

SECTION 2: STANDARDS FOR DRINKING WATER QUALITY



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Section 2: Standards for drinking water quality

Summary of Section 2

- ◆ Describes the standards of wholesomeness that public water supplies provided by Water Services Authorities (WSAs) are required to meet. If there is a failure to meet a standard, the WSA is required to take remedial action to ensure compliance with the standard.
- ◆ Describes the indicator parameter values and the actions that are necessary where there has been a failure to meet one of the indicator parameter values.

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1. Introduction

1.1 | Regulation 4 requires Water Service Authorities (WSAs) to ensure that their water supplies are wholesome and clean, and that they meet the requirements of the Regulations. Water that is “wholesome and clean” is defined as water which:

- ◆ is free from any micro-organisms and parasites and from any substances which in numbers or concentrations, constitute a potential danger to human health; and
- ◆ meets the quality standards specified in Tables A (microbiological) and B (chemical) in part 1 of the schedule to the Regulations.

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1.2 | The indicator parameter values in Table C of part 1 of the schedule to the Regulations are not part of the definition of a wholesome and clean water. However if there is a breach of one of these values, the Environment Protection Agency (the EPA) is required to consider, in consultation and agreement with the Health Service Executive (the HSE), whether the breach poses a risk to human health and if it does the EPA can require the relevant WSA to take action to restore the quality of water. In practice the WSA consults the HSE and if the HSE agrees that there is a risk to human health, the WSA informs the EPA and the EPA then requires the WSA to take action.

1.3 | The quality standards and indicator parameter values are collectively referred to as parameter values in the Regulations.

2. Parameter categories

2.1 Introduction

2.1.1 | The Regulations define three categories of parameters. These are **microbiological** parameters, **chemical** parameters and **indicator** parameters. The **indicator** parameters include some **microbiological** and **chemical** parameters and two parameters under the heading **radioactivity**. The main difference between the first two categories and the third is related to the actions that are necessary following non-compliance with the specified parametric values. Where there is non-compliance with a microbiological or chemical parameter the WSA is required to take remedial action to bring the water supply into compliance. Where there is non-compliance with an indicator parametric value the supervisory authority (the EPA) must determine, in consultation and agreement with the HSE, whether the non-compliance poses a risk to human health and if it does it may require, by means of a direction, the WSA to take remedial action to restore the quality of water. Where the EPA is satisfied that there is no risk to human health, the WSA may not be required to take remedial action. In practice the WSA consults the HSE and if the HSE agrees that there is a risk to human health, the WSA informs the EPA and then the EPA requires the WSA to take action. If the EPA requires further advice it will consult HSE directly.

2.2 Microbiological parameters

2.2.1 | The microbiological parameters and their standards in table A of the schedule to the Regulations are shown in table 2.1 below.

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Table 2.1: microbiological parameters

Parameter number	Parameter	Parameter value (number/100ml)
1	<i>Escherichia coli</i> (<i>E. coli</i>)	0
2	Enterococci	0

2.2.2 | The parameter *E. coli* is of paramount importance for the assessment of the microbiological quality of drinking water. It has been used for many years as an indicator of contamination by faecal matter. Properly treated and disinfected water will not contain *E. coli*. If *E. coli* is detected in treated or distributed water, there is a potential risk to human health. The cause of the presence of *E. coli* must be investigated immediately and remedial action must be taken promptly. The enterococci parameter comprises another group of faecal indicator organisms and its determination complements and supplements that of *E. coli*.

2.3 Chemical parameters

2.3.1 | These form the largest group of parameters in the Regulations. The parameters range from specific substances such as individual metals, individual organic compounds to generic substances such as pesticides and the disinfection by-products, trihalomethanes. The parameters and their parametric values in table B of the schedule are further defined by reference to the notes associated with the table. For example for the generic substances the notes specify the individual substances to be included within the generic parameter.

2.3.2 | Table 2.2 sets out the chemical parameters, their parametric values and measurement units and the comments as in the Regulations, but omitting some standards that are no longer applicable because a more stringent standard is now in force. The notes in the schedule are reproduced in italics after the table and where necessary are amplified in normal type to provide further explanation. Some additional explanatory notes are indicated by a superscript applied to the parameter name.

