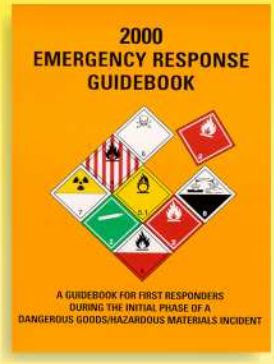


Hazardous Material Awareness

Unit 13

13-1-S130-EP

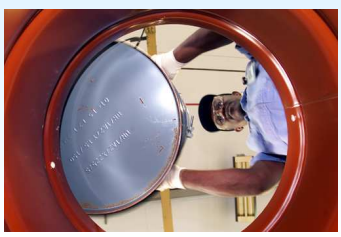
Unit 13 Objectives

1. Develop a working definition of hazardous materials.
2. Explain the general guidelines when reacting to a possible hazardous material emergency.
3. List and explain the six steps in the D.E.C.I.D.E. process.
4. List and explain the six clues for detecting the presence of hazardous materials.

13-2-S130-EP

Definition of Hazardous Materials

A single material or a combination of several materials that may produce serious health, fire or explosive hazards.

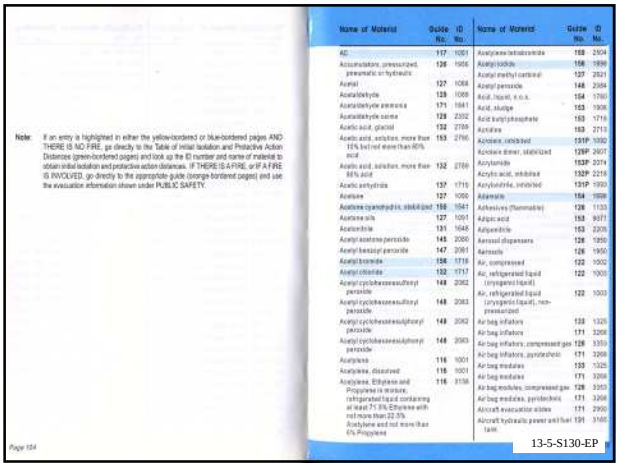


13-3-S130-EP

ID No.	Guide No.	Name of Material
1075	115	Isobutane mixture
1075	115	Isobutylene
1075	115	Liquefied petroleum gas
1075	115	LPG
1075	115	Petroleum gases, liquefied
1075	115	Propane
1075	115	Propane mixture
1075	115	Propylene
1076	125	CG
1076	125	Diphosgene
1076	125	DP
1076	125	Phosgene
1077	115	Propylene
1078	126	Dispersant gas, n.o.s.
1078	126	Refrigerant gas, n.o.s.
1079	125	Sulfur dioxide
1079	125	Sulfur dioxide, liquefied
1079	125	Sulphur dioxide
1079	125	Sulphur dioxide, liquefied
1080	126	Sulfur hexafluoride
1080	126	Sulphur hexafluoride
1081	116P	Tetrafluoroethylene, inhibited
1082	116P	Trifluorochloroethylene
1082	116P	Trifluorochloroethylene, inhibited
1083	118	Trimethylamine, anhydrous
1085	116P	Vinyl bromide, inhibited
1086	116P	Vinyl chloride
1086	116P	Vinyl chloride, inhibited
1086	116P	Vinyl chloride, stabilized
1087	116P	Vinyl methyl ether
1087	116P	Vinyl methyl ether, inhibited
1088	127	Acetal
1089	129	Acetaldehyde
1090	127	Acetone
1091	127	Acetone oils
1092	131P	Acrolein, inhibited
1093	131P	Acrylonitrile, inhibited
1098	131	Allyl alcohol
1099	131	Allyl bromide
1100	131	Allyl chloride
1104	129	Amyl acetates
1105	128	Amyl alcohols
1105	128	Pentanols
1106	132	Amylamines
1107	130	Amyl chloride
1109	127	s-Amylene
1100	127	1-Pentene
1109	129	Amyl formates
1110	127	n-Amyl methyl ketone
1110	127	Amyl methyl ketone
1110	127	Methyl amyl ketone
1111	130	Amyl mercaptan
1112	140	Amyl nitrate
1113	128	Amyl nitrite
1114	130	Benzene
1116	130	Brake Fluid, hydraulic
1120	129	Butanols
1120	129	Butyl alcohol
1123	129	Butyl acetates
1125	132	n-Butylamine
1126	129	1-Bromobutane
1126	129	n-Butyl bromide
1127	130	Butyl chloride
1127	130	Chlorobutanes
