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Radiological protection — Content of input data for the statistical analysis of dose records of individuals monitored for occupational exposure to ionizing radiation

Radioprotection — Format de données d'entrée pour la description statistique des dossiers de doses des personnes faisant l'objet d'une surveillance de l'exposition professionnelle aux rayonnements ionisants

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Foreword

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 2, *Radiological protection*.

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Introduction

Occupational exposure to ionizing radiation can occur in a range of industries, medical institutions, educational and research establishments, and nuclear fuel cycle facilities. It can also occur in workplaces with naturally occurring sources of radiation such as for underground miners to radon and aircrew to cosmic radiation. Radiation emergencies can also result in worker exposure.

The aim of an occupational radiation exposure records system is the collection and maintenance of comprehensive and accurate individual radiation exposure histories with supporting documentation. Maintaining the records in a consistent format, while considering the ease of retrieval allows for:

— evaluating the effectiveness of radiological controls;

— demonstrating that radiological controls comply with national legislative and regulatory requirements and management expectations;

— reconstructing exposure situations for medical, legal or epidemiological studies.

Recommendations of international expert bodies have been considered in the development of this document. Its application will provide the national regulatory bodies with information on recording and reporting of workers dosimetric results and will enhance the harmonization of a common and easily shared format to collect reliable and directly comparable data on individual and collective exposure in activity sectors and occupations.

Assessment of occupational exposure and evaluation of trends of these data over time is a fundamental tool for radiation protection of workers in terms of optimization of protection in line with the graded approach and dose limitation. Maintaining of life-time dose data of the occupationally exposed workers is also necessary to ensure and review radiation protection of workers, certification and other legal purposes and epidemiological studies.

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Radiological protection — Content of input data for the statistical analysis of dose records of individuals monitored for occupational exposure to ionizing radiation

1 Scope

The objective of this document is to promote the harmonization of data and information reporting formats in order to provide the basis for the evaluation of occupational exposure with a view to allow for benchmarking capacity at the user level, technical review level, country level and global level (such as UNSCEAR) database or register on occupational exposure. Activity sectors and occupations (where employees are classified as occupationally exposed workers) that is included in this database or register as well as dose types and different values of interest concerning occupational exposure are described as follows.

A typical national dose register (NDR):

— contains personal, employment, and dosimetric data of occupational employment and wage statistics (OEWs) in the country.

— assists national authorities in controlling and safekeeping of the occupational doses and to allow statistical evaluations (e.g., dose trends to answer requests from regulators and others).

— assists in regulatory control by notifying regulatory authorities of overexposures within their jurisdiction and the licensee in their respective facility.

— contributes to health research and to the scientific knowledge on risks from occupational exposure to ionizing radiation.

— provides dose histories to individual workers and organizations for work planning and for compensation and litigation cases.

All information provided by the NDR, including dose histories, may be subject to confidentiality requirements.

This document is aimed at national dose registries but may be also applicable to dosimetry services that provide data to national dose registries.

NOTE Such a database or register on occupational radiation dose for different sectors will, among other reasons, allow to prepare the data necessary for more global surveys, such as those undertaken by the UNSCEAR and other databases such as IAEA's Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR), Information System on Occupational Exposure (ISOE) and the European Platform for Occupational Radiation Exposure (ESOREX-Platform). Presently, as the formats are different, the international description of national statistics is often incomplete or inaccurate, and in the end, the comparison of data is not established yet in many countries. This standard defines a common and easily shared format to collect reliable, traceable and directly comparable data on individual and collective exposure in activity sectors and occupations as defined in a common way.

This document addresses:

a) a common list of activity sectors and occupations, and

b) a common and easily shared format about dose types and different values of interest concerning occupational exposure in order to collect consistent and directly comparable data on individual and collective exposure.

