

**Occupational Exposure Limits –
Making Sense of
Multiple Guidelines**

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Employers should understand which regulations apply where they operate and the level of protection they desire for employees.

To reduce the risk of workers suffering discomfort or irritation or developing occupational diseases, the Occupational Safety and Health Administration (OSHA) sets permissible exposure limits (PELs), which are mandatory regulatory limits for the exposure of a worker to a concentration of a substance in the air. PELs are typically measured in parts per million (ppm) or in milligrams per cubic meter (mg/m³). To evaluate the risk to employees' health, employers conduct exposure monitoring or gather related exposure measurements; the results are compared to an Occupational Exposure Limit (OEL). A number of different OELs may be utilized when assessing risk for a variety of purposes, and these are discussed below.

The OSHA air contaminant PELs for general industry can be found at 29 CFR 1910.1000, in the three Z tables and the substance-specific standards (found at 1910.1001 through 1053). OSHA State Plans that have the same or more protective PEL than the federal OSHA PELs may also exist. Employers should understand which regulations apply to each state in which they operate.

There are other accepted and utilized OEL guidelines which provide exposure guidance that is based on more current toxicological information. The most commonly referenced OELs are the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). The TLVs are guidelines that may differ from the OSHA PELs and are often lower than the OSHA standards. Employers should note that the TLVs are the most current and protective worker exposure values available. They are reviewed annually and where warranted, are updated. The TLVs are designed to give reasonable protection to the health and wellbeing of most employees exposed to air contaminants under normal working conditions.

OSHA PELs vs NIOSH RELs and ACGIH TLVs

In a statement on OSHA.gov, OSHA provides notice that their PELs are “outdated and inadequate for ensuring protection of worker health.”¹ They state further that “Industrial experience, new developments in technology and scientific data clearly indicate that in many instances the PELs are not sufficiently protective of worker health.”²

To help remedy this situation, OSHA has also created a new web resource – the Annotated Permissible Exposure Limits,³ or annotated PEL tables. This new site enables employers to view and voluntarily adopt newer workplace exposure limits that provide a greater degree of protection for employees. OSHA will continue to enforce their regulatory PELs, but on their website provides a recommendation that advises employers to utilize the lower occupational exposure limits listed in the annotated tables, since OSHA's PELs may not be fully protective:

“OSHA's mandatory PELs in the Z-Tables remain in effect. However, OSHA recommends that employers consider using the alternative occupational exposure limits because the Agency believes that exposures above some of these alternative occupational exposure limits may be hazardous to workers, even when the exposure levels are in compliance with the relevant PELs.”⁴

The annotated PEL tables provide a side-by-side comparison of the OSHA PELs to the California Division of Occupational Safety and Health (CalOSHA) PELs, the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limits (RELs), and to the ACGIH TLVs. The annotated PEL tables offer an accessible reference source for relatively up-to-date (as of 2019⁵) workplace exposure limits. The annotated PELs are available at www.osha.gov/dsg/annotated-pels/index.html.

Other OELs to Consider

Besides the regulatory and voluntary OELs discussed above, there are also other OELs – often set for specific reasons. Example: The Toxicology Excellence for Risk Assessment (TERA) Occupational Alliance for Risk Science (OARS) [www.tera.org/OARS/index.html] develops Workplace Environmental Exposure Levels (WEELs) exposure guidelines for specific chemicals for which there are no other established OELs.

There are four types of OELs: 8- or 10-hour time weighted average (TWA) exposures; short-term (15 minute) exposure limits (STELs); ceiling (C) values; and peak limits (Peak Limit) – a combination of a STEL and a ceiling value. An excellent discussion of these terms is available in the Introduction section of the TLV Book and is summarized below:⁶

