Respiratory and Other Health Hazards in Construction

Construction tasks often include abrasive blasting, tuck-pointing, cement finishing, wood cutting and sanding, masonry work, painting, gluing, cleaning with solvents, welding, and using diesel-powered heavy equipment. All of these can contribute to respiratory diseases (such as silicosis, asbestosis, chronic obstructive pulmonary disease [COPD], and lung cancer) and other health problems (for example, neurological effects from metals and solvents) in the years following exposure, and can reduce both duration and quality of life for workers.[1]

In 2010, more than 50% of construction workers reported that they were regularly exposed to vapors, gas, dust, or fumes at work twice a week or more, which was more than double that of all industries combined (chart 35a). Based on the O*NET occupational exposure ratings (*see* page 33), more than half of construction *production occupations* (*see* Glossary and page 11 for occupational classifications) are exposed to contaminants, such as pollutants, gases, dust, or odors, at least once a week (scored 75 or greater; chart 35b).

O*NET data represent only general occupational exposures for all industries, though some hazards are specific to construction. For example, welding fume exposure is a pervasive hazard in construction. According to data collected over a 30-year period (1978-2008) by the U.S. Occupational Safety and Health Administration (OSHA), welders in construction are exposed to a wide variety of toxic metal fumes at levels that exceed occupational exposure limits. Referenced limits include OSHA's Permissible Exposure Limits (PEL),[2] the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV®),[3] and the National Institute for Occupational Safety and Health's (NIOSH) Recommended Exposure Limits (REL).[4] Among construction welders, average lead exposure was four times all three limits (chart 35c).

Hazard-specific OSHA PELs were generally established over 40 years ago, when OSHA was created. Newer standards for hexavalent chromium (CrVI), lead, and cadmium were promulgated in more recent decades. Yet, OSHA's current standards continue to exceed most limits established by other organizations. Based on a large database of well over 500 welding fume exposure measurements collected by CPWR – The Center for Construction Research and Training, between 1995 and 2008, the average CrVI exposure level among construction welders is about 80% of the current OSHA PEL, but four times the NIOSH REL, with many samples exceeding the average level during stainless steel welding (chart 35d). In addition, average manganese exposures are roughly half the manganese TLV®, but the highest exposures far exceed the established limit.[5]

Construction workers are exposed to silica – a known respiratory hazard – when performing numerous tasks, such as abrasive blasting, tuck-pointing, block and brick cutting, grinding, drilling, and cutting and chipping concrete. These hazardous exposures can be reduced by dust control methods, such as local exhaust ventilation (LEV) and the use of water as a dust suppressant. For example, engineering controls such as LEV may decrease respirable silica exposure by up to 97% when using tuck-point grinders equipped with LEV.[6] Using a wet stationary saw instead of a dry portable masonry saw for block and brick cutting decreased respirable silica exposure by about 90%. A dry portable masonry saw equipped with LEV was even more effective, dropping respirable silica exposures from 2.83 mg/m^3 to 0.11 mg/m^3 for block cutting and from 0.94 mg/m^3 to 0.08 mg/m^3 for brick cutting.[3,4,6]

1. Centers for Disease Control and Prevention. 1994. *Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs): Silica, Crystalline (As Respirable Dust)*. NIOSH Publications and Products. http://www.cdc.gov/niosh/idlh/14808607.HTML (Accessed August 2012).

2. Occupational Safety and Health Administration. *Regulation 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists.* http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10629 (Accessed February 2013).

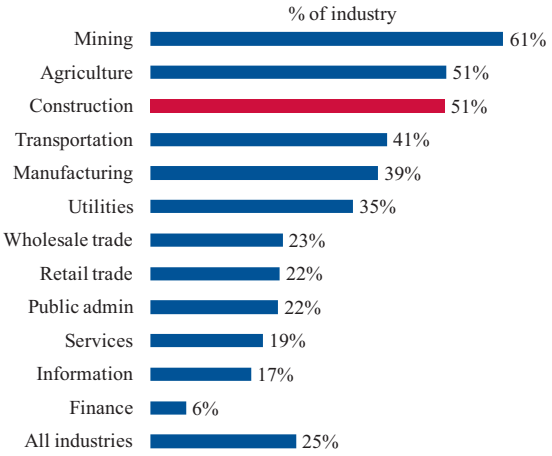
3. American Conference of Governmental Industrial Hygienists. 2011. ACGIH TLVs® and BEIs® Threshold Limit Values for Chemical Substances and Physical Agents. Cincinnati, OH.

4. National Institute for Occupational Safety and Health. 2005. *NIOSH Pocket Guide to Chemical Hazards*. U.S. Department of Health & Human Services (NIOSH). Pub No. 2005-149.

