Fact Sheet, August 2009

Testing and Evaluation of Lead Content in Plumbing Products, Materials and Components

Introduction

Examples of Plumbing Fixtures (other styles may vary)

This document outlines the test protocols the Department of Toxic Substances Control (DTSC) will use when testing drinking water faucets and other drinking water plumbing fittings and fixtures, pursuant to the authority set out in California Health and Safety Code Section 25214.4.3.

The test protocols provided in this document are designed for DTSC to assess the compliance of individual product samples acquired from locations that are readily accessible to the public at either retail or wholesale sources. DTSC's evaluation of product compliance may include review of product design information (e.g., component material specifications and description of wetted surface areas) and X-Ray Fluorescence (XRF) or other screening, along with lead content analysis of select components.

In addition, Health and Safety Code Section 116875 requires that independent certification of pipe, pipe or plumbing fittings or fixtures, solder or flux, at a minimum include testing of materials in accordance with DTSC's test protocols. This document outlines those test protocols, but does not address the certification process required in Health and Safety Code Section 116875.

The document is divided into three sections.

Section 1: lead content calculation
Section 2: Analytical procedures for determining percent lead content of materials
Section 3: Additional details in the determination of weighted average lead content

For additional information on the work being performed at the DTSC to evaluate the California's low lead requirement in plumbing products, please visit the following Web site:
http://www.dtsc.ca.gov/PollutionPrevention/LeadInPlumbing.cfm

Section 1: Weighted Average Lead Content Calculation

California law requires that DTSC annually select to the extent resources are available up to 75 drinking water faucets and other drinking water plumbing fittings and fixtures for testing and evaluation to determine compliance with the lead content standards set forth in Health and Safety Code Section 116875. (Health & Safety Code Section 25214.4.3).

On or after January 1, 2010, the maximum allowable lead content in "lead-free" pipes and pipe fittings, plumbing fittings, and fixtures intended to convey or dispense water for human consumption is a weighted average of 0.25 percent with respect to the wetted surfaces of pipes and pipe fittings, plumbing fittings, and fixtures. (Health & Safety Code Section 116875).

According to Health and Safety Code Section 116875 (e), the weighted average lead content of a pipe and pipe fitting, plumbing fitting, and fixture is calculated by using the following formula:

> The percentage of lead content within each component that comes into contact with water shall be multiplied by the percent of the total wetted surface of the entire pipe and pipe fitting, plumbing fitting, or fixture represented in each component containing lead. These percentages shall be added and the sum shall constitute the weighted average lead content of the pipe and pipe fitting, plumbing fitting, or fixture. (Health & Safety Code Section 116875 (e)).

The following formulation should 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

Section 2: Analytical Procedures for Determining Percent Lead Content of Materials

2.1 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

2.2 Lead Content Analysis of Materials

2.2.1 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.

2.2.2 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.

2.2.3 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.

2.2.4 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.

2.3 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 2.2.

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.

Section 3: Additional Details in the Determination of Weighted Average Lead Content.

3.1 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 should be used.

3.2 Use of Coatings

When coatings are used, the lead content of the coated substrate should be used in the calculation of weighted average lead content.

3.3 Use of Lead Removal Technologies

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

Additional Information

Please visit our Web site for additional information on "Lead in Plumbing" at: http://www.dtsc.ca.gov/PollutionPrevention/LeadInPlumbing.cfm.

We also maintain an e-mail list (ListServ) that you may sign up for, to receive updates from DTSC regarding Lead in Plumbing.

For more information, call DTSC's Regulatory Assistance Officers at: (800) 72TOXIC (1-800-728-6942) or (916) 255-3618 if you are calling from outside of California. You also may reach us by sending an email to leadinplumbing@dtsc.ca.gov.