Labour Standards Bureau Notification No.253
30 March 2001

To All Directors of the Prefectural Labour Bureaus

Director of Labour Standards Bureau of Ministry of Health, Labour and Welfare

(Official seal omitted)

Regarding the enforcement of the ministerial ordinance to revise part of the Ordinance on Industrial Safety and Health, and the Ordinance on Prevention of Ionizing Radiation Hazards

The Ministerial Ordinance for Partial Amendment to the Ordinance on Industrial Safety and Health, and the Ordinance on Prevention of Ionizing Radiation Hazards (the Ministerial Ordinance of the Ministry of Health, Labor and Welfare No. 42, 2001. Hereafter, referred to as the "Revised Ministerial Ordinance") has been promulgated on 27 March 2001 and will come in effect from 1 April 2001.

This revision is provided for "Regarding the Adoption of the ICRP 1990 Recommendations (Pub. 60) to the Domestic System, etc. (Recommendation)" of the Radiation Council and other international standards.

Expectations are that the purpose of this revision shown below will be fully understood to ensure notification to all those concerned or involved and to properly implement the revision.

"Regarding the pros and cons of omitting the items of Medical Examinations provided for in Article 56 of the Ordinance on Prevention of Ionizing Radiation Hazards" in Labour Standards Bureau Notification No. 3 dated 1st January 1989 and "Regarding the Radiation Control Area provided for in Article 3, paragraph (1) of the Ordinance on Prevention of Ionizing Radiation Hazards" in Labour Standards Bureau Notification No. 300 dated 22 May 1990 will be abolished on 31 March 2001.

I. Key Points of Revision

1 Amended terms, for example, replacement of the term "dose equivalent" with "dose"

2 Strengthened standards in the radiation control area, etc. (the Ordinance on Prevention of Ionizing Radiation Hazards revised by the provisions of Article 3 and Article 3-2 of the Revised Ministerial

Ordinance (Ordinance of the Ministry of Labour No. 41,1972. Hereinafter, referred to as “Ionizing Radiation Hazards Ordinance”))

3 The lowered exposure dose limit of radiation workers (Re: Ionizing Radiation Ordinance, Articles 4, 5, and 6)

4 Establishment of the equivalent dose rather than the effective dose as the exposure dose limit in emergency work (Re: Ionizing Radiation Hazards Ordinance, Article 7)

5 Extension of the period of keeping the records of measurement results of dose received by radiation workers to 30 years (Re: Ionizing Radiation Ordinance, Article 9)

6 Amendment of the leaked dose rate from the image receptor during fluorography and radioscopy work with a specified X-ray device (Re: Ionizing Radiation Hazards Ordinance, Articles 12 and 13)

7 Establishment of a regulation that, in case of the occurrence of any accident that falls under any of the items in Article 42, paragraph (1), an employer shall promptly notify the Head of the competent Labour Standards Inspection Office having jurisdiction over the area where the relevant operation site is located (Re: Ionizing Radiation Hazards Ordinance, Article 43)

8 If any worker falling under any of the items of Article 44, paragraph (1) is found, an employer must immediately report the fact to the Head of the competent Labour Standards Inspection Office (Re: Ionizing Radiation Hazards Ordinance, Article 44)

9 Amended regulations with respect to addition of the inspection items and its abbreviation in the medical examination of radiation workers, etc. (Re: Ionizing Radiation Hazards Ordinance, Article 56

10 Extension of the period of keeping the records of medical examination results of radiation workers to 30 years (Re: Ionizing Radiation Hazards Ordinance, Article 57)

II. Regarding Amendment of Terms

1. Summary of amendments

Conventionally used terms, such as dose, have been amended as follows:

Figure F_001

Term before revision	Term after revision
Tissue dose equivalent	Equivalent dose
Effective dose equivalent	Effective dose
Dose equivalent (rate)	Dose (except the limited representation of 1-cm dose equivalent (rate) or 70-μm dose equivalent (rate)
Irradiation dose (rate)	Air kerma (rate) in free air
Exposure dose measuring tool	Radiation measuring device
Measuring device	

2. Regarding terms used in the Ionizing Radiation Hazards Ordinance, etc.

(1) Equivalent dose (Re: Ionizing Radiation Hazards Ordinance, Articles 5, 6, 7, 9, 44, and 45, Forms 1 and 2)

The term “equivalent dose” means a dose for evaluating a deterministic effect (Note 1) of the influences of radiation on the human body, which is obtained by multiplying the absorbed dose (absorbed energy per kg of the specific tissue/organ of the human body by a coefficient (radiation load coefficient). The unit is “joules per kilogram”, and its alternative unit expression is “sievert (Sv)”.

The term “equivalent dose” is a term equivalent to “tissue dose equivalent” in the Ionizing Radiation Hazards Ordinance before amendment by the Revised Ministerial Ordinance (hereinafter referred to as “the Old Ionizing Radiation Hazards Ordinance”). The reason for changing the term at this time is that the International Commission on Radiological Protection (hereinafter, referred to as “ICRP”) has decided to more precisely evaluate the absorbed dose and radiation weighting factor in specific tissues and organs and to replace the term with the more accurate term “equivalent dose”.

(Note 1) The term “deterministic effect” corresponds to the previously-used term “non-stochastic effect”, and means any of the radiation effects that lead to disorders with severities depending on exposure doses while showing the presence of a threshold between the exposure dose and the generation of disorder. The effects include cataract and skin disorders.

(2) Effective dose (Re: Ionizing Radiation Hazards Ordinance, Articles 3, 3-2, 4, 6, 7, 9, 18, 42, 44, 45, and 56 and Forms 1 and 2)

The term “effective dose” means a dose for evaluating a stochastic effect (Note 2) of the effects of radiation on the human body and is the sum of equivalent doses received by each tissue/organ of the human body and multiplied by a factor (tissue weighting factor). In the Ionizing Radiation Hazards Ordinance, it is used in two ways, directly representing the dose of radiation received by the human body and representing the dose of radiation in the work environment. The unit is “joules per kilogram”, and its alternative unit expression is “sievert (Sv)”.

The term “effective dose” is a term equivalent to “effective dose equivalent” in the Old Ionizing Radiation Hazards Ordinance. The reason for changing the term at this time is that the ICRP has replaced the term “tissue dose equivalent” with the term “equivalent dose” and also reviewed and replaced the term “tissue weighting factor” with the term “effective dose”.

(Note 2) The "stochastic effect" means a radiation effect that causes a disorder in which there is a proportional relationship without a threshold between the probability of occurrence of the disorder and the exposure dose and the severity of the hazard does not depend on the radiation dose. Such effects include carcinogenesis and hereditary influences.

(3) Effective dose due to external radiation (Re: Ionizing Radiation Hazards Ordinance, Articles 3, 3-2, and 18)

In the Ionizing Radiation Hazards Ordinance, the term “effective dose due to external radiation” is used to evaluate the dose of radiation present in the workplace.

(4) Effective dose due to radioactive materials in the air (Re: Ionizing Radiation Hazards Ordinance,

Articles 3 and 3-2)

The term “effective dose due to radioactive materials in the air” is used to evaluate the amount of radioactive material present in the workplace as an effective dose received by the human body when it is incorporated into the body.

(5) 1-cm dose equivalent (rate) (Re: Ionizing Radiation Hazards Ordinance, Articles 3, 3-2, 8, 9, 15, and 54)

The term “1-cm dose equivalent” means a dose used in the measurement of evaluating the effective dose due to external exposure and calculated using a certain conversion factor based on the type and energy of radiation. The unit is “joules per kilogram”, and its alternative unit expression is “sievert (Sv)”. Such a dose is used as an approximate value because the effective dose cannot be directly measured.

The 1-cm dose equivalent differs in the case of evaluating the dose of radiation received by the human body and the case of evaluating the dose of radiation in the work environment. The “1-cm dose equivalent” in the case of evaluating the dose of radiation received by the human body corresponds to the personal dose equivalent adopted by the International Commission on Radiation Units and Measurements (hereinafter, referred to as “ICRU”). It is an amount regarded as a dose at a depth of 1 cm in the human body.

On the other hand, the “1-cm dose equivalent” in the case of evaluating the dose of radiation in the work environment corresponds to the ambient dose equivalent adopted by the ICRU sphere and is considered as one at a 1-cm depth in the ICRU sphere (Note 3).

The term “1-cm dose equivalent rate” means a 1-cm dose equivalent per hour, and its unit is “sievert (Sv) per hour”.

(Note 3) The “ICRU sphere” is a homogeneous 30-cm diameter sphere consisting of substances substantially equal to human tissue when receiving radiation exposure.

(6) 70-μm dose equivalent (rate) (Re: Ionizing Radiation Hazards Ordinance, Articles 3, 3-2, 8, 9, 15, and 54)

The term “70-μm dose equivalent” means a dose used in the measurement of evaluating the equivalent dose on the skin due to external exposure and calculated using a certain conversion factor based on the type and energy of radiation. The unit is “joules per kilogram”, and its alternative unit expression is “sievert”. Such a dose is used as an approximate value because the effective dose cannot be directly measured.