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Table 2.2: chemical parameters

Parameter number	Parameter	Parametric value	Units	Comments
3	Acrylamide	0.10	µg/l	Note 1
4	Antimony	5.0	µg/l	
5	Arsenic	10	µg/l	
6	Benzene	1.0	µg/l	
7	Benzo(a)pyrene	0.010	µg/l	
8	Boron	1.0	mg/l	
9	Bromate ¹	10	µg/l	
10	Cadmium	5.0	µg/l	
11	Chromium	50	µg/l	
12	Copper	2.0	mg/l	Note 2
13	Cyanide	50	µg/l	
14	1,2-Dichloroethane	3.0	µg/l	
15	Epichlorohydrin	0.10	µg/l	Note 1
16	Fluoride ²		mg/l	
	(a) fluoridated supplies	0.8		
	(b) supplies with naturally occurring fluoride, not needing further fluoridation	1.5		
17	Lead			Notes 2 and 3
	Until 24 December 2013	25	µg/l	
	From 25 December 2013	10	µg/l	
18	Mercury	1.0	µg/l	
19	Nickel	20	µg/l	Note 2
20	Nitrate	50	mg/l	Note 4
21	Nitrite	0.50	mg/l	Note 4
22	Pesticides	0.10	µg/l	Notes 5 and 6
23	Pesticides – Total	0.50	µg/l	Notes 5 and 7
24	Polycyclic aromatic hydrocarbons	0.1	µg/l	Sum of concentrations of specified compounds; Note 8
25	Selenium	10	µg/l	

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Parameter number	Parameter	Parametric value	Units	Comments
26	Tetrachloroethene and Trichloroethene	10	µg/l	Sum of concentrations of specified parameters
27	Trihalomethanes – Total	100	µg/l	Sum of concentrations of specified compounds; Note 9
28	Vinyl chloride	0.50	µg/l	Note 1

Note 1: acrylamide, epichlorohydrin and vinyl chloride. *The parametric value refers to the residual monomer concentration in the water as calculated according to specifications of the maximum release from the corresponding polymer in contact with the water.*

Acrylamide is the unit chemical (monomer) from which polyacrylamides, used as coagulant aids in drinking water treatment, are prepared. If polyacrylamides are used in the treatment process it is essential that the amount of acrylamide monomer in the product is determined. This will be available from the manufacturer but it should also be checked independently on a regular basis by the WSA. This figure is used with the dosage of polyacrylamide to calculate the maximum concentration of acrylamide monomer that could be present in the treated water if none is removed in the waterworks sludge. Direct measurement of acrylamide monomer in treated drinking water is only practical in specialist laboratories and should not be carried out by WSAs unless a routinely practical method becomes available. Additional acrylamide monomer may be present in the treated water when polyacrylamides are used in the waterworks sludge treatment and the supernatant is returned to works inlet. If this is the case a similar calculation will be necessary. WSAs using polyacrylamides should only use those products that have been approved (for example by the Drinking Water Inspectorate (the DWI) of England and Wales or other equivalent European approval scheme). WSAs should have regard to the CEN Report IS CR 14269:2001: Chemicals Used for the Treatment of Water Intended for Human Consumption – Guidelines for the Purchase.

Epichlorohydrin is one of the unit chemicals from which the polyamines, used as coagulants and coagulant aids in drinking water treatment, are prepared. Similar information and a similar calculation are needed as for acrylamide. WSAs using polyamines should only use those products that have been approved (for example by the DWI or other equivalent European approval scheme). WSAs should have regard

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to the CEN Report IS CR 14269:2001: Chemicals Used for the Treatment of Water Intended for Human Consumption – Guidelines for the Purchase. Epichlorohydrin is also one of the unit chemicals used to prepare epoxy resins that can be used to line the internal surfaces of service reservoirs, water towers and distribution mains. WSAs using epoxy resins should only use those products that have been approved (for example by the DWI or other equivalent European approval scheme) because they will meet the requirements of the Regulations.

Vinyl chloride is the unit chemical used to make unplasticised polyvinyl chloride (uPVC) pipes used for distribution mains. WSAs using uPVC should only use those products that have been approved (for example by the DWI or other equivalent European approval scheme) because they will meet the requirements of the Regulations.

*Note 2: **copper, lead and nickel.** The value applies to a sample of water intended for human consumption obtained by an adequate sampling method at the tap and taken so as to be representative of a weekly average value ingested by consumers and that takes account of the occurrence of peak levels that may cause adverse effects on human health.* Section 4, paragraph 4.3 describes in more detail the recommended sampling method for these parameters and particularly for lead.

*Note 3: **lead.** The lead standard is 25 µg/l until the end of 24 December 2013. From the start of 25 December 2013 the new standard of 10 µg/l must be met. All appropriate measures shall be taken to reduce the concentration of lead in water intended for human consumption as much as possible during the period needed to achieve compliance with the parametric value. When implementing the measures priority shall be progressively given to achieve compliance with that value where lead concentrations in water intended for human consumption are highest.* Section 6, subsection 5, paragraphs 5.3.9 to 5.3.13 describe the actions WSAs are required to take to meet the new lead standard.

*Note 4: **nitrate and nitrite.** Compliance must be ensured with the conditions that $[nitrate]/50 + [nitrite]/3 \leq 1$, the square brackets signifying concentrations in mg/l for nitrate (NO₃) and nitrite (NO₂), and the value of 0.10 mg/l for nitrite ex water treatment works.* The combined standard for nitrate and nitrite is important when chloramination is used as the disinfection method.

