

Ordinance №359 of the Government of Georgia

July 20, 2015

Tbilisi

On approval of the Technical Regulation – Individual Monitoring and Control Procedure

Article 1

Under Article 53(6)(g) of the Law of Georgia on Nuclear and Radiation Safety, the Technical Regulation – Individual Monitoring and Control Procedure attached hereto be approved.

Article 2

The Ordinance be enacted upon promulgation.

Prime Minister

Irakli Garibashvili

**Technical Regulation
Individual Monitoring and Control Procedure**

Article 1. Scope of regulation

1. The present Technical Regulation establishes general requirements for monitoring employee radiation doses by holders of the license on activities regulated by the Law of Georgia on Nuclear and Radiation Safety as well as the procedures of monitoring the workplace for the purposes of occupational radiation exposure assessment.

2. Irrespective of their organizational-legal form, this Technical Regulation is mandatory for all physical and/or legal entities whose activities are regulated by the Law of Georgia on Nuclear and Radiation Safety.

Article 2. The goal and objective of monitoring

1. Monitoring aims to assess effectiveness of radiation protection and promote safe working conditions through regular measurement of equivalent and effective doses as well as the intensity of radioactive contamination equivalent dose rate and application of result evaluation data.

2. The objective of the monitoring is to collect and analyze information about the doses of occupational radiation at the time intervals established by the license holder, in order to timely detect excess of the employees' permissible exposure doses and ensure nuclear and radiation safety at the workplace.

Article 3. Glossary

1. Terms used in this technical regulation have the following meanings:

a) **Activity** – a physical quantity expressed for a specified quantity of radionuclide in a specified energy condition, at a given moment in time, with the following formula:

$$A = \frac{dN}{dt}$$

Where A is Activity and dN is the expected number of nuclear transformations from the given energy state during time period dt . In international measurement system, unit of activity is Becquerel (Bq). The off-system unit Curie (Ci) is also used. $1 \text{ Curie} = 3.7 \cdot 10^{10} \text{ Bq}$;

b) **Investigation Level** - the values of effective dose or radioactive contamination, excess of which requires appropriate examination and determination of reasons;

c) **Radiation** – Exposure of humans and environment to ionizing radiation

d) **Annual Effective/Equivalent Dose** – sum of effective/equivalent doses of external radiation and expected internal effective/equivalent radiation received by a human during the calendar year. Internal radiation is caused by the radionuclides which entered the body during this year. The measurement unit of Annual effective/equivalent dose is Sievert (Sv);

e) **Ambient Dose Equivalent (Ambient Dose) ($H^*(d)$)** – dose equivalent formed by the uniformly distributed radiation field in the spherical etalon phantom in the d (mm) depth from the surface along the sphere diameter in the opposite to the field spread direction;

f) **Surface Contamination** – contamination caused by radioactive substances;

g) **Personal Protection Equipment** - means of protection from external radiation, intake of radioactive substances by the human body and radioactive contamination of the skin;

h) **Individual dosimeter** - a tool designed to measure individual equivalent doses;

i) **Individual Equivalent Dose ($H(d)$)** - equivalent of dose determined in the depth of d (mm) from the indicated point in the soft biological tissue;

j) **Individual monitoring** - systematic and constant monitoring of employees' internal and external radiation dosages, assessment of results and prediction;

k) **Monitoring** - Systematic and constant monitoring of radiation, doses, contamination as well as assessment of results and prediction;

l) **Recording Level** - level of dose of radionuclide intake in excess of which the intake or dose received by an employee is recorded in the Individual Radiation Dose Status Card;

m) **Workplace Monitoring** - performing regular and constant measurement of the equivalent dose rate and radioactive contamination at workplaces;

n) **Intervention Level** - dose level where specific defensive actions or restorative measures are taken in the event of an emergency or current irradiation;

o) **Annual Inclusion limit** - accumulation of the given radionuclide in human body during 1 year, causing exposure to expected irradiation dose equal to the annual effective (or equivalent) dose.

2. Other terms used in the Technical Regulation have the same meaning as in the Law of Georgia on Nuclear and Radiation Safety.

Article 4. General Provisions

1. The monitoring includes:

a) Individual monitoring - determination and registration of annual effective doses for people working in control zone, taking into account potential risk of irradiation;

b) Periodic monitoring of workplace in the control and observation zone.

2. The holder of a license for Nuclear and radiation activities is obliged to conduct monitoring of the employees individual doses and workplaces independently or through assistance of other licensed organizations. Based on the obtained results, the license holder shall evaluate occupational exposure of employees and predict the consequences. Recommended frequency of monitoring is defined in Annex 1.

3. Based on monitoring of individual doses and workplaces and taking into account the type of ionizing radiation, the license holder is obliged to determine registration, investigation and intervention levels. In case of exceeding investigation and intervention levels, the owner shall ensure detection of the causes and notification of the regulatory body.

4. Investigation level is determined based last 2-3 years monitoring results of individual doses and workplaces or the investigation levels defined for the staff working in similar conditions.

