



**Matthew Rodriguez**  
Secretary for  
Environmental Protection



## Department of Toxic Substances Control

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Barbara A. Lee, Director  
1001 "I" Street  
P.O. Box 806  
Sacramento, California 95812-0806



**Edmund G. Brown Jr.**  
Governor

# DEPARTMENT OF TOXIC SUBSTANCES CONTROL'S 2017 REPORT ON RESULTS OF TESTING FOR LEAD IN CALIFORNIA DRINKING WATER PLUMBING PRODUCTS

This Report is prepared pursuant to Health and Safety Code Section 25214.4.3 on results obtained from DTSC's sampling activities conducted between April 29, 2017 and May 23, 2017.

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## EXECUTIVE SUMMARY

California Health and Safety Code Section 116875 prohibits the introduction into commerce of any pipe, plumbing fitting, or plumbing fixture intended to convey or dispense water for human consumption that is not “lead-free”. To monitor and test for compliance purpose, Health and Safety Code Section 25214.4.3 requires the Department of Toxic Substances Control (DTSC), based on its available resources and staffing, to annually test potable water faucets, pipes, or other plumbing fittings or fixtures, which are readily accessible to the public, and issue a report to summarize results of the testing program. This Report is prepared pursuant to Health and Safety Code Section 25214.4.3 on results obtained from DTSC’s sampling activities conducted between April 29, 2017 and May 23, 2017.

## BACKGROUND

Exposure to lead in potable water is considered a contemporary public health issue. There is a long history of lead use in plumbing materials, some of which continue to serve as sources of potable water contamination. It is now well established that lead is toxic at low levels and exposure is associated with adverse health effects that include impaired cognitive function, neurotoxicity, and high blood pressure. In particular, infants and children are considered to be highly-susceptible populations, for which no safe blood lead level has been determined [1]. California recognizes the public health hazards of environmental lead exposure, and Health and Safety Code Section 116875 serves as a measure to prevent the introduction of lead-contaminated faucets, pipes, fittings, and fixtures into commerce. This law requires that all products introduced into commerce that are intended to convey, or dispense water for human consumption are “lead-free.” For purposes of Health and Safety Code Section 116875, the law defines “lead free” to mean the following:

- For pipes, pipe or plumbing fittings, and fixtures: “lead free” means the lead content shall not to exceed a weighted average of 0.25 percent when used with respect to the wetted surfaces.
- For solder and flux: “lead free” means the lead content shall not to exceed more than 0.2 percent lead.

In addition, Health and Safety Code Section 116875 requires all potable water pipes, fittings, fixtures, solder, and flux to be certified for compliance with the above standards by an independent, American National Standards Institute (ANSI)-approved third party.

To monitor for compliance with Health and Safety Code Section 116875, Health and Safety Code Section 25214.4.3 requires DTSC, based on its available resources and staffing, to:

- 1) Annually select no more than 75 potable water faucets, pipes, or other potable water fittings, or fixtures for testing and evaluation;
- 2) Acquire samples of faucets, pipes, fittings or fixtures from locations that are readily accessible to the public at either retail or wholesale sources;
- 3) Use test methods, protocols, and sample preparation procedures that are adequate to determine the total lead concentration in a faucet, pipe, fitting, or fixture to determine compliance with the standards for maximum allowable total lead content in Health and Safety Code Section 116875;

- 4) Post test results on DTSC's Internet Web site and transmit results in an annual report to the Division of Drinking Water of the State Water Resources Control Board, successor to the California Department of Public Health for the purpose of receiving this report.

This report presents sampling results from DTSC's monitoring and compliance testing from DTSC's sampling conducted during the calendar year of 2017.

#### SAMPLING & ANALYSIS METHODS

In 2017, DTSC collected plumbing fittings from a variety of retail locations, which were readily accessible to the California public. These fittings were purchased from hardware stores in the following geographic areas of the State: (1) Fresno, (2) Woodland, (3) Oakland/Alameda, and (4) the Greater Los Angeles Area. Each area of interest was principally identified based on DTSC's review of the 2012 CDPH report "*Top 200 California Zip Codes for BLLS at and above 4.5 micrograms per deciliter, for children less than age 6, with at least 500 children tested, 2012*" [2], and with additional assistance from DTSC and California EPA Environmental Justice staff, who assisted in further identifying the candidate neighborhoods and retail locations.

DTSC focused the 2017 testing on plumbing fittings (pipe tees, elbows, and coupling components) that were manufactured out of copper, brass, bronze, and galvanized steel. These fittings represent relatively low-cost components, which contain no moving parts, and are sourced from suppliers around the world. DTSC also focused on plumbing fittings because they are used to connect potable water pipes in residential and commercial buildings and are in use for many years, or many decades after installation.