The 70-μm dose equivalent also differs in the case of evaluating the dose of radiation received by the human body and the case of evaluating the dose of radiation in the work environment. The “70-μm dose equivalent” in the case of evaluating the dose of radiation received by the human body corresponds to the personal dose equivalent adopted by the ICRU. It is an amount regarded as a dose at a depth of 70-μm in the human body. On the other hand, the “70-μm dose equivalent” in the case of evaluating the dose of radiation in the work environment corresponds to the directional dose equivalent adopted by the ICRU and is considered as one at a 70-μm depth in the ICRU sphere.

The “70-μm dose equivalent rate” means a 70-μm dose equivalent per hour, and its unit is “sievert (Sv) per hour”.

(7) 3-mm dose equivalent

The term “3-mm dose equivalent” means a dose used in the measurement of evaluating the equivalent dose on the eye due to external exposure and used in the Old Ionizing Radiation Hazards Ordinance. However, the measurement of 3-mm dose equivalent will be deleted in this revision. However, by measurement/evaluation of both the 1-cm dose equivalent and the 70-μm dose equivalent, the equivalent dose of the lens of the eye can be managed so as to not exceed the limit. Thus, the measurement of 3-mm dose equivalent shall be deleted in this revision.

After the revision, the appropriate one from the 1-cm dose equivalent and the 70-μm dose equivalent will be considered as the equivalent dose of the lens of the eye.

(8) Dose equivalent (rate) (Re: Ionizing Radiation Hazards Ordinance, Articles 8, 45, and 54)

The term “dose equivalent (rate)” is used as a comprehensive term for the 1-cm dose equivalent (rate) and the 70-μm dose equivalent (rate).

(9) Dose (Re: Ionizing Radiation Hazards Ordinance, Articles 3-2, 8, 9, 47, 52-3, and 56)

The term “dose” is used as a comprehensive term for the “equivalent dose”, “effective dose”, and “dose equivalent”.

(10) Dose due to external exposure (Re: Ionizing Radiation Hazards Ordinance, Articles 8 and 9)

The term “dose due to external exposure” means a dose in the case of exposure by radiation irradiated from the outside the body.

(11) Dose due to internal exposure (Re: Ionizing Radiation Hazards Ordinance, Article 8)

The term “dose due to internal exposure” means a dose in the case of exposure by radiation irradiated from a radioactive material inside the body. Such exposure may be caused by inhalation of dust, vapor, and gas forms of the radioactive material or by ingestion of the liquid or solid form of the radioactive material.

Originally, the term can express comprehensively both “the effective dose due to internal exposure” and “the equivalent dose due to external exposure”. In the case of internal exposure, however, there is no possibility of a deterministic effect on any tissues/organs as long as the effective dose is controlled so as not to exceed the limit. Thus, the Ionizing Radiation Hazards Ordinance does not include any provision for “equivalent dose due to external exposure”. It is used as a term that only represents the “effective dose due to internal exposure”.

(12) Air kerma (rate) in free air (Re: Ionizing Radiation Hazards Ordinance, Articles 12, 13, and 18-4)

The term “kerma” (acronym for “kinetic energy released per unit mass”) is the sum of kinetic energies of charged particles (electrons, cations) generated in a substance by ionizing activity when 1kg of the substance is irradiated with uncharged ionizing particles (X-rays, gamma rays, neutron beams). The unit is “joule per kilogram”, and its alternative unit expression is “gray”.

Kerma in the case that the substance irradiated with uncharged ionizing particles is air is referred to as “air Kerma”.

The term “free air” refers to air in a space where walls, etc. do not prevent the movement of air.

According to this revision, the term “irradiation dose (rate) (unit is coulomb per kilogram)” will be changed to the term “internationally used “air Kerma (rate) in free air”. These terms can be converted from one to another with “one gray = 2.97×10^{-2}”.

(13) Radiation measuring instrument (Re: Ordinance on Industrial Safety and Health, Form 27 and Form 28, Ionizing Radiation Hazards Ordinance, Articles 3, 8, 19, 45, 47, 52-3, 54, 55, and 60)

The Old Ionizing Radiation Hazards Ordinance differentiates between means for measuring the exposure dose received by an individual and means for measuring the dose of radiation in the work environment, and then refers to the former as an "exposure dose measuring tool" and the latter as a "measuring instrument". In the present situation, along with technical progress, etc. of devices, it is difficult to classify the devices into measuring tools and instruments. Thus, the term "radiation measuring instrument" is used as a term to comprehensively describe these terms.

Comparing between the radiation measuring instrument for measuring the exposure dose received by the individual and the radiation measuring instrument for measuring the dose of radiation in the work environment shows they have their own conversion factors, which are different from each other, to convert their measuring data into 1-cm dose equivalents as described in the aforementioned item (8), etc. Thus, it is necessary to use a calibrated radiation measuring instrument or to perform a desired conversion in accordance with the purpose of measurement.

III. Detailed Matters

1 Re: Article 1

This article instructively describes the fundamental principles for the entire Ionizing Radiation Hazards Ordinance because the possibility of stochastic effects cannot be denied even if the dose the human body is exposed to is less than the limit specified in the Ionizing Radiation Hazards Ordinance.

2 Re: Article 2

The term "sealed material" in the proviso of paragraph (2) refers to radioactive material enclosed in a container made of a material that does not permeate any radioactive material, and there is no risk that the container will be damaged or that radioactive material will spill out of the container. The sealed materials correspond to radioactive materials enclosed in metallic capsules, and a night light clock with tritium will come under the International Organization for Standardization (ISO) standards (unless decomposed).

3 Re: Article 3

(1) The description "by posting signs" in paragraph (1) means to mark a section or to clearly divide the floor by a white line, a yellow line, a stripe pattern with yellow and black, etc. In the case that work for non-destructive testing is performed using a mobile radiation device, but when it is difficult to mark the area by any of these means, safety measures can be regarded as being taken such that flags, etc. are disposed at required places to clearly define an area surrounded by lines connecting them as a controlled area.

(2) The description "1.3 mSv per every three months" in paragraph (1) (i) is the monthly allocation of "5 mSv", which is the public annual effective dose limit under special circumstances. The reasons for the allocation for every three months are as follows: the effective dose received by the radiation worker is added up every three months except for special cases (Article 9); from the viewpoint of radiation protection, it is not always appropriate to evaluate the necessity of defining the controlled

area based on the effective dose in a short period because the sum of effective dose varies to a large extent in a short period of time of using facilities, equipment, etc.

However, if there is an area expected to exceed 1 mSv per year in a place outside the controlled area where the same worker always stays, it is preferred to take measures for the management of entry and staying time, enhancement of shielding effectiveness, and so on. In this way, it is desirable that the effective dose for the worker for one year does not exceed a public exposure dose limit of "1 mSv" per year.

(3) Regarding the areas in paragraph (1), (ii) is added if there is a possibility that internal exposure due to oral ingestion of radioactive materials adhering to equipment, etc. will exceed a certain amount.

(4) In paragraph (3), regarding the working hours per week in the case of measurement for establishing the controlled area, in the case where the use time or staying time of facilities, devices, etc. in the controlled area is specified in the company regulations, the use time or staying time per week can be allowed as a weekly working time in the controlled area.

(5) The "limit of the three-month average specified by the Minister of Health, Labor and Welfare" in paragraph (3) means a derived air concentration, which is the concentration of radioactive materials in the air equivalent to receiving of an effective dose of 50 mSv (corresponding to the effective dose per year as provided for in Article 4, paragraph (1)) by inhalation of radioactive materials due to exposure to the air for one year ([40 hours per week] × [50 weeks per year]).

(6) In the case of using a radiation device, etc. having a structure shielded so that all or part of the worker's body does not enter inside the device, etc. during irradiation, any point outside the radiation device, etc., which receives an effective dose of 1.3 mSv or less per every three months, can be allowed to be handled as if there is no controlled area outside the device. In this case, however, since there is a controlled area inside the device, it is necessary to so "by posting signs" in paragraph (1).

Examples of the devices are as described below. When these devices are used, however, the workers shall be made aware of the safe handling of the devices for preventing the influence and exposure of radiation on the human body, etc.

(a) An X-ray device with an X-ray irradiation box, the device having an interlock configured to prevent irradiation of X-rays unless the door of the irradiation box is shielded so that an effective dose outside the device does not exceeds 1.3 mSv per every three months and to prevent a worker from easily releasing the interlock.

(b) An airport baggage inspection device having an entrance and an exit for baggage, both of which are partitioned with a double lead-containing protective curtain so that worker's fingers do not get into the device and which are shielded so that an effective dose outside the device does not exceeds 1.3 mSv per every three months.

(c) A measuring instrument, etc. used in the manufacturing process of a factory, the instrument having an entrance and an exit for products, etc., both of which are partitioned with a double lead-containing protective curtains so that worker's fingers do not get into the instrument or are provided with interlocks for halting the irradiation of radiation when worker's fingers get into the instrument, the interlocks being configured to be easily released by the worker, and which are shielded so that an effective dose outside the device does not exceeds 1.3 mSv per every three

months.

(7) A radiation device shall be used generally within a controlled area around a space through which radiation passes when the radiation is extracted from the radiation device.

(8) In the case of using a radiation device in different places for three months other than a radiation equipment room, a controlled area shall be defined at each place. When the same worker works at different places in three months and works in an area outside the controlled area at each place, the worker should be provided with a guidance in taking the same measures as working in the controlled area if there is a risk that the worker will receive the same exposure as one received when working in the controlled area.