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2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 General terms and definitions

3.1.1
occupational exposure
exposure of workers incurred in the course of their work

[SOURCE: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards - IAEA Safety Standards Series GSR Part 3, 2014]

3.1.2
monitored worker
workers routinely monitored externally, internally or in combination for radiation exposure individually or by workplace monitoring

3.1.3
measurably exposed worker
worker with doses above the minimum detectable level

3.1.4
recording level
level of dose, exposure or intake specified by the regulatory body at or above which values of dose to, exposure of or intake by workers are to be entered in their individual exposure records

[SOURCE: IAEA. IAEA safety glossary: 2018 edition. Vienna: IAEA, 2019. 278 p.]

3.1.5
sector
generic field of activity of workers

3.1.6
sub-sector
more specific designation of *sector* (3.1.5)

3.1.7
emergency exposure situation
situation of exposure that arises as a result of an accident, a malicious act or other unexpected event, and requires prompt action in order to avoid or to reduce adverse consequences

Note 1 to entry: Exposure in an emergency can include both occupational exposure and public exposure and can include unplanned exposures resulting directly in the emergency exposure situation and planned exposures to emergency workers and helpers in an emergency undertaking actions to mitigate the consequences of the emergency.

Note 2 to entry: Exposure in an emergency can be reduced only by protective actions and other response actions.

[SOURCE: IAEA. IAEA safety glossary: 2018 edition. Vienna: IAEA, 2019. 278 p]

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3.1.8
planned exposure situation
situation of exposure that arises from the planned operation of a source or from a planned activity that results in an exposure due to a source

[SOURCE: IAEA. IAEA safety glossary: 2018 edition. Vienna: IAEA, 2019. 278 p]

3.1.9
existing exposure situation
situation of exposure that already exists when a decision on the need for control needs to be taken

Note 1 to entry: Existing exposure situations include exposure to natural background radiation that is amenable to control; exposure due to residual radioactive material that derives from past practices that were never subject to regulatory control; and exposure due to residual radioactive material deriving from a nuclear or radiological emergency after an emergency exposure situation has been declared ended.

[SOURCE: IAEA. IAEA safety glossary: 2018 edition. Vienna: IAEA, 2019. 278 p]

3.1.10
workplace monitoring
radiological monitoring using measurements made in the working environment

[SOURCE: ISO 12749-2:2022, 3.4.53]

3.2 Quantities

3.2.1
personal dose equivalent
$H_p(d)$
dose equivalent in soft tissue, at an appropriate depth, d, below a specified point on the body

Note 1 to entry: The SI unit of the personal dose equivalent is joule per kilogram ($J \cdot kg^{-1}$), known as sievert (Sv).

Note 2 to entry: The full specification of the personal dose equivalent includes the specification of the depth, d, expressed in millimetres.

Note 3 to entry: Soft tissue in this context is ICRU 4-element tissue with a density of 1 $g \cdot cm^{-3}$.

Note 4 to entry: For the estimation of the local skin dose, a depth of 0,07 mm is employed. The personal dose equivalent for this depth is then denoted by $H_p(0,07)$. The dose equivalent to an extremity (such as hand, forearm, foot and ankle) is denoted by $H_p(0,07)$. The dose equivalent at 10 mm depth is denoted with analogous notation $H_p(10)$. For the lens of the eye, a depth of 3 mm is employed with analogous notation $H_p(3)$.

Note 5 to entry: In the ICRU Report 47, ICRU has extended the definition of the personal dose equivalent to include the dose equivalent at a depth, d, in a phantom having the composition of the ICRU tissue. Then $H_p(d)$, for the calibration of personal dosimeters, is the dose equivalent at d in a phantom composed of ICRU tissue, but of the size and shape of the phantom used for the calibration.

Note 6 to entry: The personal dose equivalent rate is the dose equivalent rate in soft tissue below a specified point on the body at an appropriate depth, d. The unit is sievert per second ($Sv \cdot s^{-1}$). Other units are any quotient of the sievert or its decimal multiples and a suitable unit of time (e.g. $mSv \cdot h^{-1}$).

