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INDIVIDUAL MONITORING AND REPORTING OF RADIATION DOSES

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1 GENERAL

According to Resolution 594/68 of the Ministry of Social Affairs and Health, the health and radiation doses of an individual engaged in activities involving exposure to radiation shall be monitored on a regular basis. As required in Resolution 952/75 of the Council of State, the Finnish Centre of Radiation and Nuclear Safety (STUK) maintains a centralized register of radiation workers and personal doses, the Central Register. Dose, as used in this guide, means dose equivalent.

This guide provides rules and regulations for individual dose monitoring carried out by the nuclear power plants as well as for reporting the results to the Central Register of STUK. Health monitoring practices and actions in case of overexposure and accidents are dealt with in Guide YVL 7.12 and the health physics programmes in Guide YVL 7.9.

2 SCOPE

This guide shall be applied to the permanent and temporary staff at nuclear power plants, to all persons working in the controlled area, as well as to the equipment and procedures used in radiation dose monitoring.

3 GENERAL PRINCIPLES OF MONITORING

The individual doses of all persons working in the controlled area at nuclear power plants shall be monitored and reported to the Central Register in accordance with this guide.

To determine the dose history of a temporary worker, the licensee shall, if need be, check his dose data with the

Central Register, with a permanent employer or, on the basis of the latest data on his employment, with the dose records of other nuclear power plants.

3.1 Regular monitoring of individual doses

Regular monitoring of individual doses means continuous measurement and recording of the doses received by a worker in the course of his employment. Monitoring of individual exposures can also be utilized when observing changes in working conditions, collecting information for the planning of work procedures, and when making preparations for investigation of accidents and their consequences.

Monitoring of individual doses shall be started in the controlled area when the reactor is loaded.

In addition to permanent staff, the nuclear power plant is responsible for the personnel monitoring of transient workers, regardless of whether they are subject to exposure control in the course of their regular work.

For the duration of the employment, the nuclear power plant is required to maintain systematic dose records of all individuals working in the controlled area. Furthermore, the nuclear power plant shall file all dose data and effective instructions on dose control for as long as the facility remains in service.

When the employment of a transient worker is terminated, the nuclear power plant shall provide him or his employer with a dose report.

The practice applied in the reporting of individual doses and personal data to the Finnish Centre for Radiation and Nuclear Safety is described in chapter 7. Possible repor-

ting to foreign dose files will be dealt with in guides to be issued separately by the Centre.

3.2 Operational dose monitoring

Operational dose monitoring utilizes direct-reading or alarm dosemeters which make it easy to control the external doses received in the course of work. Operational dose monitoring must be performed in order to implement radiation protection in an effective and rational way. Operational dose monitoring is mandatory if the dose rate in the working area exceeds 1 mSv/h (100 mrem/h). Operational monitoring shall be organized so that the doses received can be recorded on a work-specific basis.

3.3 Observation of working conditions

In interpreting the results from the monitoring of internal doses, one shall, when necessary, utilize the recorded data on the work and the working conditions. These data are, for instance, work permits and other such work-specific information, data on surface and air contamination in the work, and data on cases of detected personal contamination.

4 MEASUREMENT OF EXTERNAL EXPOSURE

Measurement of individual external exposure shall be performed as follows:

- When in the controlled area, a worker shall wear his personal dosemeter on his chest.

- Besides the personal dosemeter, additional dosemeters shall be used if the doses to the head or limbs, weighted with respect to dose limits, may be more significant than the whole body dose.

In regular monitoring of individual doses, the duration of the observation period of external radiation is no more than one month.

The personal dosemeter should distinguish between depth dose and skin dose, and its measurement range shall normally extend at least from 0.2 mSv to 5 Sv (20 mrem to 500 rem).

Neutron doses shall be mearsured separately when the neutron dose rate exceeds one third of the simultaneous gamma dose rate.

The personal dosemeters shall be kept at the entrance of the controlled area, or in some other place accepted by STUK, so that

- the use of the meters can be controlled,
- it can be seen whether the user of the dosemeter is in the controlled area, and
- the reading of the meters and the periodic checking of their surface contamination can be easily performed.

The dosemeters and their racks shall be provided with identification numbers. Furthermore, the name of the user shall be added to those dosemeters that are in regular use.

Other than nuclear power plant dosemeters can be taken to the controlled area only if it is assured that the readings will not be recorded twice in the central register of individual doses.

Group dosemeters can be given to individuals on a short visit to the controlled area.

The equipment used in monitoring individual exposures shall be inspected before commissioning and annually in accordance with programs approved by STUK.

5 MEASUREMENT OF INTERNAL EXPOSURE

In connection with internal radiation, a dose means the committed dose witch is the total dose caused by the radioactive materials contained in the body in the course of 50 years.

For internal dose control, the licensee shall regularly monitor a pre-selected group of the permanent staff running the greatest risk of internal contamination.

To control the internal doses caused by annual maintenance and refuelling, the licensee shall monitor a group that has been selected from the representatives of each class of work. The group has the greatest risk of internal contamination and it represents all the single work performances exposing workers to contamination during the period. The group shall contain so many workers that it gives applicable information on the internal doses and internal contamination received during the shutdown. The monitoring shall be carried out at opportune times.

In addition, measurements shall also be made when an evaluation based on the surface or air contamination of the working environment or on some other observation indicates that there exists a possibility for an abnormal internal contamination.

The procedures for monitoring internal radiation shall be such that the amounts of nuclides leading to the demonstration of the dose (see chapter 7) can be reliably ascertained. The equipment possibly used in the control of doses shall be inspected before commissioning and periodically during operation in accordance with porgrams approved by STUK.

