APPENDIX F: GHS REFERENCE MATERIALS

This appendix provides both an overview of GHS highly toxic hazard classification. A listing of Particularly Hazardous Substances that Carnegie Mellon University has published with their Chemical Hygiene plan is also provided as general reference. The list is useful cross check with GHS listings to determine which materials require prior approval for use BUT NO LIST IS COMPLETE you must check the SDS for possible additional chemicals rated as highly toxic.

This appendix also provides the GHS (global harmonization system) for chemical hazard classification under the Hazard Communication Standard for highly toxic materials. This section provides overall information about categories under the classification of acute toxicity, mutagens', reproductive and carcinogen hazards.

When chemicals are rated on the GHS – Safety Data Sheet (SDS) as the following hazards then the PRIOR APPROVAL PROCESS WITH CHEMICAL HYGIENE OFFICER/COMMITTEE must be used:

- Acute toxicity category 1 and 2,
- Germ cell mutagenicity as a category 1A Substances known to induce heritable mutations in germ cells of humans and Category 1B: Substances which should be regarded as if they induce heritable mutations in the germ cells of humans,
- Reproductive Hazard as a category 1: Known or presumed human reproductive toxicants and Category 2; suspected human reproductive toxicant.
- Carcinogen as a Category 1 (includes 1A and 1B): Known or presumed human carcinogens, Category 2: Suspected human carcinogens.

The Campus Chemical Hygiene Committee (Officer) must conduct a prior approval process. Appendix C Chemical Prior Approval Form on procedure for conducing prior approval.

The following is from OSHA standard on the chemicals classifications that PCC Laboratory instructional operations shall use for defining the prior approval hazards.

HEALTH HAZARD CRITERIA

1. **ACUTE TOXICITY** there are 1 (most hazardous) to 4 categories. PCC shall only require prior approval based on acute toxicity only for Category 1 and 2 listed chemicals.

   Acute toxicity refers to those adverse effects occurring following oral or dermal administration of a single dose of a substance, or multiple doses given within 24 hours, or an inhalation exposure of 4 hours.

   - Substances can be allocated to one of four toxicity categories based on acute toxicity by the oral, dermal or inhalation route according to the numeric cut-off criteria as shown in Table A.1.1 in the standard.
   - Acute toxicity values are expressed as (approximate) LD50 (oral, dermal) or LC50 (inhalation) values or as acute toxicity estimates (ATE).

2. **GERM CELL MUTAGENICITY** include Category 1 and 2 for prior approval.

   A mutation is defined as a permanent change in the amount or structure of the genetic material in a cell. The term mutation applies both to heritable genetic changes that may be manifested at the phenotypic level and to the underlying DNA modifications when known (including, for example, specific base pair changes and chromosomal translocations). The term mutagenic and mutagen will be used for agents giving rise to an increased occurrence of mutations in populations of cells and/or organisms.

The more general terms genotoxic and genotoxicity apply to agents or processes which alter the structure, information content, or segregation of DNA, including those which cause DNA damage by interfering with normal replication processes, or which in a non-physiological manner (temporarily) alter its replication. Genotoxicity test results are usually taken as indicators for mutagenic effects.

This hazard class is primarily concerned with chemicals that may cause mutations in the germ cells of humans that can be transmitted to the progeny. However, mutagenicity/genotoxicity tests in vitro and in mammalian somatic cells in vivo are also considered in classifying substances and mixtures within this hazard class.

The classification system provides for two different categories of germ cell mutagens to accommodate the weight of evidence available. The two-category system is described in the Figure A.5.1 in OSHA standard but in summary the following categories shall require prior approval process.

- **CATEGORY 1A:**
  Substances known to induce heritable mutations or to be regarded as if they induce heritable mutations in the germ cells of humans

  Substances known to induce heritable mutations in germ cells of humans.

  Positive evidence from human epidemiological studies.

- **Category 1B:**
  Substances, which should be regarded as if they induce heritable mutations in the germ cells of humans

- **CATEGORY 2:**

  Substances, which cause concern for humans owing to the possibility that they may induce heritable mutations in the germ cells of humans

  Positive evidence obtained from experiments in mammals and/or in some cases from in vitro experiments

  Substances which are positive in in vitro mammalian mutagenicity assays, and which also show chemical structure activity relationship to known germ cell mutagens, should be considered for classification as Category 2 mutagens.

3. CARCINOGENICITY

Carcinogen means a substance or a mixture of substances, which induce cancer or increase its incidence. Substances and mixtures which have induced benign and malignant tumors in well-performed experimental studies on animals are considered also to be presumed or suspected human carcinogens unless there is strong evidence that the mechanism of tumor formation is not relevant for humans.

