



DWI PR14 Guidance – Lead in Drinking Water

1. Background

- 1.1 The standard for lead will change from 25µg/l to 10µg/l in December 2013. This has been known since the 1998 EU Drinking Water Directive was first published and is incorporated already in the Water Supply (Water Quality) Regulations 2000. The point of compliance measurement is the consumer's tap and consumer protection action is mandatory in EU and national law in response to every sample that exceeds the standard.
- 1.2 Regulation 19A of The Water Supply Regulations 2010 strengthens the requirements of s75 of the Water Industry Act 1991 in relation to water quality contamination in premises classed as public buildings. This change enables contamination to be dealt with when the cause is pipes or fittings that fall outside of the scope of the Water Supply (Water Fittings) Regulations, or do not apply (for example if a fitting is damaged).
- 1.3 Water companies in England and Wales, in response to regulatory requirements and guidance, have implemented risk-based strategies to achieve compliance with 10µg/l by December 2013. Currently 10 companies have in place formally agreed strategies covered by Section 19 Undertakings.
- 1.4 Compliance with the lead parameter means: Compliance with the standard (10µg/l from 25th December 2013); **and**, where failure to comply is due to a domestic distribution system, that companies have undertaken the mandatory consumer protection measures as required under Regulations 17(6), 17(9) and 30; and, in the case of public buildings (with reference to Regulation 19A), that companies have exercised their powers to prevent contamination, if necessary by enforcement under s75 of the Water Industry Act 1991.
- 1.5 Regulation 30 paragraphs (4) and (5) will cease to apply from 25th December 2013.
- 1.6 Compliance with the 10µg/l limit in England and Wales has been at 99% or thereabouts since 2008:

Table 1 – Compliance with the PCV for Lead from Water Company Compliance Monitoring 2001 to 2012

Year	No of samples	No (%) of samples exceeding lead standard			
		25 µg/l		10 µg/l	
2001	19,436	390	(2.01)		
2002	20,682	273	(1.32)	1,023	(4.95)
2003	23,185	172	(0.74)	691	(2.98)
2004	25,158	123	(0.49)	692	(2.75)
2005	23,128	68	(0.29)	439	(1.90)
2006	26,450	90	(0.34)	568	(2.15)
2007	23,181	55	(0.24)	395	(1.70)
2008	13,153	30	(0.23)	143	(1.09)
2009	12,975	29	(0.22)	128	(0.99)
2010	12,667	22	(0.17)	127	(1.00)
2011	12,761	20	(0.16)	119	(0.93)
2012	12,475	23	(0.18)	108	(0.87)

Appendix 1 presents the same data by company, from 2008 to 2012.

2. Regulatory Requirements and DWI Guidance for PR14

2.1 The stricter standard for lead will apply from December 2013 onwards. Water company compliance monitoring data submitted to the DWI confirms that water treatment by plumbosolvency measures has been very successful in reducing consumer exposure; however, there are areas in some towns and cities where the risk of failure and associated health concerns remains, especially where plumbing has not been modernised in older buildings and homes.

2.2 Results from lead communication pipe replacement trials completed in previous AMPs (see Appendix 2) indicate that strategic replacement of lead communication pipes by water companies does not achieve **significant** benefits (in terms of both compliance with the 10µg/l standard and reduced exposure to lead) unless the consumer replaces lead pipes serving the property at the same time. This conclusion is based on a limited dataset, however, and it is possible that further work undertaken by companies since these trials were completed has shown a different outcome.

