

## Types of Chemicals Covered in the AEGLs Series

AEGLs values for the chemicals listed below were published in the first six volumes of the AEGLs series. AEGLs for additional chemicals will continue to be published in subsequent volumes.

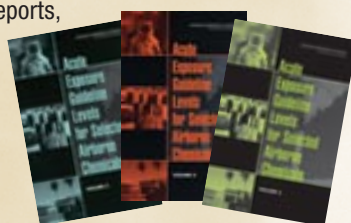
Allylamine	Hydrogen fluoride
Ammonia	Iron pentacarbonyl
Aniline	Methyl hydrazine
Arsine	Methyl isocyanate
Chlorine	Nerve agents GA [tabun],
Chlorine dioxide	GB [sarin], GD [soman], GF,
Chlorine trifluoride	and VX
Crotonaldehyde	Nickel carbonyl
Cyclohexylamine	Phosgene
Diborane	Phosphine
1,1-Dichloro-1-fluoroethane	Propylene glycol dinitrate
(HCFC-141B)	Sulfur mustard
Dimethylhydrazine	1,1,1,2-Tetrafluoroethane
Ethylenediamine	(HFC-134A)
Hydrofluoroether-7100	Tetranitromethane
Hydrogen chloride	Toluene 2,4-and 2,6-diisocyanate
Hydrogen cyanide	Uranium hexafluoride

### Accessing AEGLs Values on the Web!

Coming 2008, The National Academies will launch a website designed to make finalized AEGLs values easily accessible to emergency managers, state officials, and others at <http://dels.nas.edu/aegls>. The site also provides access to the National Research Councils AEGLs reports and related information.

For a complete list of final and preliminary AEGLs values from the U.S. Environmental Protection Agency, visit [www.epa.gov/oppt/aegl/pubs/chemlist.htm](http://www.epa.gov/oppt/aegl/pubs/chemlist.htm)

For more information, contact the National Academies' **Board on Environmental Studies and Toxicology (BEST)** at 202-334-3060 or visit <http://dels.nas.edu/best>. Sign up to receive free e-mail notifications of BEST reports and other news at <http://dels.nas.edu>. To view or to purchase AEGLs reports, visit the National Academies Press at [www.nap.edu](http://www.nap.edu).



## About the Board on Environmental Studies and Toxicology

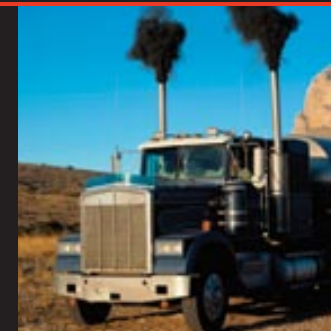
The Board on Environmental Studies and Toxicology addresses environmental pollution problems affecting human health, human impacts on the environment, and the assessment and management of risks to human health and the environment. The board's reports answer questions about air and water pollution; solid and hazardous waste; toxicology; epidemiology; risk assessment; applied ecology; natural resources; and environmental engineering, economics, law, and policy.

## About NRC Reports from the National Academies

The National Academies, through its National Research Council reports, provides a unique public service by working outside the framework of government to ensure independent, expert advice on matters of science, technology, and medicine. Today, the National Academies include three honorary societies that elect new members to their ranks each year—the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine—and the National Research Council, the operating arm that conducts the bulk of the institution's science-policy and technical work. Reports from the National Research Council cover many and diverse issues but all share one key characteristic: the use of peer-reviewed, evidence-based science to provide independent, unbiased advice on policy questions of significance to our nation.

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NATIONAL RESEARCH COUNCIL  
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# Protecting the Public and Emergency Workers from Releases of Hazardous Chemicals

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A Guide to the National Research Council's  
Acute Exposure Guideline Levels (AEGLs) Program



## Acute Exposure Guideline Levels (AEGLs) for Selected Airborne Chemicals

is a series of reports on the adverse effects and safe limits of short-term exposures to hazardous chemical releases. AEGLs values are rapidly becoming the world standard to guide emergency planning, prevention, and response for communities, the military, industrial facilities, and the transportation of chemicals. Preliminary AEGLs values are developed by a national advisory committee and then undergo a rigorous scientific peer-review process overseen by the National Research Council of the National Academies.

## How AEGLs Exposure Limits Are Defined

Three levels—AEGL-1, AEGL-2, and AEGL-3—are developed for each of five exposure periods (10 min, 30 min, 1 h, 4 h, and 8 h). The three AEGL levels represent the airborne concentrations above which it is estimated that the general population, including susceptible individuals such as children and older people, could experience:

**AEGL-1:** notable discomfort, irritation, or certain asymptomatic non-sensory effects. Effects are not disabling and are reversible once exposure stops.