(9) In establishing the controlled area, Attachment 1 "Notes on Establishing of Controlled Areas, etc." should be referred to.

(10) In paragraph (4), "persons who need to do so" include those who enter the controlled area when necessary for business, for example, when their needs are objectively recognized as in the case of workers employed by subcontractors to perform painting work.

4 Re: Article 3-2

(1) In Article 16 of the Old Ionizing Radiation Hazards Ordinance, 1-cm dose equivalent due to external radiation at sites constantly accessed by workers should be 1 mSv per week (50 mSv per year) or less. In Article 24, paragraph (1) of the Old Ionizing Radiation Hazards Ordinance, the average daily concentration of radioactive materials in the air is less than the limit (equivalent to 50 mSv per every year) specified by the Minister of Health, Labor and Welfare. Together with these revisions, this revision stipulates that the sum of "effective dose due to external radiation" and "effective dose due to radioactive materials in air" should be 1 mSv or less per every week (effective dose limit per every year).

(2) The term "at such sites that are usually entered by workers" in paragraph (1) shall mean all places where workers always work or pass, irrespective of being inside or outside of rooms, facilities, etc.

(3) The working hours specified in paragraph (3) shall be treated as one in the case of (4) of the above 3.

(4) To confirm that the effective dose in a week is 1 mSv or less, Attachment 1 "Notes on Establishing of Controlled Areas, etc." shall be referred to.

5 Re: Article 4

(1) The term "5 years" in paragraph (1) shall be allowed to be taken as a five-year period starting from the date specified for each business establishment by the employer.

(2) For example, if the term "per five years" is defined as a period "from 1st April 2001 to 31 March 2006", the term "per year" shall be defined as a period "from 1 April 2001 to 31 March 2002", "from 1 April 2002 to 31 March 2003", etc.

(3) An employer shall confirm, for the workers who newly entered the controlled area of its own business establishment during the "per five years", the exposure dose from the beginning of the "5 years" until the workers entered the controlled area by the workers' dose records issued from their

previous workplaces (if the workers do not have their respective records, they shall be reissued from their previous workplaces).

(4) Paragraph (1) sets the limit of effective dose to 100 mSv in five years, so that, for workplaces where there are workers exposed to more than 20 mSv per year, the workplaces shall be provided with direction for improving the work environment, work method, work time, etc. to reduce exposure of workers concerned.

(5) Paragraph (2) sets the exposure of the fetus for the time of being unaware of pregnancy to “5 mSv per three months”, so that the exposure of the fetus shall be less than or equal to the public exposure under special circumstances. Note that “5 mSv per three months” shall mean that “100 mSv per five years” is divided and allocated to every three months.

(6) The beginning of the first “three months” in paragraph (2) shall be the same as the beginning of the “one year” in paragraph (1). For example, if the beginning of the “one year” is set to “1 April”, then the beginnings of the “three months” are “1 April, 1 July, 1 October, and 1 January”.

(7) Radiation workers shall be thoroughly informed of the beginnings defined in the above (1), (2), and (5).

(8) The provision of paragraph (1) with respect to the effective dose limit is applied to females diagnosed as having “no possibility of pregnancy” in the provision of paragraph (2), and these provisions shall not be interpreted to the meaning of obligating the females receiving the diagnosis to report that fact to their employer.

6 Re: Article 5

(1) For the tissues and organs other than the eyes and the skin, this revision shall not specify the equivalent dose limit because there is no possibility of a deterministic effect as far as the effective dose limit provided for in Article 4 is concerned.

(2) The term “per year" means a period of one year starting from the same date as the beginning of the “one year” in Article 4, Paragraph (1), and the beginning date shall be made widely known to radiation workers.

7 Re: Article 6

Female radiation workers diagnosed as being pregnant shall have the application of more stringent limits to make the fetal radiation exposure in pregnant women less than or equal to the public radiation exposure.

8 Re: Article 7

(1) The phrase “during said emergency work” in the main clause of paragraph (2) shall mean a period for engagement in emergency work for one accident, and alternatively shall mean a period for multiple engagements if the same worker engages in multiple emergency works for one accident.

(2) In paragraph (1), if radiation workers are engaged in emergency work, they shall be led, depending on the exposure dose received by the radiation workers, to reduce the exposure dose “per year” and dose “per five year” including a period during which the workers are engaged in the said emergency

work.

(3) In paragraph (2), the equivalent dose limits for the lens of the eye and the skin are established, because the lens of the eye and the skin may be inhomogeneously exposed to radiation even in the case of an accident and there is a risk of causing deterministic effects on the lens of the eye and the skin even if the effective dose does not exceed 100 mSv. In addition, the exposure dose limit in emergency work under each of the items of paragraph (2) shall be set to a value equivalent to twice the one-year exposure limit specified in Article 4 (1) and Article 5.

(4) This article does not prevent female radiation workers (excluding those diagnosed as having no possibility of pregnancy) engaging in emergency work, but shall be limited under Article 4 (2) and Article 6 because of no application of the limit in Article 2.

9 Re: Article 8

(1) The term “workers who temporarily enter the controlled areas” in paragraph (1) shall mean workers who do not engage in radiation work. For example, such workers are those who do not perform any radiation work in the controlled area but in their work need to temporarily enter the controlled area to communicate with radiation workers, supervise radiation work, etc.

(2) If the “workers who temporarily enter the controlled areas” specified in paragraph (1) fall in the following cases (a) and (b), they can be allowed as being subjected to the dose measurements provided for in paragraph (1).

(a) a case where an effective dose due to external exposure received by a worker within the controlled area is obtained by calculation and can be confirmed not to exceed 0.1 mSv or a case where a worker acts together with other radiation workers in the controlled area, an effective dose due to external exposure during this entry is obviously confirmed to not exceed 0.1 mSv in the past situation of radiation exposure; and

(b) a case where a worker receives no internal exposure or a case where an effective dose due to internal exposure can be calculated from the concentration of radioactive materials in the air and the time duration of entrance and confirmed to not exceed 0.1 mSv.

(3) Among the “workers who temporarily enter the controlled areas” under paragraph (1), for a worker who is deemed to be subjected to the measurement of the dose according to the above (2), an employer may record the entry of the worker into the controlled area with respect to the following matters and preferably keeps the records for one year after the entry:

(a) date and time of entering the controlled area and the date and time of leaving from the controlled area;

(b) the location entered in the controlled area:

(c) the objective and details of entering the controlled area; and

(d) the name, affiliation, and job description of a person subjected to the dose measurement among radiation workers and others who act together with the worker in the controlled area.

(4) In paragraph (2), the Old Ionizing Radiation Hazards Ordinance requires the measurement of 3-mm dose equivalent. In any case, however, if the 1-cm dose equivalent and the 70-μm dose equivalent are measured and confirmed, the 3-mm dose equivalent can be managed so that it does not exceed 150

mSv, which is the one-year equivalent dose limit for the lens of the eye. Thus, this revision does not require the measurement of 3-mm dose equivalent. Here, the dose equivalent for the lens of the eye shall be evaluated by any of the reasonable methods, the 1-cm dose equivalent or the 70-μm dose equivalent, among the "methods provided by the Minister of Health, Labour and Welfare" provided for in the main clause of Article 9 (2).

(5) In paragraph (2), the 1-cm dose equivalent shall be measured because the 1-cm dose equivalent and 70-μm dose equivalent for neutron rays are almost the same value and, as long as the 1-cm dose equivalent does not exceed the 1-year effective dose limit of 50 mSv, the 70-μm dose equivalent will not exceed 500 mSv, which is equivalent to the equivalent dose limit for the skin in one year.

(6) Wearing a radiation measuring instrument at the part specified in paragraph (3) (i) and (ii) is necessary to calculate the equivalent dose for the lens of the eye and the equivalent dose for the skin from the 1-cm dose equivalent and the 70-μm dose equivalent, which are received by such a part.

In addition, wearing a radiation measuring instrument at the part specified in paragraph (3) (iii) is necessary to calculate the equivalent dose for the skin from the 70-μm dose equivalent.

(7) "Extremely difficult to measure the dose" or "this method is extremely difficult" under the proviso of paragraph (3) shall mean that, for example, a radiation measuring instrument for that radiation has not been developed yet.

(8) "By calculation" under the proviso of paragraph (3) shall mean that calculation is performed depending on the type and quantity of radiation or radioactive materials, the situation of the worker's exposure, etc.

(9) "Sections of controlled areas where there is a possibility that they will inhale or ingest radioactive materials" under paragraph (4) include the work room for handling radioactive materials provided for in Article 22, sites for mining nuclear source materials, sections contaminated with radioactive materials in nuclear power facilities, etc.

(10) In paragraph (4), the measurement is performed once every three months in order to properly conduct exposure control so that the exposure does not exceed the one-year exposure dose under Article 4 (1).

(11) Female workers (excluding female workers diagnosed as having no possibility of pregnancy) are subjected to the measurement once every month, and others are subjected to the measurement once every three months so that their exposure is controlled not to exceed the exposure dose limit by calculating and recording the dose within a period shorter than the period on which each exposure dose limit is applied. However, for females who are unlikely to exceed 1.7 mSv in one month, there is no possibility of exceeding 5 mSv in three months. Thus, it is sufficient to perform one measurement every 3 months or less.