[SOURCE: ICRU Report 51]

3.2.2
personal dose equivalent at 10 mm depth
$H_p(10)$
dose equivalent in soft tissue at a depth of 10 mm below a specified point where the dosimeter is worn/mounted, i.e., on the human body or a calibration phantom

[SOURCE: ICRP 103:2007]

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3.2.3
ambient dose equivalent at 10 mm depth
***H**(10)**
dose equivalent at a point in a radiation field, that would be produced by the corresponding expanded and aligned field, in the ICRU sphere at 10 mm depth on the radius opposing the direction of the aligned field

[SOURCE: ISO 20785-4:2019, 3.16, modified — "at 10 mm depth" has been added in the term.]

3.2.4
collective effective dose
total radiation dose incurred by a specified group of persons (e.g. a population summation of "effective dose")

Note 1 to entry: The value of this quantity is equal to the product of the number of individuals exposed to a radiation source and their average radiation dose.

Note 2 to entry: The collective dose is expressed in person-sievert.

Note 3 to entry: This entry was numbered 393-19-08 in IEC 60050-393:2003.

3.2.5
average dose monitored
collective effective dose (3.2.4) divided by the total number of workers routinely monitored for radiation exposure, in units of mSv

3.2.6
average dose above recording level
collective effective dose (3.2.4) divided by the number of workers with doses above the recording level, in units of mSv

3.2.7
internal dose
dose from internal emitters calculated with biokinetic and dosimetric models, in units of mSv

Note 1 to entry: Dose caused by contamination of the skin is considered an internal or external dose.

3.2.8
external dose
dose from penetrating external radiation fields

EXAMPLE Photons and neutrons.

3.2.9
effective dose
summation of doses from internal emitters and external radiation fields estimated using personal dose equivalent at 10 mm depth, $H_p(10)$ (3.2.1) or ambient dose equivalent at 10 mm depth, $H^*(10)$ (3.2.3), or from internal emitters only, to provide a single numerical value, in units of mSv

3.2.10
equivalent dose
absorbed dose to an organ or tissue T, adjusted to account for the effectiveness of the type of radiation, in units of mSv

Note 1 to entry: equivalent dose to the skin and an extremity is estimated using personal dose equivalent $H_p(0,07)$, in units of mSv.

Note 2 to entry: equivalent dose to the lens of the eye is estimated using personal dose equivalent, $H_p(3)$, but also $H_p(0,07)$ or $H_p(10)$ according to ISO 15382, in units of mSv.

Note 3 to entry: Equivalent dose to a tissue is estimated using personal dose equivalent (H_T), in units of mSv.

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3.2.11
committed effective dose
time integral of the equivalent dose rate over an integration period, which, in the context of this International Standard, is 50 years following any intake

4 Description of the nature of the exposure and classification list of activity sectors

The concept is to include non-exclusive classification identifiers for workers in order to characterise the nature of their exposure and the sectors/occupations associated with it (see Annex A).

Firstly, the data field describes the nature of the exposure and the method of its determination. It designates the exposure situation, the method used for the determination of a given record, the dose type and the exposure pathway. The type of radiation (alpha, photon, neutron etc.) is optional information that could be also provided.

Next, the classification list of activity sectors proposed is based on a three-level coding system.

The 1st level identifies the sector of activity concerned. Six sectors are defined:

— medical;

— nuclear;

— industrial;

— workplaces with natural radiation sources;

— military activities;

— others.

The 2nd level provides increasingly detailed information on the sub-sectors.

The 3rd level provides occupation for each of the five sectors (see Annex B).

If a worker works in several sub-sectors or performs several tasks or occupations, it shall be classified preferentially in the most dosing sub-sector or the most dosing occupation. Only annual dose for each worker should be supplied (see Annex C for an example of a dose record for a worker).

5 Description of dose types

The database or national dose registry report:

a) the doses for radiological protection purposes:
   — effective dose;
   — equivalent dose.

b) operational external doses:
   — $H_p(10)$ or $H^*(10)$ from X and gamma radiations;
   — $H_p(10)$ or $H^*(10)$ from neutron radiations;
   — $H_p(0,07)$ from X, gamma and beta radiations;
   — $H_p(3)$ from X, gamma, neutron and beta radiations.

