Drinking water system components — Lead content

Version 3

Attached is Version 3 of the criteria drafted to establish the requirements of NSF/ANSI 61 Annex G as a separate standard and tentatively identified as NSF 361. This version has been updated to include the changes discussed during the last three Lead Task Group conference calls. A new Foreword has been drafted but is still under review.

Please let me know of any errors or omissions.

Thanks!

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NSF International
October 30, 2009

Contents

Foreword [1]

- Being redrafted -

[1] The information contained in this Foreword is not part of this Standard and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

NSF Standard

Drinking water system components – Lead content

1 Purpose, scope, and normative references

1.1 Purpose

This standard establishes a uniform set of procedures for the determination of the lead content of the wetted surfaces of products, materials, and components that convey or dispense water for human consumption through drinking or cooking.

1.2 Scope

The procedures in this standard can be applied to determine the lead content of any product, material, and component that conveys or dispenses water for human consumption through drinking or cooking.

1.3 Normative references

The following documents contain procedures referenced in these procedures.

ASTM E29-06b. *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*[5]

1.4 Significant figures

For determining conformance with the specifications in this standard, the Rounding Method in ASTM E29 shall be used.

2 Definitions

2.1 **method detection limit (MDL):** As defined in 40 CFR Part 136, Appendix B, the minimum concentration of a substance that can be measured and reported with 99% confidence that the substance concentration is greater than zero. The MDL is determined from analysis of a minimum of seven aliquots of standard (known quantity of analyte in reagent matrix) at concentrations that are in the range of the estimated detection limit.

2.2 **method validation:** Verification of an analytical procedure performed by determining the method detection limit.

3 General requirements

Solders and fluxes shall have a lead content less than or equal to 0.2%. All other products shall have a lead content less than or equal to 0.25%.

3.1 All components ≤0.25%

If each component of a product has a wetted surface with a verifiable lead content of not more than 0.25%, then the product is considered compliant and no further evaluation is required.

3.2 Some components > 0.25%

If some wetted components of a product contain more than 0.25% lead, then the weighted average lead content shall be calculated according to section 4 to determine compliance.

3.3 Restriction on the use of lead containing materials

There shall be no lead added as an intentional ingredient in any product, component, or material submitted for evaluation to this standard with the exception of brass or bronze meeting the definition of "lead free" under the specific provisions of the Safe Drinking Water Act of the United States.

4 Weighted average lead content calculation

The weighted average lead content of the product shall be calculated using the surface area and lead content information established under section 4.1. For internal threaded products, the wetted surface area shall include 25% of the threaded area(s).

All of the wetted surfaces are to be included in the weighted average lead content calculation, not just those surfaces that contain lead.

The results of the weighted average lead calculation shall be rounded to two decimal places prior to determination of compliance.

4.1 Component surface areas and lead content

The following information shall be established to determine the weighted average lead content:

- a list of all of components and materials and their corresponding surface areas that come into direct contact with water;
- the lead content range of each material as specified by reference to a national or international standardized material specification (e.g. UNS copper alloy specification). If the material is not formulated to a national or international standardized specification, the manufacturers material specification shall be used.

4.2 Formula for determining weighted average lead content

The following formulation shall be used when calculating the weighted average lead content of products:

$$WLC = \sum_{c=1}^{n} \left(LC_c \times \left[\frac{WSA_c}{WSA_t} \right] \right)$$

where;

WLC	=	weighted average lead content of product
LC_c	=	percentage lead content of component
WSA_c	=	wetted surface area of component
WSA_t	=	total wetted surface area of all components
n	=	number of wetted components in product

NOTE: - An example calulation of the weighted average lead content of a product is provided in annex A.

5 Percentage lead content of water contact surfaces

The lead content of the material specification used to produce wetted components shall be used to determine compliance with this standard. For lead contents of materials that are provided as a range, the maximum content of the range shall be used. When the actual percent of lead in the chemical composition of individual components is to be determined, the procedures in section 6 shall be followed.

For verification of individual sample compliance, lead content verification by testing can be used as an alternate to the maximum lead content of the material specification.

5.1 Use of Liners: When lead-bearing surfaces have been excluded from water contact by use of a rigid liner (e.g. plastic sleeve) sealed with a permanent barrier, the lead content of the liner shall be used.

5.2 Use of coatings: When coatings are used, the lead content of the coated substrate shall be used in the calculation of weighted average lead content.

5.3 Use of lead removal technologies: For components where the wetted surface areas have been treated with a lead removal technology, the percent lead composition shall be based on the material used to manufacture the component prior to application of the surface treatment.

