name and address of the primary contractor.
    - (d) Name and address of the contractee.
    - (e) Duration of the work.
    - (f) Full name of the work leader of the work.
    - (g) Average ambient dose rate at the workplace.
    - (h) List of relevant subcontractors and approximate number of workers for decontamination work.
- 5. Medical examination by medical doctors
  - Employers of decontamination work, etc. should promptly provide workers for decontamination work with a medical examination or treatment in any of the following cases:
    - (a) When workers received effective doses higher than the exposure dose limit.
    - (b) When workers inhaled or ingested radioactive materials discharged by the accident by mistake.
    - (c) When workers cannot decontaminate themselves to the level of less than 40

Bq/cm<sup>2</sup> by washing and cleaning after being contaminated by radioactive materials discharged by the accident.

- (d) When a wound is contaminated with radioactive materials discharged by the accident.
- (2) Application of the above (1)-(b) is limited only to cases in which a certain degree of internal exposure is envisaged. For example, if workers are buried in a large amount of soil and sand, etc. in an accident, etc., and the results of their nasal smear test, etc. show a contamination level over the criterion, or if workers swallow a large amount of soil, sand or contaminated water, etc.
- (3) When an employer of decontamination work, etc. contracts a portion of decontamination work to a contractor, the employer should direct the contractor to inform its workers that when those who are engaged in decontamination work fall under any of (a) to (d) of (1), they need to be immediately examined or treated by a doctor.

### Section 5 Measures for Preventions of Contamination Spreading and Internal Exposure

- 1. Restriction of dust dispersion
  - (1) When employers of decontamination work, etc. carry out decontamination work (excluding work for handling designated contaminated soil and waste), they should take measures to control generation of dust by wetting soil, etc. in advance. This does not apply when the work is in the category "other than highly radioactive contaminated soil and waste" or "other than high dust concentration" in the table in Section 3 2-(5).

In order to wet the objects, they should not be dampened using water applied by hoses, etc., but by spraying a mist in order to control generation of contaminated water. (The same applies to (2).)

(2) When an employer of decontamination work, etc. contracts a portion of decontamination work (excluding work for handling designated contaminated soil and waste) to a contractor, the employer should direct the contractor to inform its workers that measures to control generation of dust by wetting soil, etc. should be taken in advance, except for cases of falling under the categories "other than highly radioactive contaminated soil and waste" and "other than high dust concentration" in the table in Section 3 2-(5).

- 2. Use of containers for collecting waste, etc. and measures for storage
  - (1) Employers of decontamination work, etc. collect, transport, and store removed soil or contaminated waste as work for collecting waste, etc., they should use containers with the structure defined below to prevent removed soil or contaminated waste from dispersing or leaking, and post a sign on the surface of the containers indicating that that removed soil or contaminated waste is inside.

However, provisions described above do not apply as long as measures such as covering them with waterproof sheets are taken to prevent removed soil or contaminated waste from dispersing or leaking, if the objects are extremely difficult to place in a container such as large machines, logs, or dismantled objects bigger than the container, or comprise a large volume of contaminated soil, etc. which could result in causing high external radiation exposure or exposure to dust by additional work to subdivide them into containers.

It should be noted that "work for collecting waste, etc." does not include work for moving, back filling, and temporary storing of soil generated at the workplace as part of work for decontaminating soil, etc. or handling designated contaminated soil and waste.

(a) Containers to be used for collecting or storing removed soil or contaminated waste

1) Containers should be free from risk of removed soil or contaminated waste being dispersed or leaked.

(b) Containers for transporting removed soil or contaminated waste

1) Containers should be free from risk of removed soil or contaminated waste being dispersed or leaked.

2) Dose rate (1 cm dose equivalent rate) at a distance of 1 meter from the container surface (from the surface of the package if the container is packed) should not exceed 0.1 mSv/h.

In the case of transporting containers by a loading vehicle only, however, the provisions mentioned above do not apply if the maximum dose rate (1 cm dose equivalent rate) at a distance of 1 meter from the front, rear, and both sides of the vehicle (or from the outermost surface of the tire if the vehicle is an open type) does not exceed 0.1 mSv/h.

- (2) Employers of decontamination work, etc. should take the following measures as well as the measures described in (1) above when storing removed soil or contaminated waste as part of their decontamination work.
  - (a) Post signs to clearly indicate that removed soil or contaminated waste is stored in

the area.

- (b) Install a simple fence using colored pylons, etc. to keep unauthorized people from the storage area.
- (3) When employers of decontamination work, etc. carry out work for handling designated contaminated soil and waste, they should make efforts to remove in advance highly radioactive contaminated soil and waste in areas where work is to be done, except when reduction of exposure dose is expected to be equal to or better than the removal of contaminated soil and waste, such as soil covering, paving roads, turning and plowing in farmlands, etc. However the provisions described above should not apply to work to recover local infrastructure that is the minimum required for implementing decontamination such as restoration of water supplies, electricity, roads, etc.
- 3. Implementation of contamination screening
- (1) Contamination limit

The contamination limit should be set as 40 Bq/cm<sup>2</sup> (13,000 cpm as a GM counter reading). If it is difficult to conduct radiation measurement for inspecting contamination due to a high ambient dose rate around the area, the unified contamination screening area in accordance with the provision in Section 4 2-(6) (b) should be set where the ambient dose rate is low enough.

- (2) Contamination screening for a person who is leaving the controlled area
  - (a) Employers of decontamination work, etc. should check the body contamination of workers and equipment worn by workers such as clothing, footwear, working clothing, and protection equipment at the contamination screening area when they leave the workplace after being engaged in decontamination work.
  - (b) When employers of decontamination work, etc. find, by the screening in (a), that a worker is contaminated higher than the contamination limit, the employer should not allow the person to leave the workplace until the measures listed below are taken.

1) If the body surface is contaminated, let the person wash their body until the contamination level drops to the surface contamination limit or below.

2) If equipment, etc. is contaminated, let the person remove it from their body.

- (c) Those engaged in decontamination work, etc. (excluding workers) in the workplace in (a) should check the body contamination of workers and equipment worn by the workers such as clothing, footwear, working clothing, and protection equipment at the contamination screening area when they leave the workplace.
- (d) When those who are engaged in decontamination work, etc. (excluding workers)

in the workplace in (a) find through the screening in (c) that a worker is contaminated at a level exceeding the contamination limit, they should take the following measures before the worker leaves the workplace:1) When the body is contaminated, wash the body so that the contamination level falls below the contamination limit.

2) When equipment is contaminated, take off or remove the equipment.

- (3) Contamination screening of objects to be taken from the workplace
  - (a) Employers of decontamination work, etc. should check the contamination of objects to be taken from the workplace at the contamination screening area. However this provision should not apply if those objects are encased in containers or covered with plastic sheets to prevent removed soil or contaminated waste inside from dispersing or leaking, for transfer to another workplace for decontamination.
  - (b) When employers of decontamination work, etc. and workers find, by screening in (a), that objects are contaminated at higher than the contamination limit, these objects should not be allowed to be taken from the workplace. However, this provision does not apply if the object is to be transferred to other facilities such as facilities for decontamination work, storage, or disposal or to other decontamination workplaces after necessary measures are taken such as encasement in containers or covering with plastic sheets to prevent the removed soil or contaminated waste from dispersing or leaking.
  - (c) Those who are engaged in decontamination work, etc. (excluding workers) in the workplace in (a) should check at the screening area the contamination of objects to be taken from the workplace when they are taken. However this provision should not apply if those objects are to be transferred to other decontamination workplaces after necessary measures are taken such as encasement in containers or covering with plastic sheets to prevent the removed soil or contaminated waste from dispersing or leaking.
  - (d) If, in the screening in (c), an object is found to be contaminated at a level exceeding the contamination limit, those who are engaged in decontamination work, etc. (excluding workers) in the workplace in (a) should not permit the object to be taken. However, this provision does not apply if the object is to be transferred to other facilities such as facilities for decontamination work, storage, or disposal or to other decontamination workplaces after necessary measures are taken such as encasement in containers or covering with plastic sheets to prevent the removed soil or contaminated waste from dispersing or leaking.

(e) Contamination screening for vehicles should be conducted after washing off contaminated soil, etc. from the body of the vehicles, by taking note of the following matters:

1) Contamination screening is not necessary for parts, such as tires, that directly touch the ground, because they can be contaminated again on the driving route even after decontamination to below the contamination limit at the contamination screening area.

2) Decontamination is required for the inside and cargo carrier areas, etc. of vehicles other than tires, etc., if the areas are contaminated above the contamination limit.

3) It is desirable to decontaminate, and check the contamination, at the unloading place, of the cargo carrier areas, etc. for trucks, etc. which have transported removed soil or contaminated waste. However, if that is difficult, they may be driven back to the contamination screening area again for inspection and decontamination, by covering the carrier areas, etc. with plastic sheets, etc. in order to prevent removed soil or contaminated waste from dispersing or leaking.