- **The 8 or 10-hour TWA limit** refers to the average exposure concentration of a chemical substance during a normal 8- or 10-hour workday and 40-hour workweek. It is referenced mainly for materials that have chronic inhalation health effects. Consideration must be given when employees work extended work-shifts, as many of the TWA exposure limits may not provide adequate protection given the longer exposure times. The TWA value should be reduced when evaluating exposures during extended work shifts.
- **The STEL** is a 15-minute TWA exposure limit that shall not be exceeded at any time during a workday, even if the 8-hour TWA exposure would remain within the 8-hour TWA exposure limit. Exposures at the STEL level may only occur 4 times per day or fewer with 60 minutes between each exposure. STELs are designed to prevent irritation or short-term health effects. OSHA occasionally uses "peak" exposures of various time durations.
- **Ceiling limit (C)** refers to the concentration of a substance that should not be exceeded at any instant. Ceiling limits are set to prevent irritant or acute effects.
- **TLV Peak limits** may apply for substances with a-TWA but no STEL. A peak limit is similar to a STEL; however, the peak limit exposure should not exceed 3 times the TWA limit as a STEL and should never be more than 5 times the TWA. Peak limit exposures must not cause the 8-hour TWA to be exceeded.

In addition to the numerical OEL, the ACGIH TLVs, NIOSH RELs and OARS WEELs provide documentation that explains the rationale for the establishment of these OELs and cite the references they use to arrive at the numerical OEL value. The ACGIH requests that the user of their TLVs review and factor in the information from the TLV documentation when utilizing the TLV to protect workers.⁷

Chubb Global Risk Advisors (CGRA) has provided a listing of *Useful Websites for OEL Regulations/Guidelines* in the Appendix to this article

Our team of industrial hygiene specialists has also created a listing of Occupational Exposures Values, which consolidates the ACGIH TLVs (including 2021 updated TLVs and new notice of intended changes), OSHA PELs, NIOSH RELs, OARS WEELs and the German MAK regulations into an easy-to-use spreadsheet.

Connect With Us

To obtain a copy of CGRA's listing of Occupational Exposures Values, contact Chubb Global Risk Advisors at globalriskadvisors@chubb.com or 866.357.3797 (toll-free)

www.chubb.com/CGRA

1. www.osha.gov/dsg/annotated-pels/index.html; accessed April 29, 2020

2. Ibid

3. Ibid

4. Ibid

5. Ibid

6. American Conference of Governmental Industrial Hygienists, Cincinnati, OH; "TLVs and BEIs – Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Industries"; 2020.

7. Ibid

Useful Websites for OEL Regulations/ Guidelines

(Note: Websites subject to change)

Canada Regulations

Canada's National Workplace Health and Safety Website – [Maintained by CCOSH](#)

Provides links to the Canadian Territories in one location (very good).

Canadian Center for Occupational Safety and Health – [CCOSH](#)

United States of America Regulations/Guidelines

Occupational Safety and Health Administration (OSHA) –

[Permissible Exposure Limits – Annotated Tables](#)

OSHA State Plan States – www.osha.gov/dcsp/osp/approved_state_plans.html

Mine Safety and Health Administration (MSHA) – [PH06-IV-1 Metal and Nonmetal Health Inspection Procedures](#)

American Conference of Governmental Industrial Hygienist (ACGIH) – [Threshold Limit Values \(TLVs\)](#)

National Institute for Occupational Safety and Health (NIOSH) – [Pocket Guide to Chemical Hazards](#)

NIOSH – [Immediately Dangerous to Life or Health \(IDLH\)](#)

Environmental Protection Agency (EPA) –

[Integrated Risk Information System \(IRIS\)](#)

US Department of Commerce – National Oceanic and Atmospheric Administration (NOAA) – Public Exposure Guidelines –

[AEGs](#) (Acute Exposure Guideline Levels); [ERPGs](#) (Emergency Response Planning Guidelines); [TEELs](#) (Temporary Emergency Exposure Limits)

Center for Disease Control and Prevention (CDC) – **Agency for Toxic Substance and Disease Registry (ATSDR)** – [Toxicological Profiles](#)

Toxicology Excellence for Risk Assessment (TERA) – [TERA WEELS](#)

Mexico/Australia/South America/Japan/New Zealand/Europe Regulations

International Labour Organization (a specialized agency of the United Nations) – [ILOs Chemical Exposure Limits](#) for Various countries – Not all links work correctly or are in English, but it is a start.

<http://limitvalue.ifa.dguv.de/>

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