



# Standards and Guidelines and Ethical Code of Conduct

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# Section A

## *Historical Perspective*

### Hatch Curve

- Implications:
  - Man-environment interaction is complex
  - Shift in emphasis from overt illness to physiological disturbances that may be precursors of disease

# Section B

## *ACGIH Threshold Limit Values and Biological Exposure Indices*

*American Conference of Governmental Industrial Hygienists*

# Threshold Limit Value (TLV)

- *Threshold limit values (TLVs)* 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 health effects

# Threshold Limit Value (TLV)

- Because of 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 pre-existing condition or by development of an occupational illness

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# Threshold Limit Value (TLV)

Hypersusceptible individuals or those otherwise unusually responsive to some industrial chemicals because of genetic factors, age, personal habits (smoking and use of alcohol or other drugs), medication, or previous exposures may not be adequately protected from adverse health effects of chemicals at concentrations at or below the threshold limits.

# Examples of TLVs

Substance (CAS No.)	Adopted Values			Mol Wgt	TLV Basis – Critical Effect(s)
	TWA (ppm/mg/m <sup>3</sup> )	STEL/C (ppm/mg/m <sup>3</sup> )	Notations		
Azinphos-methyl (86-50-0)	0.2 mg/m <sup>3</sup>		Skin; A4; BEI	317.34	Cholinergic
Barium (7440-39-3) and soluble compounds, as Ba	0.5 mg/mg <sup>3</sup>	—	A4	137.30	Irritation; GI; burns; muscle toxin
Barium sulfate (7727-43-7)	10 mg/m <sup>3</sup> (E)			233.43	Pneumoconiosis (baritosis)
Benomyl (17804-35-2)	10 mg/m <sup>3</sup>		A4	290.32	Dermatitis; irritation
Benz[a]anthracene (56-55-3)			A2	228.30	Cancer
Benzene (71-43-2)	0.5 ppm	2.5 ppm	Skin; A1; BEI	78.11	Cancer
Benzidine (92-87-5)			Skin; A1	184.23	Cancer (bladder)
Benzo[b]fluoranthene (205-99-2)			A2	252.30	Cancer
Benzo[a]pyrene (50-32-8)			A2	252.30	Cancer
P-Benzoquinone, see Quinone					
Benzotrichloride (98-07-7)		C 0.1 ppm	Skin; A2	195.50	Irritation; cancer
Benzoyl chloride (98-88-4)		C 0.5 ppm	A4	140.57	Irritation
Benzoyl peroxide (94-36-0)	5 mg/m <sup>3</sup>		A4	242.22	Irritation
Benzyl acetate (140-11-4)	10 ppm		A4	150.18	Irritation
Benzyl chloride (100-44-7)	1 ppm		A3	126.58	Irritation; lung

## Three categories of Threshold Limit Values are specified as follows:

### 1. *Time-weighted Average (TLV–TWA)*

- This is the time-weighted average concentration for a conventional eight-hour workday and 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.

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## 2. *Short-term Exposure Limit (TLV–STEL)*

- Contaminant concentration averaged over a 15-minute period

This is the concentration to which it is believed workers can be exposed continuously for a short period of time without suffering from:

- Irritation
- Chronic or irreversible tissue damage
- Narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency and provided that the daily TLV–TWA is not exceeded

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### 3. *Ceiling (TLV-C)*

- Instantaneous concentration; or concentration averaged over a 15 minute period if technology does not exist to measure instantaneous concentrations

This is the concentration that should not be exceeded during any part of the working exposure.

# Skin Notation

- *Skin notation (S)* indicates substances for which there is the potential for substantial contribution to exposure via adsorption through the skin
  - Examples:
    - Diazanone
    - Chlordane
    - Carbon disulfide
    - Benzene

# Sensitizer Notation

- Listed substances followed by the *sensitizer notation (SEN)* refer to the confirmed potential for worker sensitization as a result of dermal contact and/or inhalation exposure
  - Examples
    - Formaldehyde
    - Flour dust
    - Glutaraldehyde

# Carcinogenicity Classification

- A1: Confirmed human carcinogen
- A2: Suspected human carcinogen
- A3: Confirmed animal carcinogen with unknown relevance to humans
- A4: Not classifiable as a human carcinogen
- A5: Not suspected as a human carcinogen

# Excursions

- *Excursions* are concentrations above the TLV and are permitted as long as they are balanced by concentrations below the TLV such that the eight-hour TWA is less than the TLV
- Refer to the magnitude of these elevated concentrations and current guidance is that up to 30 minutes at three times the TLV is permitted but five times the TLV is not permitted

# Biological Exposure Indices (BEIs)

- Measurement of chemical determinant in a biological media
- Examples
  - Acetone in urine
  - S-Phenylmercapturic acid (metabolite of benzene) in urine
  - n-Hexane in end-exhaled air
  - Lead in blood

# Section C

*Occupational Safety and Health  
Administration (OSHA) Standards*



# OSHA Terms

- *Permissible exposure limit (PEL)* is that concentration expressed as an eight-hour time-weighted average, which shall not be exceeded
- *Short term exposure limit (STEL)* is that concentration expressed as a 15-minute time-weighted average, which shall not be exceeded

# OSHA Terms

- *Ceiling (C)* is that concentration which shall never be exceeded, although it is expressed as a 10- or 15-minute TWA
- *Action level (AL)* is defined as one-half the PEL
  - Concentrations in excess of the AL trigger specified activities in complete standards

# OSHA Terms

- *Immediately dangerous to life and health (IDLH)* signifies concentrations to substances for which exposure of more than 30 minutes would be expected to be fatal
  - Used in the selection of respirators

# OSHA Terms

- OSHA does not classify carcinogens, but instead relies on the classifications made by the National Toxicology Program (NTP) and the International Agency for Research on Cancer (IARC)

# Section D

*National Institute for Occupational  
Health and Safety (NIOSH)  
and Other Organizations*

# NIOSH

- National Institute for Occupational Safety and Health (NIOSH)
  - Part of Centers for Disease Control
  - Research, recommendation, and training duties
  - Recommended Exposure limits (RELs)

# Recommended Exposure Limits (RELs)

- Recommended by NIOSH
- Created by the OSHA Act
- Associated with Criteria Documents
- Recommendations to OSHA
- Used as another guideline but not law
- Based solely on health considerations
- Usually below corresponding PEL

## **Cannons of Ethical Conduct**

1. Practice their profession following recognized scientific principles with the realization that the lives, health, and well-being of people may depend upon their professional judgment and that they are obligated to protect the health and well-being of people

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# Cannons of Ethical Conduct

2. Counsel affected parties factually regarding potential health risks and precautions necessary to avoid adverse health effects
3. Keep confidential personal and business information obtained during the exercise of industrial hygiene activities, except when required by law or overriding health and safety considerations

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# Cannons of Ethical Conduct

4. Avoid circumstances where a compromise of professional judgment or conflict of interest may arise
5. Perform services only in the areas of their competence
6. Act responsibly to uphold the integrity of the profession