A total of 59 fittings (19 brass, 1 bronze, 19 galvanized steel, and 20 copper) were obtained for testing between April 29 and May 23, 2017. Twenty-eight of the fittings were obtained from nine (9) different stores that represented national hardware chains, while the remainder (31) were purchased from 12 small, independent hardware stores. Additional fittings were collected for quality control and assurance analyses. All sample processing and chemical analysis was conducted by DTSC chemists and scientists at DTSC's Environmental Chemistry Lab (ECL), in Berkeley, California, using validated analytical methods.

#### RESULTS

For fittings tested in 2017, DTSC found a very high compliance rate. DTSC determined that the "lead-free" compliance rate exceeded 98%, with 58 out of the 59 fittings containing less than 0.25% lead. Lead levels were below the limit of quantitation for 39 of the 59 fittings tested. The lone non-compliant fitting was identified as a brass elbow, for which the lead content of the fitting's wetted-surface material was 3.5%. On average, DTSC observed that the brass fittings tested contained the highest lead levels. None of the copper or galvanized steel fittings tested exceeded the 0.25% limit.

Due to limitations of sampling size and requirements under the law, the products selected are not representative of all products offered for sale in California. However, DTSC's sampling and testing data, provide some monitoring and compliance baselines. Such information may be useful to identify any trends in products that show a pattern of exceeding "lead-free" standards; provide consumers independent information on product compliance with the lead-

free standards; or help identify points of non-compliance in the manufacturing and supply chains. Additionally, this data can assist DTSC in developing future sampling strategies.

#### **DISCLAIMER**

As required by Health and Safety Code Section 25214.4.3, this report presents sampling and testing conducted by DTSC to determine the lead content contained in a selection of plumbing products. DTSC provides this information to meet the legal requirements and inform the general public. Any discussion of commercially available products, or compliance with the lead standards, does not constitute an actual or implied endorsement or a regulatory opinion of these products by DTSC.

## SECTION 1. INTRODUCTION

Pursuant to the California Health and Safety Code Section 25214.4.3, DTSC has prepared this report for the calendar year of 2017, to summarize the results of DTSC's lead-in-plumbing product monitoring and compliance testing, which was performed to determine the lead content of plumbing fittings that are accessible to the public at retail or wholesale sources in California. This lead-in-plumbing product monitoring and compliance testing was completed as part of DTSC's ongoing programs to monitor for, and promote reductions of toxic substances in consumer products and the environment.

It is now well established that lead is toxic at low levels and exposure to lead carries a variety of adverse health effects that include neurotoxicity, impaired cognitive function, high blood pressure, and bioaccumulation in soft tissue and bone, over time. In particular, infants and children are considered to be highly-susceptible populations, for which no safe blood lead level has been determined [1]. This is a contemporary public health issue due to the historical use of lead as a common additive in plumbing materials such as solder, brass, bronze, and other metal alloys. The contamination of potable water with lead often results from corrosion of these lead-containing plumbing materials, which may leach lead into water at increased rates when their surfaces are exposed to water with sufficiently corrosive chemical properties. However, it promises to persist as a public health issue, due in part, to the potential for lead-contaminated plumbing products to continue to enter commerce, and become integrated into new building construction or building remodeling projects.

To mitigate against the further use of lead-contaminated faucets and plumbing piping, fittings, and fixtures, California has enacted laws to restrict the allowable content of lead in products that are intended to convey or dispense water for human consumption. Section 116875 of the Health and Safety Code serves as an important measure to protect public health in California, and is aimed at preventing the introduction of lead-contaminated plumbing products into commerce. This law requires that all faucets, pipes, and plumbing fittings or fixtures introduced into commerce that are intended to convey, or dispense water for human consumption are "lead-free." For purposes of Health and Safety Code Section 116875, the law defines "lead free" to mean the following:

- For pipes, pipe or plumbing fittings, and fixtures: "lead free" means the lead content shall not to exceed a weighted average of 0.25 percent when used with respect to the wetted surfaces.
- For solder and flux: "lead free" means the lead content shall not to exceed more than 0.2 percent lead.

The Federal Safe Drinking Water Act (SDWA) has also been amended (under the 2011 Reduction of Lead in Drinking Water Act) to reflect similar requirements for "lead-free" plumbing products. Additionally, under the US Environmental Protection Agency's (EPA's) Lead and Copper Rule, the SDWA places limits on the allowable concentration of lead (and copper) in potable water at the consumer tap. The US EPA's action level for lead in potable water at customer taps is 0.015 mg/L, above which, action must be taken to treat corrosion in upstream distribution piping.

In California, Health and Safety Code Section 116875 also requires all potable water pipes, pipe or plumbing fittings or fixtures, solder, or flux to be certified for these “lead-free” compliance standards by independent, American National Standards Institute (ANSI)-approved third party.