For judging whether an individual is "likely to be exposed to an effective dose exceeding 1.7 mSv in any one-month period", it is enough to rationally judge from the exposure history and the contents of future planned work, frequency of entering the controlled area, and the results of work environment measurement, etc. with respect to the individual. It is not intended to ask for an excessive safety factor, such as assumption of an accident.

10 Re: Article 9

(1) Paragraph (1) requires an employer confirm the measurement results of the dose for a worker who is likely to be exposed to radiation exceeding 1 mSv per day of 1-cm dose equivalent. This is because, while confirming the dose every three months or one month, such a worker is likely to be exposed to radiation over than the exposure limits prescribed in Articles 4, 5, and 6.

For such a worker, consideration should be given to avoid radiation over a certain limit by making the worker wear a radiation measuring instrument with an alarm function.

(2) In the main text of paragraph (2), the reason for extension of the retention period for the records from "five years" to "30 years" is that the stochastic effect has delayed consequences. Thus, it follows the retention for records, etc. concerning specially controlled substances in the Ordinance on Prevention of Hazards due to Specified Chemical Substances. Note that it is planned to have the Radiation Effects Association as an "organization designated by the Minister of Health, Labour, and Welfare" for retaining the records.

(3) The total for every three months is calculated and recorded under paragraph (2), items (i) and (iii) and the total for every one month for female workers (excluding female workers diagnosed as having no possibility of pregnancy) is calculated and recorded under items (ii) and (iv) because the dose is calculated and recorded in a period shorter than the period for applying each exposure dose limit so as not to exceed the exposure dose limit.

(4) In paragraph (2) (i), for those whose effective doses do not exceed 20 mSv per "one year" in the "five years", the confirmation and recording of the total dose for the "five years" are not required. For those whose effective doses exceed 20 mSv per "one year" in the "five years", from then on, it is desirable to confirm and record cumulative doses from the beginning of the "five years" annually.

(5) It shall be preferred to retain records of the measurement or calculation results of the dose for workers temporarily entering the controlled areas for 5 years as before.

11 Re: Article 12

(1) The term "fluorography" under paragraph (1) is not an imaging method for directly recording the image of an irradiated object (direct radiography) but an imaging method for transferring an image received by a fluorescent plate once and then recording the image on a film.

Fluorography work involves performance of X-ray irradiations very frequently as in group health examinations, and thus workers engaged in support work such as posture correction of the irradiated object, film winding, etc. have no time to evacuate to a safe place each time may be exposed to a large amount of X-ray radiation. Accordingly, this article specifies the necessary protective measures.

Note that this revision incorporates the 1982 Recommendations of the ICRP and the criteria for medical X-ray equipment established by the International Electrotechnical Commission in 1994.

(2) The "workers engaging in fluorography work" shall include not only X-ray devices operators but also workers engaged in support works, such as posture correction of the irradiated object and winding up of films.

(3) The description "when using a specified X-ray device of shielding structure that does not allow the

whole or part of the bodies of workers engaging in fluorography to enter the irradiation field during X-ray irradiation" under the proviso of paragraph (1) includes the following devices:

(a) an X-ray device with an X-ray irradiation box, the device having an interlock configured to prevent irradiation of X-rays unless the door of the irradiation box is shielded and to prevent a worker from easily releasing the interlock; and

(b) various measuring instruments used in manufacturing processes of a factory, the instrument having an entrance and an exit for products or the like, which are partitioned with a double lead-containing protective curtains so that worker's fingers do not get into the instrument or are provided with interlocks for halting the irradiation when worker's fingers get into the instrument, the interlocks being configured to be easily released by the worker.

(4) For preventing unnecessary exposure due to irradiation of excessive X-rays, paragraph (1) (i) shall be intended to prevent an X-ray irradiation field (cross section of useful beams (X-ray flux from the X-ray device)) in an image reception area (the surface of a fluorescent plate, etc., which receives the image of an irradiated object).

(5) Paragraph (1) (ii) shall be intended to attach a primary protective shield to an image receptor, the primary protective shield controls the amount of X-rays passing through an image receptor (a device that receives the image of an irradiated object, a fluorescent plate, a fluorescence-intensifying tube, etc.) below a certain amount. Note that the term "device" in the phrase "from the accessible surface of the device" shall mean the whole of an image receptor and devices attached thereto.

(6) Paragraph (1) (iii) shall be intended to prevent exposures by reflected X-rays from an irradiated object.

(7) Paragraph (2) (i) shall be intended to prevent workers from exposure to X-rays by taking measures under Article 18 and Article 18-2. This is because it is difficult to take measures under the above items (ii) and (iii) in the case of an X-ray device that can be moved outside the room and thus such measures shall not be required to be taken.

(8) Regarding paragraph (2) (ii), if the "places where the effective dose due to external radiation is 1 mSv or less per week" can be easily excluded, there is no danger of exposure by scattered X-rays from an irradiated object. Thus, it shall not be required to take the measures of the above item (iii) of the preceding paragraph.

12 Re: Article 13

(1) The term "radioscopy" within the purview of paragraph (1) means that the image of an irradiated object is observed by continuously or periodically irradiating X-rays, and including "direct radioscopy" that directly observes the image on a fluorescent screen and "indirect radioscopy" that transfers the image to a screen and then observes the image on the screen. Recently, however, "direct radioscopy" has not been performed. Here, this revision incorporates the 1982 Recommendations of the ICRP and the criteria for medical X-ray equipment established by the International Electrotechnical Commission in 1994.

(2) The "workers engaging in radioscopy" shall mean not only the operators of X-ray devices but also those including workers engaged in support works such as posture correction of irradiated objects as

well as physicians at medical institutions who perform a surgical operation while using radioscopy of the concerned part.

(3) The "specified X-ray device of shielding structure that does not allow the whole or part of the bodies of workers engaging in fluorography to enter the irradiation field during X-ray irradiation" under the proviso of paragraph (1) shall be treated in the same way as the above 11 (3).

(4) Paragraph (1) (i) is a measure to prevent workers engaged in radioscopy work from unnecessarily receiving X-rays in addition to radioscopy, and shall be intended to provide equipment capable of fully closing an aperture, etc. at the radioscopy work position.

In the case that a medical radiological technician operates an X-ray device outside a room intended for performance of radioscopy on an affected part of a patient, while a medical doctor performs a surgical operation using radioscopy of the affected part in the room, the room should be provided with the devices provided for in this item.

(5) Paragraph (1) (ii) shall stipulate an overcurrent interlock.

The term "tube current" means current generated by electrons flowing through an X-ray tube, which is proportional to the amount of irradiated X-rays. Thus, the measures of this item are to prevent more tube current from flowing than necessary in order to prevent unnecessary exposure due to excessive X-ray irradiation.

(6) Paragraph (1) (iii) shall have the same meaning as the case of (4) of the above 11.

(7) Paragraph (1) (iv) shall be intended to shield the amount of "X-rays in useful beams" passing through the image receptor to a certain amount or less.

In the case of a specific X-ray device for industrial use, etc., the exposure dose rate in the Old Ionizing Radiation Hazards Ordinance shall be simply converted to the air kerma rate in free air.

(8) Paragraph (1) (v) shall be intended to shield the amount of "scattered X-rays forced out of useful beams" passing through an image receptor to a certain amount or less.

X -rays irradiated from the focal point of an X-ray tube are adjusted by a collimator attached to an irradiation port, but some of the X-rays may be outside the useful beams and must also be shielded to a certain amount or less. However, the X-rays have a large spread. Thus, it is not possible to shield everything by means of the image receptor, etc. Accordingly, it shall be intended to shield to a certain amount or less the X-rays that pass through the surrounding area of up to 3 cm from the maximum (possible) X-ray irradiation field in the image reception area.

(9) Paragraph (1) (vi) shall be intended to prevent exposure due to reflected X-rays on an irradiated object.

(10) Paragraph (2) (i) shall be intended to reduce exposure to workers by installing a timer, which can accumulate radioscopy time, instead of an interlock because, in the case of medical use, the X-rays may be suddenly interrupted during diagnosis or treatment and may pose danger to a patient.

(11) Paragraph (2) (ii) is intended to prevent exposure by X-rays by the measures under Article 18 and Article 18-2 because, in the case of using an X-ray device after moving it outside the radiation equipment room, the measures under the preceding paragraphs (4) to (6) cannot be easily taken and thus it shall not be required to take them.

13 Re: Article 18

(1) Paragraph (1) shall be intended to reduce exposure by workers moving away from the equipment by a certain distance because in the use of X-ray devices, etc. at places other than radiation equipment rooms, it is difficult to take measures such as shielding sufficiently.

(2) At this time, paragraph (1) shall be intended to keep a distance from the "irradiated object" in addition to keeping a distance from "the focal point of the X-ray tube or from the radiation source" because exposure due to X-rays or gamma rays reflected on the irradiated object cannot be ignored.

(3) Regarding paragraph (1), the Old Ionizing Radiation Hazards Ordinance permits workers to enter "places where the 1-cm dose equivalent rate is 0.5 mSv or less per hour". However, when non-destructive inspections, etc. are performed at places other than the radiation equipment room, different workplaces may have different work times per week. Thus, control based on the dose equivalent rate may extend a one-week work time in some workplaces, and workers may receive exposure of more than 1 mSv per week (50 mSv per year). Accordingly, places of allowed entry shall be defined as "places where the effective dose due to external radiation is 1 mSv or less per week". Depending on the actual conditions of a one-week work time for each workplace, places where workers are allowed to enter shall be defined for every workplace.