Classification of a substance or mixture as posing a carcinogenic hazard is based on its inherent properties and does not provide information on the level of the human cancer risk which the use of the substance or mixture may represent.

For the purpose of classification for carcinogenicity, substances are allocated to one of two categories based on strength of evidence and additional weight of evidence considerations. In certain instances, route-specific classification may be warranted.

- Known or presumed human carcinogens

- The classification of a substance as a Category 1 carcinogen is done on the basis of epidemiological and/or animal data. This classification is further distinguished on the basis of whether the evidence for classification is largely from human data (Category 1A) or from animal data (Category 1B)

- The classification of a substance in Category 2 is done on the basis of evidence obtained from human and/or animal studies, but which is not sufficiently convincing to place the substance in Category 1A or B. This classification is based on strength of evidence together with weight of evidence considerations. Such evidence may be from either limited evidence of carcinogenicity in human studies or from limited evidence of carcinogenicity in animal studies.
    - Where the weight of evidence for the carcinogenicity of a substance does not meet the above criteria, any positive study conducted in accordance with established scientific principles, and which reports statistically significant findings regarding the carcinogenic potential of the substance, must be noted on the safety data sheet.

4. REPRODUCTIVE TOXICITY – Prior Approval for Category 1 (1A and 1B) and Category 2:

- **Category 1: Known (1A) or presumed human (1B) reproductive toxicant:** Reproductive toxicity includes adverse effects on sexual function and fertility in adult males and females, as well as adverse effects on development of the offspring. Some reproductive toxic effects cannot be clearly assigned to either impairment of sexual function and fertility or to developmental toxicity. Nonetheless, chemicals with these effects shall be classified as reproductive toxicants.

  Adverse effects on sexual function and fertility means any effect of chemicals that interferes with reproductive ability or sexual capacity. This includes, but is not limited to, alterations to the female and male reproductive system, adverse effects on onset of puberty, gamete production and transport, reproductive cycle normality, sexual behaviour, fertility, parturition, pregnancy outcomes, premature reproductive senescence, or modifications in other functions that are dependent on the integrity of the reproductive systems.

  Adverse effects on development of the offspring means any effect of chemicals which interferes with normal development of the conceptus either before or after birth, which is induced during pregnancy or results from parental exposure. These effects can be manifested at any point in the life span of the organism. The major manifestations of developmental toxicity include death of the developing organism, structural abnormality, altered growth and functional deficiency.

- **Category 2: Suspected human reproductive toxicant**.

- **Effects on or Via Lactation**
  Adverse effects on or via lactation are also included in reproductive toxicity, but for classification purposes, such effects are treated separately. Classifications are (a), (b) and (c).

Particularly Hazardous Substances

Carnegie Mellon University

In its Laboratory Standard, OSHA requires the establishment of additional protections for persons working with "Particularly Hazardous Substances" (PHS). OSHA defines these materials as **"select" carcinogens, reproductive toxins and acutely toxic materials**. Carnegie Mellon adds **explosive, violently reactive, pyrophoric and water-reactve materials to this category. Carbon nanotubes** have also been added due to their suspected carcinogenic properties.

This table is designed to assist the laboratory in the indentification of PHS, although it is not definitively conclusive.

*Notes on the proper use of this table appear on page 12.

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
A-a-C(2-Amino-9H-pyrido[2,3,b]indole)	2648-68-5				2B		
Acetal	105-57-7						yes
Acetaldehyde	75-07-0	NTP	AT		2B		
Acrolein (2-Propenal)	107-02-8		AT				
Acetamide	126850-14-4				2B		
2-Acetylaminofluorene	53-96-3	NTP		ORC			
Acrylamide	79-06-6	NTP			2B		
Acrylyl Chloride	814-68-6		AT				
Acrylonitrile	107-13-1	NTP		ORC	2B		
Adriamycin	23214-92-8	NTP			2A		
Aflatoxins	1402-68-2	NTP			1		
Allylamine	107-11-9		AT				
Alkylaluminums	varies		AT				
Allyl Chloride	107-05-1		AT				
ortho-Aminoazotoluene	97-56-3	NTP			2B		
para-aminoazobenzene	60-09-3				2B		
4-Aminobiphenyl	92-67-1	NTP		ORC	1		
1-Amino-2-Methylanthraquinone	82-28-0	NTP					
(2-Amino-6-methyldipyrido[1,2-a:3',2'-d]imidazole)	67730-11-4				2B		
2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole	712-68-5				2B		
2-Aminoanthraquinone	117-79-3	NTP					
Amitrole	61-82-5	NTP			2B		
Ammonia, Anhydrous	7664-41-7		AT				
Ammonia solutions (>44%by weight)	7664-41-7		AT				
Ammonia Perchlorate	7790-98-9		AT				yes
Ammonia Permanganate	7787-36-2		AT				yes
Analgesic mixtures containing phenacetin	62-44-2	NTP			1		
Androgenic steroids	various				2A		
Anesthetic gases (Halothane, methoxyflurane)	various					yes	
ortho-Anisidine	91-04-0	NTP			2B		
Antimony trioxide	1309-64--4				2B		
AramiteTM	140-57-8				2B		
Arochlor 1254 (PCB)	11097-69-1	NTP					
Arochlor 1260 (PCB)	11096-82-5	NTP					