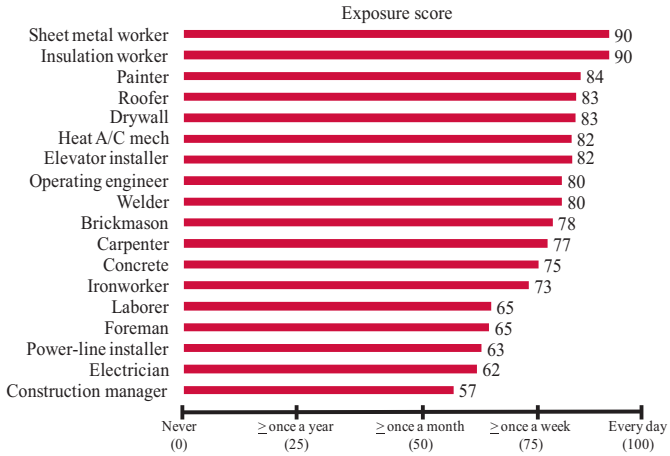
5. Unpublished data collected as part of CPWR's Exposure Assessment Program.

6. Meeker JD, Cooper MR, Lefkowitz D, & Susi P. 2009. Engineering control technologies to reduce occupational silica exposures in masonry cutting and tuck-pointing. *Public Health Reports*, 124(Suppl 1):101-124. Exposure levels should be used with caution as they are based on a small number of samples and may not be generalizable to all workers performing these tasks. The NIOSH REL for respirable crystalline silica is 0.05 mg/m^3 as a time-weighted average for up to 10 hours/day during a 40-hour workweek.

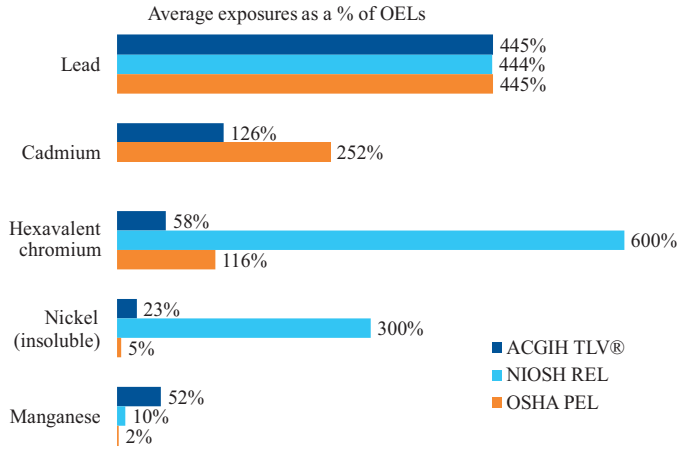
35a. Exposure to vapors, gas, dust, or fumes at work, twice a week or more, by industry, 2010



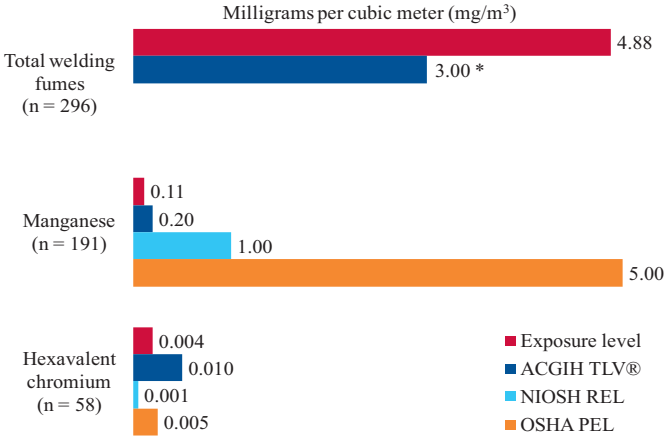
35b. Exposure to contaminants (such as pollutants, gases, dust, or odors) at work, selected occupations



35c. Average welding fume exposures in construction, by occupational exposure limits, based on OSHA data, 1978-2008



35d. Average welding fume exposures in construction compared to occupational exposure limits



Note: Chart 35b - Exposure scores: 0 = Never; 25 = Once a year or more but not every month; 50 = Once a month or more but not every week; 75 = Once a week or more but not every day; and 100 = Every day.
Chart 35d - *There is currently no welding fume TLV®. The TLV® for respirable particulate is used because most welding fumes are in the respirable size range.

Source: Chart 35a - National Center for Health Statistics. 2010 National Health Interview Survey Occupational Health Supplement. Calculations by CPWR Data Center.
Chart 35b - O*NET OnLine. 2010. *Work Context: Physical Work Conditions*. http://www.onetonline.org/find/descriptor/browse/Work_Context/4.C.2/ (Accessed May 2012).
Chart 35c - Flynn M & Susi P. Welding Exposures in the Construction Industry - 30 Years of OSHA Data (Under review at Archives of Environmental and Occupational Health - Manuscript ID 11-12-062).
Chart 35d - Unpublished data collected as part of CPWR's Exposure Assessment Program.