4. Measures to prevent contamination

Employers of decontamination work, etc. should take effective measures including those listed below to prevent bodies, equipment, or objects from being contaminated beyond the limit;

- (1) Changing shoes, and changing or disposing of clothing, gloves, and protection equipment.
- (2) Pre-treating machinery to prevent its contamination, and decontaminating machinery after work.
- (3) Handling treatment for transportation of removed soil, etc.
- (4) Maintaining cleanliness of the workplace.
- 5. Prevention of body surface and internal contamination
  - (1) Employers of decontamination work, etc. should provide dust masks with collection efficiencies as given in the table below according to the work categories and radioactivity concentration of soil and waste or should provide respiratory protective equipment with higher effectiveness, and should direct decontamination workers to wear them when engaged in the work. Decontamination workers should wear the respiratory protective equipment.

	Contaminated soil and waste with radioactivity concentration higher than 500,000 Bq/kg (Highly radioactive contaminated soil and waste)	Those other than highly radioactive contaminated soil and waste
Work under dust		Dust collection efficiency:
concentration higher than 10 mg/m <sup>3</sup> (work	to or higher than 95%	equal to or higher than 80%
under a high dust concentration)		
Work other than that under a high dust concentration	Dust collection efficiency: equal to or higher than 80%	Dust collection efficiency: equal to or higher than 80%

It should be noted that non-woven fabric masks (that is, masks other than the dust masks certified by the national test, made of non-woven fabric material, and commonly used to prevent colds or pollen allergies, known as surgical masks, pleated masks, and face masks, but excluding gauze masks) may be used instead of dust masks if the work does not involve highly radioactive contaminated soil and waste nor is it conducted under high dust concentration, and the work does not fall under Articles 27 (Use of respiratory protective equipment) of the "Ordinance on Prevention of Hazards Due to Dust" (Ministry of Labour Ordinance No.18 of 1979) such as handling grass and trees or leaf mold, etc.

- (2) When decontamination and related work may result in workers becoming contaminated above the contamination limit, the employers of said workers shall keep the following matters in mind and shall instruct their workers in performing such decontamination work to wear appropriate protective clothing, gloves, or shoes for preventing contamination, according to work categories and radioactivity concentration of soil and waste given in the table below. The workers so instructed shall wear such protective gear.
  - (a) Gloves made of material less likely to cause allergies should be prepared if needed, because some types of rubber glove material may cause allergic symptoms.
  - (b) Measures such as shoes covered by plastic, etc. may be required in the case that

wearing rubber boots is difficult to use due to the nature of the work.

(c) Waterproof clothing such as raincoats, etc. should be worn as appropriate when using water for high-pressure cleaning, etc.

	Contaminated soil and waste	Those other than highly
	with radioactivity concentration	radioactive contaminated
	higher than 500,000 Bq/kg	soil and waste
	(Highly radioactive	
	contaminated soil and waste)	
Work under dust	Whole-body chemical protective	Long-sleeve shirts, cotton
concentration higher	shirts (for example, air-tight	gloves, rubber boots
than 10 mg/m <sup>3</sup>	coveralls), rubber gloves (over	
(work under a high	conoli gioves), iuddei dools	
dust concentration)		
Work other than under	Long-sleeve shirts, rubber	Long-sleeve shirts, cotton
a high dust	gloves (over cotton gloves),	gloves, rubber boots
concentration	rubber boots	

- (3) When an employer of decontamination work, etc. contracts a portion of decontamination work to a contractor, the employer should direct the contractor to inform its workers that the protective gear in (1) and (2) should be used; provided, however, that the contractor does not need to do so when the contractor and its workers, etc. use only the protective gear prepared by the employer.
- (4) When the protective gear to be used by workers for decontamination and related work is contaminated above the contamination limit (40 Bq/cm<sup>2</sup> (13,000 cpm as a GM counter reading)), employers of said decontamination-related workers shall not allow the workers to use such protective gear, unless it is decontaminated by washing or cleaning to the level of or lower than the said contamination limit. Disposable-type dust masks or non-woven masks should be discarded at the end of work each day. If a mask is taken off during a break in the day, the mask should be stored properly so that the inner side of the mask will not be contaminated with dust or soil, etc. or it should be discarded. If a dust mask is an exchangeable type, the filter should be discarded at the end of work each day and the mask face piece should be cleaned according to the instructions by the manufacturer. During cleaning, dust and sweat should not be left on the surface of the face piece, and replaceable parts such as

exhaust and intake valves and lacing should be checked for any dirt or damage. If required, they should be replaced with new parts before the next use.

- (5) When an employer of decontamination work, etc. contracts a portion of decontamination work to a contractor, the employer should direct the contractor to inform its workers that protective gear used according to (3) are found to be contaminated at a level exceeding the contamination limit (40 Bq/cm2 (13,000 cpm as a GM counter reading)) cannot be used unless the contamination is removed in advance by washing, etc. until the contamination level falls below the contamination limit; provided, however, that the contractor does not need to do so when the contractor and its workers, etc. use only protective gear, including contamination control, prepared by the employer.
- (6) Employers of decontamination work, etc. should clearly show that workers engaged in decontamination work, etc. are prohibited from smoking, eating, and drinking in areas other than the area designated in Section 4-2 (5), or use other means to prohibit them from doing so. In the latter case, the employers should inform workers engaged in decontamination work, etc. of the prohibition of smoking, eating, and drinking in the areas in writing such as by a letter or posting a notice. Workers engaged in decontamination work, etc. should not smoke or eat and drink in the non-designated areas.

### Section 6 Education for Workers

- 1. Education for operation leaders
  - (1) When employers of decontamination work, etc. appoint an operation leader for decontamination work (for work for handling designated contaminated soil and waste, they are limited to those in the workplaces where the average ambient dose rate exceeds 2.5 µSv/h), they should provide education to the operation leader with the following courses:
    - (a) How to determine work procedures and arrange workers engaged in decontamination work.
    - (b) How to direct workers engaged in decontamination work.
    - (c) Measures in case of abnormal events.
    - (d) See the Attachment 7 for details in implementing the education.
- 2. Special education for the workers engaged in decontamination work

- Employers of decontamination work, etc. should provide special education consisting of lectures and practical training with respect to the following courses to workers engaged in decontamination work before assigning them to decontamination work.
  - (a) Lectures

1) Knowledge about the effects of ionizing radiation on human body and exposure dose control methods

2) Knowledge about the methods of decontamination-related work

3) Knowledge about the structure and handling of the machinery, etc. used for decontamination-related work (except for work for handling designated contaminated soil and waste)

4) Names and intended use of the machinery, etc. used for decontaminationrelated work (limited only to work for handling designated contaminated soil and waste)

5) Relevant laws and regulations

(b) Practical training

1) Methods of decontamination and handling machinery, etc. used for decontamination-related work (except for work for handling designated contaminated soil and waste)

2) Methods of decontamination-related work (limited only to work for handling designated contaminated soil and waste)

- (2) See Attachment 8 for details in implementing the special education.
- 3. Education, etc. for other workers who require education
- (1) Employers other than employers of decontamination work, etc. who conduct decontamination-related work of their own sites or facilities, etc., or employers who conduct decontamination-related work in areas other than special decontamination areas, etc. should provide education to workers necessary for conducting decontamination-related work. It is desirable to provide education as well to those who are not employed by employers of decontamination work, etc. themselves such as individual proprietors, self-employed workers, volunteers, etc.
- (2) It is desirable that the ordering parties place an order for decontamination work only after confirming that employers of decontamination work, etc. have established a system to secure the required number of educated operation leaders and workers sufficient to conduct the work.

#### **Section 7 Measures for Health Care**

- 1. Special medical examination
  - (1) Employers of decontamination work, etc. should provide the workers regularly engaged in decontamination work (for work for handling designated contaminated soil and waste, limited to those in workplaces with an average ambient dose rate exceeding 2.5 µSv/h) with the following medical examinations by medical doctors at the time of employment or of being transferred to the work, and once within every 6 months thereinafter on a regular basis.

It should be noted that for workers with less than a 6-month-contract or a dispatched contract or dispatched workers, the medical examinations should be also provided at the time of employment in order to acquire their exposure history and health condition.