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Arsenic and arsenic compounds	7440-38-2	NTP		ORC	1	yes	
Arsine (arsenic hydride)	7784-42-1		AT				
Asbestos	1332-21-4	NTP		ORC	1		
Auramine, technical-grade	492-80-8				2B		
Azactidine	320-67-2	NTP			2A		
Azaserine	115-02-6				2B		
Azathioprine	446-86-6	NTP			1		
Azides	various						yes
Aziridine	151-56-4				2B		
Benz[a]anthracene	56-55-3				2A		
Benzene	100-41-4	NTP		ORC	1	yes	
Benzidine	92-87-5	NTP		ORC	1		
Benzidine-based dyes	various				2A		
Benzo[a]pyrene	50-32-8	NTP			2A		
Benzo[b]fluoranthene	205-99-2	NTP			2B		
Benzo[f]fluoranthene					2B		
Benzo[j]fluoranthene	205-82-3	NTP					
Benzo[k]fluoranthene	207-08-9	NTP			2B		
Benzofuran	271-89-6				2B		
Benzyl violet (acid violet)	1694-09-3				2B		
Benzoyl peroxide	94-36-0						yes
Beryllium and Be compounds	7440-41-7	NTP			2A		
Beryllium Chloride	7787-47-5	NTP			2A		
Beryllium Fluoride	7787-49-7	NTP			2A		
Beryllium Hydroxide	13327-32-7	NTP			2A		
Beryllium Oxide	1304-56-9	NTP			2A		
Beryllium Phosphate	13598-15-7	NTP			2A		
Beryllium Sulfate	13510-49-1	NTP			2A		
Beryllium Sulfate Tetrahydrate	7787-56-6	NTP			2A		
Beryllium Zinc Silcate	39413-47-3	NTP			2A		
Betel quid with tobacco					1		
Bis(chloroethyl) nitrosourea (BCNU)	154-93-8	NTP			2A		
Bis(chloroethylnaphthyl)amine					1		
Bis(chloromethyl) ether	542-88-1	NTP	AT	ORC	1		
bitumens, extracts of steam-refined & air refined					2B		
Bleomycins	11056-06-7				2B		
Boron Trichloride	10294-34-5		AT				
Boron Trifluoride	7637-07-2		AT				
Braken fern: Toxic Component is shikimic acid	138-59-0				2B		
Bromine	7726-95-6		AT				
Bromine Chloride	13863-41-7		AT				
Bromine Pentafluoride	7789-30-2		AT				
Bromine Trifluoride	7787-71-5		AT				
Bromodichloromethane	75-27-4	NTP			2B		
3-Bromopropyne	106-96-7		AT				
1,3 Butadiene	106-99-0	NTP		ORC	2A		
1,4 Butanediol dimethanesulfonate ("Busulfan" "Myleran")	55-98-1	NTP			1		