2.3 The results of these trials suggest that strategic lead communication pipe replacement is not, in most situations, the most cost-effective solution to achieve

- compliance with the standard. A summary of the findings from the trials is included in Appendix 2.
- 2.4 Replacement of company-owned communication pipes has been shown to reduce consumers' exposure to lead where there remains a lead service pipe and/or lead pipework within the property, but the reduced exposure is unlikely to have a significant impact on risk to health. The DWI is sponsoring research which should provide more information on this issue.
- 2.5 The Inspectorate expects water companies to continue to develop strategies to meet the future lead standard. As part of that strategy, water companies are expected to agree a collective approach with relevant stakeholders such as the local authorities and the local Director of Public Health/Consultant in Communicable Disease Control. Such targeted action may include effective communications aimed at vulnerable consumer groups and their advisors or carers.
- 2.6 Water companies may also wish to consider opportunistic lead pipe replacement as one of a number of benefits (e.g. reducing leakage and pressure problems) from planned work on the distribution system (e.g. when preparing pipe-work for the installation of meters).
- 2.7 Guidance issued in September 2010 provides comprehensive advice on the approach companies should take to fulfil Regulation 17(9). Furthermore, *"in the period up to 24 December 2013, companies are strongly recommended to respond to sample failures of the future lead standard of 10 µg/l, because these will constitute failures on and after 25 December 2013"*.
- 2.8 The current guidance to companies is, therefore, that they are expected to continue to apply a risk-based approach to managing compliance with the lead parameter. If there is a risk of exceedances of the 10µg/l standard companies must treat the water to reduce plumbosolvency. The treatment must be optimised (i.e. optimum dose, with other parameters such as pH, Langelier index, hardness and colour taken into consideration) to achieve stability in the network to minimise the risk of exceedances of 10µg/l.
- 2.9 Where there are existing (PR09) programmes of work for lead strategies covered by s19 Undertakings, companies must, through the reporting requirements of those undertakings, keep the Inspectorate updated on progress with the work programmes and benefits achieved. The Inspectorate will use these reports when considering any new or extended proposals at PR14.
- 2.10 For the specific purpose of securing support through the PR14 process for lead compliance, companies must identify the risk in an up to date regulatory risk assessment of the water supply system and identify an appropriate integrated package of measures to mitigate this risk. In addition to companies' statutory

duties as outlined in paragraph 1.4 above, this package should include the following measures:

- Identification of high, medium and low risk supply zones in terms of consumer exposure to lead in water supplies.
- Continuation of, and, if necessary, further enhancement to plumbosolvency control measures.
- Replacement of lead communications pipe where the standard of 10µg/l is not met, and consideration of the benefits of replacement of customer service pipes. Replacement of customers' service pipes alongside replacement of company-owned pipes has been shown to deliver significant benefits (see paragraph 2.2. above), but the Inspectorate does not have the statutory power to **require** companies to include this in their lead strategies. We recognise, however, that some companies have demonstrated the benefits of this approach and include it in their existing lead strategies.
- Consideration of the benefits of opportunistic lead communications and service pipe replacement from planned work on the distribution system (e.g. when preparing pipe-work for the installation of meters)
- Work with local authorities to identify vulnerable consumers, and to identify appropriate solutions, including the replacement of lead pipes in public buildings (e.g. when refurbishment is carried out in local authority housing).
- Work with health protection teams to identify vulnerable consumers and appropriate solutions.
- A Communications and education strategy to make consumers, and other stakeholders, aware of the risk of lead in tap water, what can be done to mitigate the risk, and who has responsibility for lead pipes.

2.11 The Inspectorate is aware that some companies are investigating lining techniques for communication pipes and service pipes, and that these techniques may be beneficial when applied to lead pipes by reducing the risk of compliance failures and consumers' exposure to lead. The results of these trials are expected to be known later on in AMP5.

2.12 The Inspectorate recognises that there may be some elements of such an integrated package that do not naturally fit within the drinking water quality improvement programme and therefore do not require a legal instrument to be put in place by DWI, for example a solution allocated under maintenance. However, given this is a clear human health protection matter, DWI considers that it is essential that a clear and transparent integrated package that covers the measures as set out above should be included in its entirety, as a business plan proposal for drinking water quality.

2.13 Our requirements may change necessarily as a consequence of Defra's anticipated Policy Statement and Ofwat's PR14 methodology guidance, all due to be published later in 2012, along with any subsequent Ofwat or ministerial guidance for PR14. Therefore this document may be updated from time to time, as required.