- (a) Inquiry and assessment of their exposure history (their work location, work descriptions and durations, whether they have subjective symptoms or not, and other relevant matters regarding radiation exposure for workers who have an exposure history)
- (b) White blood cell count and differential white blood cell count
- (c) Red blood cell count and hemoglobin or hematocrit value
- (d) Eye inspection for cataracts
- (e) Skin inspection
- (2) Regardless of the definition in (1) above, the tests (b) to (e) in (1) are not required if a medical doctor deems so for a worker whose medical examination (provided on a regular basis) of the previous year show that the effective dose was less than 5 mSv, and whose medical examination of the present year shows that the effective dose will unlikely exceed 5 mSv.
- (3) Employers of decontamination work, etc. should prepare the "ionizing radiation medical examination cards for decontamination, etc." (Form 3) based on the results of medical examinations in (1) above and keep them for 30 years. It should be noted, however, that this shall not be applicable if the records are transferred to the organization designated by the Minister of Health, Labour and Welfare (Radiation Effects Association, a public interest incorporated foundation) after the records have been kept for five years or the workers engaged in decontamination work recorded therein have left the job.
- 2. General medical examinations

- (1) Employers of decontamination work, etc. (for dispatched workers, their employer should provide a general medical examination and the same should apply hereinafter) should provide workers engaged in decontamination work who will be regularly engaged in decontamination work (for work for handling designated contaminated soil and waste, limited to those in the workplaces where the average ambient dose rate exceeds  $2.5 \,\mu$ Sv/h) with the following medical examinations by medical doctors at the time of employment or of being transferred to the work, and once within every 6 months thereinafter on a regular basis. For item (d), however, it is enough to regularly conduct a test once a year.
  - (a) Inquiry for medical history and work history
  - (b) Inquiry for subjective and objective symptoms
  - (c) Measurement of height, weight, and waist, and visual and hearing tests
  - (d) Thoracic spine X-ray examination and sputum test
  - (e) Measurement of blood pressure
  - (f) Anemia test
  - (g) Liver function tests
  - (h) Lipid blood tests
  - (i) Glucose test
  - (j) Urine test
  - (k) Electrocardiography
- (2) Employers of decontamination work, etc. should provide decontamination workers who will be regularly engaged in work for handling designated contaminated soil and waste except for (1) above, with the medical examination for tests (a) to (k) in (1) (at the time of employment, it is sufficient only to conduct a thoracic spine X-ray examination for the test (d)) by a medical doctor at the time of employment and once within every year thereinafter on a regular basis.
- (3) Regarding medical examinations for (1) above (limited to those on a regular basis), workers who were examined for items (f) through (i) and (k) of the above (1) at the previous medical examination may be exempted from all or part of such items, if the occupational physician considers them unnecessary.
- (4) As for items (c), (d), (f) through (i), and (k) of the medical examinations in (1) (excluding those at the time of employment), they may be omitted if the occupational physician considers them unnecessary based on the criteria set by the Minister of Health, Labour and Welfare.
- (5) The hearing test of item (c) of the medical examinations in (1) (limited to tests conducted during regular medical examinations) may be substituted by hearing tests that the occupational physician considers appropriate (excluding tests for hearing

ability for 1,000 Hz and 4,000 Hz sounds), for workers who were examined for the said items during the previous medical examination, or who are younger than 45 years (except those aged 35 and 40 years old).

- (6) Items (c), (d), (f) through (i), and (k) of (1) may be omitted from the medical examinations (limited to regular ones) in (2) if the occupational physician considers them unnecessary based on the criteria set by the Minister of Health, Labour and Welfare.
- (7) The hearing test of (1)-(c) of the medical examinations in (2) (limited to tests conducted during regular medical examinations) may be substituted by hearing tests that the occupational physician considers appropriate (excluding tests for hearing ability for 1,000 Hz and 4,000 Hz sounds), for workers who are younger than 45 years (except those aged 35 and 40 years old).
- (8) Employers of decontamination work, etc. should prepare the medical examination card, based on the results of the medical examination in (1) or (2) and keep them for 5 years.
- 3. Subsequent actions on the results of the medical examination
  - (1) Employers of decontamination work, etc. should seek opinions from the medical doctor about the results of the medical examination described in 1 or 2 above (limited to workers who were diagnosed as abnormal in the said medical examinations items) in the following manner.
    - (a) A medical doctor's opinion should be sought within three months from the date of a medical examination.
    - (b) The opinions and observations of the medical doctor should be recorded in each employee's personal medical examination card.
  - (2) Employers of workers engaged in decontamination work, etc. should inform those workers for decontamination and related work who had the said examinations of their medical examination results without delay.
  - (3) Employers of workers engaged in decontamination work, etc., when the medical examinations described in 1 above (limited to those conducted regularly) have been conducted, should submit the "Report of results on the ionizing radiation medical examinations for decontamination, etc." to the relevant Head of the Labour Standards Inspection Office without delay.
  - (4) When a worker has, or is suspected to have, or may have a radiation hazard ailment based on the results of the medical examinations described in 1 or 2 above, employers of the workers engaged in decontamination work, etc. should take the necessary measures to maintain the health of the worker including transferring them to another

workplace or changing the specific work, minimizing the radiation exposure time and changing the method of work and so forth, until there are no doubts about the worker's radiation hazard ailment or its possibility.

- 4. Transfer of records
  - (1) When any employer of decontamination work, etc. intends to discontinue its operation, the ionizing radiation medical examination cards for decontamination, etc. defined in 1-(3) above should be transferred to the organization designated by the Minister of Health, Labour and Welfare (Radiation Effects Association, a public interest incorporated foundation).
  - (2) Employers of decontamination work, etc. should issue copies of the ionizing radiation medical examination card for decontamination, etc. defined in 1-(3) above to workers who are going to leave the job or to all of the workers when the business is terminated.

### Section 8 Safety and Health Management System

- 1. Establishment of the safety and health management system by the primary contractors
- (1) Appointing a general safety and health manager

The primary contractors should appoint a general safety and health manager among the individuals who supervise and manage the decontamination work, and assign them to conduct tasks (2) to (4) shown below in order to ensure appropriate safety and health management for the decontamination work.

(2) Appointing a person responsible for safety and health control in relevant subcontractors

The primary contractor should require the relevant subcontractors to assign a person responsible for safety and health control to conduct the following tasks.

- (a) Communication with the general safety and health manager.
- (b) Coordination with the general safety and health manager to ensure that the following matters are conducted smoothly among the relevant subcontractors.
- (c) Communication and coordination with all of the relevant subcontractors when the relevant subcontractors assign part of their work to other subcontractors.
- (3) Holding the safety and health coordinating meeting consisting of all relevant subcontractors, etc.
  - (a) The safety and health coordinating meeting consisting of all relevant

subcontractors should be established and the meetings should be held once within a month on a regular basis.

(b) The following matters should be discussed at the safety and health coordinating meeting:

1) Implementation of education necessary for safety and health management such as special education for workers who are newly engaged in the decontamination work.

2) Implementation of preliminary surveys, and preparation and improvement of work plans.

3) Setting of contamination inspection areas and implementation of contamination inspections.

4) Emergency communications and actions in case of abnormal events, including the occurrence of occupational hazards.

- (4) Guidance and support for preparing work plans, etc.
  - (a) The general safety and health manager should guide or support the relevant subcontractors as appropriate to ensure that the relevant subcontractors conduct a preliminary survey, and prepare work plans appropriately.
  - (b) The general safety and health manager should guide or support the relevant subcontractors as appropriate to ensure that the relevant subcontractors inform their workers about the results of the preliminary survey and details of the work plans appropriately.
- 2. Consolidated management of radiation exposure by the primary contractor The primary contractor should assign a radiation administrator to conduct radiation dose control specified in Sections 3-2 through 3-4 and assign the radiation administrator to consolidate radiation exposure management for all workers from the relevant subcontractors under the direction of the general safety and health manager in paragraph 1-(1) by taking into account the following matters, in order to ensure that radiation exposure is controlled appropriately.

It is recommended that the radiation administrator be selected from among those who have radiation-related national qualifications, or those who have been trained through courses regarding radiation management at professional educational institutions.

(1) Implement setting of the contamination inspection area and contamination inspections appropriately upon consulting with the ordering party.

- (2) Guide or support the persons in charge of radiation administration from the relevant subcontractors to ensure that the relevant subcontractors take measures stated in Sections 3-2 through 3-4 and Section 8-4 appropriately.
- (3) Take part in the Organization for Registration Control of Radiation Exposure Doses for Decontamination and Related Work in order to properly determine the accumulated exposure doses of workers and to prevent exposure dose records from getting scattered or lost.
- (4) Implement any other tasks necessary for radiation control.
- 3. Safety and health management system by employers of decontamination work, etc.
  - Employers of decontamination work, etc. should appoint health managers or safety and health promoters to assign administration of technical matters stated in Sections 3-2 and 3-4 (Dose measurement and records of dose measurement, etc.), Section 5-3 (Contamination inspection, etc.), Sections 5-4 and 5-5 (Prevention for body and internal contamination), Section 6 (Education for workers), and Section 7 (Measures for health care).

It is desirable to appoint a safety and health promoter even if the number of workers is less than 10.

- (2) Employers of decontamination work, etc. should appoint a person in charge of radiation administration regardless of the size of workplaces to assign them to conduct those tasks stated in Sections 3-2 and 3-4 (Dose measurement and records of dose measurement results, etc.), Section 5-3 (Contamination inspection, etc.), and Sections 5-4 and 5-5 (Prevention for body and internal contamination).
- 4. Measures for maintaining and promoting the health of emergency workers at the TEPCO Fukushima Daiichi Nuclear Power Plant Employers of decontamination work, etc. should implement the following matters when they assign workers who had been engaged in the emergency work at the TEPCO Fukushima Daiichi Nuclear Power Plant to decontamination work.
  - (1) A report pursuant to Article 59, Paragraph 2 of the Ionizing Radiation Ordinance should be submitted to the Minister of Health, Labour and Welfare (c/o Office of Workers Health Planning for Ionizing Radiation, Industrial Health Division, Industrial Safety and Health Department, Labour Standards Bureau, Ministry of Health, Labour and Welfare).
    - (a) Copies of the medical examination card stated in Sections 7-1-(3) and 7-2-(8) should be submitted after medical examination without delay.
    - (b) The "status report on radiation dose control, etc. for workers engaged in designated emergency work, etc." (the Ionizing Radiation Ordinance Form No.