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Butyl Hydroperoxide (tertiary)	75-91-2		AT				yes
Butyl Perbenzoate (tertiary)	614-45-9		AT				yes
Butyl Peroxyacetate, tert	107-71-1						yes
Butyl Peroxypivalate, tert	927-07-1						yes
Butylated hydroxyanisole (BHA)	25013-16-5	NTP			2B		
Butyllithium, n-	107-72-8						yes
Butyllithium, tert-	594-19-4						yes
b-Butyrolactone	3068-88-0				2B		
Cadmium Chloride	10108-64-2	NTP		ORC	2A	yes	
Cadmium and Cadmium compounds	7440-43-9	NTP		ORC	2A	yes	
Cadmium Oxide	1306-19-0	NTP		ORC	2A	yes	
Cadmium Sulfate	10124-36-4	NTP		ORC	2A	yes	
Cadmium Sulfide	1306-23-6	NTP		ORC	2A	yes	
Caffeic acid	331-39-5				2B		
Captafol	191906				2A		
Carbon Disulfide	75-15-0					yes	
Carbon Monoxide	630-08-0		AT			yes	
Carbon Nanotubes	various						
Carbon tetrachloride	56-23-5	NTP			2B		
Carbon-black extracts	1333-86-4				2B		
Carbonyl Chloride (see Phosgene)	75-44-5		AT				
Carbonyl Fluoride	353-50-4		AT				
Carrageenan, degraded	9049-05-2				2B		
Catechol	120-80-9				2B		
Cellulose Nitrate (conc.>12.6% nitrogen)	9004-70-0		AT				
Ceramic fibers	various				2B		
Chloramphenicol	56-75-7				2A		
Chlordane	57-74-9				2B		
Chlordecone ("Kepone")	143-50-0				2B		
Chlorendic acid	115-28-6				2B		
a-Chlorinated toluenes	various				2A		
Chlorine	7782-50-5		AT				
Chlorine Dioxide	10049-04-4		AT				
Chlorine Pentafluoride	13637-63-3		AT				
Chlorine Trifluoride	7790-91-2		AT				
Chloroambucil	305-03-3	NTP			1		
para-Chloroaniline	106-47-8				2B		
Chlorodiethylaluminum	96-10-6		AT				
1-Chloro-2,4-Dinitrobenzene	97-00-7		AT				yes
1-Chloro-2-methylpropene	513-37-1				2B		
1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea (CCNU)	13010-47-4	NTP			2A		
1-(2-chloroethyl)-3-methylcyclohexyl)-1-nitrosourea (Methyl-CCNU)	13909-09-6	NTP			1		
Chloroform	67-66-3	NTP			2B		
Chloromethyl Methyl Ether	107-30-2	NTP	AT				
Chlorophenols	various				2B		
Chlorophenoxy herbicides	various				2B		
Chloropicrin	76-06-2		AT				

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Chloropicrin & methyl bromide mixture	none		AT				
Chloropicrin & methyl chloride mixture	none		AT				
Chloroprene	126-99-8				2B		
Chlorothalonil	1897-45-6				2B		
Chlorotrifluoroethylene	79-38-9						yes
CI Acid Red	6459-94-5				2B		
CI Basic Red 9	569-61-9	NTP			2B		
CI Direct Blue 15	2429-74-5				2B		
Citrus Red no. 2	6358-53-8				2B		
Clorozotocin	54749-90-5	NTP			2A		
4-Chloro-ortho-phenylenediamine	563-47-3	NTP			2B		
para-Chloro-ortho-toluidine	95-69-2	NTP			2A		
Chromium (VI) compounds	various	NTP			1		
Cisplatin	15663-27-1				2A		
Citrus Red No. 2	6358-53-8				2B		
Coal tar pitches	65996-93-2			ORC	1		
Coal tars	8007-45-2	NTP		ORC	1		
Cobalt & cobalt compounds, (finely divided)	7440-48-4				2B		yes
Creosotes	8001-58-9	NTP			2A		
para-Cresidine	120-71-8				2B		
Crystobalite (Crystalline Silica)	14464-46-1	NTP			2A		
Cumene hydroperoxide	80-15-9		AT				yes
Cyanide Compounds	various		AT				
Cyanogen	460-19-5	NTP	AT				
Cyanogen Chloride	506-77-4		AT				
Cyanuric Fluoride	675-14-9		AT				
Cycasin	14901-08-7				2B		
Cyclophosphamide	50-18-0	NTP			1		
Cyclosporin A	59865-12-1	NTP					
Dacarbazine	4342-03-4	NTP			2B		
Dantron (Chrysazin; 1,8-Dihydroxyanthraquinone)	117-10-2	NTP			2B		
Daunomycin	20830-81-3				2B		
DDT	5029-3				2B		
N,N'-Diacetylbenzidine	613-35-4				2B		
Diacetylene	460-12-8						yes
Diacetyl Peroxide (conc.>70%)	110-22-5		AT				
2,4-Diaminoanisole	615-05-4	NTP			2B		
4,4'-Diaminodiphenyl ether	28434-86-8	NTP			2B		
2,4-Diaminotoluene	95-80-7	NTP			2B		
Diazomethane	334-88-3		AT				yes
Dibenz[a,j]acridine	224-42-0	NTP			2B		
Dibenz[a,h]acridine	226-36-8	NTP			2B		
Dibenz[a,f]acridine	224-42-0				2B		
7H-Dibenzo[c,g]carbazole	194-59-2				2B		
Dibenz[a,h]anthracene	53-70-3	NTP			2A		
Dibenzo[a,e]pyrene	192-65-4	NTP			2B		
Dibenzo[a,h]pyrene	189-64-0	NTP			2B		