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6 Description of statistical endpoints

6.1 General

All kinds of data format could be used (text, csv, spreadsheet, etc.).

The statistical endpoints that shall be presented are as follows (see Annex D for an example of statistical endpoints).

6.2 Assessment of effective dose (external dosimetry, aircrew, radon and internal dosimetry)

a) Number of monitored workers for external exposure**:** total number of workers routinely monitored for external radiation exposure individually or by workplace monitoring should be included or considered in this case.

b) Recording level: level of effective dose above which a result from a monitoring programme is of sufficient significance to require the measured value or calculated value to be included in a dose record, according to rounding rules for official requirements.

c) Number of workers by annual dose intervals: the number of workers should be given for the following annual dose intervals (mSv) for $H_p(10)$:

- below the Recording Level (RL): < L_R
- greater than or equal to RL and lower 1 mSv: ≥ L_R to 1
- greater than or equal to 1 and lower 5 mSv: ≥1 to 5
- greater than or equal to 5 and lower 10 mSv: ≥5 to 10
- greater than or equal to 10 and lower 15 mSv: ≥10 to 15
- greater than or equal to 15 and lower 20 mSv: ≥15 to 20
- greater than or equal to 20 and lower 30 mSv: ≥20 to 30
- greater than or equal to 30 and lower 50 mSv: ≥30 to 50
- greater than or equal to 50 mSv: ≥50

If a database does not allow to follow the above dose intervals, others interval that fit best may be chosen or selected.

d) Average effective dose: average annual dose (monitored) or average annual dose (above recording level) for the whole body in units of mSv.

e) Collective dose: Total collective dose of all measurably exposed workers above recording level in units of person-sievert.

f) Number of workers monitored for internal exposure: Total number of workers routinely monitored for internal radiation exposure should be included or considered in this case.

g) Number of internally exposed workers: Total number of internally exposed workers is requested here, i.e., with a positive result, i.e., result higher than the detection limit, after in vitro radiobioassay or direct body counting.

h) Number of workers with committed effective dose ≥ 1 mSv: Total number of internally exposed workers with doses above 1 mSv is requested here.

NOTE 1 mSv is the value of the exposure or intake dose level corresponding to 5 % of the annual effective dose limit, in accordance with ISO 20553

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i) Effective dose due to internal exposure (%): Percentage of the total collective effective dose due to internal exposure in the workplace.

6.3 Assessment of equivalent dose

a) Number of workers by annual dose intervals: The number of workers should be given for the following annual dose intervals (mSv) for $H_p(3)$:

- below the Recording Level (RL): < L_R
- greater than or equal to RL and lower 1 mSv: ≥ L_R to 1
- greater than or equal to 1 and lower 5 mSv: ≥1 to 5
- greater than or equal to 5 and lower 10 mSv: ≥5 to 10
- greater than or equal to 10 and lower 15 mSv: ≥10 to 15
- greater than or equal to 15 and lower 20 mSv: ≥15 to 20
- greater than or equal to 20 and lower 30 mSv: ≥20 to 30
- greater than or equal to 30 and lower 50 mSv: ≥30 to 50
- greater than or equal to 50 mSv: ≥50

Intervals for $H_p(0,07)$:

- below the Recording Level (RL): <L_R
- greater than or equal to RL and lower 50 mSv: ≥ L_R to 50
- greater than or equal to 50 and lower 150 mSv: ≥50 to 150
- greater than or equal to 150 and lower 500 mSv: ≥150 to 500
- greater than or equal to 500 mSv: ≥500

If a database does not allow to follow the above dose intervals, others interval that fit best may be chosen or selected.

b) Average dose to the lens of the eye (mSv): Average annual dose (monitored) or average annual dose (above recording level) for the lens of the eye.

c) Average dose to the skin and extremity (mSv): Average annual dose (monitored) or average annual dose (above recording level) for the skin and an extremity such as hand, forearm, foot, and ankle.