**AEGL-2:** irreversible or other serious, long-lasting adverse health effects, or an impaired ability to escape.

**AEGL-3:** life-threatening adverse health effects or death.

*\* Airborne concentrations are expressed as ppm (parts per million) or mg/m<sup>3</sup> (milligrams per cubic meter)*

## Types of Evidence Used to Develop AEGLs

Various types of evidence are assessed when establishing AEGLs for a chemical including information from:

- Chemical-physical characterizations of hazardous chemicals
- Estimating effects by studying similar chemicals
- Toxicity studies using cell cultures (or other in vitro studies)
- Animal toxicity studies
- Controlled human exposure studies
- Observations of humans involved in chemical accidents
- Human population (epidemiologic studies)

## AEGLs Are Being Used Worldwide to Protect Public Safety

Local emergency responders are using AEGLs values on the spot. For example, on August 28, 2005, a railway tank car emitted styrene gas into the Cincinnati area, forcing approximately 800 people to evacuate the area (including schools and businesses) for four days. Emergency personnel used an AEGL exposure limit for the chemical styrene to determine when the contaminated area was safe for reentry. Following are more examples of how AEGLs values are being used and adopted:

- The U.S. Federal Emergency Management Agency and Department of the Army have adopted AEGLs for chemical warfare agents in case of enemy attacks or accidental releases. Army commanders refer to AEGLs when deciding whether or not to use protective gear, estimating the size of vulnerability zones, and making decisions regarding evacuation procedures.
- The U.S. Department of Transportation is using AEGLs in the calculation of “Protective Action Distances” for toxic-by-inhalation materials that will appear in the 2008 Emergency Response Guidebook (ERG2008). The ERG is a guidebook for use by first responders during the initial phase of a hazardous materials incident to make emergency planning, preparedness and response decisions or to address incidents occurring during the transport of hazardous materials.
- The U.S. Department of Energy uses AEGLs in its Fixed Facility chemical emergency planning guidance.
- The Emergency Response Cards prepared by the U.S. National Institute for Occupational Safety and Health (NIOSH), which can be viewed online, incorporate data from the AEGLs reports.
- Industrial firms are using AEGLs to prepare emergency plans for accidental releases of hazardous chemicals and to determine the optimal location of storage sites for chemicals to reduce the potential for adverse health effects of accidental releases on surrounding communities.

## A Brief History of the AEGLs Program

In the Bhopal, India disaster of 1984, approximately 2,000 residents living near a Union Carbide chemical plant were killed and 20,000 more suffered irreversible damage to their eyes and lungs following the accidental release of methyl isocyanate from the plant. The community did not know what chemicals were being used at the plant, how dangerous they were, and what steps to take in case of an emergency. This tragedy led to the need for governments around the world to identify hazardous substances and to assist local communities in emergency planning for chemical accidents that could threaten human health.

In response to Bhopal and subsequent accidents, the Superfund Amendments and Reauthorization Act of 1986 required the U.S. Environmental Protection Agency (EPA) to identify extremely hazardous substances that could be released into the air as a result of chemical spills, industrial explosions, fires, or accidents during their transport. Possible chemical releases resulting from acts of terrorism have also become a significant concern in recent years.

In 1993, the National Research Council published Guidelines for Developing Community Emergency Exposure Levels for Hazardous Substances, which establishes the criteria and methods that should be used for developing AEGLs values, including what data are needed, what data are available, how to evaluate the data, and how to present the results. Those guidelines were updated in the 2001 report, Standing Operating Procedures for Developing Acute Exposure Guideline Levels for Hazardous Chemicals.

Preliminary AEGLs values are developed by a group, known as the National Advisory Committee for Acute Exposure Guidelines for Hazardous Substances (NAC/AEGL)—consisting of members from EPA, the Department of Defense, the Department of Energy, the Department of Transportation, other federal and state governments, the chemical industry, academia, and other organizations from the private sector. The advisory committee has developed AEGLs for approximately 150 extremely hazardous substances (on the Web at [www.epa.gov/oppt/aegl/pubs/chemlist.htm](http://www.epa.gov/oppt/aegl/pubs/chemlist.htm)). These values then undergo the most exhaustive of all EPA reviews: draft reports are published in the Federal Register for public comment and then sent to the National Research Council for final evaluation.

Through its own rigorous peer-review process, the National Research Council assesses the scientific validity of the preliminary AEGLs values. To do this, the National Research Council convenes committees of science experts with diverse backgrounds and points of view who work together to review the available scientific evidence, reach consensus, and issue a report with their findings and recommendations in an environment free of political, special-interest, and agency influence. The National Research Council publishes final AEGLs values in a series of reports available on the Web at <http://dels.nas.edu/aegls>.