To monitor for compliance with Health and Safety Code Section 116875, Health and Safety Code Section 25214.4.3 requires DTSC, based on its available resources and staffing, to:

- 1) Annually select no more than 75 potable water faucets, or other potable water pipes or plumbing fittings, or fixtures for testing and evaluation;
- 2) Acquire samples of the selected faucets, pipes, fittings, and fixtures from locations that are readily accessible to the public at either retail or wholesale sources;
- 3) Use test methods, protocols, and sample preparation procedures that are adequate to determine the total lead concentration in a potable water plumbing fitting or fixture to determine compliance with the standards for maximum allowable total lead content in Health and Safety Code Section 116875;
- 4) Post test results on DTSC’s Internet Web site and transmit results in an annual report to the Division of Drinking Water of the State Water Resources Control Board, successor to the California Department of Public Health for the purpose of receiving this report.

As mentioned above, the scope of this testing is contingent upon the availability of DTSC’s resources and staffing, per Health and Safety Code Section 25214.4.3, subsection (b). For further information, please refer to the specific sections of the Health and Safety Code.

## SECTION 2. PLUMBING FITTING SELECTION AND SAMPLING

DTSC focused the 2017 testing on plumbing fittings (e.g. – pipe tees, elbows, couplings) which were manufactured out of copper, brass, bronze, and galvanized steel. These fittings types are relatively low-cost, ubiquitous components, which contain no moving parts and are sourced from suppliers around the world. DTSC also focused on plumbing fittings because they are used to connect potable water pipes in residential and commercial buildings and are in use for many years, or many decades after installation.

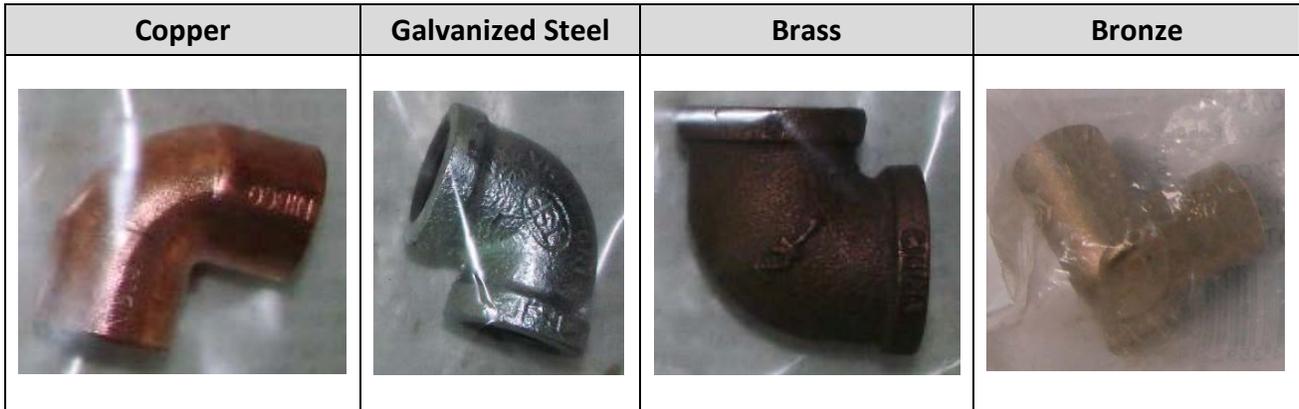
As required in Health and Safety Code Section 25214.4.3, DTSC collected fittings from locations that are readily accessible to the public, including both retail and wholesale locations. DTSC took efforts to identify both local, independent hardware stores, as well as national chains, which were located in communities associated with potential lead exposure issues. These fittings were purchased from retail locations in the following geographic areas of California: (1) Fresno, (2) Woodland, (3) Oakland/Alameda, and (4) the Greater Los Angeles Area. Each area of interest was principally identified based on DTSC’s review of from the 2012 CDPH report “*Top 200 California Zip Codes for BLLS at and above 4.5 micrograms per deciliter, for children less than age 6, with at least 500 children tested, 2012*” [2], as well as two recent Reuters articles citing the same CDPH data [3, 4] and tap water testing data from the City of Fresno Department of Public Utilities [5]. In addition, DTSC and California EPA Environmental Justice staff assisted in further identifying the candidate neighborhoods and retail locations.

These retail locations were either located within, or were neighboring to zip codes that were identified to have an elevated prevalence of child blood lead levels (BLL), or elevated

concentrations of lead in residential tap water. DTSC acknowledges that there are a variety of potential sources of lead exposure in the environment (e.g. – lead paint, lead-contaminated soils), and the selection of these geographic areas for plumbing fitting sampling should not be interpreted as an association between the reported lead exposure issues and lead-contaminated plumbing products currently in commerce.