*Note 5: **pesticides.** Only those pesticides which are likely to be present in a given supply require to be monitored. "Pesticides" means:*

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- organic insecticides,
 - organic herbicides,
 - organic fungicides,
 - organic nematocides,
 - organic acaricides,
 - organic algicides,
 - organic rodenticides,
 - organic slimicides,
 - related products [inter alia, growth regulators]
- and their relevant metabolites, degradation and reaction products.

Section 4, paragraph 4.2 gives detailed advice to WSAs on how to decide which pesticides are likely to be present in water supplies, what constitutes relevant metabolites, degradation and reaction products and therefore which pesticides need to be included in their compliance monitoring programme.

Note 6: pesticides. *The parametric value applies to each individual pesticide. In the case of aldrin, dieldrin, heptachlor and heptachlor epoxide the parametric value is 0.030 mg/l.*

Note 7: total pesticides. *“Pesticides – Total” means the sum of all individual pesticides detected and quantified in the course of the monitoring procedure. Any pesticide included in the compliance monitoring programme that was not detected, that is its concentration was between 0.0 µg/l and the limit of detection of the method used, is assumed not to be present and to make no contribution to the total pesticides concentration.*

Note 8: polycyclic aromatic hydrocarbons. *The specified compounds are:*

- benzo(k)fluoranthene
- benzo(b)fluoranthene
- benzo(ghi)perylene
- indeno(1,2,3-cd)pyrene.

Thus the polycyclic aromatic hydrocarbons (PAH) parameter refers to the sum of the detected and quantified concentrations of the specified individual PAH calculated in a similar manner to the total pesticides parameter. WSAs should note that there is a separate standard for another individual PAH, benzo(a)pyrene, of 0.01 µg/l as it is the

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most toxic of the PAHs found in drinking water. The usual source of PAH in drinking water is from the degradation of the internal lining of coal tar pitch applied to some of the older cast iron distribution mains.

Note 9: trihalomethanes. For the “trihalomethanes – total” parameter – the specified compounds are chloroform, bromoform, dibromochloromethane and bromodichloromethane. Thus the total trihalomethanes (THMs) parameter refers to the sum of the detected and quantified concentrations of the specified individual THMs calculated in a similar manner to the total pesticides parameter. The following part of the note in the schedule to the Regulations is now irrelevant because WSAs were required to meet the standard for total THMs of 100 µg/l by the start of 25 December 2008. *All appropriate measures must be taken to reduce the concentration of THMs in water intended for human consumption as much as possible during the period needed to achieve compliance with the parametric value. When implementing the measures to achieve this value, priority must progressively be given to those areas where THM concentrations in water intended for human consumption are highest*

¹**Bromate.** This is a disinfection by-product that occurs when waters containing bromide are treated with strong oxidants such as ozone. Bromate is also present in sodium hypochlorite solutions that are often used to disinfect drinking water supplies.

²**Fluoride.** The standard for fluoride for those water supplies that are fluoridated is 0.8 mg/l. For supplies that are not fluoridated, that is containing only naturally occurring fluoride, the standard is 1.5 mg/l.

2.4 Indicator parameters

2.4.1 | The indicator parameters are a mixture of microbiological, chemical and radiological parameters and parameters covering other characteristics of drinking water supplies. A failure to meet an indicator parameter value does not necessarily mean that there is a human health risk from the supply. A failure is a signal that there may be a problem with the supply that needs investigation and consideration of whether there is a human health risk. For example a failure to meet the aluminium indicator parameter value could be a signal that the coagulation and filtration treatment plant is not being operated effectively or the detection of coliform bacteria could be a signal that the water supply has become contaminated. Any failure to meet an indicator parameter must be investigated by the WSA to determine the cause but the EPA is only required to take enforcement action against the WSA requiring the WSA to take remedial action

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when the EPA, in consultation and agreement with the HSE, decides that there is a risk to human health. In practice the WSA consults the HSE under regulation 10(9) and if the HSE agrees that there is a risk to human health, the WSA informs the EPA. This decision on the risk to human health takes into account the nature of the parameter and the extent and duration of the failure and whether other indicator parameters fail in the same supply. Many of the indicator parameters describe the aesthetic quality of water supplies – the characteristics of drinking water that are noticed by consumers because of its appearance, taste or smell.

2.4.2 | Table 2.3 sets out the indicator parameters except for radiological parameters, their parametric values and measurement units and the comments as in the Regulations. The radiological parameters are set out similarly in table 2.4. The notes in the schedule are reproduced in italics after the tables and where necessary are amplified in normal type to provide further explanation. Some additional explanatory notes are indicated by a superscript applied to the parameter name.

