



The Houston Metropolitan area contains a number of plants and refineries that utilize or manufacture toxic chemicals. An accidental release or an explosion can expose residents in the vicinity to a variety of toxic chemicals. There is also concern about the possibility of a terrorist attack involving toxic industrial chemicals (TICs), or toxic industrial materials (TIMs). These agents can be highly toxic and are produced in large quantities. The following frequently asked questions will help workers understand what toxic industrial chemicals are and how they may affect their health and safety.

### **General Information**

#### **What are toxic industrial chemicals?**

Toxic industrial chemicals are industrial chemicals that are manufactured, stored, transported, and used throughout the world. Toxic industrial chemicals can be in the gas, liquid, or solid state. They can be chemical hazards (e.g., carcinogens, reproductive hazards, corrosives, or agents that affect the lungs or blood) or physical hazards (e.g., flammable, combustible, explosive, or reactive). The following table lists the most common TICs listed by their hazard index.

<b>TICs listed by hazard index</b>		
<b>High</b>	<b>Medium</b>	<b>Low</b>
Ammonia	Acetone cyanohydrin	Allyl isothiocyanate
Arsine	Acrolein	Arsenic trichloride
Boron trichloride	Acrylonitrile	Bromine
Boron trifluoride	Allyl alcohol	Bromine chloride
Carbon disulfide	Allylamine	Bromine pentafluoride
Chlorine	Allyl chlorocarbonate	Bromine trifluoride
Diborane	Boron tribromide	Carbonyl fluoride
Ethylene oxide	Carbon monoxide	Chlorine pentafluoride
Fluorine	Carbonyl sulfide	Chlorine trifluoride
Formaldehyde	Chloroacetone	Chloroacetaldehyde
Hydrogen bromide	Chloroacetonitrile	Chloroacetyl chloride
Hydrogen chloride	Chlorosulfonic acid	Crotonaldehyde
Hydrogen cyanide	Diketene	Cyanogen chloride
Hydrogen fluoride	1,2-Dimethylhydrazine	Dimethyl sulfate
Hydrogen sulfide	Ethylene dibromide	Diphenylmethane-4.4'-



		diisocyanate
Nitric acid, fuming	Hydrogen selenide	Ethyl chloroformate
Phosgene	Methanesulfonyl chloride	Ethyl chlorothioformate
Phosphorus trichloride	Methyl bromide	Ethyl phosphonothioic dichloride
Sulfur dioxide	Methyl chloroformate	Ethyl phosphonic dichloride
Sulfuric acid	Methyl chlorosilane	Ethyleneimine
Tungsten hexafluoride	Methyl hydrazine	Hexachlorocyclopentadiene
	Methyl isocyanate	Hydrogen iodide
	Methyl mercaptan	Iron pentacarbonyl
	Nitrogen dioxide	Isobutyl chloroformate
	Phosphine	Isopropyl isocyanate
	Phosphorus oxychloride	n-Butyl chloroformate
	Phosphorus pentafluoride	n-Butyl isocyanate
	Selenium hexafluoride	Nitric oxide
	Silicon tetrafluoride	n-Propyl chloroformate
	Stibine	Parathion
	Sulfur trioxide	Perchloromethyl mercaptan
	Sulfuryl fluoride	sec-Butyl chloroformate
	Tellurium hexafluoride	tert-Butyl isocyanate
	n-Octyl mercaptan	Tetraethyl lead
	Titanium tetrachloride	Tetraethyl pyrophosphate
	Trichloroacetyl chloride	Tertramethyl lead
	Trifluoroacetyl chloride	Toluene 2,4-diisocyanate
		Toluene 2,6-diisocyanate

Source: National Institute of Justice Guide 103-00 (Volume I) (2001, October).  
 Guide for the Selection of Chemical and Biological Decontamination Equipment for  
 Emergency First Responders: <http://www.ojp.usdoj.gov/nij/pubs-sum/189724.htm>  
 This guide for emergency first responders provides information about the selection  
 and use of chemical and/or biological decontamination equipment for various  
 applications.