DTSC staff obtained a total of 59 fittings (19 brass, 1 bronze, 19 galvanized steel, and 20 copper) for testing between April 29 and May 23, 2017. These fittings ranged in diameter from 3/8” to 3/4” (examples are shown in Figure 1). Twenty-eight of these fittings were obtained from nine (9) different stores that represented national hardware chains, while the remainder (31) were purchased from 12 small, independent hardware stores. On average, one brass/bronze, one galvanized steel, and one copper fitting was purchased from each store. Additional fittings were collected for quality control and assurance analyses. No fittings were obtained from internet-based sources for this round of testing and evaluation.

**Figure 1 – Examples of Potable Water Plumbing Fittings Tested in 2017**



DTSC collected product information associated with categories listed in Table 1, based upon product packaging, in-store signage, or information provided on the internet web page of a fitting’s distributor or manufacturer. In some instances, it was not possible to determine the complete information for a given fitting, including information such as the manufacturer, distributor, country of origin, or “lead-free” certification. The results of the lead analyses are summarized in Table 2 in Section 3. Sample Analysis & Results, with a further-detailed summary of information for each fitting in Appendix A.

**Table 1 – Fitting Information Categories**

Store of Purchase	Fitting Type
Material Type	“Lead-free” Labeling
Diameter(s)	Country of Origin
Part ID or Product code	Distributor
Unit Cost	Manufacturer

## SECTION 3. SAMPLE ANALYSIS & RESULTS

After fittings were purchased from each of the selected retail locations, they were submitted to DTSC’s Environmental Chemistry Laboratory (ECL), via the Lab’s chain-of-custody process. At ECL, the fittings were further processed to develop samples suitable for analysis via inductively coupled plasma atomic emission spectroscopy (ICP-AES). Since each fitting was a single component, it was composed of just one material type and had only one surface that would be exposed to potable water during use (i.e. – a single “wetted surface”). Therefore, for these fittings, it was not necessary to conduct calculations regarding the weighted average lead content across the entire wetted surface of the fitting.

In previous years of testing, multi-component plumbing products (e.g. - faucets) were included in DTSC’s testing. The wetted surface of products such as faucets often contain multiple components manufactured from different materials, each of which require lead analysis. As a result, Health and Safety Code Section 116875 requires that a weighted average calculation is completed to assess lead content across the total wetted surface of the product. For further detail on this calculation of the weighted-average lead content for multi-component plumbing products, DTSC refers readers to the Health and Safety Code Section 116875.

For the 2017 testing, samples were processed at ECL. A drill press was used to drill through each fitting with a clean 5/16” diameter black carbide drill bit, after which, approximately one gram of drilling shavings was collected. The samples were dissolved via an acid digestion, in accordance with US EPA Method 3050B (SW-846) [6], and lead analysis was then completed via ICP-AES, following US EPA Method 6010C (SW-846) [7]. The protocol for the pre-processing and drilling of fittings is summarized in previous reports for DTSC’s 2010 and 2011 lead-in-plumbing product monitoring and compliance testing [8] [9].

**Table 2 – 2017 Test Results for Lead Content in Plumbing Fittings**

Sample Number	Fitting Description	Material Type	Fitting Manufacturer (M) or Distributor (D) <sup>1</sup>	Lead Content (%) <sup>2</sup>	“Lead-free” Compliant? <sup>3</sup>
1	½” 90° Elbow	Copper	NIBCO (M)	ND	Yes*
2	½” 90° Elbow	Bronze	NIBCO (M)	0.066%	Yes*
3	½” Tee	Galv. Steel	Mueller Global (M/D)	ND	Yes*
4	¾” Tee	Brass	SharkBite Plumbing Solutions (M)	0.015%	Yes*
5	½” 90° Elbow	Brass	LDR Global Ind., LLC (D)	0.040%	Yes*
6	¾” 90° Elbow	Brass	LDR Global Ind., LLC (D)	0.090%	Yes*
7	½” 90° Elbow	Galv. Steel	LDR Global Ind., LLC (D)	0.020%	Yes*
8	¾” 90° Elbow	Galv. Steel	LDR Global Ind., LLC (D)	ND	Yes*
9	½” 90° Elbow	Galv. Steel	Mueller Global (M/D)	0.060%	Yes*
10	½” 90° Elbow	Brass	Thrifty Supply Co. (D)	ND	Yes*
11	½” 90° Elbow	Copper	Mueller Global (M/D)	ND	Yes*
12	½” 90° Elbow	Copper	Elkhart Product Corp. (M)	ND	Yes*
13	½” 90° Elbow	Galv. Steel	TSP Brand (M)	ND	Yes*
14	½” 90° Elbow	Brass	<i>Unknown</i>	ND	Yes*