7 Additional data

Depending on exposure and specific dosimetry circumstances, additional data on factors that may impact dosimetric results should be added. For example, if necessary:

- Whether radiation background is taken into account [e.g., indicating if the contribution of external natural ambient dose is subtracted (or not) and how it is determined (control dosimeter, local background, etc.)].
- The use of supplemental shielding, e.g. (lead apron, and positioning of dosimetric devices (on/under/combination of both) relative to the shielding).
- The positioning of ring dosimeters (dominant/non-dominant hand, above/underneath glove, etc.).
- The wearing of the eye dosimeter (on/under the goggles).

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— As allowed by regulatory authorities, detailed worker demographic information could provide optional statistical endpoints.

The most frequent practice during the year shall be reported.

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Annex A
(informative)

Description of the nature of the exposure and classification list of activity sectors

First level	Second level	CODE
Exposure situation	Planned exposure situations	E1
	Emergency exposure situations	E2
	Existing exposure situations	E3
	Unknown	E0
Method of determination	Personal dosimetry with passive detector(s)	M1
	Personal dosimetry with active detector(s)	M2
	Evaluation based on workplace monitoring	M3
	Evaluation based on retrospective dose assessment, e.g., fluorescence measurement from SIM card and smartphone glass, and ESR/EPR measurement of teeth	M4
	Evaluation based on in-vivo measurements	M5
	Evaluation based on in-vitro measurements	M6
	Evaluation based on calculation	M7
	Evaluation based on air sampling	M8
	Other	M9
	Unknown	M0
Dose type	Effective dose or Equivalent dose (H_T, organ dose)	D1
	Whole-body personal dose equivalent, $H_p(10)$	D2
	Eye-lens personal dose equivalent, $H_p(3)$	D3
	Extremity personal dose equivalent H_p (0,07)	D4
	Committed effective dose	D5
	Unknown	D0
Frequency and start of period of wearing dosimeters	YYYY-MM-DD P 1M (=monthly)	F1
	YYYY-MM-DD P 3M (= three-monthly)	F2
	Mixed	F0
Pathway of exposure	Internal exposure	P3
	External exposure	P1
	Both (internal + external)	P2
	Unknown	P0
Radiation type	Alpha radiation (including radon)	R1
	Photons (X-ray, gamma) radiation	R2
	Beta radiation	R3
	Neutron radiation	R4
	Heavy charged particles (protons, heavy ions)	R5
	Other	R6
	Unknown	R0

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First level	Second level	CODE
SECTORS		
Sector 1	Medical	S1
Sector 2	Nuclear	S2
Sector 3	Industry	S3
Sector 4	Natural sources	S4
Sector 5	Military activities	S5
Sector 6	Others	S6
SUB-SECTORS S1 [Medical]		
Unknown		S1-00
Diagnostic radiology (other than dental practice)		S1-10
Dental practice		S1-20
Interventional radiology		S1-40
Radiotherapy		S1-50
Nuclear medicine		S1-60
Veterinary medicine		S1-70
Medical logistics and maintenance		S1-80
Transport of radioactive materials for medical uses		S1-90
Medical and veterinary research		S1-100
Waste processing and treatment		S1-110
Other medical uses		S1-120
SUB-SECTORS S2 [Nuclear]		
Unknown		S2-00
Uranium ore extraction and processing		S2-10
Uranium conversion and enrichment		S2-20
Reactor operation		S2-30
Fuel fabrication		S2-40
Fuel reprocessing		S2-50
Decommissioning		S2-60
Waste processing and treatment		S2-70
Nuclear logistics and maintenance		S2-80
Transport of radioactive materials for nuclear uses		S2-90
Nuclear research facilities		S2-100
Nuclear safety and inspection		S2-110
Storage of radioactive materials		S2-120
Others nuclear uses		S2-130
SUB-SECTORS S3 [Industry]		
Unknown		S3-00
Industrial irradiation (sterilisation, irradiation of consumer products etc.)		S3-10
Non-destructive testing (radiography)		S3-20

