Explanation of Exposure Criteria for Chemical Substances

Appendix A

The American Conference of Governmental Industrial Hygienists (ACGIH) publishes Threshold Limit Values (TLV) for selected chemical substances and physical agents. The limits are intended for use as guidelines or recommendations in the control of potential health hazards. The ACGIH TLV are reviewed and revised on a regular basis.

Threshold Limit Values refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

Because of the wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the TLV. A smaller percentage may be affected more seriously by aggravation of a preexisting condition or by development of an occupational illness.

Threshold Limit Values are based on the best available information from industrial experience, and from experimental human and animal studies. The basis on which the values are established may differ from substance to substance. The protection against impairment of health may be a guiding factor, whereas reasonable freedom from irritation may be the basis for others.

The amount and nature of the information available for establishing a TLV varies from substance to substance. Consequently, the precision of the estimated TLV is also subject to variation, and the latest Documentation of Threshold Limit values should be consulted in order to assess the extent of the data available for a given substance.

The Threshold Limit Value-Time Weighted Average (TLV-TWA) is the average concentration for a normal 8-hour workday, for a 40-hour week to which nearly all workers may be repeatedly exposed without adverse effects.

The Threshold Limit Value-Short Term Exposure Limit (TLV-STEL) is defined as a 15-minute or less exposure which should not be exceeded even if the 8-hour TWA is within the TLV. There should be at least 60 minutes between successive exposures at the STEL, and the exposures should not be repeated more than four times a day.

The Threshold Limit Value-Ceiling (TLV-C) concentration should not be exceeded even instantaneously.

Mixtures should be given special consideration in assessing the health hazards. When two or more hazardous substances act upon the same organ system, their combined effect, rather than that of either individually, must be considered. In the absence of information, the effects of the different hazards should be considered as additive. Each component’s concentration is divided by its TLV. The addition of the fractions should not exceed the sum of 1:

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\frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + ... = <1
\]

\[
C_x = \text{Concentration of specific substance in air}
\]
\[
T_x = \text{Threshold Limit Values of same substance}
\]
The Occupational Safety and Health Act of 1970 authorizes the federal government to develop and set mandatory occupational safety and health standards applicable to any business affecting interstate commerce. The responsibility of promulgating and enforcing the standards rests with the Occupational Safety and Health Administration (OSHA) in the United States Department of Labor (US-DOL).

Within its first two years, OSHA adopted Permissible Exposure Limits (PEL) for airborne contaminants from existing federal standards and national consensus standards. In May 1971, OSHA adopted the existing consensus standards of the Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH). Since 1971, OSHA has also issued approximately 25 substance specific health regulations of its own.

In an effort to update inadequate and obsolete information contained in the original air contaminants standard, OSHA issued revised PELs in 1989. In the course of promulgating this new standard, OSHA reviewed the health, risk, and feasibility evidence for all 428 substances for which changes in the PEL were considered.

The final air contaminants standard includes the following changes:

- Adoption of PELs for 164 new substances
- Adoption of updated PELs for 212 new substances
- No change for 225 substances
- The PELs for 9 substances were left unchanged because OSHA is considering more in-depth rulemaking for these substances.

The revised PELs were issued as “Final Rule Limits” and became effective in September 1989. Compliance with the revised limits may be accomplished by a combination of administrative and engineering control methods through December 31, 1991. On July 7, 1992, an Appeals Court decision vacated the “Final Rule” of the Air Contaminants Standard and OSHA assumed a position not to appeal the decision. Effective March 22, 1993 the 1971 Permissible Exposure Limits listed in the Air Contaminants Standard 29 CFR 1910.1000 as “Transitional Limits” are now the current OSHA PEL's in effect from a regulatory standpoint. It should be noted that these limits do not necessarily represent exposure guidelines based on current health effects data. Per the OSHA Director of Compliance Programs, “OSHA believes the 1989 PEL's are more protective and encourages employers to continue compliance efforts to meet these levels particularly where engineering and work practice controls have already been implemented, OSHA always encourages employers to go beyond the minimum protections afforded by the standards.”

OSHA standards often reference an “Action Level.” Normally, the Action Level is defined as one-half of the PEL. It is believed that some workers start to display signs, symptoms or irritations at the Action Level concentrations or exposures. An Action Level is established for some substances to express the level of toxicant requiring medical surveillance, periodic monitoring or other workplace measurements.

Threshold Limit Values (as issued by the American Conference of Governmental Industrial Hygienists) are presented as recommendations and should be used as guidelines for good industrial hygiene practices. By contrast, the OSHA standards are legally enforceable governmental regulations.