Sample Number	Fitting Description	Material Type	Fitting Manufacturer (M) or Distributor (D) <sup>1</sup>	Lead Content (%) <sup>2</sup>	"Lead-free" Compliant? <sup>3</sup>
15	½" 45° Elbow	Copper	NIBCO (M)	ND	Yes*
16	¾" 90° Elbow	Brass	Sharkbite Plumbing Sol. (M)	0.017%	Yes*
17	½" 90° Elbow	Brass	<i>Unknown</i>	3.500%	<b>No</b>
18	½" 90° Elbow	Copper	<i>Unknown</i>	ND	Yes
19	½" 90° Elbow	Copper	Elkhart Product Corp. (M)	ND	Yes*
20	½" 90° Elbow	Brass	JMF Company (M/D)	0.050%	Yes*
21	½" 90° Elbow	Galv. Steel	Mueller Global (M/D)	ND	Yes*
22	½" 90° Elbow	Galv. Steel	TSP Brand (M)	ND	Yes*
23	½" 90° Elbow	Brass	<i>Unknown</i>	0.034%	Yes*
24	½" 90° Elbow	Copper	NIBCO (M)	ND	Yes*
25	½" 90° Elbow	Copper	Larson Supply Co. (D)	ND	Yes*
26	½" 90° Elbow	Galv. Steel	Larsen Supply Co. (D)	ND	Yes*
27	½" 90° Elbow	Brass	Larsen Supply Co. (D)	ND	Yes*
28	½" 90° Elbow	Copper	Elkhart Product Corp. (M)	ND	Yes*
29	¾" 90° Elbow	Galv. Steel	Mueller Global (M/D)	0.138%	Yes
30	½" 90° Elbow	Copper	Elkhart Product Corp. (M)	ND	Yes*
31	½" 90° Elbow	Brass	JMF Company (M/D)	0.225%	Yes
32	¾" 90° Elbow	Galv. Steel	Mueller Global (M/D)	ND	Yes*
33	½" 90° Elbow	Copper	Copper Fit Industries (M)	ND	Yes*
34	½" 90° Elbow	Brass	Larsen Supply Co. (D)	0.112%	Yes*
35	½" 90° Elbow	Galv. Steel	Mueller Industries (M/D)	ND	Yes
36	½" 90° Elbow	Copper	Elkhart Product Corp. (M)	ND	Yes
37	⅜" Nipple	Brass	JMF Company (M/D)	0.136%	Yes*
38	½" 90° Elbow	Galv. Steel	Mueller Global (M/D)	ND	Yes
39	½" 90° Elbow	Copper	Larson Supply Co. (D)	ND	Yes
40	½" 90° Elbow	Brass	NIBCO (M)	0.075%	Yes*
41	½" 90° Elbow	Galv. Steel	LDR Global Ind., LLC (D)	ND	Yes
42	½" 90° Elbow	Copper	Mueller Global (M/D)	ND	Yes
43	¾" 90° Elbow	Brass	LDR Global Ind., LLC (D)	0.037%	Yes
44	½" 90° Elbow	Galv. Steel	Mueller Global (M/D)	ND	Yes
45	¾" 90° Elbow	Copper	Elkhart Product Corp. (M)	ND	Yes*
46	½" x ¼" Insert	Brass	Anderson Metals Corp. (M)	0.068%	Yes*
47	¾" 90° Elbow	Galv. Steel	Mueller Global (M/D)	ND	Yes
48	¾" 90° Elbow	Copper	NIBCO (M)	ND	Yes
49	½" 90° Elbow	Brass	Apollo Flow (D)	0.151%	Yes*
50	¾" 90° Elbow	Galv. Steel	Mueller Global (M/D)	ND	Yes
51	¾" 90° Elbow	Copper	NIBCO (M)	ND	Yes
52	½" 90° Elbow	Brass	SharkBite Plumbing Sol.(M)	0.015%	Yes*
53	½" Sleeve	Copper	<i>Unknown</i>	ND	Yes

Sample Number	Fitting Description	Material Type	Fitting Manufacturer (M) or Distributor (D) <sup>1</sup>	Lead Content (%) <sup>2</sup>	“Lead-free” Compliant? <sup>3</sup>
54	½” Tee	Galv. Steel	TSP Brand (M)	ND	Yes*
55	½” Sleeve	Copper	Copper Fit Industries (M)	ND	Yes*
56	½” 90° Elbow	Brass	<i>Unknown</i>	0.013%	Yes
57	½” 90° Elbow	Galv. Steel	TSP Brand (M)	ND	Yes*
58	½” Sleeve	Copper	Larsen Supply Co. (D)	ND	Yes*
59	½” Nipple	Galv. Steel	Larsen Supply Co. (D)	ND	Yes*

(1) Denotes primary role as Manufacturer (M) or Distributor (D) of product.