(4) Attachment 1 "Notes on Establishing of Controlled Areas, etc." should be referred to for establishing restricted places where the effective dose due to external radiation exceeds 1 mSv per every week.

(5) The term "securely housed in the radiation source container of the device loaded with radioactive materials" under the proviso of paragraph (1) shall mean that the radiation source is housed in a predetermined place in the container of the equipment, which is provided with shielding and so configured that the radiation source can be removed.

(6) The "other necessary work" under the proviso of paragraph (1) shall not include works for opening and closing a shutter and adjusting the position of a radiation source.

(7) Regarding paragraph (2), the Old Ionizing Radiation Hazards Ordinance restricts medical X-ray devices to "those used for fluorography" under paragraph (1). This time, according to the Ministry of Health Ordinance No. 194 dated 26 December 2000, the Ordinance for Enforcement of the Medical Care Act (Ministry of Health Ordinance No. 50 of 1948) has been revised such that mobile and portable X-ray devices and X-ray devices used during surgery shall be those having a structure that can be operated at the focal point of an X-ray tube and at a position two meters away from a patient. Along with this amendment, in the case of using an "X-ray device for medical use for the purpose of X-ray photography" other than in a radiation equipment room, the employer must prohibit workers from entering a place within two meters from the X-ray device (excluding places where the effective dose due to external radiation is 1 mSv or less per week).

As for the "X-ray device for medical use", the reason for "within two meters" is that the need of use in a narrow place such as an ordinary house is considered.

(8) "Post a sign to clearly indicate" under paragraph (4) should be performed in a concrete effective way, such as one using a rope.

The "places where workers are prohibited from entering" under the same paragraph shall be

provided separately from the controlled area under Article 3 (1).

14 Re: Article 24

(1) "Daily mean concentration" is changed to "weekly average concentration". This is because, the document "Regarding the Adoption of the ICRP 1990 Recommendations (Pub. 60) to the Domestic System, etc. (Recommendation)" of the Radiation Council stipulates that the concentration of radioactive materials in the air at a place where persons always enter shall be the "concentration equivalent to an effective dose of 1 mSv per every week" or less.

(2) In the underground mining work of nuclear source materials, for example, the amount of radon gas generated during blasting increases. Thus, the concentration of the radioactive materials in the air fluctuates drastically. Accordingly, an average for three months shall be taken.

15 Re: Article 25

The concentration of radioactive materials in the air in each of the work rooms for handling radioactive materials and mines of nuclear source materials, which are places where unsealed radioactive materials are handled, should not exceed the concentration limit in air (concentration equivalent to an effective dose of 50 mSv per year) under Article 3-2(1) and Article 24. For other places, it shall be intended to make it less than 1/10 of the concentration limit in air (equivalent to 5 mSv).

16 Re: Article 28

(1) The term "take measures for preventing the spread of the contamination" shall include those of sucking with blotting paper, etc. if radioactive materials are in a liquid form or those of wiping with dampened clothes, etc. if radioactive materials are in a powder form.

(2) The measurement of contamination in contaminated areas shall be performed such that the average contamination density in the area of 100 cm^2 (the radioactivity is measured in the area of 100 cm^2 s and the result is then multiplied by 100 cm^2) is evaluated by a method, for example one in which a measurement is performed for an area of 100 cm^2 (10 cm × 10 cm) of as many places as possible by wiping with smear filter paper and measuring with a survey meter, the places including those where contamination density (in Bq / cm^2) is expected to be the largest among contaminated areas.

Similarly, inspections of the state of contamination provided for in Article 29 (1), Article 30 (1), Article 32 (1), and Article 41 shall be evaluated with respect to the average surface density in the area of 100 cm^2.

For inspections of contamination for workers prescribed in Article 31, the contamination of the hands shall be evaluated with the surface density in an area of 300 cm^2 and the contamination of the skin shall be evaluated with the surface density in an area of 100 cm^2.

17 Re: Article 43

(1) Under the Old Ionizing Radiation Hazards Ordinance, an employer must report when the area under Article 42 (1) (an area where an effective dose received in an accident may exceed 15 mSv)

occurs. From the viewpoint of early grasping of accident situations and making prompt responses, this revision stipulates that, in the case of the occurrence of any accident that falls under any of the items of this paragraph, the employer must immediately report the accident.

(2) The report under this article is not limited in particular to being written paper, but in principle it should report on matters prescribed in each item of Article 45 (1).

18 Re: Article 44

(1) Not limited to radiation workers, paragraph (1) (ii) shall be applicable to all workers who receive the effective dose exceeding “100 mSv for the five-year period” or “50 mSv for the one-year period” or who receive the equivalent dose exceeding “150 mSv for the one-year period with respect to the lens of the eye” or “500 mSv for the one-year period with respect to the skin”.

Also, for workers engaged in emergency work, if they receive the above dose, they shall fall under Paragraph (1) (ii).

(2) Regarding paragraph (2), the Old Ionizing Radiation Hazards Ordinance stipulates that, as a result of the evaluation under paragraph (1), if an employer finds that any worker is suffering or suspected of suffering from exposure to a radiation hazard or may suffer from exposure to a radiation hazard, the employer must report it. Furthermore, from the viewpoint of early grasping of accidents and making prompt responses, the employer shall promptly report if there is a worker falling under each item of paragraph (1).

19 Re: Article 45

(1) The reason for adding the record of “the equivalent dose of the lens of the eye and the skin” under paragraphs (1) and (2) is in addition to the equivalent dose limit of workers engaged in emergency work under Article 7 (2).

(2) The “dose equivalent rate due to external radiation” under paragraph (2) and the “dose equivalent rate” under paragraph (3) shall denote the “1-cm dose equivalent rate” and “70-μm dose equivalent”, respectively.

20 Re: Article 46

X-ray devices corresponding to those listed in (a) to (c) of the above 3 (6) have no controlled area outside them. In the case of using the devices after keeping the conditions listed in (a) to (c) of the above 3 (6), therefore, appointment of an operations chief of work with X-rays is not required. However, in order to properly use the device, an employer shall appoint a person with necessary knowledge as the person responsible for management of the device, effectively maintaining the safety of the devices, and taking necessary measures to prevent workers' hands, etc. from entering the device.

21 Re: Article 54

(1) The purpose of paragraph (1) is to measure the dose of external radiation in the control area under Article 53 (1) in order to know the situation in which workers engaged in work are exposed to radiation in the controlled area. As a result of the measurement, if there is a danger of exceeding each

dose limit for the dose of radiation, it is important to take measures such as maintenance of facilities and improvement of the work method.

(2) The “dose equivalent” under paragraph (1) shall mean “1-cm dose equivalent” and “70-μm dose equivalent”. In addition, these provisions are added at this time, because the criteria for controlled area shall be specified in a three-month period under Article 3 (1). Also in this paragraph, the measurement shall be assumed to be performed with not only a radiation measuring instrument that measures the dose equivalent ratio but also a cumulative radiation measurement instrument such as a film badge.

(3) The description “when measurement using a radiation measuring instrument is extremely difficult” under paragraph (2) shall include the case where the measurement entails danger to the person making the measurement.

(4) Regarding the proviso of paragraph (3), the equivalent dose limit of the skin is 10 times higher than the effective dose limit. In a place where the 70-μm dose equivalent (rate) may exceed 10 times the 1-cm dose equivalent (rate), it is more likely that the limit can be exceeded by the equivalent dose of the skin rather than the effective dose. Accordingly, it shall be intended that, in such a place, there is no need of measuring and confirming the 1-cm dose equivalent as long as the 70-μm dose equivalent (rate) is measured and confirmed.

(5) “Methods for displaying easy-to-see positions” under paragraph (4) include a method for drawing of an equivalent dose (rate) line or drawing an equivalent dose (rate) line on the floor of the controlled area.

22 Re: Article 55

Measurements under the present paragraph shall measure the concentrations of radioactive materials in the air, such as in work rooms for handling radioactive materials, to know the situation under which workers engaged in work in the room, etc. are exposed to radioactive materials. As a result of the measurement, if there is a risk that the average concentration will exceed the air concentration limit, it is important to take measures such as maintenance of facilities and improvement of the work method.

23 Re: Article 56

(1) Medical examinations prescribed in this article shall continuously grasp the health condition of workers engaging in radiation work to promote occupational health management for the workers.

(2) In paragraph (1), the Old Ionizing Radiation Hazards Ordinance states that there is a high possibility of partial exposure to radiation of the lens of the eye and the skin and eye examination for cataract and skin examination in regular medical examinations shall be performed once in every three months. In recent years, however, the exposure dose of radiation workers has drastically decreased. There are very few situations where deterministic effects on the eye and skin may occur. In this revision, therefore, these examinations shall be performed in every six months.

(3) Paragraph (1) stipulates that, regardless of the radiation work history, the examinations listed in each item are conducted in principle at the time of employment or transfer to radiation work. This is for the following reasons: when the same kind of influence as that due to radiation occurs after

engagement of a worker in radiation work, the influence is judged as to whether or not it is due to radiation work; and after engagement of the worker in radiation work, the degree of influence on the worker due to the engagement on the radiation work is known.