3) shall be submitted at the end of every three months. The submission shall, in principle, be in electromagnetic form as CSV file format.

(2) Health guidance should be provided to workers generally and inspections required by the guidelines should be implemented for workers having received exposure dose greater than 50 mSv during the period of the emergency operation in accordance with the "Guidelines on Maintaining and Improving Health of Emergency Workers at Nuclear Facilities, etc." (Public Notice No. 6 of Guidelines on Maintaining and Improving Health, 31 August, 2015).

# Attachment 1. List of special decontamination areas, etc.

- 1. Special decontamination areas
  - Designated areas

Areas, etc. included in former restricted areas and deliberate evacuation areas

	Number of	Designated areas
	municipalities	
Fukushima	10	All areas in Naraha town, Tomioka town, Okuma town, Futaba
Prefecture		town, Namie town, Katsurao village, and Iitate village. And
		areas that used to be designated as Warning Zones or Planned
		Evacuation Zones in Minamisoma city, Kawamata town, and
		Kawauchi village.

- 2. Intensive contamination survey areas
- Designated areas

Areas for which the radiation dose rate is 0.23  $\mu$ Sv/h or above

	Number of	Designated areas
	municipalities	
Iwate	3	All areas in Ichinoseki city, Oshu city, and Hiraizumi town
Prefecture		
Miyagi	7	All areas of Shiroishi city, Kakuda city, Kurihara city,
Prefecture		Shichikashuku town, Ogawara town, Marumori town, and
		Yamamoto town

Fukushima	14	All areas in Iwaki city, Date city, Nishigo village, Tanagura
Prefecture		town, Ishikawa town, Tamakawa village, Hirata village,
		Asakawa town, Furudono town, Hirono town, and Shinchi town;
		and areas excluding the restricted and designated areas in
		Minamisoma city, Kawamata town, and Kawauchi village
Ibaraki	19	All areas in Hitachi city, Tsuchiura city, Ryugasaki city, Joso
Prefecture		city, Hitachiota city, Takahagi city, Kitaibaraki city, Toride
		city, Ushiku city, Tsukuba city, Hitachinaka city, Kashima city,
		Moriya city, Inashiki city, Hokota city, Tsukubamirai city,
		Tokai village, Miho village, Ami town, and Tone town
Tochigi	7	All areas in Kanuma city, Nikko city, Ohtawara city, Yaita city,
Prefecture		Nasushiobara city, Shioya town, and Nasu town
Gunma	8	All areas in Kiryu city, Numata city, Shibukawa city, Midori
Prefecture		city, Shimonita town, Takayama village, Higashiagatsuma
		town, Kawaba village
Saitama	2	All areas in Misato city and Yoshikawa city
Prefecture		
Chiba	9	All areas in Matsudo city, Noda city, Sakura city, Kashiwa city,
Prefecture		Nagareyama city, Abiko city, Kamagaya city, Inzai city, and
		Shiroi city
Total	69	

\* Prepared by Division of Environmental Restoration, Environmental Restoration and Resources Recycling Bureau, Ministry of the Environment (March 2023)

# Attachment 2. Specific activities (work) prohibited for dispatched workers among decontamination work

No person should be allowed to carry out a Worker Dispatching Undertaking with regard to services falling under construction work (which refers to work relating to civil engineering, and construction, remodeling, maintenance, repairing, modification, wrecking, or dismantling of buildings and other structures, or preparation for any of these; hereinafter referred to as "civil engineering/construction work") pursuant to the provisions of Article 4, Paragraph 1 of the "Act for Securing the Proper Operation of Worker Dispatching Undertakings and Improved Working Conditions for Dispatched Workers." Thus, among decontamination work, those that fall under construction work of any of the above items are not allowed to engage dispatched workers.

Therefore, generally, if dispatched workers are employed at the construction site, their work is mainly considered as preparation for civil engineering/construction work. Thus they are in most cases prohibited, although the work may not be defined as construction work when conducted independently.

For reference, several examples are shown in the following, but, in principle, it should be judged whether or not decontamination work falls under construction work in line with the actual situation. In addition, it should be noted that even though the work may not be defined as civil engineering/construction work when conducted independently, it falls under civil engineering/construction work, and accordingly is prohibited because it is considered as preparation for the civil engineering/construction work.

Description of work (Machinery	Whether or not allowed	
used, etc.)		
Decontamination of forests	Generally, the work on the left is allowed. However,	
(removal of fallen leaves,	when it is practically conducted as preparation for civil	
branches, and leaves, etc. and	engineering or construction, etc., it falls under	
pruning of trees) (electric saws)	construction services, and accordingly is not allowed.	
Watering of soil, etc. (hoses, etc.)	Generally, the work is allowed as long as it is completed	
	independently. However, when it is practically	
	conducted as preparation for civil engineering or	
	construction, etc., it falls under construction services,	
	and accordingly is not allowed.	

Mowing, stripping of topsoil,	Generally, mowing and removal of grass, moss, and
removal of soil, grass, moss, fallen	fallen branches are allowed. However, when they are
branches and leaves, and garbage	practically conducted as preparation for civil engineering
	or construction, etc. they fall under construction
(mowers, shovels, brooms, rakes,	services, and accordingly are not allowed. In addition,
and sandbags)	stripping of topsoil and removal of soil are considered as
	construction services themselves, and accordingly are
	not allowed.
Stripping of topsoil, etc., removal	They are not allowed because they are considered as
of soil, grass, moss, fallen	construction services themselves.
branches and leaves, and garbage	
(heavy machines, such as	
backhoes, and sandbags)	
Removal of sludge in gutters, etc.	Generally, the work is allowed as long as it is completed
(shovels, brooms, rakes, and	independently. However, when it is practically
sandbags)	conducted as preparation for civil engineering or
	construction, etc., it falls under construction services,
	and accordingly is not allowed.
	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
Cleaning of roots, walls, roads and	Generally, the work is allowed as long as it is completed
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure	Generally, the work is allowed as long as it is completed independently. However, when it is practically
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes,	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or
Cleaning of roots, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services,
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed.
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels,	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself.
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for civil engineering or construction, etc., and therefore it
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for civil engineering or construction, etc., and therefore it falls under construction services.
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields) Transfer of removed soil, etc. to	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for civil engineering or construction, etc., and therefore it falls under construction services. It is not allowed because it is considered as a
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields) Transfer of removed soil, etc. to temporary storage places, etc.	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for civil engineering or construction, etc., and therefore it falls under construction services. It is not allowed because it is considered as a construction service itself.
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields) Transfer of removed soil, etc. to temporary storage places, etc. (backhoes)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for civil engineering or construction, etc., and therefore it falls under construction services. It is not allowed because it is considered as a construction service itself.
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields) Transfer of removed soil, etc. to temporary storage places, etc. (backhoes) Transport of removed soil, etc.	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for civil engineering or construction, etc., and therefore it falls under construction services. It is not allowed because it is considered as a construction service itself.
Cleaning of roofs, walls, roads and gutters, etc. (high-pressure washing machines, brushes, buckets, and rags) Temporary storage and burial of removed soil, etc. (shovels, sandbags, impermeable sheets, and shields) Transfer of removed soil, etc. to temporary storage places, etc. (backhoes) Transport of removed soil, etc. (transportation vehicles)	Generally, the work is allowed as long as it is completed independently. However, when it is practically conducted as preparation for civil engineering or construction, etc., it falls under construction services, and accordingly is not allowed. Burial of removed soil, etc. on the left is not allowed because it is considered as a construction service itself. For temporary storage of removed soil, etc., it is generally allowed as long as the work is simply transferring removed and accumulated soil. However, in most cases, it is practically conducted as preparation for civil engineering or construction, etc., and therefore it falls under construction services. It is not allowed because it is considered as a construction service itself.

	civil engineering or construction, etc. in most cases, and
	therefore it falls under construction services.
	On the other hand, transporting removed soil from a
	temporary storage yard as a secondary purpose is not
	allowed.
Stripping of roof tiles and side	It is not allowed because it is considered as a
walls of buildings (various tools)	construction service itself.
Stripping of asphalt (electric	It is not allowed because it is considered as a
cutters)	construction service itself.
cutters) Removal and transportation of	construction service itself.These are allowed when they refer to removal by manual
cutters) Removal and transportation of debris	construction service itself. These are allowed when they refer to removal by manual labor of: debris that is not fixed firmly; sediment that
cutters) Removal and transportation of debris	construction service itself. These are allowed when they refer to removal by manual labor of: debris that is not fixed firmly; sediment that flowed into residences; or sediment and debris left
cutters) Removal and transportation of debris	construction service itself. These are allowed when they refer to removal by manual labor of: debris that is not fixed firmly; sediment that flowed into residences; or sediment and debris left behind on the ground or on roads. However, when these
cutters) Removal and transportation of debris	construction service itself. These are allowed when they refer to removal by manual labor of: debris that is not fixed firmly; sediment that flowed into residences; or sediment and debris left behind on the ground or on roads. However, when these are conducted by using heavy work machines or as
cutters) Removal and transportation of debris	construction service itself. These are allowed when they refer to removal by manual labor of: debris that is not fixed firmly; sediment that flowed into residences; or sediment and debris left behind on the ground or on roads. However, when these are conducted by using heavy work machines or as preparation for civil engineering or construction, etc.,
cutters) Removal and transportation of debris	construction service itself. These are allowed when they refer to removal by manual labor of: debris that is not fixed firmly; sediment that flowed into residences; or sediment and debris left behind on the ground or on roads. However, when these are conducted by using heavy work machines or as preparation for civil engineering or construction, etc., they fall under construction services, and accordingly are

# Attachment 3. Determination on whether or not the work falls under the category of work under high dust concentration

1. Objectives

The purpose of the determination on whether or not the work falls under the category of work under high dust concentration is for employers to find out if a high concentration of dust that exceeds the lower limit of 10 mg/m<sup>3</sup> is generated during the work, and accordingly to determine the measurement method to control internal exposure.