1128	129	n-Butyl formate
1129	128	Butyraldehyde
1130	128	Camphor oil
1131	131	Carbon bisulphide
1131	131	Carbon disulfide
1131	131	Carbon disulphide
1133	128	Adhesives (flammable)
1133	128	Cement (flammable)
1133	128	Cement, container, linoleum, tile or wallboard, liquid
1133	128	Cement, leather
1133	128	Cement, liquid, n.o.s.
1133	128	Cement, pyroxylin
1133	128	Cement, roofing, liquid
1133	128	Cement, rubber
1134	130	Chlorobenzene
1135	131	Ethylene chlorohydrin
1136	128	Coal tar distillates, flammable
1137	128	Coal tar distillate
1139	127	Coating solution
1142	127	Compound, cleaning, liquid (flammable)
1142	127	Compounds, polishing, liquid, etc. (flammable)
1142	127	Flammable liquid preparations, n.o.s.
1143	131P	Crotonaldehyde, inhibited
1143	131P	Crotonaldehyde, stabilized
1144	128	Crotonylene
1145	128	Cyclohexane
1146	128	Cyclopentane
1147	130	Decahydronaphthalene
1148	129	Diacetone alcohol
1149	127	Butyl ethers
1149	127	Dibutyl ethers
1150	130P	1,2-Dichloroethylene
1150	130P	Dichloroethylene
1152	130	Dichloropentanes
1153	127	Ethylene glycol diethyl ether
1154	132	Diethylamine
1155	127	Diethyl ether
1156	127	Diethyl ketone
1157	127	Diisobutyl ketone
1158	132	Diisopropylamine
1159	127	Diisopropyl ether
1160	129	Dimethylamine, aqueous solution
1160	129	Dimethylamine, solution
1161	129	Dimethyl carbonate
1162	155	Dimethyldichlorosilane
1163	131	1,1-Dimethylhydrazine
1163	131	Dimethylhydrazine, unsymmetrical
1164	130	Dimethyl sulfide
1164	130	Dimethyl sulphide
1165	127	Dioxane
1166	127	Dioxolane
1167	131P	Divinyl ether, inhibited
1168	127	Diluents, paint or varnish, liquid, n.o.s.
1169	127	Extracts, aromatic, liquid
1170	127	Ethanol
1170	127	Ethanol, solution
1170	127	Ethyl alcohol
1170	127	Ethyl alcohol, solution
1171	127	Ethylene glycol monoethyl ether

Page 28

13-4-S130-EP

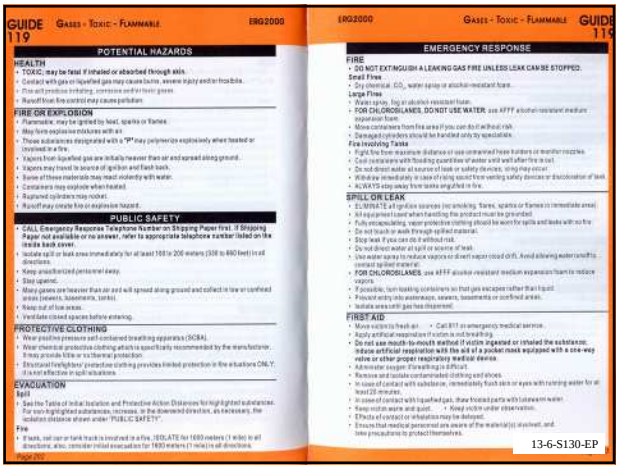


Note: If an entry is highlighted in either the yellow-bordered or blue-bordered pages AND THERE IS NO FIRE, go directly to the Table of Initial Isolation and Protective Action Distances (green-bordered pages) and look up the ID number and name of material to obtain initial isolation and protective action distances. IF THERE IS A FIRE, or IF A FIRE IS INVOLVED, go directly to the appropriate guide (orange-bordered pages) and use the evacuation information shown under PUBLIC SAFETY.