For further information on this guidance, please contact Jacqueline Atkinson, Inspector, Telephone Number: 03000686402: jacqueline.atkinson@defra.gsi.gov.uk

Appendix 1 - Compliance with the future 10µg/l PCV for Lead from Water Company Compliance Monitoring, 2008 to 2012, by Company

Company	2008			2009			2010			2011			2012		
	No. of samples for lead	No. >10µg/l	% >10µg/l	No. of samples for lead	No. >10µg/l	% >10µg/l	No. of samples for lead	No. >10µg/l	% >10µg/l	No. of samples for lead	No. >10µg/l	% >10µg/l	No. of samples for lead	No. >10µg/l	% >10µg/l
Albion	4	0	0.00	4	0	0.00	4	0	0.00	4	0	0.00	4	0	0.00
Anglian	1631	8	0.49	1417	6	0.42	1322	6	0.45	1249	11	0.88	1229	11	0.90
Bristol	391	8	2.05	388	1	0.26	388	5	1.29	388	6	1.55	384	3	0.78
Cambridge	60	0	0.00	62	0	0.00	63	0	0.00	78	0	0.00	72	0	0.00
Cholderton	4	0	0.00	4	0	0.00	4	0	0.00	4	0	0.00	4	0	0.00
Dee Valley	132	3	2.27	132	3	2.27	132	2	1.52	133	2	1.50	132	1	0.76
Dwr Cymru	607	4	0.66	592	5	0.84	581	2	0.34	602	4	0.66	596	6	1.01
Essex & Suffolk	377	4	1.06	379	2	0.53	379	4	1.06	355	7	1.97	323	1	0.31
Hartlepool	20	0	0.00	20	0	0.00	20	0	0.00	20	0	0.00	20	0	0.00
IWNL	4	0	0.00	10	0	0.00	16	0	0.00	24	0	0.00	20	0	0.00
Northumbrian	549	8	1.46	552	7	1.27	547	8	1.46	545	5	0.92	538	2	0.37
Peel				2	0	0.00	4	0	0.00	4	0	0.00	4	0	0.00
Portsmouth	134	2	1.49	117	1	0.85	116	0	0.00	159	0	0.00	112	2	1.79
Sembcorp	109	0	0.00	91	0	0.00	90	1	1.11	81	0	0.00	100	0	0.00
Severn Trent	1472	15	1.02	1526	17	1.11	1531	23	1.50	1531	16	1.05	1517	11	0.73
South East	665	8	1.20	662	2	0.30	666	5	0.75	664	5	0.75	574	4	0.70
South Staffs	190	2	1.05	190	2	1.05	190	0	0.00	190	3	1.58	198	2	1.01
South West	276	2	0.72	383	0	0.00	390	1	0.26	390	1	0.26	383	4	1.04
Southern	584	7	1.20	594	4	0.67	596	8	1.34	643	2	0.31	597	2	0.34
SSE	1	0	0.00	6	0	0.00	18	0	0.00	35	0	0.00	49	0	0.00
Sutton & East Surrey	160	0	0.00	160	1	0.63	160	2	1.25	161	1	0.62	160	0	0.00
Thames	1806	27	1.50	1803	28	1.55	1798	31	1.72	1908	32	1.68	1898	26	1.37
United Utilities	2185	25	1.14	2109	23	1.09	1888	14	0.74	1804	11	0.61	1777	13	0.73
Veolia Central	532	3	0.56	527	9	1.71	525	4	0.76	529	2	0.38	528	6	1.14
Veolia East	32	0	0.00	32	0	0.00	32	1	3.13	32	0	0.00	32	1	3.13
Veolia Projects				4	0	0.00	8	0	0.00	8	0	0.00	8	0	0.00
Veolia South East	44	0	0.00	44	0	0.00	44	0	0.00	44	0	0.00	44	0	0.00
Wessex	607	7	1.15	588	7	1.19	577	2	0.35	601	5	0.83	598	3	0.50
Yorkshire	577	10	1.73	577	10	1.73	577	8	1.39	575	6	1.04	574	10	1.74

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Updated to include 2012 data in Table 1 and Appendix 1

Appendix 2 - AMP3 and AMP4 pilot studies.