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First level	Second level	CODE
Isotope processing and production		S3-30
Neutron sources		S3-40
Process control (with beta, gamma, X-ray sources)		S3-50
Industrial logistics and maintenance		S3-60
Stationary and/or mobile industrial gauges		S3-70
Well-logging		S3-80
Safety monitoring for people and property (luggage, cargo etc.)		S3-90
Transport of radioactive materials for industrial uses		S3-100
Industrial research		S3-110
Waste processing and treatment		S3-120
Borehole inspections/measurements		S3-130
Electronic beam welding		S3-140
X-ray fluorescence		S3-150
Accelerator operation		S3-160
Remediation of contaminated land, buildings and other constructions		S3-170
Others industrial uses		S3-180
SUB-SECTORS S4 [Natural sources]		
Unknown		S4-00
Civilian aviation		S4-10
Space aviation		S4-20
Mineral mining activities and ore processing other than coal and uranium		S4-30
Gas and oil industries		S4-40
Coal industries		S4-50
Radon in workplaces other than mineral extraction industries (touristic caves, radon healing caves etc.)		S4-60
Handling and storage of raw materials containing elements of naturally occurring families of thorium uranium and zirconium including NORM		S4-70
Other natural uses		S4-80
SUB-SECTOR S5 [Military activities]		
Unknown		S5-00
Weapon fabrication		S5-10
Nuclear ships and their support facilities		S5-20
Military aviation		S5-30
Other military activities		S5-40
SUB-SECTORS S6 [Others]		
Research (other than nuclear, industry and medical) and Education		S6-10

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First level	Second level	CODE
Emergency responders (fire service, civil defence, etc.)		S6-20

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Annex B
(informative)

Occupation classification

NOTE "XX" in the code is the number for the sub-sector used in Annex A.

Occupations for medical	Code
Anaesthesiologist	S1-XX-001
Radiotherapist	S1-XX-002
Nuclear medicine	S1-XX-003
Electro-radiology technician	S1-XX-004
Cardiologist	S1-XX-005
Surgeon	S1-XX-006
Radiation physicist, Medical physicist	S1-XX-007
Radiographer	S1-XX-008
Nuclear medicine technologist	S1-XX-009
Radiation therapy technician	S1-XX-010
Nurse – anaesthetics, operating room nurse with a state diploma	S1-XX-011
Nurse	S1-XX-012
Health care aid	S1-XX-013
Stretcher bearer	S1-XX-014
Radiopharmacist	S1-XX-015
Medical laboratory technician	S1-XX-016
Veterinarian	S1-XX-017
Veterinary assistant	S1-XX-018
Dentist, dental surgeon	S1-XX-019
Dental assistant	S1-XX-020
Occupational health physician	S1-XX-021
Logistics operator (cleaning, services and setting up the equipment and the site before maintenance activity)	S1-XX-022
Maintenance operator for ionising radiation devices (keeping devices in good operating condition, including both preventive and corrective or repair aspect)	S1-XX-023
Student, trainee	S1-XX-024
Researcher (director, assistant, manager), etc.	S1-XX-025
Medical assistant, dietician, physical therapist or other medical field	S1-XX-026
Engineer (management, project, quality, etc.)	S1-XX-027
Chemist, physicist, biochemist, geologist	S1-XX-028
Salesperson	S1-XX-029
Pharmacist	S1-XX-030

