

Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption

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ANNEX I

PARAMETRIC VALUES FOR RADON, TRITIUM AND ID OF WATER INTENDED FOR HUMAN CONSUMPTION

Parameter	Parametric value	Unit	Notes
Radon	100	Bq/l	(Note 1)
Tritium	100	Bq/l	(Note 2)
ID	0,1	mSv	

Note 1:

(a) Member States may set a level for radon which is judged inappropriate to be exceeded and below which optimisation of protection should be continued, without compromising water supply on a national or regional scale. The level set by a Member State may be higher than 100 Bq/l but lower than 1 000 Bq/l. In order to simplify national legislation, Member States may choose to adjust the parametric value to this level.

(b) Remedial action is deemed to be justified on radiological protection grounds, without further consideration, where radon concentrations exceed 1 000 Bq/l.

Note 2: Elevated levels of tritium may indicate the presence of other artificial radionuclides. If the tritium concentration exceeds its parametric value, an analysis of the presence of other artificial radionuclides shall be required.

ANNEX II

MONITORING OF RADIOACTIVE SUBSTANCES

1. General principles and monitoring frequencies

All parameters for which parametric values must be set pursuant with Article 5(1) shall be subject to monitoring. However, no monitoring of a specific parameter shall be required where a competent authority can establish that, for a period of time to be determined by them, that parameter is not likely to be present in a given supply of water intended for human consumption in concentrations which could exceed the corresponding parametric value.

In case of naturally occurring radionuclides, where previous results have shown that the concentration of radionuclides is stable, the frequency, in derogation from the minimum sampling requirements set out in point 6, is to be decided by the Member State, taking into consideration the risk to human health. A Member State is not required to monitor water intended for human consumption for radon or tritium or to establish the ID where it is satisfied on the basis of representative surveys, monitoring data or other reliable information that, for a period of time to be determined by them, the levels of radon, tritium or of the calculated ID will remain below the respective parametric values listed in Annex I. In that case, it shall communicate the grounds for its decision to the Commission and provide the Commission with the necessary documentation supporting that decision, including the findings of any surveys, monitoring or investigations carried out. In this context, the provisions with regard to the minimum sampling and analysis requirements set out in point 6 of this Annex do not apply.

2. Radon

Member States shall ensure that representative surveys are undertaken to determine the scale and nature of likely exposures to radon in water intended for human consumption originating from different types of ground water sources and wells in different geological areas. The surveys shall be designed in such a way that underlying parameters, and especially the geology and hydrology of the area, radioactivity of rock or soil, and well type, can be identified and used to

direct further action to areas of likely high exposure. Monitoring of radon concentrations shall be undertaken where there is reason to believe, on the basis of the results of the representative surveys or other reliable information, that the parametric value laid down pursuant to Article 5(1) might be exceeded.

3. Tritium

Member States shall ensure that monitoring of tritium in water intended for human consumption is carried out where an anthropogenic source of tritium or other artificial radionuclides is present within the catchment area and it cannot be shown on the basis of other surveillance programmes or investigations that the level of tritium is below the parametric value listed in Annex I. Where monitoring for tritium is required, it shall be carried out at the frequencies indicated in the table appearing in point 6 of this Annex. If the concentration of tritium exceeds its parametric value, an investigation of the presence of other artificial radionuclides shall be required.

4. Indicative dose

Monitoring of water intended for human consumption for the ID shall be carried out where a source of artificial or elevated natural radioactivity is present and it cannot be shown on the basis of other representative monitoring programmes or other investigations that the level of ID is below the parametric value listed in Annex I. Where monitoring for artificial radionuclide levels is required, it shall be carried out at the frequency indicated in the table appearing in point 6 of this Annex. Where monitoring for natural radionuclide levels is required, each Member State shall define the frequency of the monitoring of either gross alpha activity, gross beta activity or individual natural radionuclides depending on the screening strategy adopted by it (according to Annex III). The monitoring frequency may vary from a single check measurement to the frequencies indicated in the table appearing in point 6 of this Annex. Where only a single check for natural radioactivity is required, a recheck shall be required at least where any change occurs in relation to the supply likely to influence the concentrations of radionuclides in water intended for human consumption.

