

7.4: Occupational (Workplace) Exposure Standards/Guidelines/Approaches

Occupational Safety and Health Administration (OSHA) Standards

Recommended or mandatory **occupational exposure limits (OELs)** for chemicals exist in many countries. For example, legal standards in the United States are established by the Occupational Safety and Health Administration (OSHA). These standards are known as [Permissible Exposure Limits \(PELs\)](#). The majority of PELs were issued after the 1970 [Occupational Safety and Health \(OSH\) Act](#).

OSHA maintains the "Permissible Exposure Limits – Annotated Tables" that contain comparative information taken from federal, state, and professional organizations such as the:

- California Division of Occupational Safety and Health (Cal/OSHA) PELs.
- ACGIH® (formerly known as the [American Conference of Governmental Industrial Hygienists](#)) Threshold Limit Values (TLVs®).
- [National Institute for Occupational Safety and Health](#) (NIOSH) Recommended Exposure Limits (RELs).

These tables list air concentration limits for chemicals but do not include notations for skin absorption or sensitization. The PEL Annotated Tables include the following: [Table Z-1](#), [Table Z-2](#), and [Table Z-3](#).

Figure 7.4.1. Screenshot of a portion of OSHA PEL Annotated Table Z-2

Most OSHA PELs are for airborne substances with allowable exposure limits averaged over an 8-hour day in a 40-hour week. This is known as the **Time-Weighted-Average (TWA) PEL**. While adverse effects are not expected to be encountered with repeated exposures at the PEL, OSHA recommends that employers consider using the **alternative occupational exposure limits** because it believes levels above some of the alternative occupational exposure limits may be hazardous to workers even when the exposure levels are in compliance with the relevant PELs.

Short Term Exposure Limits, Ceiling Limits, and Skin Designations

OSHA also issues Short Term Exposure Limit (STELs) PELs, Ceiling Limits, and PELs that carry a skin designation.

- [Short Term Exposure Limit \(STELs\)](#) -- PEL STELs are concentration limits of substances in the air that a worker may be exposed to for 15 minutes without suffering adverse effects. The 15-minute STEL is usually considerably higher than the 8-hour TWA exposure level.
- [Ceiling Limits](#) are concentration limits for airborne substances that should never be exceeded.
- A [skin designation](#) indicates that the substance can be readily absorbed through the skin, eye or mucous membranes, and substantially contribute to the dose that a worker receives from inhalation of the substance. OSHA standards do not include surface contamination criteria or quantifications for skin absorption.

Theoretically, an occupational substance could have PELs as TWA, STEL, and Ceiling Value, and with a skin designation, but that is rare. Usually, an OSHA-regulated substance will have only a PEL as a time-weighted average.

Immediately Dangerous to Life or Health (IDLH)

The **Immediately Dangerous to Life or Health (IDLH)** occupational exposure guideline was developed jointly by the OSHA and NIOSH [Standards Completion Program](#) in 1974. IDLH represents:

- An airborne exposure "likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment" (NIOSH).
- "An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere" (OSHA).

IDLH values can be used in assigning respiratory protection equipment.

Recommended Exposure Limits and Biological Exposure Indices

The NIOSH **Recommended Exposure Limits** (RELs) are also designated as time-weighted average, short-term exposure limits, and ceiling limits. NIOSH also uses immediately dangerous to life or health (IDLH) values.

ACGIH® also has developed **Biological Exposure Indices (BEIs®)** as guidance values for assessing biological monitoring results (concentration of a chemical in biological media such as blood or urine). The OSHA [Policy Statement](#) on the Uses of TLVs® and BEIs® provides an overview on using these guidelines.

Control Banding (CB)

Control banding (CB) is an emerging area internationally for guiding the assessment and management of workplace chemical risks. CB is a technique that determines a control measure such as dilution by air ventilation or engineering controls based on a range or “band” of hazards such as skin irritation or carcinogenic potential and exposures such as an assessment of a small, medium, or large exposure. It is based on the fact that there are a limited number of control approaches, and a history of having many problems solved in the past. CB is used with other health and safety practices such as chemical substitution. It is not a replacement for the use of experts in occupational safety and health and it does not eliminate the need to perform exposure monitoring.

Knowledge Check

1) The Occupational Safety and Health Administration (OSHA) develops legal standards for workplace exposure. These standards are called:

- a) Threshold Limit Values (TLVs)
- b) Recommended Exposure Limits (RELs)
- c) Permissible Exposure Limits (PELs)

Answer

Permissible Exposure Limits (PELs)

OSHA establishes Permissible Exposure Limits, or PELs, which are legal standards for workplace exposure.

2) What exposure standards can be used to assign respiratory protection equipment?

- a) Immediately Dangerous to Life or Health (IDLH)
- b) Short Term Exposure Limits (STELs)
- c) Biological Exposure Indices (BEIs)

Answer

Immediately Dangerous to Life or Health (IDLH)

Immediately Dangerous to Life or Health (IDLH) values can be used in assigning respiratory protection equipment.

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