Table 2.3: indicator parameters (excluding radiological parameters)

Parameter number	Parameter	Parametric value	Units	Comments
29	Aluminium	200	µg/l	
30	Ammonium	0.30	mg/l	
31	Chloride	250	mg/l	Note 1
32	<i>Clostridium perfringens</i> (including spores)	0	Number/100ml	Note 2
33	Colour ¹	Acceptable to consumers and no abnormal change		
34	Conductivity	2500	µS cm ⁻¹ at 20°C	Note 1
35	Hydrogen ion concentration	≥6.5 and ≤ 9.5	pH units	Note 1
36	Iron	200	µg/l	
37	Manganese	50	µg/l	
38	Odour ¹	Acceptable to consumers and no abnormal change		
39	Oxidisability	5.0	mg/l O ₂	Note 3
40	Sulphate	250	mg/l	Note 1
41	Sodium	200	mg/l	

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Parameter number	Parameter	Parametric value	Units	Comments
42	Taste ¹	Acceptable to consumers and no abnormal change		
43	Colony count 22°C ²	No abnormal change		
44	Coliform bacteria	0	Number/100 ml	
45	Total organic carbon [TOC] ²	No abnormal change		Note 4
46	Turbidity ¹	Acceptable to consumers and no abnormal change		Note 5

Note 1: chloride, conductivity, pH value and sulphate. *The water should not be aggressive. The values of these parameters should be such that the water does not corrode the tanks and pipes at the treatment works and in the distribution network.*

Note 2: clostridium perfringens (including spores). *This parameter need not be measured unless the water originates from or is influenced by surface water. In the event of non-compliance with this parametric value, the supply shall be investigated to ensure that there is no potential danger to human health arising from the presence of pathogenic micro-organisms, e.g. Cryptosporidium.*

Note 3: oxidisability. *This parameter need not be measured if the parameter TOC is analysed. The EPA recommends that TOC is measured rather than oxidisability in all water supplies as it is a more useful parameter and easier to determine.*

Note 4: total organic carbon (TOC). *This parameter need not be measured for supplies of less than 10,000 m³ a day. The EPA recommends that TOC is measured rather than oxidisability in all water supplies as it is a more useful parameter and easier to determine.*

Note 5: turbidity. *In the case of surface water treatment, a parametric value not exceeding 1.0 NTU (nephelometric turbidity units) in the water ex treatment works must be strived for. If the turbidity exceeds 1.0 NTU in the water leaving a treatment works that is a strong indication that the coagulation and filtration process is not working efficiently and there could be harmful micro-organisms, such as *Cryptosporidium*, in the supply.*

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1 Colour, odour, taste and turbidity. The requirement for these parameters is that they should be acceptable to consumers and no abnormal change. Acceptable to consumers means that consumers are not rejecting the water for drinking, cooking etc because of its taste, smell or appearance. No abnormal change means that there is no significant variation in the value for the parameter compared to the value normally expected in that supply.

2 Colony counts at 22°C and TOC. The requirement for these parameters is that there is no abnormal change. This means that there is no significant variation in the value for the parameter compared to the value normally expected in that supply.

Table 2.4: radiological parameters

Parameter number	Parameter	Parametric value	Units	Comments
47	Tritium	100	Bq/l	Notes 6 and 8
48	Total indicative dose	0.10	mSv/year	Notes 7 and 8

Note 6: tritium. *Monitoring frequencies to be set at a later date in Part 2 of the Schedule.* The Department of Environment, Heritage and Local Government (DoEHLG) has not modified part 2 to include monitoring frequencies for tritium. Meanwhile guidance on monitoring for tritium is given in section 4, sub-section 4.4.

Note 7: total indicative dose. *Excluding tritium, potassium-40, radon and radon decay products; monitoring frequencies, monitoring methods and the most relevant locations for monitoring points to be set at a later date in Part 2 of the Schedule.* DoEHLG has not modified part 2 to include monitoring locations for total indicative dose. Meanwhile guidance on monitoring for total indicative dose is given in section 4, sub-section 4.4.

Note 8: tritium and total indicative dose. (A) *The proposals required by Note 6 on monitoring frequencies, and in Note 7 on monitoring frequencies, monitoring methods and the most relevant locations for monitoring points in Part 2 of the Schedule shall be adopted in accordance with the Committee procedure laid down in Article 12 of Council Directive 98/83/EEC.* (B) *Drinking water need not be monitored for tritium or radioactivity to establish total indicative dose where, on the basis of other monitoring carried out, the levels of tritium or the calculated total indicative dose are well below*

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the parametric value. The European Commission has not yet promulgated requirements on monitoring for these parameters. Meanwhile guidance on monitoring for these parameters is given in section 4, sub-section 4.4.