5. Water treatment

Where treatment to reduce the level of radionuclides in water intended for human consumption has been taken, monitoring shall be carried out at the frequencies indicated in the table appearing in point 6 to ensure the continued efficacy of that treatment.

6. Minimum sampling and analysis frequencies

The minimum sampling and analysis frequency for the monitoring of water intended for human consumption supplied from a distribution network or from a tanker or used in a food production undertaking shall be as set out in the following table:

TABLE

Minimum sampling and analysis frequencies for monitoring of water intended for human consumption supplied from a distribution network or from a tanker or used in a food production undertaking

Volume of water distributed or produced each day within a supply zone(Notes 1 and 2)m ³	Number of samples per year(Notes 3 and 4)
volume ≤ 100	(Note 5)
100 < volume ≤ 1 000	1
1 000 < volume ≤ 10 000	1

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	+ 1 for each 3 300 m ³ /d and part thereof of the total volume
10 000 < volume ≤ 100 000	3 + 1 for each 10 000 m ³ /d and part thereof of the total volume
volume > 100 000	10 + 1 for each 25 000 m ³ /d and part thereof of the total volume

Note 1: A supply zone is a geographically defined area within which water intended for human consumption comes from one or more sources and within which water quality may be considered as being approximately uniform.

Note 2: The volumes are calculated as averages taken over a calendar year. A Member State may use the number of inhabitants in a supply zone instead of the volume of water to determine the minimum frequency, assuming a water consumption of 200 l/day/capita.

Note 3: As far as possible, the number of samples should be distributed equally in time and location.

Note 4: In the event of intermittent short-term supply the monitoring frequency of water distributed by tankers is to be decided by the Member State concerned.

Note 5: The frequency is to be decided by the Member State concerned.

Member States shall define sampling frequencies for water intended for human consumption put into bottles or containers intended for sale. In so doing Member States may take into consideration the volume of water produced.

7. Averaging

Where a parametric value is exceeded in a particular sample, Member States shall define the extent of resampling necessary to ensure that the measured values are representative of an average activity concentration for a full year.

ANNEX III

MONITORING FOR INDICATIVE DOSE AND ANALYTICAL PERFORMANCE CHARACTERISTICS

1. Monitoring for compliance with the ID

Member States may use various reliable screening strategies to indicate the presence of radioactivity in water intended for human consumption. These strategies may include screening for certain radionuclides, or screening for an individual radionuclide, or gross alpha activity or gross beta activity screening.

- (a) screening for certain radionuclides, or screening for an individual radionuclide

If one of the activity concentrations exceeds 20 % of the corresponding derived value or the tritium concentration exceeds its parametric value listed in Annex I, an analysis of additional radionuclides shall be required. The radionuclides to be measured shall be defined by Member States taking into account all relevant information about likely sources of radioactivity.

- (b) screening strategies for gross alpha activity and gross beta activity

Member States may use screening strategies for gross alpha activity and gross beta activity⁽¹⁾ to monitor for the parametric indicator value for ID.

For this purpose gross alpha activity or gross beta activity screening levels shall be set. The recommended screening level for gross alpha activity is 0,1 Bq/l. The recommended screening level for gross beta activity is 1,0 Bq/l.

If the gross alpha activity and gross beta activity are less than 0,1 Bq/l and 1,0 Bq/l respectively, the Member State may assume that the ID is less than the parametric value of 0,1 mSv and radiological investigation is not needed unless it is known from other sources of information that specific radionuclides are present in the water that are liable to cause an ID in excess of 0,1 mSv.

If the gross alpha activity exceeds 0,1 Bq/l or the gross beta activity exceeds 1,0 Bq/l, analysis for specific radionuclides shall be required.

Member States may set alternative screening levels for gross alpha activity and gross beta activity where they can demonstrate that the alternative levels are in compliance with an ID of 0,1 mSv.

The radionuclides to be measured shall be defined by Member States taking into account all relevant information about likely sources of radioactivity. Since elevated levels of tritium may indicate the presence of other artificial radionuclides, tritium, gross alpha activity and gross beta activity should be measured in the same sample.