Name of Material	Guide No.	ID No.
AC	117	1051
Accumulators, pressurized, pneumatic or hydraulic	126	1956
Acetal	127	1088
Acetaldehyde	129	1089
Acetaldehyde ammonia	171	1841
Acetaldehyde oxime	129	2332
Acetic acid, glacial	132	2789
Acetic acid, solution, more than 10% but not more than 80% acid	153	2789
Acetic acid, solution, more than 80% acid	132	2789
Acetic anhydride	137	1715
Acetone	127	1090
Acetone cyanohydrin, stabilized	155	1541
Acetone oils	127	1091
Acetonitrile	131	1648
Acetyl acetone peroxide	145	2080
Acetyl benzoyl peroxide	147	2081
Acetyl bromide	156	1716
Acetyl chloride	132	1717
Acetyl cyclohexanesulfonyl peroxide	148	2082
Acetyl cyclohexanesulfonyl peroxide	148	2083
Acetyl cyclohexanesulphonyl peroxide	148	2082
Acetyl cyclohexanesulphonyl peroxide	148	2083
Acetylene	116	1001
Acetylene, dissolved	116	1001
Acetylene, Ethylene and Propylene in mixture, refrigerated liquid containing at least 71.5% Ethylene with not more than 22.5% Acetylene and not more than 6% Propylene	116	3138
Acetylene tetrabromide	159	2504
Acetyl iodide	156	1898
Acetyl methyl carbinol	127	2621
Acetyl peroxide	148	2084
Acid, liquid, n.o.s.	154	1760
Acid, sludge	153	1906
Acid butyl phosphate	153	1718
Acridine	153	2713
Acrolein, inhibited	131P	1092
Acrolein dimer, stabilized	129P	2607
Acrylamide	153P	2074
Acrylic acid, inhibited	132P	2218
Acrylonitrile, inhibited	131P	1093
Adiponitrile	154	1938
Adhesives (flammable)	128	1133
Adipic acid	153	9077
Adiponitrile	153	2205
Aerosol dispensers	126	1950
Aerosols	126	1950
Air, compressed	122	1002
Air, refrigerated liquid (cryogenic liquid)	122	1003
Air, refrigerated liquid (cryogenic liquid), non-pressurized	122	1003
Air bag inflators	133	1325
Air bag inflators	171	3268
Air bag inflators, compressed gas	128	3353
Air bag inflators, pyrotechnic	171	3268
Air bag modules	133	1325
Air bag modules	171	3268
Air bag modules, compressed gas	128	3353
Air bag modules, pyrotechnic	171	3268
Aircraft evacuation slides	171	2990
Aircraft hydraulic power unit fuel tank	131	3165

Page 154

13-5-S130-EP



GUIDE 119 GASES - TOXIC - FLAMMABLE ERG2000

POTENTIAL HAZARDS

HEALTH
- TOXIC; may be fatal if inhaled or absorbed through skin.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control may cause pollution.

FIRE OR EXPLOSION
- Flammable; may be ignited by heat, sparks or flames.
- May form explosive mixtures with air.
- Those substances designated with a "P" may polymerize explosively when heated or involved in a fire.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- Vapors may travel to source of ignition and flash back.
- Some of these materials may react violently with water.
- Containers may explode when heated.
- Ruptured cylinders may rocket.
- Runoff may create fire or explosion hazard.

PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- Isolate spill or leak area immediately for at least 100 to 200 meters (330 to 660 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION

Spill
- See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".