6 Analytical Procedures for Determining Percent Lead Content of Materials

Note: The procedures in this section are as provided by the California Department of Toxic Substances Control (DTSC) in section 2 of their August 2009 fact sheet titled “Testing and Evaluation of Lead Content in Plumbing Products, Materials and Components”. A full copy of that document is available at the following website:

http://www.dtsc.ca.gov/PollutionPrevention/upload/lead-in-plumbing-testing-protocol.pdf

6.1 References

U.S. EPA SW 846 Test Methods for Evaluating Solid Waste, Physical Chemical Methods, Method 3050 B – Acid Digestion of Sediments, Sludges, and Soils

US EPA SW846, Method 3052 - Microwave Assisted Acid Digestion of Siliceous and Organically Based Matrices

U.S. EPA SW 846, Method 6010C – Inductively Coupled Plasma-Atomic Emission Spectrometry

6.2 Lead Content Analysis of Materials

6.2.1 Sampling of Components

Samples from components can be obtained by various methods, such as drilling, turning, sawing, or milling. Where possible, blend material from a minimum of three areas taken at random locations across the part, so as to obtain a sample that is representative of the properties of the entire component. Care should be taken not to include coating materials in the sampled material. With the exception of very large parts, test pieces should be drilled or sawed completely through in order to avoid over- or under-representation of the center portion.

6.2.2 Sample Preparation

Dissolve a minimum of 1.0 gram of sample in accordance with U. S. EPA SW-846 Method 3050B, Method 3052, or equivalent. Other applicable sample preparation methods may be employed, provided that adequate performance can be demonstrated for the analytes and matrices of interest.

6.2.3 Analysis

Analysis for metals should be performed, except as otherwise provided for herein, in accordance with currently accepted EPA SW-846 Method 6010C, or equivalent. Other applicable chemical analysis methods may be employed, provided that adequate performance can be demonstrated for the analytes and matrices of interest.

6.2.4 Quality Control

Sample preparation and analysis procedures should be validated for the analytes and matrices to be tested. All the quality assurance/quality control protocols and other requirements specified in the method being used should be followed. If a specified protocol is not followed, a justification for the deviation should be explicitly addressed.

6.3 Lead Content Screening

Screening may be used to check the lead content in the following cases, but not limited to:

− Screening of components where no lead is expected (e.g. certain plastics, elastomers, coatings).
− Initial screening of components to prioritize items for further testing.
− Comparison to material specification information.

The results from lead content screenings may be used to identify or prioritize items for testing according to Section 6.2.

XRF (X-Ray Fluorescence), OES (Optical Emission Spectroscopy) Arc /Spark, SEM (Scanning Electron Microscopy) /EDS (Energy Dispersive Spectrometer) are acceptable methods for screening components, provided the instrument is calibrated to standard reference materials. Other applicable screening methods may be employed, provided that adequate performance can be demonstrated. The following should be taken into consideration with a screening method:

- Surface scanned should be clean, dry, and free of coating. Even slight overspray of coatings can significantly reduce lead content readings.
- Part finishes that remove surface lead, such as acid washes, will affect surface lead content readings and may affect the value of the screening analysis.
- Part size, shape, and condition of the surface can impact reading. Area analyzed should be no smaller than the instrument observation window. Shapes, such as curved surfaces, should be minimized.
- Lower lead content parts may require longer read times and the average of several measurements (3 or more) with different orientation to produce accurate results.

Annex A
(informative)

Example weighted average lead content calculation

The following is an example of how this weighted average lead content calculation is conducted on a faucet with 13 wetted components.

1. Identify those components of the faucet that water flows through and comes into contact with during the normal operation (wetted components).

2. Use the percentage of lead content within each component (supplied by the component manufacturer or supplier). Table 1, column 4 provides the lead content for each of the wetted components.

3. Determine the percent of total wetted surface area represented in each component using the part specifications.

    a. The *wetted surface area* of each component that comes into direct contact with water is required under 3.1 (to be provided by the manufacturer). Table 1, column 2 shows the *wetted surface area* of the subject faucet.

    b. Add the areas of the wetted surface for each component together: this is the *total wetted surface area of the faucet*.

    c. For each component, divide the *area of its wetted surface* by the *total wetted surface area of the faucet (times 100)*: this is the percent of total wetted surface area of each component (see Table 1, column 3).

$$\text{Percent wetted surface area} = \frac{\text{Wetted surface area of component}}{\text{Total wetted surface area}} \times 100$$

4. For each component, multiply the percentage of lead content by the percent of total wetted surface area of that component: this is the *contributing percent lead for each component* (Table 1, column 5).

$$\text{Contributing percent lead} = \frac{\text{Percent wetted surface area}}{100} \times \frac{\text{Percent lead content}}{100} \times 100$$

5. Calculate the weighted average lead content of the faucet by totaling the *contributing percent lead for the components that make up the wetted surface* of the faucet (Table 1, column 5). For the faucet to be in compliance with requirements, this total must be no more than 0.25%.

Table 1. **Example of weighted average lead content calculations.**

1	2	3	4	5
Component No.	**Wetted surface area[1] (total = 61.96 in^2)**	**% wetted surface area (total = 100%)**	**% lead content**	**Contributing % lead**
1	17.31	27.94	0.05	0.014
2	1.15	1.86	2.86	0.053
3	4.99	8.05	0.23	0.019
4	18.25	29.45	0.05	0.015
5	11.14	17.98	0	-
6	4.02	6.49	0	-
7	1.09	1.76	1.30	0.023
8	0.54	0.87	0	-
9	0.91	1.47	2.54	0.037
10	0.76	1.23	0	-
11	1.02	1.65	2.54	0.042
12	0.35	0.56	2.54	0.014
13	0.43	0.69	2.54	0.018
			Total of contributing percent lead =	**0.234%**
			Weighted average lead content =	**0.23%** (in compliance)