

Summary of CDPH Proposed Changes to the General Industry Lead Standard

Introduction

The Cal/OSHA general industry lead standard is based on lead toxicity information that is now over 30 years old. Current medical information clearly demonstrates harmful effects of chronic and low-level exposures to lead in adults, levels well below those currently allowed by the standard. The California Department of Public Health's Occupational Lead Poisoning Prevention Program (OLPPP), has reviewed the recent scientific information and has made health-based recommendations on the care of lead-exposed employees¹. These recommendations need to be incorporated into revised lead standards.

Sections of Standard Needing Updating

Based on current medical/toxicological knowledge of lead, OLPPP is recommending revisions of the Medical Surveillance, Medical Removal Protection (MRP), Permissible Exposure Limit (PEL) and Action Level (AL) sections of the general industry (GI) standard. OLPPP is also recommending changes to Protective Clothing, Hygiene, Training, and Warning Sign requirements to strengthen these aspects of the standard consistent with current medical/toxicological knowledge.

Summary of Key Recommendations

Medical Surveillance

- Medical surveillance, including blood lead level (BLL) testing, should be provided to all employees with potential for lead exposure and should not be dependent on personal airborne lead level measurements.
- After the initial series of BLLs, time intervals between sampling need to reflect the importance of maintaining BLLs below 10 µg/dL, with testing intervals decreasing once BLLs are above 10 µg/dL.
- Examination of teeth and gums is obsolete and should be deleted.
- All employees with the potential for lead exposure should be provided an annual blood pressure measurement and a brief questionnaire regarding medical conditions that might increase the risk of adverse health effects of lead exposure.
- Routine ZPP testing should be deleted.

Medical Removal Protection

- Workers should be removed from lead exposure if a single blood lead concentration exceeds 30 µg/dL or if two successive blood lead concentrations measured over a four-week interval are ≥ 20 µg/dL.

Permissible Exposure Limit/Action Level

- The PEL and AL should be reduced in order to achieve lower BLLs which reflect new medical/toxicological information on chronic and low-level health effects.

¹ [OLPPP Medical Guidelines for the Lead-Exposed Worker](#), April 2009. (See:

www.cdph.ca.gov/Programs/CCDPPP/DEODC/OHB/OLPPP/CDPH%20Document%20Library/medgdln.pdf)

Additional Recommendations

Protective Work Clothing

- Employers should be required to provide protective work clothing and shoes to all employees exposed to lead at or above the AL.

Hygiene

- More health protective hygiene practices and policies should be in place to eliminate ingestion of lead.
- Employers should be required to regularly test surfaces in lunchroom facilities, as defined in the standard, and to clean more frequently when lead is found. A quantitative limit on surface contamination that should never be exceeded in these facilities should be set and acceptable sample collection and analysis methods should be specified.

Training

- Employee training should be repeated quarterly.
- Training should be provided in a format that is accessible to employees. Specifically, training should be in a language understandable to workers and the methods used should be appropriate for employees with no or low literacy skills. Training should maximize the use of participatory and hands-on methods.

Warning Signs

- Employers should be required to post a warning sign in areas where lead is present. The sign should be in a language understandable to workers.

Medical Surveillance

Trigger for Medical Surveillance ²

Recommendation: Medical surveillance, including blood lead level testing, should be provided to all employees with the potential for lead exposure and should not be dependent on personal airborne lead level measurements.

The current standard requires medical surveillance of exposed workers only if personal airborne lead level measurements exceed $30 \mu\text{g}/\text{m}^3$ on 30 or more days per year. As few employers ever conduct the air monitoring required for making this determination, many lead-exposed workers never receive the benefit of medical surveillance. In addition, using personal airborne lead level measurements as the trigger for medical surveillance misses possible dangerous ingestion exposure that may occur even when airborne lead levels are low.

OLPPP is providing a definition of a “de minimus” lead level above which employers would be required to provide employees with medical surveillance. OLPPP’s definition of de minimus is not dependent on air sampling and is based on the program’s experience developing and using a regulatory definition for de minimus.

Frequency of BLL Testing

Recommendation: After the initial BLL, time intervals between sampling need to reflect the importance of maintaining BLLs below $10 \mu\text{g}/\text{dL}$, with testing intervals decreasing once BLLs are above $10 \mu\text{g}/\text{dL}$.