Fire
- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

Page 210

ERG2000 GASES - TOXIC - FLAMMABLE GUIDE 119

EMERGENCY RESPONSE

FIRE
- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

Small Fires
- Dry chemical, CO_2, water spray or alcohol-resistant foam.

Large Fires
- Water spray, fog or alcohol-resistant foam.
- **FOR CHLOROSILANES, DO NOT USE WATER**; use AFFF alcohol-resistant medium expansion foam.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire Involving Tanks
- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Do not direct water at spill or source of leak.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- **FOR CHLOROSILANES**, use AFFF alcohol-resistant medium expansion foam to reduce vapors.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Isolate area until gas has dispersed.

FIRST AID
- Move victim to fresh air. • Call 911 or emergency medical service.
- Apply artificial respiration if victim is not breathing.
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.**
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- Keep victim warm and quiet. • Keep victim under observation.
- Effects of contact or inhalation may be delayed.
- Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

13-6-S130-EP

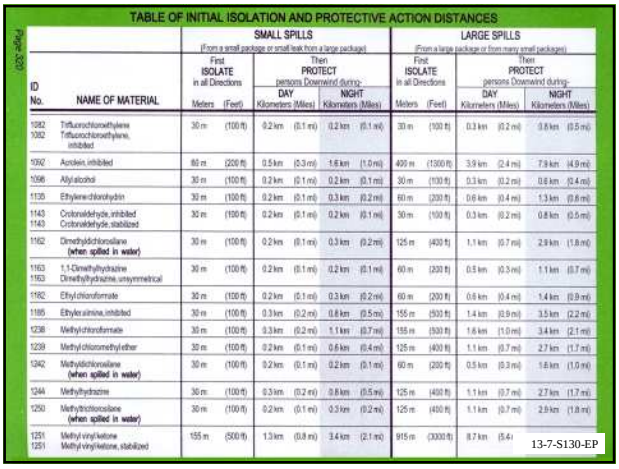


TABLE OF INITIAL ISOLATION AND PROTECTIVE ACTION DISTANCES

ID No.	NAME OF MATERIAL	SMALL SPILLS (From a small package or small leak from a large package) First ISOLATE in all Directions Meters	(Feet)	Then PROTECT persons Downwind during- DAY Kilometers	(Miles)	NIGHT Kilometers	(Miles)	LARGE SPILLS (From a large package or from many small packages) First ISOLATE in all Directions Meters	(Feet)	Then PROTECT persons Downwind during- DAY Kilometers	(Miles)	NIGHT Kilometers	(Miles)
1082 1082	Trifluorochloroethylene Trifluorochloroethylene, inhibited	30 m	(100 ft)	0.2 km	(0.1 mi)	0.2 km	(0.1 mi)	30 m	(100 ft)	0.3 km	(0.2 mi)	0.8 km	(0.5 mi)