(2) (ND) indicates result below limit of quantitation (LQ) for ICP-AES lead testing. LQ = 0.012%.

(3) Asterisk (\*) indicates observation of “lead-free” certification markings on fitting or packaging, or notation of such in production description on website of hardware store or product distributor/manufacturer.

## SECTION 4. DISCUSSION

As indicated in Table 2, above, 58 out of the 59 fittings tested were compliant with the “lead-free” requirements for maximum allowable lead content set forth in Health and Safety Code Section 116875. The wetted surface of one brass elbow exceeded the statutory “lead-free” threshold, with a lead concentration of 3.5%, or 35,000 milligram per kilogram (mg/kg), for the fitting’s wetted surface material. None of the fittings were comprised of more than a single component, and effort was directed toward evaluating copper, brass, bronze, and galvanized steel fittings that are currently in commerce. The following observations are noted, in relation to the 2017 testing results:

- Lead levels were below the limit of quantitation (LQ) for nearly two-thirds of the fittings tested (39 of the 59 total). The LQ for this testing was 125 mg/kg or 0.012%.
- Lead levels above the LQ were observed in 20 fittings, with concentrations that ranged between 0.013% and 3.5%. Of these 20 fittings, the median lead concentration was 0.066% (662 mg/kg), with a standard deviation (SD) of 0.767%. However, when the single non-compliant fitting was removed from the data set, the median concentration decreased slightly, to 0.063%, and the SD was reduced considerably, to 0.057%.
- Seventeen (17) of the twenty (20) fittings with lead levels above the LQ were manufactured from brass or bronze. The single, non-compliant fitting was manufactured from brass.
- Only three (3) of the nineteen (19) galvanized steel fittings that were tested in 2017 contained lead levels above the LQ.
- None of the twenty (20) copper fittings contained lead levels above the LQ, which may be expected, as these copper fittings are predominantly manufactured from wrought copper, which is a highly pure grade of copper, with a minimum copper content of 99.3%, per American Society of Mechanical Engineers (ASME) standard B16.22.

DTSC structured the 2017 testing to focus on select fittings, and material types, which were identified to be relatively low cost, commonly used, and likely to connect potable water pipes in residential or commercial buildings for many years, or perhaps many decades, after installation.

Due to limitations of sampling size and requirements under the law, the products selected are not representative of all products offered for sale in California. However, DTSC's sampling and testing data provide some monitoring and compliance baselines. Such information may be useful to identify any trends in products that show a pattern of exceeding "lead-free" standards; provide consumers independent information on product compliance with the lead-free standards; or help identify points of non-compliance in the manufacturing and supply chains. Additionally, this data can assist DTSC in developing future sampling strategies.

## SECTION 5. CONCLUSION

For fittings tested in 2017, DTSC reports a high rate of compliance (98%) with the "lead-free" limits imposed under Health and Safety Code Section 116875. The information provides insight towards the current propensity of different fitting material types to contain lead, and provides consumers with independent information on product compliance with the "lead-free" standards. When multi-component products are tested (as in previous years), the report also helps identify points of non-compliance in the manufacturing and supply chains, by determining which individual components carry the highest lead content. However, DTSC cautions that this testing represents a limited cross-section of fittings offered for sale in California, and therefore, it is not statistically representative of all similar plumbing products in commerce.