2. Calculation of the ID

The ID shall be calculated from the measured radionuclide concentrations and the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom or more recent information recognised by the competent authorities in the Member State, on the basis of the annual intake of water (730 l for adults). Where the following formula is satisfied, Member States may assume that the ID is less than the parametric value of 0,1 mSv and no further investigation shall be required:

$$\sum_{i=1}^n \frac{C_i(\text{obs})}{C_i(\text{der})} \leq 1$$

where

- $C_i(\text{obs})$ = observed concentration of radionuclide i
 $C_i(\text{der})$ = derived concentration of radionuclide i
 n = number of radionuclides detected.

DERIVED CONCENTRATIONS FOR RADIOACTIVITY IN WATER INTENDED FOR HUMAN CONSUMPTION⁰

Origin	Nuclide	Derived concentration
Natural	U-238 ^b	3,0 Bq/l
	U-234 ^b	2,8 Bq/l
	Ra-226	0,5 Bq/l
	Ra-228	0,2 Bq/l
	Pb-210	0,2 Bq/l

a This table includes values for the most common natural and artificial radionuclides; these are precise values, calculated for a dose of 0,1 mSv, an annual intake of 730 litre and using the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom; derived concentrations for other radionuclides can be calculated on the same basis, and values can be updated on the basis of more recent information recognised by the competent authorities in the Member State.

b This table allows only for the radiological properties of uranium, not for its chemical toxicity.

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	Po-210	0,1 Bq/l
Artificial	C-14	240 Bq/l
	Sr-90	4,9 Bq/l
	Pu-239/Pu-240	0,6 Bq/l
	Am-241	0,7 Bq/l
	Co-60	40 Bq/l
	Cs-134	7,2 Bq/l
	Cs-137	11 Bq/l
	I-131	6,2 Bq/l

- a** This table includes values for the most common natural and artificial radionuclides; these are precise values, calculated for a dose of 0,1 mSv, an annual intake of 730 litre and using the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom; derived concentrations for other radionuclides can be calculated on the same basis, and values can be updated on the basis of more recent information recognised by the competent authorities in the Member State.
- b** This table allows only for the radiological properties of uranium, not for its chemical toxicity.

3. Performance characteristics and methods of analysis

For the following parameters and radionuclides, the method of analysis used must, as a minimum, be capable of measuring activity concentrations with a limit of detection specified below:

Parameters and radionuclides	Limit of detection (Notes 1, 2)	Notes
Tritium	10 Bq/l	Note 3
Radon	10 Bq/l	Note 3
gross alpha activity	0,04 Bq/l	Note 4
gross beta activity	0,4 Bq/l	Note 4
U-238	0,02 Bq/l	
U-234	0,02 Bq/l	
Ra-226	0,04 Bq/l	
Ra-228	0,02 Bq/l	Note 5
Pb-210	0,02 Bq/l	
Po-210	0,01 Bq/l	
C-14	20 Bq/l	
Sr-90	0,4 Bq/l	
Pu-239/Pu-240	0,04 Bq/l	
Am-241	0,06 Bq/l	
Co-60	0,5 Bq/l	
Cs-134	0,5 Bq/l	

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Cs-137	0,5 Bq/l	
I-131	0,5 Bq/l	

Note 1: The limit of detection shall be calculated according to the ISO standard 11929: Determination of the characteristic limits (decision threshold, detection limit and limits of the confidence interval) for measurements of ionising radiation — Fundamentals and application, with probabilities of errors of 1st and 2nd kind of 0,05 each.

Note 2: Measurement uncertainties shall be calculated and reported as complete standard uncertainties, or as expanded standard uncertainties with an expansion factor of 1,96, according to the ISO Guide for the Expression of Uncertainty in Measurement.

Note 3: The limit of detection for tritium and for radon is 10 % of its parametric value of 100 Bq/l.

Note 4: The limit of detection for gross alpha activity and gross beta activities are 40 % of the screening values of 0,1 and 1,0 Bq/l respectively.

Note 5: This limit of detection applies only to initial screening for ID for a new water source; if initial checking indicates that it is not plausible that Ra-228 exceeds 20 % of the derived concentration, the limit of detection may be increased to 0,08 Bq/l for routine Ra-228 nuclide specific measurements, until a subsequent re-check is required.

- (1) Where appropriate gross beta activity may be replaced by residual beta activity after subtraction of the K-40 activity concentration.