1092	Acrolein, inhibited	60 m	(200 ft)	0.5 km	(0.3 mi)	1.6 km	(1.0 mi)	400 m	(1300 ft)	3.9 km	(2.4 mi)	7.9 km	(4.9 mi)
1098	Allyl alcohol	30 m	(100 ft)	0.2 km	(0.1 mi)	0.2 km	(0.1 mi)	30 m	(100 ft)	0.3 km	(0.2 mi)	0.6 km	(0.4 mi)
1135	Ethylene chlorohydrin	30 m	(100 ft)	0.2 km	(0.1 mi)	0.3 km	(0.2 mi)	60 m	(200 ft)	0.6 km	(0.4 mi)	1.3 km	(0.8 mi)
1143 1143	Crotonaldehyde, inhibited Crotonaldehyde, stabilized	30 m	(100 ft)	0.2 km	(0.1 mi)	0.2 km	(0.1 mi)	30 m	(100 ft)	0.3 km	(0.2 mi)	0.8 km	(0.5 mi)
1162	Dimethyldichlorosilane (when spilled in water)	30 m	(100 ft)	0.2 km	(0.1 mi)	0.3 km	(0.2 mi)	125 m	(400 ft)	1.1 km	(0.7 mi)	2.9 km	(1.8 mi)
1163 1163	1,1-Dimethylhydrazine Dimethylhydrazine, unsymmetrical	30 m	(100 ft)	0.2 km	(0.1 mi)	0.2 km	(0.1 mi)	60 m	(200 ft)	0.5 km	(0.3 mi)	1.1 km	(0.7 mi)
1182	Ethyl chloroformate	30 m	(100 ft)	0.2 km	(0.1 mi)	0.3 km	(0.2 mi)	60 m	(200 ft)	0.6 km	(0.4 mi)	1.4 km	(0.9 mi)
1185	Ethylenimine, inhibited	30 m	(100 ft)	0.3 km	(0.2 mi)	0.8 km	(0.5 mi)	155 m	(500 ft)	1.4 km	(0.9 mi)	3.5 km	(2.2 mi)
1238	Methyl chloroformate	30 m	(100 ft)	0.3 km	(0.2 mi)	1.1 km	(0.7 mi)	155 m	(500 ft)	1.6 km	(1.0 mi)	3.4 km	(2.1 mi)
1239	Methyl chloromethyl ether	30 m	(100 ft)	0.2 km	(0.1 mi)	0.6 km	(0.4 mi)	125 m	(400 ft)	1.1 km	(0.7 mi)	2.7 km	(1.7 mi)
1242	Methyldichlorosilane (when spilled in water)	30 m	(100 ft)	0.2 km	(0.1 mi)	0.2 km	(0.1 mi)	60 m	(200 ft)	0.5 km	(0.3 mi)	1.6 km	(1.0 mi)
1244	Methylhydrazine	30 m	(100 ft)	0.3 km	(0.2 mi)	0.8 km	(0.5 mi)	125 m	(400 ft)	1.1 km	(0.7 mi)	2.7 km	(1.7 mi)
1250	Methyltrichlorosilane (when spilled in water)	30 m	(100 ft)	0.2 km	(0.1 mi)	0.3 km	(0.2 mi)	125 m	(400 ft)	1.1 km	(0.7 mi)	2.9 km	(1.8 mi)
1251 1251	Methyl vinyl ketone Methyl vinyl ketone, stabilized	155 m	(500 ft)	1.3 km	(0.8 mi)	3.4 km	(2.1 mi)	915 m	(3000 ft)	8.7 km	(5.4		