## REFERENCES

1. Centers for Disease Control and Prevention (CDC) (2012, August 10). "Lead in Drinking Water and Human Blood Lead Levels in the United States. MMWR. Morbidity and Mortality Weekly Report." Retrieved from:  
<https://www.cdc.gov/mmwr/preview/mmwrhtml/su6104a1.htm>
2. California Department of Public Health (CDPH) (2012). "Top 200 California Zip Codes for BLLs at and above 4.5 micrograms per deciliter, for children less than age 6, with at least 500 children tested, 2012." Retrieved from:  
<https://www.cdph.ca.gov/programs/CLPPB/Documents/Top%20200%20Calif%20Zips%20with%20BLLs%20above%20CDC%20limit%202012%20at%20least%20500%20children%20tested.pdf>
3. Schneyer, J. and Pell, M.B. (2017, Mar. 22). "Exclusive: Lead poisoning afflicts neighborhoods across California." *Reuters*. Retrieved from:  
<http://www.reuters.com/article/us-usa-lead-california-exclusive-idUSKBN16T18Y>
4. Pell, M.B. and Schneyer, J (2016, Dec. 19). "Off the Charts: The thousands of U.S. locales where lead poisoning is worse than in Flint." *Reuters*. Retrieved from:  
<http://www.reuters.com/investigates/special-report/usa-lead-testing/>
5. Department of Public Utilities (2016, July). "Lead Detection Map – July 2016. City of Fresno." Retrieved from: <https://www.fresno.gov/publicutilities/wp-content/uploads/sites/16/2016/11/LeadAALJUL282016.pdf>
6. U.S. EPA (2007). "Method 6010C (SW-846): Inductively Coupled Plasma-Atomic Emission Spectrometry," Revision 3. Retrieved from:  
<https://www.epa.gov/sites/production/files/2015-07/documents/epa-6010c.pdf>
7. U.S. EPA (1996). "Method 3050B: Acid Digestion of Sediments, Sludges, and Soils," Revision 2. Retrieved from: <https://www.epa.gov/sites/production/files/2015-06/documents/epa-3050b.pdf>
8. DTSC (2011). "DTSC Sampling for Lead Concentration in California Plumbing Products: 2010 Report of Lead in Plumbing Sampling." Retrieved from:  
<http://www.dtsc.ca.gov/PollutionPrevention/upload/Annual-Report-final-13-July-2011.pdf>
9. DTSC (2013). "2011 Report of Lead in Plumbing Sampling". Retrieved from:  
<https://www.dtsc.ca.gov/PollutionPrevention/upload/LIP-FEB2013.pdf>

# Appendix A: Plumbing Fitting Descriptions

(Starting on next page.)

Sample Number	Material Type	Fitting Type	Product ID	Manufacturer (M) / Distributor (D)	Country of Origin	Unit Cost	Lead Content, mg/kg (%)
1	Copper	1/2" 90° Elbow	C607	NIBCO (M)	USA	\$ 0.70	ND
2	Bronze	1/2" 90° Elbow	C707-LF	NIBCO (M)	Mexico	\$ 6.83	662 (0.066%)
3	Galv. Steel	1/2" Tee	510-603HN	Mueller Global (M/D)	China	\$ 2.37	ND
4	Brass	3/4" Tee	UC370LFA	SharkBite Plumbing Sol.(M)	China	\$ 3.47	150 (0.015%)
5	Brass	1/2" 90° Elbow	323 E90-12	LDR Global Ind., LLC (D)	China	\$ 7.49	396 (0.040%)
6	Brass	3/8" 90° Elbow	323-E90-3S	LDR Global Ind., LLC (D)	China	\$ 6.59	934 (0.093%)
7	Galv. Steel	1/2" 90° Elbow	313-E90-12	LDR Global Ind., LLC (D)	China	\$ 1.79	176 (0.018%)
8	Galv. Steel	3/8" 90° Elbow	341-E90-38	LDR Global Ind., LLC (D)	China	\$ 2.69	ND
9	Galv. Steel	1/2" 90° Elbow	446107	Mueller Global (M/D)	China	\$ 2.29	596 (0.596%)
10	Brass	1/2" 90° Elbow	9317005	Thrifty Supply Co. (D)	China	\$ 6.59	ND
11	Copper	1/2" 90° Elbow	W 61652	Mueller Global (M/D)	N/A	\$ 0.99	ND
12	Copper	1/2" 90° Elbow	107C2	Elkhart Product Corp. (M)	N/A	\$ 0.45	ND
13	Galv. Steel	1/2" 90° Elbow	21923	TSP Brand (M)	Indonesia	\$ 0.80	ND
14	Brass	1/2" 90° Elbow	89207-50	Unknown	China	\$ 5.49	ND
15	Copper	1/2" 90° Elbow	C606	NIBCO (M)	USA	\$ 1.10	ND
16	Brass	3/4" 90° Elbow	UC256LFA	Sharkbite Plumbing Sol. (M)	China	\$ 2.56	165 (0.165%)
17	Brass	1/2" 90° Elbow	N/A	Unknown	China	\$ 4.99	35,000 (3.50%)
18	Copper	1/2" 90° Elbow	N/A	Unknown	N/A	\$ 0.99	ND
19	Copper	1/2" 90° Elbow	107C2	Elkhart Product Corp. (M)	N/A	\$ 1.99	ND
20	Brass	1/2" 90° Elbow	N/A	JMF Company (M/D)	China	\$ 7.99	496 (0.496%)
21	Galv. Steel	1/2" 90° Elbow	510-003BG	Mueller Global (M/D)	N/A	\$ 1.39	ND
22	Galv. Steel	1/2" 90° Elbow	21923	TSP Brand (M)	Indonesia	\$ 1.91	ND
23	Brass	1/2" 90° Elbow	756259	Unknown	Indonesia	\$ 4.22	336 (0.336%)
24	Copper	1/2" 90° Elbow	5332	NIBCO (M)	N/A	\$ 0.73	ND
25	Copper	1/2" 90° Elbow	18-1730	Larson Supply Co. (D)	N/A	\$ 0.98	ND
26	Galv. Steel	1/2" 90° Elbow	30-0008S	Larsen Supply Co. (D)	China	\$ 0.71	ND
27	Brass	1/2" 90° Elbow	30-7008	Larsen Supply Co. (D)	China	\$ 5.12	ND
28	Copper	1/2" 90° Elbow	107C2	Elkhart Product Corp. (M)	N/A	\$ 1.99	ND
29	Galv. Steel	3/4" 90° Elbow	47768	Mueller Global (M/D)	NA	\$ 2.14	1,380 (0.138%)
30	Copper	1/2" 90° Elbow	107C2	Elkhart Product Corp. (M)	NA	\$ 0.73	ND
31	Brass	1/2" 90° Elbow	4338521	JMF Company (M/D)	Taiwan	\$ 9.33	2,250 (0.225%)
32	Galv. Steel	3/4" 90° Elbow	510-004BG	Mueller Global (M/D)	NA	\$ 2.29	ND
33	Copper	1/2" 90° Elbow	18-1750	Copper Fit Industries (M)	NA	\$ 1.69	ND
34	Brass	1/2" 90° Elbow	17-9009	Larsen Supply Co. (D)	China	\$ 6.99	1,120 (0.112%)
35	Galv. Steel	1/2" 90° Elbow	47767	Mueller Industries (M/D)	NA	\$ 2.49	ND
36	Copper	3/4" 90° Elbow	41321	Elkhart Product Corp. (M)	NA	\$ 2.29	ND
37	Brass	3/8" nipple	4338711	JMF Company (M/D)	NA	\$ 3.99	1,360 (0.136%)
38	Galv. Steel	1/2" 90° Elbow	47767	Mueller Global (M/D)	NA	\$ 1.79	ND
39	Copper	3/4" 90° Elbow	18-1750	Larson Supply Co. (D)	NA	\$ 1.59	ND