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Laboratory technician, research assistant	S1-XX-031
Teacher (middle and high school), professor (university), instructor, trainer	S1-XX-032
Driver	S1-XX-033
Others (medical)	S1-XX-034
Occupations for nuclear	**Code**
Logistics operator (preparation of construction sites and setting up the equipment and the site before maintenance activity)	S2-XX-022
Maintenance operator for ionising radiation devices (keeping devices in good operating condition, including both preventive and corrective or repair aspect)	S2-XX-023
Student, trainee	S2-XX-024
Researcher (director, assistant, manager), etc.	S2-XX-025
Driver (only hauling)	S2-XX-035
Engineer (management, project, quality, etc.)	S2-XX-027
Chemist, physicist, biochemist, geologist	S2-XX-028
Salesperson	S2-XX-029
Stationary X-ray inspection device operator (gamma ray technician, etc.),	S2-XX-036
Mobile X-ray inspection device operator	S2-XX-037
Welder	S2-XX-038
Construction worker (painter, mason, etc.)	S2-XX-039
Laboratory technician, research assistant	S2-XX-031
Manufacturing operator	S2-XX-040
Control operator (I&C, reactor control, field operator, fuel handling)	S2-XX-041
Control technician (liquid penetrant testing, ultrasound, etc.)	S2-XX-042
Decontaminator (removal of contamination from surfaces of facilities or equipment)	S2-XX-043
Diver	S2-XX-044
Pipe fitter	S2-XX-045
Boilermaker	S2-XX-046
Cableman	S2-XX-047
Scaffolder	S2-XX-048
Insulator	S2-XX-049
Electrician, electronics engineer, instrumentation engineer	S2-XX-050

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Valve mechanic, plumber	S2-XX-051
Teleoperator	S2-XX-052
Radiation protection personnel	S2-XX-053
Driver also responsible for handling	S2-XX-054
Radiochemist	S2-XX-055
Waste manager/maintenance waste handler	S2-XX-056
Security personnel (security, fire brigade)	S2-XX-057
Cleaner (cleaning of the controlled area, not actual decontamination work)	S2-XX-058
Others (nuclear)	S2-XX-034
Occupations for industry	**Code**
Logistics operator (cleaning, services and setting up the equipment and the site before maintenance activity)	S3-XX-022
Maintenance operator for Ionising radiation devices (keeping devices in good operating condition, including both preventive and corrective or repair aspect)	S3-XX-023
Student, trainee	S3-XX-024
Researcher (director, assistant, manager), etc.	S3-XX-025
Driver (only hauling)	S3-XX-035
Engineer (management, project, quality, etc.)	S3-XX-027
Chemist, physicist, biochemist, geologist	S3-XX-028
Salesperson	S3-XX-029
Stationary X-ray inspection device operator (gamma ray technician, etc.),	S3-XX-036
Mobile X-ray inspection device operator	S3-XX-037
Welder	S3-XX-038
Construction worker (painter, mason, etc.)	S3-XX-039
Laboratory technician, research assistant	S3-XX-031
Manufacturing operator	S3-XX-040
Control operator (I&C, reactor control, field operator, fuel handling)	S2-XX-041
Radiation protection personnel	S2-XX-052

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Control technician (liquid penetrant testing, ultrasound, etc.)	S3-XX-042
Decontaminator	S3-XX-043
Diver	S3-XX-044
Pipe fitter	S3-XX-045
Boilermaker	S3-XX-046
Cableman	S3-XX-047
Electrician, electronics engineer, instrumentation engineer	S3-XX-050
Valve mechanic, plumber	S3-XX-051
Driver also responsible for handling	S3-XX-054
Foreman	S3-XX-059
Packer, store clerk, bus driver, crane operator, bridge operator, Longshoreman	S3-XX-060
Others (industry)	S3-XX-034
Occupations for natural sources	**Code**
Logistics operator (cleaning, services and setting up the equipment and the site before maintenance activity)	S4-XX-022
Maintenance operator for ionising radiation devices (keeping devices in good operating condition, including both preventive and corrective or repair aspect)	S4-XX-023
Student, trainee	S4-XX-024
Researcher (director, assistant, manager), etc.	S4-XX-025
Driver (only hauling)	S4-XX-034
Driver also responsible for handling	S4-XX-053
Engineer (management, project, quality, etc.)	S4-XX-027
Chemist, physicist, biochemist, geologist	S4-XX-028
Salesperson	S4-XX-029
Laboratory technician, research assistant	S4-XX-031
Construction worker (painter, mason, etc.)	S4-XX-039
Manufacturing operator	S4-XX-040

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