13-7-S130-EP

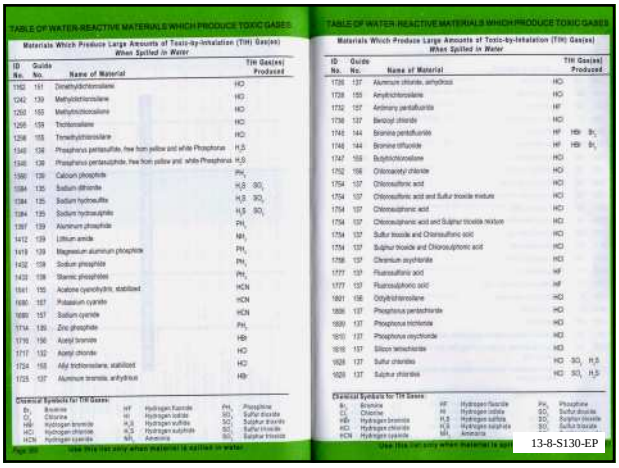


TABLE OF WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1162	151	Dimethyldichlorosilane	HCl
1242	139	Methyldichlorosilane	HCl
1250	155	Methyltrichlorosilane	HCl
1295	139	Trichlorosilane	HCl
1298	155	Trimethylchlorosilane	HCl
1340	136	Phosphorus pentasulfide, free from yellow and white Phosphorus	H_2S
1340	136	Phosphorus pentasulphide, free from yellow and white Phosphorus	H_2S
1360	139	Calcium phosphide	PH_3
1384	135	Sodium dithionite	H_2S SO_2
1384	135	Sodium hydrosulfite	H_2S SO_2
1384	135	Sodium hydrosulphite	H_2S SO_2
1397	139	Aluminum phosphide	PH_3
1412	139	Lithium amide	NH_3
1419	139	Magnesium aluminum phosphide	PH_3
1432	139	Sodium phosphide	PH_3
1433	139	Stannic phosphides	PH_3
1541	155	Acetone cyanohydrin, stabilized	HCN
1680	157	Potassium cyanide	HCN
1689	157	Sodium cyanide	HCN
1714	139	Zinc phosphide	PH_3
1716	156	Acetyl bromide	HBr
1717	132	Acetyl chloride	HCl
1724	155	Allyl trichlorosilane, stabilized	HCl
1725	137	Aluminum bromide, anhydrous	HBr

Chemical Symbols for TIH Gases:

Br_2	Bromine	HF	Hydrogen fluoride	PH_3	Phosphine
Cl_2	Chlorine	HI	Hydrogen iodide	SO_2	Sulfur dioxide
HBr	Hydrogen bromide	H_2S	Hydrogen sulfide	SO_2	Sulphur dioxide
HCl	Hydrogen chloride	H_2S	Hydrogen sulphide	SO_2	Sulfur trioxide
HCN	Hydrogen cyanide	NH_3	Ammonia	SO_3	Sulphur trioxide

Use this list only when material is spilled in water

TABLE OF WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1726	137	Aluminum chloride, anhydrous	HCl
1728	155	Amyltrichlorosilane	HCl
1732	157	Antimony pentafluoride	HF
1736	137	Benzoyl chloride	HCl
1745	144	Bromine pentafluoride	HF HBr Br_2
1746	144	Bromine trifluoride	HF HBr Br_2
1747	155	Butyltrichlorosilane	HCl
1752	156	Chloroacetyl chloride	HCl
1754	137	Chlorosulfonic acid	HCl
1754	137	Chlorosulfonic acid and Sulfur trioxide mixture	HCl
1754	137	Chlorosulphonic acid	HCl
1754	137	Chlorosulphonic acid and Sulphur trioxide mixture	HCl
1754	137	Sulfur trioxide and Chlorosulfonic acid	HCl
1754	137	Sulphur trioxide and Chlorosulphonic acid	HCl
1758	137	Chromium oxychloride	HCl
1777	137	Fluorosulfonic acid	HF
1777	137	Fluorosulphonic acid	HF
1801	156	Octyltrichlorosilane	HCl
1806	137	Phosphorus pentachloride	HCl
1809	137	Phosphorus trichloride	HCl
1810	137	Phosphorus oxychloride	HCl
1818	137	Silicon tetrachloride	HCl
1828	137	Sulfur chlorides	HCl SO_2 H_2S
1828	137	Sulphur chlorides	HCl SO_2 H_2S

Chemical Symbols for TIH Gases:

Br_2	Bromine	HF	Hydrogen fluoride	PH_3	Phosphine
Cl_2	Chlorine	HI	Hydrogen iodide	SO_2	Sulfur dioxide
HBr	Hydrogen bromide	H_2S	Hydrogen sulfide	SO_2	Sulphur trioxide
HCl	Hydrogen chloride	H_2S	Hydrogen sulphide	SO_3	Sulfur trioxide
HCN	Hydrogen cyanide	NH_3	Ammonia	SO_3	Sulphur trioxide

Use this list only when material is spilled in water

13-8-S130-EP

Hazardous Material Placard

13-9-S130-EP

Review Unit 13 Objectives

1. Develop a working definition of hazardous materials.
2. Explain the general guidelines when reacting to a possible hazardous material emergency.
3. List and explain the six steps in the D.E.C.I.D.E. process.
4. List and explain the six clues for detecting the presence of hazardous materials.

13-10-S130-EP