Specifically, all employees subject to medical surveillance should have a BLL at least every month for the first three months or upon change in task to a higher exposure, then every six months thereafter. Employees with a BLL at or above $10 \mu\text{g}/\text{dL}$ should be tested at least every three months, and those with a BLL at or above $20 \mu\text{g}/\text{dL}$ should be tested at least every four weeks. Once three consecutive BLLs, taken at least four weeks apart, indicate a BLL below $10 \mu\text{g}/\text{dL}$, the testing reverts to at least every six months. Employees on medical removal protection due to an elevated blood lead level should be tested every four weeks during the removal period.

Medical Examinations

Recommendation: Examination of teeth and gums is obsolete and should be deleted.

Improvements in oral hygiene and decreases in average blood lead levels make examination of the teeth and gums obsolete and OLPPP recommends deleting this component of the exam. The content of the baseline or pre-placement history and physical exam for lead-exposed employees should continue to follow the comprehensive scope already in the lead standard.

Recommendation: Provide to all employees with the potential for lead exposure an annual blood pressure measurement and a brief questionnaire regarding the presence of medical

² Primary Reference for this section: Kosnett M, Wedeen R, Rothenberg S, Hipkins K, Materna B, Schwartz BS, Hu H, Woolf A. (2007). [Recommendations for Medical Management of Adult Lead Exposure. Environmental Health Perspect, 115\(3\):463-471](http://www.ehponline.org/members/2006/9784/9784.pdf). (See: <http://www.ehponline.org/members/2006/9784/9784.pdf>)

conditions (such as renal insufficiency) that might increase the risk of adverse health effects of lead exposure.

This will supply physicians overseeing employee care with an annual update on medical information which could be important to consider in medical management decisions of lead-exposed workers. OLPPP can assist with the development of an annual questionnaire.

Labs

Recommendation: Routine ZPP testing should be deleted.

OLPPP recommends deleting routine measurement of zinc protoporphyrin as it is an insensitive biomarker of lead exposures in individuals with blood lead concentrations less than 25 µg/dL.

MRP Level³

Recommendation: Workers should be removed from lead exposure if a single blood lead concentration exceeds 30 µg/dL or if two successive blood lead concentrations measured over a four-week interval are ≥ 20 µg/dL.

Looking at the preamble to the Federal OSHA's general industry lead standard, MRP is viewed as a protective, preventive health mechanism providing temporary medical removal for workers at risk of sustaining material impairment to health from continued exposure to lead. OLPPP's blood lead level removal criteria derive from the conclusion that long-term blood lead levels in excess of 10 µg/dL must be avoided to prevent long-term health risks associated with lead exposure (including hypertension, effects on renal function, cognitive dysfunction, and adverse female reproductive outcomes).

OLPPP is also evaluating the need for recommendations for extending the maximum period of time of medical removal protection benefits for workers with chronic exposure to lead, based on modeling of the decline of elevated BLL in workers with significant bone stores. As discussed in more detail below, OLPPP is working with the California Environmental Protection Agency's (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) on pharmacokinetic modeling for lead.

PEL/AL

Recommendation: The PEL and AL should be reduced in order to achieve lower BLLs which reflect new medical/toxicological information on chronic and low-level health effects.

The existing lead PEL of 50 µg/m³ was selected with a goal of achieving a mean and maximum BLL of 40 µg/100g and 60 µg/100g, respectively⁴, and was derived from computer modeling of correlations between air lead levels and corresponding BLLs. The PEL was based on consideration of the health effects associated with exposure to lead, feasibility issues⁵, and

³ Primary Reference for this section: Kosnett M, Wedeen R, Rothenberg S, Hipkins K, Materna B, Schwartz BS, Hu H, Woolf A. (2007). [Recommendations for Medical Management of Adult Lead Exposure. Environmental Health Perspect, 115\(3\):463-471](http://www.ehponline.org/members/2006/9784/9784.pdf). (See: <http://www.ehponline.org/members/2006/9784/9784.pdf>)

⁴ Federal Register, 1978, U.S. Department of Labor, Occupational Safety and Health Administration, Occupational Exposure to Lead, Attachments to the Preamble for the Final Standard, Vol. 43-No. 225, November 21. p. 54400.