(4) Regarding Paragraph (1) (i), based on the fact that the exposure dose of radiation workers has been drastically decreasing, when this revision finds that a physician shall not be required to perform examinations according to the exposure dose in paragraphs (3) and (4), part or all of the examinations prescribed in items (ii) to (vi) of the same paragraph can be omitted or are not required to be conducted. However, in order to make an appropriate judgment on omission, etc., the "existence of subjective symptoms" in radiation workers shall be added as a new investigation item. The reason why the "evaluation" is added means that the matters under the present item clarify judgment of whether or not the examinations prescribed in items (ii) to (v) of the same paragraph can be omitted.

(5) Paragraph (2) stipulates that, in medical examinations at the time of employment or transfer to radiation work, eye examination can be omitted according to the type of radiation source used, etc. because of the following reasons: the types, etc. of radiation sources that may cause cataracts are limited; the type, etc. of the radiation sources include neutron sources (including neutron generators) and generators of these radiations under circumstances where there is a risk of receiving large amounts of X-rays or gamma rays to the eyes; and, in other cases, in view of the fact that there is little risk of cataracts occurring, except for accidents, etc., and cataract occurrence is a delayed disorder even if an accident happens, an examination by the physician can fulfill the role of the above (3) if the examination of the physician is received at the time of an accident, etc.

Based on the type, etc. of the radiation source, it is sufficient for an employer to determine whether or not examination of the eyes under the present paragraph can be omitted. However, the eye examination should be conducted if the physician considers that there is a need of conducting it based on the results of an "investigation and evaluation of radiation exposure history".

(6) Regarding paragraph (3), in the periodical medical examination, it is necessary to principally conduct the examinations of items (i) to (ii) of paragraph (1) for all workers who perform periodical radiation work in a controlled area. However, as a result of the examination under item (i) of paragraph (1), for a worker who has acknowledged that the physician does not need to carry out part or all of the examinations of items (ii) to (v) of paragraph (1), an employer can omit the examinations.

(7) Regarding paragraph (4), in principle, item (i) of paragraph (1) need only be conducted on workers whose exposed effective dose for the "one-year period" preceding the year (one year starting from the day an employer specifies in each workplace) to which the day of the periodical medical examinations belongs does not exceed 5 mSv and exposed effective dose for the one-year period to which the day of the regular medical examinations belongs is not expected to exceed 5 mSv. As a result of the examinations under item (i) of paragraph (1), as long as the physician recognizes the need for some or all of the examinations under items (ii) to (v) of paragraph (1), it is sufficient to carry out the examinations. If the "one-year period" preceding the year on the regular medical examination date includes a period before 1 April 2001, the effective dose equivalent at that time may be allowed to be

considered as an effective dose.

(8) For the judgment of "not likely to exceed 5 mSv" under paragraph (4), it is reasonable to judge from the history of individual exposure and the contents of future scheduled work, the frequency of entry into a controlled area, the results of work environment measurement, etc. It is not intended to ask for an excessive safety factor, such as assumption of an accident. .

(9) The criteria shown separately can be referred to with respect to the judgement of whether the investigation items under item (i) of paragraph (1), and the omission of the medical examinations under paragraph (2) to (4), etc. is appropriate or not.

(10) Regarding "the exposed doses of said workers after the last medical examinations" under item (v), if the previous medical examinations were conducted before 1 April 2001, the effective dose equivalent or the tissue dose equivalent received from this time period to 31 March 2001 may be allowed to consider as the effective dose or the equivalent dose, respectively.

(11) The term "if the doses cannot be determined by calculation" under item (v) refers to a case where an accident occurs and the dose specified under Article 45, paragraph (2) cannot be calculated, etc. In such a case, it is necessary to show the physician the situation at the time of the accident, the time the workers stayed at the accident site, etc.

24 Re: Article 57

The extension of retention period for the records, etc. is the same as (2) of 10.

25 Re: Form 1

(1) In this revision, description fields for the doses to which the eyes and the skin may be exposed by accidents, etc. as well as change of terms are provided, the column of "atypical lymphocytes" as "white blood cell percentage" is provided. Columns, etc. are changed based on the assumption that the periodic medical examinations of the eyes and the skin are performed once in six months.

(2) Regarding the column of "history of radiation works (including those in other projects)", the history of past radiation works shall be described.

(3) The "exposed doses of said workers after the last medical examinations" is the same as (10) of the above 23.

26 Re: Form 2

(1) In the present form (front side), in addition to changing terms, "category with effective dose" is reviewed based on the amendments to the establishing criteria of the controlled area under Article 3 (1) and the effective dose limit under Article 4 (1).

(2) Regarding Remark 12 of the present form (back side), it should be noted that the classification with dose is performed based on the dose received during the one-year period preceding the year to which the day of the medical examinations conducted this time belongs.

IV. Transitional Measures

1 At the time of enforcement of the Revised Ministerial Ordinance, before 31 March 2003, prior

provisions of Article 3 and Article 3-2 of the Ionizing Radiation Hazards Ordinance continue to apply to an employer who currently carries out the business of radiation work.

2 At the time of enforcement of the Revised Ministerial Ordinance, prior provisions continue to govern the applicability of provisions of Article 12 and Article 13 of the Ionizing Radiation Hazards Ordinance to employers who have made notification of the installation of X-ray devices to Article 88, paragraph (1) (including as applied mutatis mutandis pursuant to paragraph (2) of the same Article) of the Industrial Safety and Health Act.

3 The provisions of Article 9 (1) and Article 57 of the Revised Ministerial Ordinance shall be applied to records provided for in Article 9 (1) and Article 57 of the Ionizing Radiation Hazards Ordinance, the storage of the records being started before the enforcement of the Revised Ministerial Ordinance and the records being already stored at the time of the enforcement of the Revised Ministerial Ordinance. In this case, the remaining storage period after 1 April 2001 shall be the period subtracting the period already elapsed from 30 years at the time of 1 April 2001.

V. Re: Partial Revision of Related Notifications

1 "Re: Amendment of the Ministerial Ordinance to Revise Part of the Ordinance on Prevention of Ionizing Radiation Hazards", Labour Standards Bureau Notification No. 1, originally issued on 1 January 1989 was revised on 31 March 2001 as follows:

(1) delete I, II, III-1 to 6 and 8 to 11, and 1, 2, 5, 6, 9, 11, 21, 24, 36, 39 and 40 of IV of Chapter 2 in Description;

(2) change "しゃへい" (shield) to "遮へい"（shield) in (2) of 12 of IV of Chapter 2 in Description;

(3) change "radiation dose rate" to "the air kerma rate in free air" in (1) of 14 of IV of Chapter 2 in Description;

(4) delete "paragraph (2)" in 21 of IV of 2 in Description;

(5) change "measuring instrument" to "radiation measuring instrument" in (2) of 24 of IV of Chapter 2 in Description;

(6) change "dose equivalent" to "dose" in (3) of 41 of IV of Chapter 2 in Description;

(7) change "つど" (in each) to "都度"（in each）and "measuring instrument" to "radiation measuring instrument" in 42 of IV of Chapter 2 in Description.

2 The "Reinforcement of Occupational Safety and Health Management Measures for Radiation Work in Nuclear Facilities", Labour Standards Bureau Notification No. 581, dated on 19 September 2000, is amended on 31 March 2001 as follows:

(1) in (2) and (4) of 4 in Description and Form 1, change "dose equivalent" (except "dose equivalent rate") to "effective dose";

(2) in Form 1, change "radiation measuring tool" to "radiation measuring instrument"; and

(4) in Form 3, change "effective dose equivalent" to "effective dose", and "dose equivalent" to "effective dose".

(5) Form 4 should be revised as shown in Attachment 2.

Attachments

Attachment 1

Notes on Establishing of Controlled Areas, etc.

1 Effective dose due to external radiation

(1) Selection of radiation measuring instrument

For radiation measuring instruments that measure external radiation, attention should be paid to the following requirements and selection of the appropriate one:

(a) 1-cm dose equivalent or 1-cm dose equivalent rate (hereinafter referred to as "1-cm dose equivalent, etc.") can be measured;

(b) directional dependence (the sensitivity varies depending on the incident direction of the different types of radiation) is small, and the energy characteristics can be to matched to conversion factors, such as 1-cm dose equivalent;

(c) the radiation measuring instrument must have sufficient performance that its measurement limit, when set at its highest sensitivity, as well as either its smallest measurement unit or the magnitude of its indicated value (when the instrument scale does not have marked graduations), are able to read the 1 cm dose equivalent, etc.;

(d) in a measurable state, no drift (zero-point movement) occurs when the pointer of the radiation measuring instrument is left at the zero point, and less zero-point movement occurs when switching the measurable range;

(e) the drift of the pointer is small during measurement;

(f) in addition to the above, the Japanese Industrial Standard (JIS) is applicable or its equivalent performance is provided; and

(g) within one year before the day of conducting the measurement, the instrument must be calibrated using a reference measuring instrument having traceability clearly defined with the national standard and a quantity-proved radiation source.