- 2. Basic Policy
  - (1) A simplified measurement instead of an accurate one is acceptable as long as it can determine whether or not the dust concentration exceeds the lower limit of 10 mg/m<sup>3</sup> as a high dust concentration.
  - (2) It is desirable that carrying out the measurement be commissioned to experts.
- 3. Measurement method
  - (1) A personal sampler should be used during the work in order to determine whether or not the work falls under work under high dust concentration; the measurement should be based on the relative concentration indication method using a digital dust meter, in principle, measured near workers during work that generates dust.
  - (2) Measurement should follow the procedures described below:
    - (a) Relative concentration (cpm) should be measured for 2-3 minutes using a digital dust meter (e.g., LD-5) in the vicinity of workers (downwind), to the extent that it does not disturb the workers engaged in dust-generating work.
    - (b) It is desirable to conduct the measurement of the relative concentration described in (a) for all workers engaged in the work. However, when several workers are engaged in similar tasks within a distance of several meters, it may be sufficient to measure for a representative worker of the group.
    - (c) Both a digital dust meter and an inhalable dust concentration measurement device should be set in parallel in the vicinity (downwind), to the extent that they do not disturb the work, of the worker for whom the simplified measurement in (a) showed the highest relative concentration (cpm), and the concentration should be measured for 10 minutes or longer continuously to obtain a massconcentration conversion factor.

1) The concerned particles for the dust concentration measurement should be airborne inhalable dust (respiratory dust, particle diameter 100  $\mu$ m, 50% cut) that could be inhaled through a person's nose or mouth.

2) The concentration of the inhalable dust should be measured using an open-

face type of sampler at a face-velocity of 19 (cm/s) on a sampling filter paper. 3) Article 2 of the Working Environment Measurement Standards (Ministry of Labour Notification No. 46 of 1976) should be followed, except for the specifications of dust particle diameters of the dust particle separators and the measurement positions.

- (3) Dust particle concentrations (mg/m<sup>3</sup>) should be calculated from the relative concentration measurements (a) using a mass-concentration conversion factor obtained from the result in (c). In the case that the highest value of the measurements exceeds 10 mg/m<sup>3</sup>, the concentration in the environment for all other workers engaged in the same task should be considered as exceeding 10 mg/m<sup>3</sup>.
- 4. Measurement method (when using the specified mass-concentration conversion factor)
  - (1) Applied conditions

This measurement method should be applied only for handling soil mainly. Items that contain a large quantity of organic matter, including fallen leaves and branches, paddy straws, grasses, supply/sewage water sludge, and items such as rubble, construction waste, etc. that contain a large amount of dust other than soil should be handled in accordance with the measurement method set forth in Section 3.

- (2) Setting of measuring points
  - (a) The measurement during work under high dust concentration should be conducted in principle by the relative concentration indication method using a digital dust meter in the vicinity of workers engaged in dust-generating work. The measuring positions should be spots where the dust concentration is assumed to be the highest, downwind of the dust-generating source, and where the exhaust gas from heavy machines, etc. is less likely to affect the measurement. The concentration should be measured for all work during which dust is expected to be generated.
  - (b) When several workers are engaged in the same task, the measurement should be performed for a representative worker of the group.
  - (c) The measurement should be conducted as closely as possible to workers to the extent that it does not disturb the work and the safety of a measurer be ensured. If possible, it is desirable that the measurer take a digital dust meter with him and conduct the measurement as close as possible to the workers. If there should be no safety problems concerning the work, it is also possible that the workers themselves conduct measurement carrying the LD-6N on them.

#### (3) Measuring time

- (a) The measuring time should be 10 minutes continuously or longer during work at which the concentration is estimated to be the highest. If work is repeatedly carried out for short cycles of a few minutes each, the measurement should be made for a period of at least 10 minutes including the time that the work is underway.
- (b) If one work cycle is somewhere between 10 minutes and one hour, the measurement should be made for the entire cycle. If work is continued longer than that, the concentration should be measured several times for about a period of 10 minutes during the work and the highest value should be recorded.

#### (4) Evaluation

- (a) The relative concentration value indicated by the digital dust meter (the number counted per minute: cpm) is multiplied by the mass-concentration conversion factor to obtain the mass concentration and whether or not the value is exceeding 10 mg/m<sup>3</sup> should be determined.
- (b) The mass-concentration conversion factor

The mass-concentration conversion factor in this measurement method should be set to 0.15mg/m<sup>3</sup>/cpm. However, note the following items when using the factor. 1) Because the factor is set based on the results of limited measurements, it should be reviewed appropriately in step with the advancement of future research.

2) It is assumed that this factor will be applied to the digital dust meter of the light-scattering method, the LD-5 and LD-6.

#### Attachment 4. Internal exposure screening test method

1. Objectives

Screening tests are conducted by employers of decontamination work, etc. to judge if they are required to provide workers with measurement of internal exposure.

- 2. Basic policy
  - (1) For work under a high dust concentration (10 mg/m<sup>3</sup>) environment and involving handling of highly radioactive contaminated soil (500,000 Bq/kg), internal exposures exceeding the effective dose of 1 mSv/y could be expected assuming that work was conducted under an unprotected situation condition without wearing a dust mask. Therefore, measurement of internal exposure should be conducted once within every three months for workers engaged in such work.
  - (2) For workers other than the above, the screening test should be conducted when the work of the day is finished, and if the screening test result suggests a higher dose than the limit, measurement of internal exposure should be conducted once every three months.

In the case that the work is not conducted under a high dust concentration  $(10 \text{ mg/m}^3)$  environment or involves handling of highly radioactive contaminated soil (500,000 Bq/kg), the maximum value of internal exposure is estimated not to exceed 0.153 mSv/y, so internal exposure measurement should be conducted only when incidentally exposed to high dust concentration .

- 3. Screening test methods
  - (1) Screening tests should be conducted as follows:
    - (a) Radioactivity density on the surface of the mask should be measured with a radiation counter when the work of the day is completed.
    - (b) Radioactivity density in the intranasal area should be measured (nasal smear test) with a radiation counter when the work of the day is completed.
  - (2) The criteria for the screening tests should be that the radioactivity density on the surface of the mask and in the intranasal area should be low enough to ensure that the internal exposure of the workers engaged in decontamination work is well below 1 mSv per three months. Reference values are as follows:
    - (a) 10,000 cpm on the surface of a mask for the screening test (equivalent to 0.01 mSv based on the calculation using a protection coefficient of 2 instead of 3, which is normally used (with severer assumption), and assuming that 50 % of the

radioactive materials were attached on the mask surface, and the other 50 % were inhaled).

- (b) 1,000 cpm (equivalent to approximately 0.03 mSv of internal effective dose) and 10,000 cpm (equivalent to approximately 0.3 mSv of internal effective dose) for the nasal smear test, which is assumed to be conducted as a secondary screening test.
- (3) Actions after the screening tests
  - (a) In the case that the result of the test for a dust mask exceeds the criterion, the nasal smear test should be conducted.

In the case that the nasal smear test exceeds 10,000 cpm, internal exposure should be measured once every three months. For female workers who have been clinically confirmed as having a capability to become pregnant, internal exposure should be measured immediately when the nasal smear test exceeds the criterion.
 In the case that the nasal smear test result exceeds 1,000 cpm but is equal to 10,000 cpm or less, the results are recorded. If the nasal smear test result exceeds 1,000 cpm several times, then the internal exposure should be measured once every three months.

(b) In the measurement of the dose rate on the surface of a dust mask as specified in (1)-a, when the surface radioactivity density of a specific worker shows a drastically lower value than that of other workers who do the same work, instruction on how to properly wear a dust mask should be provided to the worker because the surface radioactivity density tends to show lower values due to improper wearing of the dust mask.

#### Attachment 5. Methods of measurement and evaluation of average ambient dose rate

1. Objectives

The purposes of measurement and evaluation of average ambient dose rates are for employers of decontamination work, etc. to measure and evaluate whether or not the average ambient dose rate at a workplace exceeds 2.5  $\mu$ Sv/h, and accordingly to determine the details of radiation dose control to be implemented when employers assign workers to the decontamination work.