⁵ Ibid. p. 54412.

correlation of airborne concentrations of lead with BLLs associated with adverse health effects and symptoms of exposure. Physicians and scientists now recognize that health effects can occur with long-term BLLs in excess of 10 µg/dL; a BLL goal of 40 µg/dL is unacceptable. In addition, lower air lead levels not achievable in 1978 are now feasible.

The existing lead AL of 30 µg/m³ was set at a 'point commensurate with the beginning of potential risks to reproductive capacity.' According to the Attachments to the Preamble for the Final Lead Standard, the 'blood lead level of both men and women who wish to plan pregnancies should be maintained at less than 30 µg/100 g during this period, and this evidence forms the basis for the action level of 30 µg/m³, and for other provisions of the standard.'⁶ It is now recognized that adverse female reproductive outcomes associated with lead exposure in adults are associated with BLLs of 5 µg/dL or higher.

OLPPP has not yet developed specific recommendations for a health-based PEL and AL. We are working in collaboration with Cal/EPA's OEHHA to select the best available physiologically-based pharmacokinetic model to generate a revised PEL and AL, one which takes into account current medical information about the health effects of lead at lower BLLs and potential routes of workplace exposure. When this work is completed OLPPP will make a specific recommendation on the appropriate health-based PEL and AL and will provide documentation for the levels.

Protective Work Clothing

Recommendation: Employers should be required to provide protective work clothing and shoes to all employees exposed to lead at or above the AL.

The current standard does not require that employers provide protective work clothing and shoes until exposures are above the PEL. OLPPP believes that this is insufficiently protective. Lead brought home from the workplace on workers' clothes and shoes has resulted in numerous cases of lead poisoning in children and other family members.⁷

Hygiene

Recommendation: Eating, drinking, smoking, or applying cosmetics should be prohibited in areas where lead is present above the de minimus level.

Recommendation: Workers should be required to wash up before eating, drinking, smoking or applying cosmetics when lead is present above the de minimus level.

⁶ Ibid. p. 54412.

⁷ National Institute of Occupational Safety and Health. (1995). [Report to Congress on Workers' Home Contamination Study Conducted Under the Workers' Family Protection Act \(29 USC 671a\), DHHS \(NIOSH\) Publication No. 95-123](#). See: <http://www.cdc.gov/niosh/pdfs/95-123-a.pdf>; Hipkins KL, Materna BL, Payne SF, Kirsch LC (2004). Family Lead Poisoning Associated with Occupational Exposure. *Clinical Pediatrics*, November/December 2004: 845-849. E A Whelan, G M Piacitelli, B Gerwel, T M Schnorr, C A Mueller, J Gittleman, and T D Matte. (1997). Elevated blood lead levels in children of construction workers. *Am J Public Health* 87: 1352-1355.

Recommendation: Employers should be required to provide a clean eating area whenever lead is present above the de minimus level. Employers should be required to conduct qualitative testing for lead to ensure cleanliness.

Studies have shown an association between lead contamination on workers' hands and their blood lead levels.⁸ To eliminate the potential for ingestion of lead, more health protective hygiene practices and policies are needed. Elimination of the potential for exposure via ingestion will help achieve lower BLLs which reflect new medical/toxicological information on chronic and low-level health effects.

Recommendation: Employers should be required to regularly test surfaces in lunchroom facilities, as defined in the standard, and to clean more frequently when lead is found. A quantitative limit on surface contamination that should never be exceeded in these areas, as well as change rooms, should be set and acceptable sample collection and analysis methods should be specified.

To minimize ingestion as an exposure route, the general industry lead standard requires that employers provide clean lunchrooms and clean change rooms. However, the standard does not define clean in quantitative terms, making it difficult for Cal/OSHA to enforce these provisions. In fact, several Cal/OSHA inspectors have asked OLPPP for guidance on quantitative surface contamination limits they could reference in their citations.

OLPPP has not yet developed a specific recommendation for a quantitative limit for surface contamination. As described earlier in this document, we are working in collaboration with California Environmental Protection Agency's OEHHA to select the best available pharmacokinetic model for lead. When this work is completed OLPPP will make a specific recommendation for a quantitative limit and will provide documentation for the level.