Sample Number	Material Type	Fitting Type	Product ID	Manufacturer (M) / Distributor (D)	Country of Origin	Unit Cost	Lead Content, mg/kg (%)
40	Brass	1/2" 90° Elbow	4568291	NIBCO (M)	China	\$ 4.49	748 (0.075%)
41	Galv. Steel	1/2" 90° Elbow	19442148393	LDR Global Ind., LLC (D)	China	\$ 1.79	ND
42	Copper	1/2" 90° Elbow	N/A	Mueller Global (M/D)	NA	\$ 1.59	ND
43	Brass	3/4" 90° Elbow	19442467968	LDR Global Ind., LLC (D)	China	\$ 7.49	368 (0.037%)
44	Galv. Steel	1/2" 90° Elbow	446107	Mueller Global (M/D)	China	\$ 2.29	ND
45	Copper	3/4" 90° Elbow	232132	Elkhart Product Corp. (M)	NA	\$ 1.79	ND
46	Brass	1/2" x 1/4" Insert	134149	Anderson Metals Corp. (M)	NA	\$ 2.99	679 (0.068%)
47	Galv. Steel	3/4" 90° Elbow	21980	Mueller Global (M/D)	China	\$ 2.48	ND
48	Copper	3/4" 90° Elbow	21620	NIBCO (M)	NA	\$ 1.31	ND
49	Brass	1/2" 90° Elbow	314687	Apollo Flow (D)	China	\$ 1.98	1,510 (0.151%)
50	Galv. Steel	3/4" 90° Elbow	32888405035	Mueller Global (M/D)	China	\$ 2.37	ND
51	Copper	3/4" 90° Elbow	39923312884	NIBCO (M)	N/A	\$ 1.31	ND
52	Brass	1/2" 90° Elbow	N/A	SharkBite Plumbing Sol.(M)	N/A	\$ 1.96	146 (0.015%)
53	Copper	1/2" Sleeve	N/A	<i>Unknown</i>	Korea	\$ 0.79	ND
54	Galv. Steel	1/2" Tee	N/A	TSP Brand (M)	Indonesia	\$ 3.66	ND
55	Copper	1/2" Sleeve	N/A	Copper Fit Industries (M)	N/A	\$ 0.29	ND
56	Brass	1/2" 90° Elbow	N/A	<i>Unknown</i>	China	\$ 3.79	125 (0.013%)
57	Galv. Steel	1/2" 90° Elbow	N/A	TSP Brand (M)	Indonesia	\$ 0.79	ND
58	Copper	1/2" Sleeve	18-0730	Larsen Supply Co. (D)	N/A	\$ 1.58	ND
59	Galv. Steel	1/2" Nipple	N/A	Larsen Supply Co. (D)	China	\$ 1.98	ND

\* (ND) = Results below limit of quantitation