1. Pilot Trial of Replacement of Lead Communication Pipes – July 2007

In general the objectives of the lead pipe replacement pilot trials for water companies were:

- **to inform the water company's strategies and methods for lead communication pipe replacement;**
- **to test and evaluate those strategies and methods;**
- **to identify the problems, and find solutions to those problems, for delivering a lead communication pipe replacement strategy;**
- **to identify the most efficient and cost effective method of delivering a lead pipe communication replacement strategy; and**
- **to assess the impacts on, and benefits to, consumers;**

and the objectives of the Inspectorate were:

- **to inform the development of criteria to trigger strategic lead communication pipe replacement programmes of work under the provisions of regulation 41 of the Regulations;**
- **to inform the development of national guidance on lead communication pipe replacement programmes, including a framework for water companies' strategies and guidance on the content of those strategies; and**
- **to inform the Inspectorate's decisions on the requirements for, and the development of guidance to water companies on, lead communication pipe replacement for Periodic Review 2004.**

Key Outcomes of the AMP3 Trials

- These pilot trials were a very good learning opportunity for both the water companies and the Inspectorate
- The results informed the Inspectorate's decisions on the whether any lead communication pipe replacement should be allowed for in the Periodic Review 2009 and the Inspectorate published guidance on the strategy for such replacements.
- The pilot trials have demonstrated successful methodologies for the identification and strategic replacement of lead communication pipes.
- The time and effort spent on identifying up front, properties supplied through lead communication pipes and the precise location of those pipes can reduce significantly the amount of abortive work during the replacement stage. A number of techniques were evaluated.
- The contractor for the lead pipe replacement exercise should be involved in some aspects of the identification and location of lead services as that can make the overall exercise more efficient. The contractor should also be given the opportunity to bid for replacing the consumer's pipe.

- Careful planning by the water company with the selected contractor is essential for a successful replacement exercise, particularly to avoid abortive excavations when the service is not lead and to identify possible problems at the replacement locations.
- Early consultation and careful planning with the local authorities including the highway authority, the police and other utilities is essential to ensure the smooth and efficient operation of the replacement exercise.
- Management of the contractor, with regular meetings and progress reports, is an important consideration for efficient running of the lead communication pipe replacement exercise.
- Good record keeping by the contractor of key aspects of the replacement exercise is needed to up-date water company records.
- Speedy re-instatement is essential with excavations ideally filled on the same day whenever practical and permanent re-instatement completed within 48 hours.
- It is essential to maintain good relations with the occupiers of affected properties and the general public before, during and after the replacement exercise by informing them by letters during the planning stage and immediately before the replacement exercise.
- In the urban areas, owners of properties showed very little interest in replacing their lead supply pipes at their own cost despite being provided by the water company with information about the health risks from lead and the opportunity to obtain a quotation for the work. When the water company offered to replace the property owners' lead supply pipes free of charge at the same time as it replaced the communication pipes, there was a very high take up in a rural area, but a lower take up in an urban area.
- The pilot trials were not specifically designed to measure the benefit of lead pipe replacement in terms of reduction in lead concentrations and improvement in compliance with lead standards, but they all included an element of measuring the benefit. The results must be treated with caution because in a number of the trials the effect was masked by improved treatment to remove colour and improved control of pH value and phosphate dosing and relatively few properties were involved in the trials that included property owner's supply pipe replacement.
- The indications are that replacement of lead communication pipes alone has little effect on compliance **but that replacement of the property owner's supply pipe at the same time appears to give significant reduction in lead concentrations and significant improvement in compliance with lead standards.** This conclusion is, however, based on small datasets and new evidence may emerge from further work undertaken by water companies since these trials were carried out that alters this position.
- On the limited evidence of these trials, however, we believe that it is not appropriate to recommend widespread replacement of only water company's lead communication pipes as it seems unlikely that this will deliver significant reductions in lead

concentrations to fully meet the future lead standard of 10µg/l or significant public health benefits. **For there to be significant reductions in lead concentrations and significant public health benefits, it appears that property owners' lead supply pipes (and internal lead plumbing) need to be replaced at the same time as the water companies' lead communication pipes.**

2. AMP4 Trials

One company completed six pilot studies on lead during AMP4. The key points arising from these pilot studies are summarised below:

Organics Removal

Overall the project indicates that there is substantial opportunity to reduce the plumbosolvent characteristics of soft upland waters through improved removal of organics.