Employee Information and Training⁹

Recommendation: In addition to the current training requirements of the standard, employee training should be repeated quarterly.

The current requirement that training only be repeated annually is insufficient. More frequent training will remind workers of the need to consistently follow lead-safe practices and ensure that employers address new hazards or changes to work processes in a timely manner.

Recommendation: Training should be provided in a format that is accessible to employees. Specifically, training should be in a language understandable to workers and the methods used should be appropriate for employees with no or low literacy skills. Training should maximize the use of participatory and hands-on methods.

⁸ Askin, D.P., Volkman, M. (1997). Effect of personal hygiene on blood lead levels of workers at a lead processing facility. *Am Ind Hyg Assoc J*, Oct (58)10:752-753.

⁹ Primary References for this section: National Research Council, (2003). *Safety is Seguridad*. Washington, DC. National Academy of Sciences; Brunette, M.J. (2005). *Development of Educational and Training Materials on Safety and Health: Targeting Hispanic Workers in the Construction Industry*. *Fam Community Health*, 28, No. 3, 253-266; Gillen, M., Baltz, D., Gassel, M., Kirsch, L., Vaccaro, D., (2002). Perceived safety climate, job demands, and coworker support among union and nonunion injured construction workers. *J Safety Res*, 33, 33-51; Harrington, D., Materna, B., Vannoy, J, Scholz, P. (2009). *Conducting Effective Tailgate Trainings*, *Health Promot Pract*, Volume 10 Issue 3, 359-369.

In OLPPP's experience employer lead safety training is often provided only in English and is heavily dependent on written materials with little use of participatory and hands-on methods. The result is that many workers are poorly trained in lead safety.

Warning Signs

Recommendation: Employers should be required to post a warning sign in areas where lead is present above the de minimus level. The sign should be in a language understandable to workers.

The current standard requires that a warning sign be posted in work areas that exceed the PEL. The sign warns workers that lead is a poison and that no smoking or eating is allowed in the area. As OLPPP is recommending that eating, drinking, and smoking be prohibited in areas where lead is present above the de minimus level, a warning sign should be required in any area where lead is present above the de minimus level.

Comparison Table of Current GI Standard Triggers/Requirements vs. Proposed Triggers/Requirements (6/3/10)

REQUIREMENT	TRIGGER			
	Scope	De minimus	AL	PEL
Exposure monitoring	--Initial determination (air monitoring of single most highly exposed employee)		--Initial air monitoring representative of all employee exposures --Repeat every 6 months	--Repeat monitoring every 3 months
Protective clothing + laundry			--Protective clothing and laundry service	--Protective clothing and laundry service
Housekeeping	--All work surfaces maintained free of lead dust accumulation			
Hygiene (next 7 reqs.)				
Prohibit eating, drinking, smoking, in work areas		--Prohibit eating, drinking, smoking, etc in work areas		Prohibit eating, drinking, smoking, etc in work areas
Change rooms			--Provide clean change rooms	--Provide clean change rooms
Showers				--Provide showers
Lunchrooms/eating area		--Provide clean eating area		--Provide clean lunchroom facilities as defined in standard
Wash-up requirement		--Ensure employees wash-up before breaks		--Ensure employees wash-up before breaks
Surface contamination limit				--Quantitative limit for lunchroom facilities and change rooms
Surface sampling		--Test eating area surfaces weekly with a colorimetric method		--Test lunchroom facilities weekly with colorimetric or quantitative method
Medical surveillance		--Enroll in medical surveillance program	--Enroll in medical surveillance if exposure \geq AL 30 or more days/year	
Medical removal protection		--Transfer to area at or below the de minimus	--Transfer to area at or below the AL	
Training	--Inform workers of contents of App A&B if potential for air exposure at any level	--Inform employees of contents of Appendices A&B	--Comprehensive training	--Comprehensive training
Signs		--Warning sign in work area with lead above the de minimus		--Warning sign in work area above the PEL
Exposure Control				Engineering, work practice, respirators
Compliance Plan				Written plan

Black text = current standard; blue text = CDPH proposed changes • California Department of Public Health • [Occupational Lead Poisoning Prevention Program](#)