- 2. Basic policy
  - (1) Average ambient dose rate should be measured prior to commencing the work.
  - (2) When conducting the work for handling designated contaminated soil and waste and work that is ongoing at the same place, the dose rate should be measured once every two weeks as well as prior to commencing the work. Even when the measured dose rate is equal to  $2.5 \ \mu S_V/h$  or less, the measurements should be continued until the dose rate falls below approximately 90% of  $2.5 \ \mu S_V/h$  ( $2.2 \ \mu S_V/h$ ). Also, the dose rate should be measured when there are significant changes in the surrounding environment due to typhoons, flooding, or land slippage.
  - (3) The measurement should appropriately reflect the actual exposure situation of workers.
- 3. Measurement and evaluation of average ambient dose rate
  - (1) Common subjects
    - (a) Average ambient dose rate should be measured at a point 1m above the ground.
    - (b) The measuring device should comply with Article 8 of the Working Environmental Measurement Standards.
  - (2) When small scattering of ambient dose rate is expected (except for the work for handling designated contaminated soil and waste).
    - (a) When the working area is a rectangular shape, ambient dose rate should be measured at the four corners and at the intersection of the two diagonal lines of the rectangle. (Working area refers to each of the sub-divisions of the original working area, which are less than 1,000 m<sup>2</sup>, if the size of the working area is greater than 1,000 m<sup>2</sup>.) Average ambient dose rate is derived by averaging the measurements from these five points.
    - (b) When the working area is not rectangular in shape, the ambient dose rates should be measured at four points set at almost equal distances along the outer periphery

and one intersection point of the two diagonal lines from facing points. The average ambient dose rate is derived by averaging the measurements at these five points.

- (3) When small scattering of the ambient dose rate is expected (except for the work for handling designated contaminated soil and waste).
  - (a) Ambient dose rate should be measured at three different points at least where the dose rate is likely to be the highest in the working area. Average ambient dose rate is derived by averaging the measurements from three points.
  - (b) In the case that the area was decontaminated in advance and contaminated soil, etc. with high concentration of radioactive materials has been removed, this is basically considered as a case with small scattering of ambient dose rate
- (4) When large scattering of ambient dose rate is expected:
  - (a) Average dose rate should be calculated according to the formula shown below regardless of the provision in (2) when radioactive materials are concentrated at a certain place in the work area resulting in a significant difference in the ambient dose rate from that in other work areas.
  - (b) The following matters should be noted:

(i) Ambient dose rate should be measured at several points every 1,000 m<sup>2</sup> around the points where a higher dose rate is expected (hereinafter referred to as "specified measuring points").

(ii) Exposure dose should be calculated for a representative individual for whom the highest dose is expected.

(iii) When the work continues for several days at the same place, the calculation should be done assuming the day when the work is conducted is the day with the highest exposure dose:,

$$R = \left(\sum_{i=1}^{n} \left(B^{i} \times WH^{i}\right) + A \times (WH - \sum_{i=1}^{n} \left(WH^{i}\right)\right)\right) \div WH$$

where,

*R*: average ambient dose rate ( $\mu$ Sv/h);

- n: number of specified measuring points;
- A: average ambient dose rate ( $\mu$ Sv/h) calculated according to (2);
- $B^i$ : ambient dose rate values at each specified measuring point ( $\mu$ Sv/h); to be put in the formula to obtain *R*;
- WH<sup>i</sup>: working hours (h) at the place of concern of a worker whose exposure dose is expected to

be the highest among the workers engaged in decontamination work who carry out the decontamination work at the place near each specified measuring point;

*WH*: working hours (h) in a day for the concerned decontamination work.

# Attachment 6. Measurement methods for radioactivity concentration in the contaminated soil and waste.

#### 1. Objectives

The objectives of measuring radioactivity concentration of contaminated soil and waste, removed soil, or contaminated waste are to assist employers in determining whether the contaminated soil and waste exceeds the reference value (10,000 Bq/kg or 500,000 Bq/kg) and in deciding the necessary radiation protection measures for assigning their workers to the decontamination work.

- 2. Basic policy
  - (1) Radioactivity concentration should be measured prior to commencing the work.
  - (2) When conducting the work for handling designated contaminated soil and waste and work that is ongoing at the same place, the radioactivity concentration should be measured once every two weeks as well as prior to commencing the work. When the measured radioactivity concentration is below 10,000 Bq/kg, the measurements should be continued until consistent low measurements can be obtained (approximately 10 weeks) considering the fluctuation of the measurements, except in the case that the measurement is clearly lower than 10,000 Bq/kg. Also, the radioactivity concentration should be measured when there are significant changes in the surrounding environment due to typhoons, flooding, or land slippage.
  - (3) It is desirable that the measurement be commissioned to experts.
  - (4) The radioactivity concentration should be measured for soil, etc. to be actually handled in the work.
  - (5) The highest value among measurements should be selected as a representative one considering the large variability of radioactivity concentration.
  - (6) The measurement before commencing the work should be based on the methods shown in Attachment 6-2 or the lookup table in Attachment 6-3, or other knowledge. The provision here does not require the measurement of radioactivity concentration when it can be clearly determined that the radioactivity concentration of contaminated soil and waste involved in the work is significantly lower than 10,000 Bq/kg, and the work does not fall under those for handling designated contaminated soil and waste.

### 3. Sampling

- (1) Principles for sampling
  - (a) Either one of following materials should be sampled:(i) Contaminated soil, removed soil, or contaminated waste in the location where the highest ambient dose rate was observed among air dose measurement points

of the workplace; or

(ii) Samples considered to have the highest radioactivity concentrations, among contaminated soil, removed soil, or contaminated waste to be handled during the work.

- (b) Several materials should be sampled from each workplace (every 1,000 m<sup>2</sup> when the size of the workplace is larger than 1,000 m<sup>2</sup>). For the workplace whose size is significantly larger than 1,000 m<sup>2</sup> and where radioactivity concentrations are relatively consistent for farmland, contaminated soil and waste, removed soil, or contaminated waste, the number of materials to be sampled may be considered as at least one for every 1,000 m<sup>2</sup>.
- (c) Average radioactivity concentration should be determined for sampled materials when soil is sampled at different depths up to a certain depth from the surface.
- (2) Location of sampling (except work for handling specified contaminated soil and waste.) Areas to be decontaminated with potentially high radioactivity concentration include the following:
  - (a) Farmland

Soil in the zone up to 5 cm in depth from the surface

(b) Forest

(i) Representative leaves and bark of trees, and fallen leaves and branches(ii) Leaf mold in the zone up to 3 cm in depth in the fallen leaf layer (leaf mold)

- (c) Living environment (Areas around structures such as buildings or roads)
   The area where rain water is collected and where the collected rain water exits,
   plants and their roots, locations where rainwater, mud, or soil tend to be
   accumulated, and removed objects such as sludge near the structures to which
   small particles tend to be attached
- (3) Location of sampling (limited to the work for handling specified contaminated soil and waste)
  - (a) Farmland

Soil in the zone up to 15 cm in depth from the surface.

(b) Forest

Leaves of trees, bark, and fallen leaves and branches whose potential radioactivity concentration is expected to be the highest. (When measuring the fallen leaf layer (leaf mold), soil up to 15 cm in depth including the soil beneath the layer should be measured.)

- (c) Living environment (Areas around the structures such as buildings or roads) The soil, etc. among those items to be handled in the work, accumulated in places where rain water flows in and out, where there are plants and their roots, and where rain water, mud, and soil tend to pool, and those of the places near structures to which particles easily attach (soil, etc. from the ground surface down to the depth of actual handling of soil, etc.; the depth should vary depending on the excavation depths in the actual decontamination work).
- 4. Analysis methods

Either method below should be used for analysis.

- (1) The total gamma ray measurement or gamma spectrum analysis, as specified in Article 9, Paragraph 1-2 of the Working Environment Measurement Standards.
- (2) Simplified measurement method
  - (a) The radioactivity concentration should be calculated using the following method if the correlation between the dose rate on the sample surface and the sum of the concentrations of Cs-134 and Cs-137 is known. (See Attachment 6-1 for details.)
    (i) Place the sample in a container and measure the weight.
    - (ii) Measure the maximum dose rate on the surface of the container.
    - (iii) Use the measured weight and the dose rate to calculate the sum of the concentrations of Cs-134 and Cs-137 in the sample.
  - (b) It is difficult to measure radioactivity concentrations equal to 300,000 Bq/kg or more with the simplified method even when using the V5-type container because the upper measurement limit of the typical NaI scintillation counter is as low as 30 μSv/h. Therefore, when the pointer on the scintillation counter goes past 30 μSv/h, the relevant regulations should be applied under the assumption that the concentration of the measured object exceeds 500,000 Bq/kg, or an analysis should be carried out using the method of (1) above.
  - (c) When measuring specimens for which radioactivity concentration is expected to be around 10,000 Bq/kg, the surface dose rate should be measured while placing a sandbag at the area with low ambient dose rate because the measured surface dose rate could be lower than the ambient dose rate in the area.
- (3) Simplified measurement based on the relationship between ambient dose rate and radioactivity concentration

- (a) In the area where the average ambient dose rate is equal to  $2.5 \ \mu$ Sv/h or less, the radioactivity concentration may be calculated using the following method if the correlation between the ambient dose rate at a height of 1 m and the sum of the concentrations of Cs-134 and Cs-137 in the soil (the average from the ground surface to the depth of 15 cm) is known. (See Attachments 6-2 and 6-3 for details.) It should be noted that the simplified method shall not be applied to work to handle soil near the ground surface of unplowed farmlands only or to handle fallen leaf layers or soil near the ground surface only, because data have indicated that approximately 50% of radioactive materials (for unplowed farmlands) or 60% of radioactive materials (for school yards) is accumulated in the zone from the ground surface to 1 cm in depth, and that radioactivity in the forest is mainly accumulated in fallen leaves.
- (b) For contaminated soil in the living environment (areas around buildings, structures, and roads), the simplified measurement described in (2) should be applied to soil, etc. to be actually handled in the work, because applying the estimation result uniformly is not practical due to variation in the properties of buildings, structures, roads, rivers, and soil, etc.
- (c) Measurement methods

(i) Agricultural soil

- Measure average ambient dose rate at 1 m in height from the ground surface (according to Attachment 5)
- Select the estimation equation and conversion factor depending on the type of farmland and type of soil.
- Use the estimation equation to estimate the sum of the concentrations of Cs-134 and Cs-137 in the soil, etc.