### **Why are we concerned about toxic industrial chemicals as a terrorist's weapon?**

There are large quantities of toxic industrial chemicals manufactured, stored, transported, and used throughout the United States. If obtained by terrorists or caused to be released, these chemicals may have extremely serious effects on exposed individuals.

### **How long would aerosolized toxic industrial chemicals persist in the environment?**

The time that these agents persist in the environment is dependent on many variables, such as physical state (solid, liquid, or gas), weather conditions (wind speed, rain or snow, air or surface temperature), indoor or outdoor release, chemical stability, method of release (vapor or aerosol), or quantity released.

### **Health Effects**

#### **How do toxic industrial chemicals affect people?**

Many toxic industrial chemicals are highly toxic and may rapidly affect exposed individuals. Toxic industrial chemicals (whether as a gas, aerosol, or liquid) enter the body through inhalation, through the skin, or through digestion. The time that it takes for a toxic industrial chemical to begin working is dependent mainly on the route that the agent enters the body. Generally, poisoning occurs more quickly if a chemical enters through the lungs (because of the ability of the agent to rapidly diffuse throughout the body). Information related to how the chemicals affect humans and symptoms of exposure to specific chemicals can be found in material safety data sheets (MSDS) or chemical information cards.

#### **For additional information, see**

- Centers for Disease Control and Prevention (CDC) Chemical Agents List (A-Z): <http://www.bt.cdc.gov/agent/agentlistchem.asp>
- National Institute for Occupational Safety and Health (NIOSH) International Chemical Safety Cards (ICSCs): <http://www.cdc.gov/niosh/ipcs/icstart.html>
- New Jersey State Department of Health and Senior Services Right to Know Hazardous Substance Fact Sheets: <http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm>
- Vermont Safety Information Resources, Inc. (SIRI) The Vermont SIRI MSDS Collection: <http://siri.uvm.edu/msds>



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## **Personal Protection and Sanitation**

### **How do I protect myself from toxic industrial chemicals?**

If you are exposed to a toxic industrial chemicals attack, get away from the impacted area quickly without passing through the contaminated area, if possible. OSHA has developed an Evacuation Planning Matrix (<http://www.osha.gov/dep/evacmatrix/index.html>) to provide employers with planning considerations and on-line resources that may help employers reduce their vulnerability to a terrorist act or the impact of a terrorist release. Terrorist incidents are not emergencies that OSHA expects an employer to reasonably anticipate. However, if a terrorist release does occur in or near your workplace, an effective evacuation plan increases the likelihood that your employees will reach shelter safely. It may be necessary to "shelter-in-place" if you can't get out of a building or if the nearest place with clean air is indoors.

If available, a good way to protect yourself from a toxic industrial chemicals is to wear suitable chemical protective clothing and respiratory protection. However, it must be stressed that this protective equipment does not always work against toxic industrial chemicals. The effectiveness is determined by the materials of construction, the type and level of exposure, and duration of exposure. If you have been exposed to a toxic industrial chemical, consult with your physician as soon as possible. Personal decontamination can be performed by removing contaminated clothing and washing exposed skin with soap and water.

### **What does it mean to "shelter-in-place"?**

"Shelter-in-place" means to go indoors, close up the building, and wait for the danger to pass. If you are advised to shelter in place, close all doors and windows; turn off fans, air conditioners, and forced-air heating units that bring in fresh air from the outside; only re-circulate air that is already in the building; move to an inner room or basement; and keep your radio turned to the emergency response network or local news to find out what else you need to do. For additional information, see the Shelter-in-Place Information Center (<http://www.nicsinfo.org/SIP%20Center.htm>).



**Has the federal government made recommendations to protect human health?**

OSHA has set occupational exposure levels for workplace exposure of employees to many toxic industrial chemicals.

For the OSHA standards, see

- [29 CFR 1910.1000 TABLE Z-1 Limits for Air Contaminants](#)
- [29 CFR 1910.1000 TABLE Z-2 Ceiling Concentrations](#)

Other organizations with recommendations for occupational exposure are

- National Institute for Occupational Safety and Health (NIOSH):  
<http://www.cdc.gov/niosh/npg/>
- American Conference of Governmental Industrial Hygienists (ACGIH)  
<http://www.acgih.org/store/ProductDetail.cfm?id=1676>