5. Based on the goals of monitoring, three types of monitoring are conducted:

a) Ongoing (routine) - determining the individual dose of the worker in the conditions of normal operation of ionizing radiation sources (designed to verify compliance with requirements of the legislation on working conditions and individual doses values);

b) Targeted (operative) - determining the individual dose of the worker for specific activities, given the probability of exposure to irradiation exceeding the permissible dose limit (including repair and maintenance services, radiation accident consequences elimination activities);

c) Emergency (special) - in case of emergency exposure, for the purpose of determining the emergency doses, and/or in the event of commissioning the new modified equipment and/or practical application of new procedures.

Article 5. Individual Monitoring

1. Individual monitoring involves monitoring of the workers external and internal irradiation.

2. Individual monitoring is conducted for workers constantly or temporarily working in the control zone whose effective annual dose may be more than 6 mSv. If individual monitoring is inadvisable or impossible, workers' occupational exposure shall be assessed based on the workplace monitoring data.

3. Persons who work temporarily in the control and observation zones shall be subjected to the same individual monitoring procedure as permanent workers.

4. When conducting individual monitoring, determination of doses (individual dosimetry) is performed only based on the methods agreed with the regulatory authority. The measurement tools consistent with international or national standards shall be used for Individual dosimetry.

5. Dosimetric devices shall match the type of radiation (gamma, neutron and other) and energy.

Article 6. External Irradiation Monitoring

1. Monitoring of external irradiation implies measuring the doses received by the employee when the ionizing radiation source is outside the body and the radiation emitted from it has ability to cause exposure.

2. The following dosimetric quantities are recommended for radiation protection:

- a) At external irradiation, operative dosimetric quantities of individual monitoring are individual dose equivalent $H_p(d)$ and ambient dose, measurement unit of which is Sievert (Sv);
- b) The recommended depths are 0.07 mm and 10 mm for weakly penetrating radiation (e.g. beta particles or photons with energy less than 15 keV), and strongly penetrating radiation, respectively. Although for other cases the different values of the depth can be used, such as $d = 3$ mm for eye crystal ;
- c) The individual dose equivalent at 10 mm depth - $H_p(10)$ is used to assess effective dose. Taking into account that sensitive cells of the skin are placed in the depth of 0.05 to 0.1 mm from the skin surface, $H_p(0.07)$ is used to assess the skin equivalent dose.
3. Depending on the specifics of activity, monitoring of the workers' individual organs exposure dose shall be performed.
4. Interrelation between operative and normalized quantities as well as placement of dosimeter on the worker's body (in view of activity specifics) are given in Table №1.

Table № 1 Operative and normalized quantities of individual monitoring and placement of dosimeter on the worker's body

Normalized quantities	Operative quantity: Individual dose equivalent $H_p(d)$		
	Placement of individual dosimeter on the body	d , <i>mm</i>	Symbolic notation
Skin external radiation equivalent dose	Area of maximum direct irradiation of skin surface	0,07	$H_p(0,07)$
Eye crystal external radiation equivalent dose	Part of the skull	3	$H_p(3)$
Equivalent dose on lower part (third) of female abdomen	Relevant location on the body surface	10	$H_p(10)$

External radiation effective dose	Optimal locations of the body surface in view of irradiation geometry	10	Hp(10)
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5. External irradiation monitoring is performed by measuring employee individual equivalent doses with individual dosimeter. External exposure effective dose as well as skin and eye crystal external exposure equivalent dose are monitored based on measurement results.

6. When selecting the dosimeter, the source radiation type as well as the information required for equivalent dose calculation shall be considered.

7. Individual dosimeters directly recording received dose and dose rate (direct-reading dosimeter) as well as indirect-reading dosimeters which record the received dose only upon performing certain procedures (e.g. film badge dosimeter, thermoluminescence albedo dosimeter, optically stimulated luminescence dosimeter, etc.) shall be used for individual monitoring. Advisability of application of direct-reading and indirect-reading dosimeters shall be defined based on current irradiation situation as well as nuclear and radiation safety purposes.

Article 7. Dosimeter carrying rules

1. Direct-reading and indirect-reading dosimeters accumulated dose readings shall be taken and recorded every 3 months. Based on the specifics of worker's activities, when there is a probability of receiving high effective and equivalent doses (interventional radiology and cardiology) from external irradiation, indirect-reading dosimeter accumulated dose readings shall be taken and recorded at least once a month.

2. The worker shall carry the dosimeter at the chest level, on the outside surface of personal protection equipment so that the detector is directed towards the source. In the case of potentially possible high irradiation, the worker (e.g. interventional radiology and cardiology worker) shall carry two dosimeters: one - at the chest or waist level, under personal protection equipment and another - at the chest level, outside personal protection equipment.

3. In case of working under high irradiation conditions (e.g. nuclear and radiation accident consequences elimination activities, industrial radiography) when the workplace monitoring is not fully implemented, the worker shall use individual electric direct-reading dosimeter.

4. When working under uneven exposure conditions, the worker shall carry the dosimeter on the body part which may receive the highest external irradiation dose (back, side, chest) and indicate in the Individual Radiation Dose Status Card the part of the body where the dosimeter is attached.

