Basic Facts Regarding Chemical Exposure Standards and Guidelines

Chemicals do not have a single ‘safe level.’ Every chemical has multiple health-based exposure standards, limits, and guidelines—these criteria are usually represented as a specific concentration level. The exposure levels can vary depending on the duration and frequency which people may be exposed, as well as the degree of what is considered acceptable risk, which will depend on the type of situation and population. In addition, different standards and guidelines are designed for air, water, soil, and even other sources, such as food.

Health organizations (such as the USEPA, CDC, OSHA/NIOSH, FDA, as well as military health organizations) develop specific exposure concentration levels for a variety of applications. When assessing or preventing health risks associated with chemicals, it is important that the most appropriate health-based chemicals standards/guidelines are used for comparison. Figure 1 shows a generic example of the range of the types of airborne exposure standards and guidelines developed by various organizations for different applications:

Figure 1. Airborne Exposure Standards and Guidelines

Chemical Air Exposure Levels Continuum*

<table>
<thead>
<tr>
<th>Category</th>
<th>Exposure Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic release</td>
<td>IDLH</td>
</tr>
<tr>
<td>Work environments</td>
<td>AEGL-1, AEGL-2</td>
</tr>
<tr>
<td>Ambient air (emissions)</td>
<td>AEGL-3 [ERPGs, TEELs]</td>
</tr>
</tbody>
</table>

*not to scale for any specific chemical—general representation

Use of trademark names(s) does not imply endorsement by the U.S. Army but is intended only to assist in the identification of a specific product.
ACRONYMS and ABBREVIATIONS:

**USEPA**  
United States Environmental Protection Agency

**AIHA**  
American Industrial Hygiene Association

**ACGIH®**  
American Conference of Governmental Industrial Hygienists (ACGIH® is a registered trademark of the American Conference of Governmental Industrial Hygienists.)

**CDC**  
Centers for Disease Control and Prevention

**OSHA**  
Occupational Safety and Health Agency

**NIOSH**  
National Institute for Occupational Safety and Health

**FDA**  
Food and Drug Administration

**WHO**  
World Health Organization

**NRC**  
National Research Council

**mg/m³**  
milligram chemical per cubic meter of air

**µg/m³**  
 microgram chemical per cubic meter of air

**LC₅₀**  
or military casualty prediction, lethal concentration-50% = concentration at which 1/2 of an exposed group are expected to die

**LC₀₁**  
for military casualty prediction Lethal Concentration-1% = concentration at which 1% of an exposed group are expected to die

**EC₅₀**  
for military casualty prediction, Effective Concentration-50% for (Severe) or (Mild/Threshold) effects = concentration at which 1/2 of an exposed group would be expected to have symptoms of designated severity

**IDLH**  
Immediately Dangerous to Life and Health = occupational use, 30 minute standard used as criteria for donning full protective gear

**AEGLE**  
Acute Exposure Guidelines Levels - for civilian emergencies; multiple durations 10 min, 30 min, 1 hr, 4 hr, 8 hr; published by NRC

**AEGL 1**  
initial level above which of discomfort (minor transient effects) may begin to be noted

**AEGL 2**  
level above which effects may begin to be more significant, begin to impair normal activities

**AEGL 3**  
level above which effects may begin to be very severe

**ERPGs**  
Emergency Response Planning Guidelines –developed by AIHA. AEGLs to supersede; also

**PACs**  
Protective Action Criteria—for emergencies—when AEGLs/ERPGs not available; sponsored by DOE Office of Emergency Management and Policy, only for 1 hr

**PALs**  
Provisional Advisory Levels – to assist in emergency planning and decision-making for exposure durations of 24 hr, 30 days, 90 days, and 2 years: temporary values that will not be promulgated nor issued as regulatory guidance by USEPA National Homeland Security Research Center; Levels 1, 2, 3

**TEELs**  
Temporary Emergency Exposure Levels—for emergencies—when AEGLs/ERPGs not available; sponsored by the Department of Energy Office of Emergency Management and Policy; only for 1 hr

**STEL**  
Short-Term Exposure Limit—occupational use; a 15 min ‘ceiling’ level to ensure peak exposures maintain safe conditions

**WPL**  
Worker Population Limit—a military term used for chemical warfare agents; represents standards similar to a TLV (see below)

**TLV®**  
Threshold Limit Value—an 8-hr time weighted average developed by the ACGIH used in occupational settings to ensure. (TLV® is a registered trademark of the American Conference of Governmental Industrial Hygienists.

**GPL**  
General Population Limit—a term used for chronic protection levels developed by CDC for Army for chemical warfare agents; represents criteria similar to adjusted RfC (see below)

**RIC**  
Reference concentration—estimated concentration that could be breathed in continuously every day for a lifetime without adverse effects (primarily used in environmental health risk assessments, developed by U.S. EPA (many found in IRIS website/database)

For additional information, contact Environmental Medicine Program, 410-436-2714