(ii) Fallen leaf layer in a forest

- Measure average ambient dose rate at 1 m in height from the ground surface (according to Attachment 5)
- Use the estimation equation to estimate the sum of the concentrations of Cs-134 and Cs-137 in the soil, etc.

#### Attachment 6-1. Simplified measurement procedures for radioactivity concentration

- 1. Type of usable containers
  - Round V-series containers (plastic containers of 128 mmφ x 56 mmH; hereinafter referred to as "the V5 container.")
  - (2) Sandbags
  - (3) Flexible containers
  - (4) 200 L (liter) drum cans
  - (5) 2 L (liter) polyethylene bottles

The following is the method for determining whether the radioactivity concentration of a container containing accident-derived waste is below 10,000 Bq/kg or 500,000 Bq/kg.

1) Measure the radiation dose rate on the surfaces of containers containing accidentderived waste, and define the largest value as A ( $\mu$ Sv/h).

2) Determine the radioactivity B (Bq) of the containers containing accident-derived waste by putting factor X depending on the measurement date and the measured radiation dose rate A ( $\mu$ Sv/h) into the following formula. Table 1 lists the values of the factor X by the measurement date and container type.

 $A \times Factor X = B$ 

3) Measure the weight of the containers containing accident-derived waste. Set this as C (kg).

4) To determine the radioactivity concentration D (Bq) of the containers containing accident-derived waste, substitute the radioactivity of the containers containing accident-derived waste for B (Bq) and the weight for C (kg) in the following formula.

B  $\div$  C = D

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

	Values of the factor X				
Measurement date	V5 containers	Sandbag	Flexible containers	200 L drum cans	2L polyethylen e bottles
Until January 2022	4. 8E+04	1.1E+06	1. 5E+07	3.8E+06	1.4E+05
Until April 2022	4.9E+04	1.1E+06	1. 5E+07	3.8E+06	1.4E+05
Until July 2022	4.9E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until October 2022	4.9E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until January 2023	4.9E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until April 2023	4.9E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until July 2023	4.9E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until October 2023	4.9E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until January 2024	4.9E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until April 2024	5.0E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until July 2024	5.0E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until October 2024	5.0E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until January 2025	5.0E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until April 2025	5.0E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until July 2025	5.0E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until October 2025	5.0E+04	1.1E+06	1.5E+07	3.8E+06	1.4E+05
Until January 2026	5. 0E+04	1.1E+06	1. 5E+07	3.8E+06	1.4E+05

Table 1 Values of factor X listed by the measurement date and container types

\* Prepared by the Office of Workers Health Planning for Ionizing Radiation, Industrial Health Division, Industrial Safety and Health Department, Labour Standards Bureau, Ministry of Health, Labour and Welfare with the cooperation of the Japan Atomic Energy Agency

# Attachment 6-2. Simplified procedures for measurement of radioactivity concentration of agricultural soil

- 1. Method to determine that the radioactivity (total radioactivity of Cs-134 and Cs-137) in agricultural soil is lower than 10,000 Bq/kg based on the average ambient dose rate at the height of 1 m from the ground surface
  - 1) Measure the average ambient dose rate  $\underline{A}$  ( $\mu$ Sv/h) at the workplace (farmland) before starting the work (See Attachment 5 for the measurement method)
  - Select the estimation formula depending on the type of farmland and type of soil<sup>\*1</sup> as summarized in Table 1.
  - 3) Estimate the radioactivity concentration of Cs in the agricultural soil (15 cm in depth), by substituting the measurement  $\overline{A}$  ( $\mu$ Sv/h) into the formula selected in Step 2).

Ambient dose rate  $A(\mu Sv/h)$  x Factor X – Factor Y

= Radioactivity concentration (total of Cs-134 and Cs-137) (Bq/kg)

(Example)

Radioactivity concentration of Cs in Andosols for a "rice paddy in other areas" when the average ambient dose rate is 0.2  $\mu$ Sv/h (Estimation formula: C)<sup>\*2</sup>

$$0.2 \times 9,950 - 261 = 1,729$$
 Bq/kg (Estimated)

Zone	Type of	Type of soil	Formula	Factor X	Factor Y
	farmland				
Evacuation	Non-decontamin	ated farmland	А	8, 370	477
area	Decontaminated	Topsoil	В	7, 980	562
	farmland *4	stripping			
		Deep	С	10, 730	717
		plowing			
Other areas	Rice paddy	Andosol	D	9, 950	261
		Non-Andosol	E	7, 350	93
	Agricultural	Andosol	F	5, 000	76
	field	Non-Andosol	G	5, 880	125
	Orchard•	Pasture	Н	5, 070	42

Table 1: Selection of estimation formu
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- \*1 Whether or not the soil of the farmland is an Andosol type can be checked by using the soil distribution map in the "Japan Soil Inventory" on the web page of the National Agriculture and Food Research Organization (NARO) [URL: https://soil-inventory.rad.naro.go.jp/]
- \*2 The conversion factors will change due to radioactivity decay with time. The estimation formula will be revised before the change becomes too large to be negligible.
- \*3 Prepared by the Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization (January 2021)
- \*4 Farmlands that have been deeply plowed or whose topsoil has been stripped.

Ambient	Cs	Ambient	Cs	Ambient	Cs
dose rate	concentration	dose rate	concentration	dose rate	concentration
(µSv/h)	(Bq/kg)	(µSv/h)	(Bq/kg)	(µSv/h)	(Bq/kg)
0.1	360	1.1	8, 730	2. 1	17, 100
0. 2	1, 197	1. 2	9, 567	2. 2	17, 937
0.3	2, 034	1. 3	10, 404	2.3	18, 774
0.4	2, 871	1.4	11, 241	2.4	19, 611
0.5	3, 708	1.5	12, 078	2.5	20, 448
0.6	4, 545	1.6	12, 915	2.6	21, 285
0.7	5, 382	1.7	13, 752	2.7	22, 122
0.8	6, 219	1. 8	14, 589	2.8	22, 959
0.9	7, 056	1.9	15, 426	2.9	23, 796
1.0	7, 893	2. 0	16, 263	3.0	24, 633

 Table 2: Correspondence between radioactive Cs concentration and averaged ambient

 dose rates in non-decontaminated farmland in the emergency evacuation areas

Prepared by the Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization (January 2021) Attachment 6-3. Simplified measurement method for radioactivity concentration of forest soil, etc.

- Method to determine that the radioactivity (total of Cs-134 and Cs-137) in the fallen leaf layer and soil in forest (hereinafter referred to as "forest soil, etc.") is lower than 10,000 Bq/kg based on the average ambient dose rate at the height of 1 m from the ground surface
- 1) Measure the average ambient dose rate  $\overline{A}$  ( $\mu$ Sv/h) at the workplace (forest) before starting the work (See Attachment 5 for the measurement method)
- 2) To estimate the radioactivity concentration of Cs in the forest soil, etc. (15 cm in depth), substitute the measurement  $\overline{A}$  ( $\mu$ Sv/h) into the formula.\*

 $(A (\mu Sv/h) \times 8,780) + 950 =$  Radioactivity concentration (total of Cs-134 and Cs-137) (Bq/kg) (\*1, 2)

## Example

The radioactivity concentration of Cs when the average ambient dose rate is 1.0  $\mu Sv/h$ 

 $(1.0 (\mu Sv/h) \ge 8,780) + 950 = 9,730 Bq/kg$  (Estimated)

Lookup table for radioactive Cs concentrations in forest soil as a function of ambient dose rates\*3

Average	Cs	Average	Cs	Average	Cs
ambient	concentration	ambient	concentration	ambient	concentration
dose rate	(Bq/kg)	dose rate	(Bq/kg)	dose rate	(Bq/kg)
(µSv/h)		(µSv/h)		(µSv/h)	
0.1	1, 828	1.1	10, 608	2. 1	19, 388
0. 2	2, 706	1. 2	11, 486	2.2	20, 266
0.3	3, 584	1.3	12, 364	2.3	21, 144
0.4	4, 462	1.4	13, 242	2.4	22, 022
0.5	5, 340	1.5	14, 120	2.5	22, 900
0.6	6, 218	1.6	14, 998		
0.7	7, 096	1.7	15, 876		
0.8	7, 974	1.8	16, 754		
0. 9	8, 852	1. 9	17, 632		

1.0 9, 730 2.0 18, 510
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- \* 1 Source: Dr. Shinji Kaneko, "Aging of Radioactive Cesium Amount and Air Dose Rate in Forest," Abstracts of the Annual Meeting, Japanese Society of Soil Science and Plant Nutrition No. 63 September 2017, P.15
- \* 2 The conversion factors will vary due to radioactivity decay over time. The estimation formula will be revised before the variation becomes too large to ignore.
- \* 3 Prepared by Forestry Labor and Management Support Office, Forestry Management Improvement Division, Forest Policy Planning Department, Forestry Agency with the cooperation of Forest and Forest Products Research Institute, Forest Research and Management Organization (January 2022)

## Attachment 7. Special education for operation leaders

Education for operation leaders who direct the decontamination work (for work for handling designated contaminated soil and waste, limited to that in the workplaces where the average ambient dose rate exceeds 2.5  $\mu$ Sv/h.) should be provided by lectures according to the table below, which shows general subject areas in the left column with specific topics in the middle column. Minimum hours for each subject are shown in the right column.

