



# ENCYCLOPEDIA OF TOXICOLOGY

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## Recommended Exposure Limits (REL)

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Recommended exposure limit (REL) is the name used by the US National Institute for Occupational Safety and Health (NIOSH) for the occupational exposure limits (OELs) it recommends to protect workers from hazardous substances and conditions in the workplace.

RELs are not regulations. While they are intended primarily as recommendations to the US Occupational Safety and Health Administration (OSHA) and the Mine Safety and Health Administration (MSHA) for use in promulgating legal standards, they also may help employers, workers, and health professionals to recognize and control occupational hazards. Most RELs have been developed for chemical air contaminants, usually represented as numerical values for airborne concentrations (expressed as ppm,  $\text{mg m}^{-3}$ , or fibers  $\text{cm}^{-3}$ ). However, NIOSH has developed RELs for other hazards, including physical agents such as noise, heat, and ultraviolet radiation. Like other OELs, NIOSH expresses most RELs as time-weighted average (TWA) exposures, for up to 10 h  $\text{day}^{-1}$  during a 40 h workweek.

An REL also may be expressed as a:

- short-term exposure limit (ST) that should never be exceeded and is to be measured in a specified sampling time (usually 15 min), or
- ceiling limit (C) that should never be exceeded even instantaneously, unless specified over a given time period.

In addition to quantitative exposure recommendations, NIOSH occasionally assigns one or more notations to selected RELs. Most prominent of these is the 'skin' designation for chemical substance RELs, indicating the potential for dermal absorption and implying a recommendation that skin exposure be prevented by using good work practices and gloves, coveralls, goggles, and other appropriate equipment.

The US Occupational Safety and Health Act of 1970, in addition to creating OSHA and NIOSH, mandated NIOSH to develop objective safety and health criteria describing RELs "at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience." Most RELs that were independently developed by NIOSH resulted from exhaustive reviews of available data, called criteria documents, in the 1970s. However, the criteria document process almost stopped after the 1970s. NIOSH generated hundreds of RELs in the 1980s through other processes, mainly by accepting most 1989 proposed updates of the OSHA permissible exposure limits (PELs), which generally were derived indirectly from the then-current American Conference of Governmental Industrial Hygienists (ACGIH®) threshold limit values (TLVs®). NIOSH continues to review and develop RELs in much smaller numbers and to publish the RELs in various documents, most notably the frequently updated NIOSH Pocket Guide to Chemical Hazards.

NIOSH develops most RELs from qualitative and semiquantitative risk assessments, using expert judgments based on comprehensive reviews of relevant scientific literature. However, a number of RELs have been based on limits of sampling capabilities or on limits of technological feasibility. In response to an OSHA rule on carcinogens (29 CFR 1990.103), NIOSH had subscribed to a policy calling for 'no detectable exposure levels for proven carcinogenic substances'. NIOSH bases recently developed RELs for carcinogens and other chemical substances on risk evaluations using human and animal health effects data, and on feasibility assessments for engineering controls and analytical methods.

### See also

American Conference of Governmental Industrial Hygienists; Occupational Exposure Limits; Occupational Safety and Health Act, US; Occupational Safety and Health Administration; Occupational Toxicology.

### Further Reading

[1] Fairchild E. J.: Guidelines for a NIOSH policy on occupational carcinogenesis. *Annals of the New York Academy of Sciences* 271:1976. 200–207.

[2] NIOSH. 1992. Recommendations for Occupational Safety and Health: Compendium of Policy Documents and Statements. Cincinnati, OH:US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 92-100.

[3] NIOSH. 2004. Pocket Guide to Chemical Hazards (NPG). Cincinnati, OH:US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 97-140, Fourth printing with changes and updates (2004).

[4] US Public Law 91-596, 91st Congress, S.2193. Occupational Safety and Health Act of 1970.

### Relevant Website

<http://www.cdc.gov> – The current version of the NIOSH *Pocket Guide to Chemical Hazards (NPG)* is available online at an extension on this webpage.

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