[Note: A number of companies have, over previous AMP periods, delivered drinking water quality improvement schemes to address lead and other parameters that have involved enhanced removal of organic compounds. There are a number of AMP5 schemes planned that will also deliver benefits in this respect, even where lead is not the formal quality driver. This includes a number of catchment management schemes].

Health Intervention Study

Key findings of the study included:-

- People were more willing to engage with the topic as their understanding and knowledge of lead risk increased. Delivery of information from health professionals in a face to face setting is likely to achieve the greatest improvement in knowledge, and change in behaviour.
- Information provided needs to be specific for target groups for example landlords, tenants, childcare establishments and health professionals because the power to act on advice differs.
- The best time to inform parents is at the prenatal stage since when expectant mothers are most receptive, due to the time constraints and competing demands in the immediate post natal period.
- Once customers were made aware of an elevated risk from lead within their properties, they were more positively inclined to change their behaviour, for example by running the tap to flush standing water from pipes. Whilst this does not have an impact on overall compliance, it reduces consumers' exposure to lead and associated risks to health.

The impact of discolouration and aeration (white water)

- Statistical analysis of water quality data taken as part of the regulatory and operational sampling programme showed that lead concentrations were higher when iron and/or manganese concentrations exceeded regulatory limits, but the effect was very small.
- It was nevertheless estimated that further general reduction in iron concentrations could deliver up to 15 % reduction in lead concentrations at customers' taps.
- However the study showed no significant difference in lead concentrations in areas with a higher than average number of consumer contacts for discolouration and white water compared with the control areas.
- It is concluded that the current guidance to customers is adequate and that the issuing of further advice to customers experiencing white and discoloured water is unnecessary.

The nature and persistence of elevated lead concentrations associated with black particulates in water.

- The study confirmed the theory that exceedances of the lead parameter associated with the presence of particulates are likely to recur.
- The study on lead associated with discolouration events showed that the high lead levels tend to be transient, occurring at the same time as the discolouration. It was concluded, therefore, that advice given to customers to flush the tap until [*the particulates – implied*] clear, remains appropriate.
- The survey did reveal that customers have limited knowledge about their plumbing materials and how to identify them. Providing better tools for customers to identify plumbing materials, in particular lead, would be of benefit.

[Note: It is not reported whether any attempt was made to identify the nature of the particulates associated with elevated lead levels. If particulates are caused by disintegration of lead pipework or other fittings, then the standard advice given to customers experiencing discoloured water would not necessarily be appropriate. Some further studies may be needed].

Develop and evaluate a targeted lead pipe replacement strategy for properties served by long lengths (greater than 30 metres) of lead pipe.

- GIS records provide some useful indication where long lengths of lead may be found. However, the limited extents of these records mean that only a small proportion will be identified through this route.
- The best way to identify long lengths is by local review using a combination of desktop investigations, site investigations and the all important local knowledge.

A methodology for accurately assessing the proportion of properties with lead pipes in a WSZ

- Any estimation of lead services has to take into account the regional variation in the likelihood of lead services as previous Water Corporations had differing policies governing service pipe material.
- No direct method of using water quality random sampling data was found, though it could potentially be used as a measure of relative risk within areas of the same supply.
- First draw water quality sampling cannot be used to predict the presence of lead in service pipework.
- Lead non-compliance varies with property age band. Proportionately lead was used most between 1920 and 1944.
- Capturing pipe material data from meter installation inspections has been found to be a low cost way of gathering useful information on lead services. Over the next AMP it is expected that this data source will lead to at least 100,000 new records.
- Using asset data is likely to be unreliable due to the quantity of data that is inferred or assumed.
- Existing service pipe information is very incomplete and significantly erroneous.
- A model has been developed which augments the existing knowledge on services by incorporating meter survey data.