5. Depending on the specifics of activities, monitoring of eye crystal and extremities irradiation equivalent dose shall be carried out when the exposure dose may account for 0.3 of the annual permissible dose limit (e.g. interventional cardiology) or when new diagnostic methods are applied or introduced and excess exposure of eye crystal and extremities is expected. In case of application of normal procedures, the eye crystal and extremities irradiation equivalent dose is measured within one month of the year. Based on the obtained results, the annual external irradiation equivalent doses are determined and predicted.

6. Dosimeter designed for measuring the equivalent exposure dose for extremities, is attached the way which allows to measure the maximum equivalent dose of external exposure.

7. Dosimeter designed to measure the eye crystal equivalent exposure dose is attached at the eye or forehead level.

8. In case of using an additional dosimeter, the location of its attachment shall be indicated in the Dose Status Card.

9. If there is reasonable suspicion that the worker's exposure dose exceeded the investigation one, dosimeter data shall be immediately checked, regardless the expiration of determined dosimeter carrying period.

10. If the worker notifies the administration about her pregnancy, additional monitoring of the equivalent dose received in lumbar area shall be performed. The dosimeter shall be placed under the personal protection equipment, on the surface of lower part (third) of the abdomen.

Article 8. Internal Irradiation Monitoring

1. Internal irradiation monitoring implies measuring the doses received by the worker in cases of radionuclide intake through inhalation, digestive tract or direct contact with the skin.

2. Internal irradiation monitoring is carried out if the amount of radionuclides in the body exceeds or may exceed 1/10 of annual permissible dose. In the event of intake of several radionuclides, the annual inclusion limit is calculated for the radionuclide with relatively high radio toxicity.

3. Based on the results of individual monitoring of internal irradiation, the evaluation and prediction of expected equivalent and effective doses is performed.

4. Direct measurement of internal doses is not be possible. There are various methods of internal monitoring, such as direct measurement of Gamma radionuclide activity in the human body and separate organs; measurement of radionuclide activity in human biological samples; measurement of specific activity of radionuclides emitted into the air and so forth.

5. The personnel working with unsealed sources of ionizing radiation shall be subjected to skin surface contamination measurements as well skin intake equivalent dose evaluation and prediction.

Article 9. Workplace Monitoring

1. Workplace monitoring includes the following:

- a) Determine the equivalent dose rate as well as evaluate and predict the results;
- b) Detect workplace Surface contamination as well as evaluate and predict the results;
- c) Evaluate and predict the voluminous activity of radioactive materials in the air.

2. When conducting monitoring of workplace within the scope of monitoring program, the license holder shall indicate the following in the relevant recordings:

- a) Source data and its current activity;
- b) Type and energy of radiation;;
- c) Measurement units and quantities to be measured;
- d) Location and periodicity of measurement;
- e) Used dosimetric devices that correspond to the type of radiation, radionuclide energy and activity;

f) Person responsible for performing measurements;

g) Investigation levels and in case if they are exceeded – the relevant measures.

3. The monitoring program shall ensure timely implementation of all necessary procedures therein. The results shall be registered, evaluated and properly stored (protected).

Article 10. Registration and Storage of Monitoring Data

1. The license holder is obliged to record individual doses and workplace monitoring data, fill out the Individual Radiation Dose Status Card and inform the employee about the received dose (Annexes No 2 – No 4).

2. The following data on external irradiation is subject to registration:

a) Worker's personal data: first name, last name, personal number, year of birth, occupied position, time of starting work with source;

b) Name of the source and type of radiation;

c) Data on irradiation doses;

d) Measured quantities of external exposure: Hp(10) intended to measure penetrating ionizing radiation; Hp(0,07) intended to measure weakly penetrating ionizing radiation; Hp(3) intended to measure eye crystal exposure; Hp(n) intended for measuring neutron irradiation;

e) Equivalent and effective doses received from external radiation;

f) Evaluation and prediction of measurement results.

3. The following data on the worker's internal exposure is subject to registration:

a) Worker's personal data: first name, last name, personal number, year of birth, occupied position, time of starting work with source

b) Name of the source and type of radiation;

c) Measurement methods;

d) Date of measurement;

e) Measured quantities: expected equivalent - H (50) and expected effective dose - E (50).

4. The license holder shall keep the results obtained for the following period:

a) Workplace monitoring results - within 5 years;

b) The data on the basis of which the control zone boundaries are determined until changing the control zone boundaries;

c) Individual monitoring results - throughout the worker's activities until the age of 75. In case of termination of professional activities - within 30 years.

5. In case of transfer to another organization, the worker is given the data on received doses for submitting to the new employer. The original Radiation Dose Status Card is retained at the previous employer.

6. A copy of the Radiation Dose Status Card is issued to the person assigned to another organization.

Individual doses received during the business trip shall be included in the original Radiation Dose Status Card of the primary employer.

7. While working in several organizations, the Radiation Dose Status Card is filled in each organization separately. For this purpose, one organization the filled Card of which contains the sum of doses received in all organizations, is defined as a base one.

8. Information on the doses received by workers is a part of annual reporting.

9. Information on the individual doses received by the workers is confidential.