Subject areas	Topics	Minimum
		duration
How to determine work	1) Structure and handling of radiation detectors	2.5 hours
procedures and arrange	2) Methods for preliminary survey	
workers engaged in	3) Establishment of work plans	
decontamination work	4) Determination of work procedures	
How to direct workers	1) Methods for directing inspections, including before	2 hours
engaged in	work, etc. and education	
decontamination work	2) Methods of instruction during work	
	3) Methods to instruct workers in appropriate usage of	
	protective equipment	
How to take actions in	1) Emergency actions in case of occupational hazards	1 hour
case of abnormal events	2) Methods of transport to the hospital, etc.	

# Attachment 8. Special education for workers

Special education for the workers engaged in decontamination work should be provided by lectures and practical training.

The theoretical education by lectures should follow the table below showing general subject areas in the left column with specific topics in the middle column. Minimum hours for each subject are shown in the right column.

Subject areas	Topics	Minimum
		duration
Knowledge about	For workers engaged in decontamination work (except for	1 hour
effects of ionizing	those who handle designated contaminated soil and waste.,	
radiation on living	only at a workplace where the average ambient dose rate is	
bodies and	equal to 2.5 $\mu$ Sv/h or less):	
exposure dose		
control methods	1) Types and nature of ionizing radiation	
	2) Effects of ionizing radiation on cells, tissues,	
	organs, and the whole body	
	3) Exposure dose limit and methods of dose measurements	
	4) Method for confirming and recording the result of dose	
	measurements	
	For workers engaged in work for handling designated	1 hour
	contaminated soil and waste, only at a workplace where the	
	average ambient dose rate is equal to 2.5 $\mu$ Sv/h or less:	
	1) Types and nature of ionizing radiation	
	2) Effects of ionizing radiation on cells, tissues, organs, and	
	the whole body	
	3) Exposure dose limit	
Knowledge about	For workers engaged in decontamination, etc.:	1 hour
the methods for	1) Methods and procedures of work for decontamination, etc.	
decontamination-	2) Methods for radiation measurement	
related work	3) Methods for monitoring of dose equivalent rate from	
	external radiation	
	4) Methods for preventing spread of contamination	
	5) Methods for inspection of contamination on the body	
	surface, etc. and for decontamination	
	6) Functions and use of protective equipment	
	7) Emergency actions in case of abnormal events	

For workers engaged in collecting, transporting, or storing	1 hour
removed soil (hereinafter as "work for collecting removed	
soil, etc."):	
1) Methods and procedures of work for collecting removed	
soil, etc.	
2) Methods for radiation measurement	
3) Methods for monitoring of dose equivalent rate from	
external radiation	
4) Methods for preventing spread of contamination 5)	
Methods for inspection of contamination on the body surface,	
etc. and for decontamination	
6) Functions and use of protective equipment	
7) Emergency actions in case of abnormal events	
For workers engaged in collecting, transporting, or storing	1 hour
contaminated waste (hereinafter "work for collecting	
contaminated waste, etc."):	
1) Methods and procedures of work for collecting	
contaminated waste, etc.	
2) Methods for radiation measurement	
3) Methods for monitoring of dose equivalent rate from	
external radiation	
4) Methods for preventing spread of contamination	
5) Methods for inspection of contamination on the body	
surface, etc. and for decontamination	
6) Functions and use of protective equipment	
7) Emergency actions in case of abnormal events	
For workers engaged in work for handling designated	1 hour
contaminated soil and waste, at a workplace where average	
ambient dose rate is greater than 2.5 $\mu$ Sv/h (hereinafter "work	
for handling designated contaminated soil and waste."):	
1) Methods and procedures of work for handling designated	
contaminated soil and waste.	
2) Methods for radiation measurement	
3) Methods for monitoring of dose equivalent rate from	
external radiation	
4) Methods for preventing spread of contamination	
5) Methods for inspection of contamination on the body	

	surface, etc. and for decontamination	
	6) Functions and use of protective equipment	
	7) Emergency actions in case of abnormal events	
		11
	For workers engaged in the work for handling designated	1 hour
	contaminated soil and waste, only at a workplace where	
	average ambient dose rate is equal to 2.5 $\mu$ Sv/h or less):	
	1) Methods and procedures of work handling designated	
	contaminated soil and waste.	
	2) Methods for radiation measurement	
	3) Methods for preventing spread of contamination	
	4) Methods for inspection of contamination on the body	
	surface, etc. and for decontamination	
	5) Functions and use of protective equipment	
	6) Emergency actions in case of abnormal events	
Knowledge about	For workers engaged in decontaminating soil, etc.: The	1 hour
structure and	structure and handling of the machinery, etc. used for	
handling of the	decontamination work	
machinery, etc.	For workers engaged in collecting removed soil, etc.:	1 hour
used for	The structure and handling of the machinery, etc. used for the	
decontamination-	work collecting removed soil, etc.	
related work	For workers engaged in collecting waste, etc.:	1 hour
(limited to the	The structure and handling of the machinery, etc. used for the	
name and usage of	work collecting waste, etc.	
the machinery in	For workers engaged in handling designated contaminated	30
the case of workers	soil and waste.	minutes
engaged in	The name and use of machinery for work for handling	
handling	designated contaminated soil and waste.	
designated		
contaminated soil		
and waste.)		
Relevant laws and	Relevant provisions stipulated in the Industrial Safety and	1 hour
regulations	Health Act, the Order for Enforcement of the Industrial	
	Safety and Health Act, the Ordinance on Industrial Safety and	
	Health, and the Ionizing Radiation Ordinance for	
	Decontamination	

Training should provide the education topics described in the middle column of the following table according to each subject area listed in the left column. Minimum hours for each subject are shown in the right column.

Subject areas	Topics	Minimum
		duration
How to conduct	For workers engaged in decontamination, etc.:	1.5 hours
decontamination-	1) Practice of work for decontamination, etc.	
related work and how	2) Handling of radiation detectors	
to handle the	3) Monitoring of dose equivalent rate from external	
machinery, etc.	radiation	
(limited to the	4) Measures for preventing spread of contamination	
practice on how to	5) Inspection of contamination on the body surface, etc.	
conduct	and decontamination	
decontamination-	6) Handling and use of protective equipment	
related work in the	7) Handling of the machinery used for decontaminating	
case of workers	soil, etc.	
engaged in handling	For the workers engaged in collecting removed soil	1.5 hours
designated	etc. : 1) Practice of work for collecting removed soil,	
contaminated soil and	etc.	
waste)	2) Handling of radiation detectors	
	3) Monitoring of dose equivalent rate from external	
	radiation	
	4) Measures for preventing spread of contamination	
	5) Inspection of contamination on the body surface, etc.	
	and decontamination	
	6) Handling and use of protective equipment	
	7) Handling of the machinery used for collecting	
	removed soil, etc.	
	For workers engaged in collecting contaminated waste,	1.5 hours
	etc.:	
	1) Practice of work for collecting contaminated waste,	
	etc.	
	2) Handling of radiation detectors	
	3) Monitoring of dose equivalent rate from external	
	radiation	
	4) Measures for preventing spread of contamination	
	5) Inspection of contamination on the body surface, etc.	

and decontamination	
6) Handling and use of protective equipment	
7) Handling of the machinery used for collecting	
contaminated waste, etc.	
For workers engaged in work for handling designated	1 hour
contaminated soil and waste, at a workplace where the	
average ambient dose rate is greater than 2.5 $\mu$ Sv/h: 1)	
Practice of work for handling designated contaminated	
soil and waste.	
2) Handling of radiation detectors	
3) Monitoring of dose equivalent rate from external	
radiation	
4) Measures for preventing spread of contamination	
5) Inspection of contamination on the body surface, etc.	
and decontamination	
6) Handling and use of protective equipment	
For workers engaged in work for handling designated	1 hour
contaminated soil and waste, only at a workplace where	
average ambient dose rate is equal to 2.5 $\mu$ Sv/h or less:	
1) Practice of work for handling designated	
contaminated soil and waste	
2) Handling of radiation detectors	
3) Measures for preventing spread of contamination	
4) Inspection of contamination on the body surface, etc.	
and decontamination	
5) Handling and use of protective equipment	