6 PROCEDURES WITH RESPECT TO AUTHORITIES

The Preliminary Safety Analysis Report (PSAR) shall specify the measuring instruments, including their numbers and locations at the plant. The technical specifications of the equipment used in individual dose monitoring, and the programs for their pre-operational testing, periodic inspection and calibration, as well as the administrative procedures associated with monitoring and reporting shall be presented in the FSAR, in separate documents or in operating instructions.

The licensee shall submit a specific plan for internal exposure monitoring in connection with the review of the FSAR.

7 DOSE REPORTING

7.1 General

The nuclear power plant shall monthly report the individual external doses of the workers to the Central Register of the Finnish Centre for Radiation and Nuclear Safety. The personal data of employees who have either begun or ended a piece of work that is subject to dose monitoring shall be provided at the same time.

Internal radiation doses shall be reported in connection with the next monthly report after an observation has been

verified. The whole-body dose and the possibly received dose to the thyroid shall be specified.

The workers' doses are reported as individual doses when they exceed the recording threshold of the STUK Central Register.

The recording threshold of the whole-body dose of external radiation is 0.2 mSv (20 mrem).

The measured neutron doses are recorded separately.

Skin doses are recorded separately if they exceed the simultaneous depth dose by one third.

The measured doses to the limbs and the head are recorded separately.

The recording threshold for the whole-body dose of internal readiation (effective dose equivalent commitment) is formed as follows: the working history of an individual and the probable time and manner of exposure shall be worked out and the dose to be reported to STUK shall be calculated with a method approved separately by STUK, if it is detected in the measurement that the activity caused by internal contamination for any one nuclide exceeds 0.4 % of the ALI (Annual Limit of Intake) figures recommended by the ICRP /7/.

The personal data and doses of employees permanently engaged in work involving exposure to radiation are reported by filling in form HD-3 (Appendix 1A) or by using a corresponding format. The individual doses of persons temporarily working in the controlled area are reported by filling in form HD-2 (Appendix 1B) or by using a corresponding format. If the licensee wishes to use a different repor-

ting procedure, he shall consult STUK. Whenever possible, fast and safe methods of data transmission should be utilized (e.g. online or offline computer systems).

The annual report of the nuclear power plant shall include the dose data required in Guide YVL 1.5 of the Finnish Centre for Radiation and Nuclear Safety.

7.2 Reporting in exceptional conditions

In accordance with Guide YVL 7.12, the Finnish Centre for Radiation and Nuclear Safety (Department of Nuclear Safety) shall be immediately notified of accidents in work which involves exposure to radiation if it is ascertained that a dose limit has been exceeded or if the resulting doses are unclear.

8 RECOMMENDATIONS, REFERENCES

1 General Principles of Monitoring for Radiation Protection of Workers, ICRP Publication 12, Pergamon Press, Oxford (1969)

2 Film Badge Performance Criteria, Regulatory Guide 8.3, U.S. Atomic Energy Commission 1973.

3 Direct-Reading and Indirect-Reading Pocket Dosimeters, Regulatory Guide 8.4, U.S. Atomic Energy Commission 1973.

4 Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program, Regulatory Guide 8.9, U.S. Atomic Energy Commission 1973.

5 Permissible Dose for Internal Radiation. ICRP Publication 2, Pergamon Press, Oxford (1960).

6 Evaluation of Radiation Doses to Body Tissues from Internal Contamination due to Occupational Exposure, ICRP Publication 10, Pergamon Press, Oxford (1968)

7 Limits for Intakes of Radionuclides by Workers, ICRP Publication 30, Pergamon Press, Oxford (1979, 1980, 1981)

In the event of any differences in interpretation of this guide, the Finnish version shall take precedence over this translation.

APPENDIX 1A

1 (2)

FORM HD-3

Report of radiation doses received by the permanent staff at a nuclear power plant.

Date Nuclear power plant Year Month

Family name and first names	Social security number	53	56 57 work	Starting date	Finishing date	Doses body	Doses skin	Comments
			6					
			6					
			6					
			6					
			6					
			6					
			6					
			6					
			6					
			6					
			6					
			6					
			6					
			6					

HOW TO FILL IN FORM HD-3

In case of a foreign national, enter a nationality symbol consisting of three letters (SFS 3481) in column 53. Number 6 in column 56 means permanent employment at the nuclear power plant. Column 57 is reserved for other symbols characterizing the work.

The doses are expressed in millisieverts (mSv).

The column reserved for comments is used if the information given in the line is supplemented with a separate note or explanation (reporting in a separate appendix). In this way it is possible to report a separately given neutron dose, a separately given dose of external radiation to the limbs and the head, as well as the calculated whole-body or thyroid dose of internal radiation.

APPENDIX 1B
1 (2)

FORM HD-2

Report of radiation doses received by the temporary staff at a nuclear power plant.

Date | Nuclear power plant | Year | Month

PERMANENT EMPLOYER (Only one employer to one form)

Name | Identification symbol of employer

Street address

Postal code and post office

Contact person

Name	Social security number	53	56 57 work	7	Starting date	Finishing date	Doses body	Doses skin	Comments

HOW TO FILL IN FORM HD-2

In case of a foreign national, enter a nationality symbol consisting of three letters (SFS 3481) in column 53. Number 7 in column 56 means temporary employment at the nuclear power plant. Column 57 is reserved for other symbols characterizing the work.

The doses are expressed in millisieverts (mSv)

The column reserved for comments is used if the information gives in the line is supplemented with a separate note or explanation (reporting in a separate appendix). In this way it is possible to report a separately given neutron dose, a separately given dose of external radiation to the limbs and the head, as well as the calculated whole-body or thyroid dose of internal radiation.