(2) Measurement points

Measurement points shall be selected in consideration of the following;

(a) include, in an area where the operator of the instrument enters, a point where the 1-cm dose equivalent, etc. is predicted to be the maximum, such as a point closest to the radiation source or a point where shielding is thin, etc.;

(b) include a point where workers are always working;

(c) include a place near the boundary delimited by structures such as walls;

(d) take measurement points densely if 1-cm dose equivalent, etc. is predicted to be changed greatly depending on position;

(e) include places where it is predicted that the sum of the 1-cm dose equivalent, etc. will be the maximum if different types of radiation are mixed;

(f) if the sum of the effective dose due to radioactive materials in the air and the effective dose due to external radiation is required, conduct the measurement so as to reach a point where the 1-cm dose

equivalent, etc. is low; and

(g) set the height of the measurement point to the position of about one meter above the workplace floor.

(3) Actions to be taken before measurement

(a) To conduct the measurement effectively and safely, prior to making it, perform calculations, etc. to confirm the distribution pattern of 1-cm dose equivalent, etc. in the area to be measured.

In addition, if necessary, use an additional radiation device, etc. of the same type and capacity to investigate the results of the measurement.

(b) Confirm that the radiation measuring instrument is not contaminated before use.

In a place with less influence from radiation, subject the radiation measuring instrument to a check of battery consumption status, a zero-point adjustment, a check of operation conditions with a calibration radiation source, etc. to confirm the proper operation of the radiation measuring instrument.

(c) Investigate the background value, and subtract it from the measurement result to provide a correct measurement result.

(d) Ensure the measurement is conducted by a person who has the expertise to measure 1-cm dose equivalent, and confirm and evaluate the method and result of the measurement by a person having expertise on radiation, such as an operations chief of work with X-rays.

(4) Matters to be noted for measurement

(a) Conduct the measurement sequentially from a point with a previously calculated low 1-cm dose equivalent, etc. to a point with a higher 1-cm dose equivalent.

(b) Ensure the person who is engaged to make measurements uses the radiation measurement instrument properly and has necessary protection such as protective clothing.

(c) If different kinds of radiation are mixed, sum the 1-cm dose equivalents, etc. due to the respective kinds of radiation according to the following (5) to provide their sum as a 1-cm dose equivalent at the point.

(5) Measurement method and calculation, etc. of effective dose in a three-month period

(a) In the case that the 1-cm dose equivalent, etc. is constant during working hours,

(i) when measuring with a radiation measuring instrument such as a survey meter, measure a 1-cm dose equivalent rate at any time during work hours, multiply the measurement result by the maximum total work hours anticipated in the three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period; and

(ii) when measuring with a cumulative-type radiation measurement instrument such as a film badge, measure a 1-cm dose equivalent at any time during work hours, multiply the measurement result by the maximum total work hours anticipated in the three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period.

(b) In the case that the 1-cm dose equivalent, etc. varies with time period,

(i) when measuring with a radiation measurement instrument such as a survey meter, conduct the

measurement several times including one at the time where the 1-cm dose equivalent rate is assumed to be the maximum during work hours to give the average, and multiply the measurement result by the maximum total work hours anticipated in the three-month period to give the 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period; and

(ii) when measuring with a cumulative-type radiation measurement instrument such as a film badge, conduct the measurement in any time period including the time where the 1-cm dose equivalent rate is assumed to be the maximum during work hours to give a 1-cm dose equivalent, multiply the 1-cm dose equivalent by a value obtained by subtracting the above time period from the maximum total work hours anticipated in the three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period.

(c) In the case of a device, such as an X-ray device or a gamma ray irradiation device (hereinafter, referred to as a "radiation device"), which is used in a method in which short-time irradiation is repeated in a short-time period under the same conditions,

(i) when measuring with a radiation measuring instrument such as a survey meter, the measurement/calculation shall be conducted by one of the following procedures:

(i-a) measure a 1-cm dose equivalent rate during irradiation, multiply the rate by an irradiation time period to give a 1-cm dose equivalent per one time of irradiation, multiply the 1-cm dose equivalent by the number of irradiation times per hour to give a 1-cm dose equivalent per hour, multiply the 1-cm dose equivalent by the maximum total work hours anticipated in the three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period; and

(i-b) measure a 1-cm dose equivalent rate during irradiation, multiply the rate by an irradiation time period to give a 1-cm dose equivalent per one time of irradiation, multiplying the 1-cm dose equivalent by the maximum number of irradiation times in the work hours anticipated in the three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period.

(ii) when measuring with a cumulative-type radiation measurement instrument such as a film badge, the measurement/calculation shall be conducted by one of the following procedures:

(ii-a) measure a 1-cm dose equivalent over a certain time period of repetitive irradiation, multiply the 1-cm dose equivalent by a value obtained by subtracting the above time period from the maximum total work hours anticipated in the three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period; and

(ii-b) measure a 1-cm dose equivalent per one irradiation time, multiply the 1-cm dose equivalent by the maximum number of irradiation times in the work hours anticipated in the three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month period.

(d) In the case that a radiation device is used and the 1-cm dose equivalent, etc. is varied by moving

the focal point of the X-ray device or by moving the radiation source of a gamma ray irradiation device,

(i) when measuring with a radiation measuring instrument such as a survey meter, the measurement/calculation shall be conducted by one of the following procedures:

(i-a) under each of the conditions of use in one task, measure a 1-cm dose equivalent rate during irradiation, multiply the 1-cm dose equivalent rate by an irradiation time period to give a 1-cm dose equivalent per one irradiation time, multiply the 1-cm dose equivalent by the number of irradiation times to give the sum of 1-cm dose equivalents under each of the conditions of use, sum all of the 1-cm dose equivalents under the respective conditions to give a 1-cm dose equivalent for the entire one task, subtract the total time period of the one task from the sum to give an average 1-cm dose equivalent per hour, multiply the average 1-cm dose equivalent by the maximum work hours anticipated in a three-month period to give a 1-cm dose equivalent in the three-month period;

(ii-b) under each of the conditions of use in one task, measure a 1-cm dose equivalent rate during irradiation, multiply the 1-cm dose equivalent rate by an irradiation time period to give a 1-cm dose equivalent per one irradiation time, multiply the 1-cm dose equivalent by the number of irradiation times to give the sum of 1-cm dose equivalents under each of the conditions of use, sum all of the 1-cm dose equivalents under the respective conditions to give a 1-cm dose equivalent for the entire one task, and multiply the sum by the maximum total number of tasks in a three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose in the three-month period.

(ii) When measuring with a cumulative-type radiation measurement instrument such as a film badge, the measurement/calculation shall be conducted by one of the following procedures:

(ii-a) measure a 1-cm dose equivalent for one task, divide the 1-cm dose equivalent by the total time of the one task to give an average 1-cm dose equivalent per hour, multiply the result by the maximum work hours anticipated in a three-month period to give a 1-cm dose equivalent in the three-month period, and provide the result as an effective dose in the three-month effective dose;

(ii-b) measure a 1-cm dose equivalent for one task, multiply the 1-cm dose equivalent by the maximum number of tasks anticipated in a three-month period to give a 1-cm dose maximum equivalent in the three-month period, and provide the result as an effective dose due to external radiation in the three-month irradiation.

(e) In the case that a radiation device is used at a place other than a radiation equipment room,

(i) when performing the task at the same place in a three-month period,

conduct the same measurement as that of the above (c) or (d) and calculate an effective dose due to external radiation in the three-month period;

(ii) when performing tasks at different workplaces in a three-month period,

conduct the same measurement as that of the above (c) or (d) at each of the workplaces (“three-month period” in the above (c) or (d) is replaced with “total number of work days in the three-month period at each workplace”), and provide the 1-cm dose equivalent over the total

number of work days in the three-month period at each workplace as an effective dose due to external radiation in the three-month period at each workplace.

(f) If it is expected that the correct measurement result cannot be obtained due to the performance of a radiation measuring instrument, specifically due to influence of noise from peripheral equipment on the radiation measuring instrument, a very short irradiation time, no response from the radiation measuring instrument, etc., a 1-cm dose equivalent in the three-month period shall be obtained by calculation. In this case, the effective dose in the three-month period may be directly obtained by calculation.

(6) Maintenance of records

Upon conducting the measurement, records shall be made for measurement date/time, measurement method, measurement place, name of the person measuring the radiation, the type, model, and performance (calibration constant, calibration date and background value) of the radiation measuring instrument (if the radiation source is the X-ray device, type, model, and performance, such as rated output, of the device; if it is a gamma-ray irradiation device, name of the nuclide and isotope number, etc. of installed radioactive materials, type, model, and performance of the device; in the case of handling radioactive materials, name of the nuclide and isotope number, etc. of radioactive materials).

2 Effective dose due to radioactive materials in air

A measurement for establishing a controlled area shall be preferably conducted by a Class-1 Working Environment Measurement Expert if the workplace for measurement corresponds to the provisions of Article 53(2) of the Ionizing Radiation Hazards Ordinance.

(1) Sampling method

Radioactive materials in the air include particulate materials collected by fibrous filter papers and gaseous materials, such as vapors and chemically inert rare gases.

These materials should be collected by their suitable sampling methods based on the respective conditions. The selection shall be determined with reference to the appended table, depending on the main radionuclides and their properties.

(2) Sampling time and points

(a) Sampling shall be performed under normal working conditions during the time period in which the concentration of radioactive materials in the air may be highest.

(b) Sampling shall be performed based on the range of actions of workers during work, the distribution conditions of radioactive materials, etc. and particular attention shall be paid to the instructions described below. In this case, the flow of air in a work room shall be understood in advance for accurately determining the concentrations of radioactive materials in the air and detecting the radioactive materials in the air.

(i) Sampling shall be performed at one or more points for each unit workplace.

(ii) If the workplace to be measured is wide, the number of sampling points depends of the workplace size.

(iii) The selected points shall allow the concentrations of radioactive materials in the air to be properly detected. For example, the point shall be located on the leeward side of a workplace where

radioactive materials may become scattered in the air.

(c) The height of a sampling point shall be in the range of 0.5 to 1.5 meters above the workplace floor.

(3) Analysis method

Analysis of collected samples shall be conducted according to the analysis methods listed in Article 9(1) (ii) of the Working Environment Measurement Standards (Notification No. 46 of the Ministry of Labor, 1976).

(4) Calculation of effective dose

The effective dose shall be calculated by the following equation with values (unit: Bq/cm^3) obtained as a result of the sampling and the analysis, based on the provisions of Article 3 (3) of the Ionizing Radiation Hazards Ordinance.

Figure F_002

$$\text{Effective dose} = 1.3\ \text{mSv} \times \frac{\text{[2] Three-month average of weekly average concentration}}{\text{[1] Limit specified by the Minister of Health, Labor and Welfare} \times \frac{1}{10}}$$

[1] The “limit specified by the Minister of Health, Labor and Welfare” shall be the concentration of radioactive materials in the air equivalent to 50 mSv per year (effective dose limit), or the “concentration limit in the air”

$$\text{[2] Weekly average concentration} = \text{Average of concentrations of radioactive materials in the air during work hours per week (measured value)} \times \frac{\text{Work hours per week}}{40\ \text{hours}}$$

The “weekly average concentration for a three-month period” means an average of 13 calculated weekly average concentrations (for the three-month period).

(5) Provision of records

Upon conducting the measurement, records shall be made for, for example, measurement date/time, measurement place, name of the person making the measurement, name of the nuclide and quantity of radioactive materials for each nuclide) used in the measurement, sampling method, analysis method, and model of the device or instrument used, and results of the measurement.

3 Establishing the controlled area

(1) Workplace where only effective dose due to external radiation is considered

The control area shall be a place where the effective dose in the three-month period calculated in the above 1 may exceed 1.3 mSv.

Particular attention shall be paid to the instructions described below.

(a) If different methods are applied to the use of a radiation device, the control area shall be the place where the sum of values calculated in the above 1 for each method may exceed 1.3 mSv.

(b) If two or more radiation devices are installed in close proximity, the controlled area shall be the

place where the sum of the values calculated in the above 1 for each device may exceed 1.3 mSv.

(c) In the case that the boundary equivalent to the controlled area is formed inside one room, etc. structurally partitioned in an indoor workshop, except for the case in which the boundary can be appropriately managed as a boundary of the controlled area, the controlled area shall be the entire area of the above room, etc.

(d) If the radiation device is used at different places other than the radiation equipment room in the three-month period, the controlled area shall be defined at each place.

(2) Workplace where effective dose may be only due to radioactive materials in air

The control area shall be a place where the effective dose calculated in the above 2 may exceed 1.3 mSv.

Regarding radioactive materials in the air, contamination may spread unless an area is structurally partitioned. Thus, in the case that a boundary equivalent to the controlled area is formed in the inside of one structurally partitioned room, etc., in principle, the entire area of the room, etc. shall be provided as a controlled area.

(3) Workplace where effective dose may be due to both the above 1 and 2

The effective doses calculated in the above 1 and 2 are summed. Then, the control area shall be a place where the sum may exceed 1.3 mSv.

Particular attention shall be paid to the instructions described below.

(a) In principle, if the effective dose due to radioactive materials alone in the air exceeds 1.3 mSv, the whole area in the structurally partitioned room, etc. shall be defined as a controlled area.

(b) If a boundary of an area, where the effective dose due to radioactive materials alone in the air does not exceed 1.3 mSv but the sum of the effective dose due to radioactive materials and the effective dose due to external radiation exceeds 1.3 mSv, is formed in one structurally partitioned room, etc., the controlled area shall be the entire area of the above room, except for the case in which the boundary can be appropriately managed as a boundary of the controlled area.

4 Confirm that the effective dose at a place constantly accessed by workers under Article 3(2)(i) of the Ionizing Radiation Hazards Ordinance is 1 mSv or less per week

(1) Workplace where only effective dose due to external radiation is considered

According to the above 1 (“three-month period” is replaced with “one-week period”, “1.3 mSv” is replaced with “1 mSv”, and the same is also applied to the below 5), an effective dose due to external radiation in a one-week period is calculated in the above 1 to confirm the effective dose at sites usually entered by workers is 1 mSv or less. If there is a place where the effective dose exceeds 1 mSv, shielding shall be enhanced or workers shall be prohibited from entering the place.

Particular attention shall be paid to the instructions described below.

(a) If different methods are applied to the use of a radiation device, the sum of values calculated in the above 1 for each of them shall be confirmed to be 1 mSv or less. If there is a place where the exposure dose exceeds 1mSv, shielding shall be enhanced or workers shall be prohibited from entering the place.

(b) If two or more radiation devices are installed in close proximity, the sum of values calculated in

the above 1 for each of the devices, etc. shall be confirmed to be 1 mSv or less. If there is a place where the exposure dose exceeds 1mSv, shielding shall be reinforced or workers shall be prohibited from entering the place.

(2) Workplace where only effective dose due to radioactive materials is considered

Sampling and analysis shall be performed with respect to radioactive materials in the air in accordance with (1) to (3) of the above 2 (“establishing the control area” is replaced with “confirming that the effective dose at sites usually entered by workers under Article 3-2(1) of the Ionizing Radiation Hazards Ordinance is 1 mSv or less per week”), and the effective dose due to radioactive materials in the air shall be calculated using the following equation to confirm the value to be 1 mSv or less. If there is a place where the effective dose exceeds 1 mSv, a local exhauster or equipment for sealing a diffusion source shall be reinforced, or workers shall be prohibited from entering the place.

Figure F_003

$$\text{Effective dose} = 1\ \text{mSv} \times \frac{\text{Weekly average concentration}}{\text{Limit specified by the Minister of Health, Labor and Welfare}}$$

(3) Workplace where effective dose is due to both the above 1 and 2

The values obtained in the above 1 and 2 shall be summed, and a place where the sum is 1 mSv or less shall be confirmed as a control area. If there is a place where the value exceeds 1 mSv, shielding or a local exhauster or equipment for sealing a diffusion source, shall be reinforced, or workers shall be prohibited from entering the place.

5 Establishing of restricted places where effective dose due to external exposure under Article 18(1) of the Ionizing Radiation Hazards Ordinance exceeds 1 mSv per week

The effective dose due to external radiation in a one-week period shall be calculated in the above 1, and a place where the effective dose exceeds 1 mSv shall be established as a restricted area.

Particular attention shall be paid to the instructions described below.

(1) If different methods are applied to the use of a radiation device, a place where the sum of values calculated in the above 1 for each of them shall be confirmed to 1 mSv or less is defined as a restricted area.

(2) If two or more radiation devices are used in close proximity, a place where the sum of values calculated in the above 1 for each of the devices, etc. shall be confirmed to 1 mSv or less is defined as a restricted area.

Appended table

Figure F_004

Major radionuclides and sampling methods based on their forms

Major radionuclides	Forms of radionuclides	Sampling methods	Trapping materials and collecting instruments
^{60}Co, ^{67}Ga, ^{99m}Tc, ^{147}Pm, ^{201}Tl, U, Pu	Particulate	Filtration method	Filter
^{32}P, ^{35}S, ^{123}I, ^{125}I ^{131}I, ^{203}Hg	Gaseous (Volatile materials)	Solid adsorption method	Activated carbon impregnated filter paper
^{123}I, ^{125}I, ^{131}I, ^{203}Hg			Activated carbon cartridge
^{3}H	Water vapor		Silica gel
Radioactive noble gases ^{3}H, ^{14}C	Gaseous	Direct sampling method	Ionization chamber for gas collection
Radioactive noble gases			Gas sampling container
^{3}H	Water vapor	Cooling condensation sampling method	Cold trap
^{3}H, ^{14}C	Water vapor, mist	Liquid absorption method	Water bubbler

Attachment 2

Form 4

Figure F_005

Heisei Number of workers classified by effective dose

(Unit: person)

Business classification / Effective dose classification	Nuclear facility employer	Relevant subcontractor					Total
		Classification	Resident	Periodic inspection construction only	Others	Subtotal	
		Number of workplaces					
5 mSv or less							
Exceeding 5 mSv and 15 mSv or less							
Exceeding 15 mSv and 20 mSv or less							
Exceeding 20 mSv and 25 mSv or less							
Exceeding 25 mSv and 50 mSv or less							
Exceeding 50 mSv							
Total							
Average effective dose (mSv)							
Maximum effective dose (mSv)							
Total effective dose (person・mSv)							

Y/M/D

Name of Employer Seal

To: The Head of the Labour Standards Inspection Office

Remarks

1. After the end of the fourth quarter, together with Form 2 and 3, this report describes the effective dose received by radiation workers in the one-year period (the effective dose received by a person who has engaged in radiation work at the reported workplace in a one-year period).

2. Fill in the column “Name of Employer” with one’s full name and a signature may be affixed instead of seal or stamp.