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Dibenzo[a,i]pyrene	189-55-9	NTP			2B		
Dibenzo[a,l]pyrene	191-30-0				2B		
Dibenzoyl Peroxide	94-36-0		AT				
Diborane	19287-45-7		AT				
1,2-Dibromo-3-chloropropane	96-12-8	NTP		ORC	2B	yes	
Dibutyl Peroxide (tertiary)	110-05-4		AT				
Dichloro Acetylene	7572-29-4		AT				
Dichlorvos	62-73-7				2B		
para-Dichlorobenzene	106-46-7	NTP			2B		
3,3'-Dichlorbenzidine	91-94-1	NTP		ORC	2B		
3,3'-Dichloro-4,4'-diaminophenyl ether	101-80-4				2B		
1,2-Dichloroethane	107-06-2	NTP			2B		
Dichloromethane	75-09-2	NTP			2B		
1,3-Dichloropropene (technical-grade)	8003-19-8				2B		
Dichlorosilane	4109-96-0		AT				
Dicyclopentadiene	77-73-6						yes
Diepoxybutane	1464-53-5	NTP			2B		
Di(2-ethylhexyl)phthalate	117-81-7	NTP			2B		
1,2-Diethylhydrazine	1615-80-1				2B		
Diacetyl Peroxide (conc.>70%)	110-22-5		AT				
Diethyl Azodicarboxylate	1972-28-7						yes
Diethyl sulfate	64-67-5				2A		
Diethylstilbestrol	56-53-1	NTP		ORC	1		
Diethylzinc	557-20-0		AT				
Diglycidyl resorcinol ether	101-90-6	NTP			2B		
Dihydrosafrole	94-58-6				2B		
Diisopropyl Peroxydicarbonate	105-64-6		AT				yes
Diisopropyl sulfate	392186				2B		
Dilauroyl Peroxide	105-74-8		AT				
2,6-Dimethylaniline (2,6-Xylidine)	87-62-7				2B		
3,3'-Dimethoxybenzidine (ortho-Dianisidine)	119-90-4	NTP			2B		
Dimethylamine, Anhydrous	124-40-3		AT				
para-Dimethylaminoazobenzene	60-11-7	NTP			2B		
trans-2[(Dimethylamino)methylimino]-	x	x	x	x	x		
5(2-(5-nitro-2-furyl)vinyl-1,3,4-oxadiazole	55738-54-0				2B		
3,3-Dimethylbenzidine (ortho-Tolidine)	119-93-7				2B		
1,1-Dimethylhydrazine	57-14-7	NTP			2B		
1,2-Dimethylhydrazine	540-73-8				2A		
Dimethylcarbamoyl chloride	79-44-7	NTP			2A		
Dimethyldichlorosilane	75-78-5		AT				
Dimethyl sulfate	77-78-1	NTP			2A		
2,4,-Dinitroaniline	97-02-9		AT				
Dinitrobenzene, ortho	99-65-0						yes
3,7-Dinitrofluoranthene	105735-71-5				2B		
3,9-Dinitrofluoranthene	22506-53-2				2B		
1,6-Dinitropyrene	42397-64-8	NTP			2B		
1,8-Dinitropyrene	42397-65-9	NTP					

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
2,4-Dinitrotoluene	121-14-2				2B		
2,6-Dinitrotoluene	606-20-2				2B		
1,4-Dioxane	123-91-1	NTP			2B		yes
Direct Black 38	1937-37-7	NTP					
Direct Blue 6	2602-46-2	NTP					
Divinyl acetylene	821-08-9						yes
Epichlorohydrin	106-89-8	NTP			2A		
Erionite	66733-21-9	NTP			1		
Ethidium Bromide	1239-45-8					yes	
Ethyl acrylate	140-88-5	NTP			2B		
Ethyl ether (w/o inhibitor)	60-29-7						yes
Ethyl methanesulphonate	62-50-0	NTP			2B		
Ethyl Methyl Ketone Peroxide (conc.>60%)	1338-23-4		AT				
Ethyl Nitrate	109-95-5		AT				yes
Ethylamine	75-04-7		AT				
Ethylene dibromide	106-93-4				2A		
Ethylene Fluorohydrin	371-62-0		AT				
Ethylene glycol dimethyl ether (glyme)	110-71-4						yes
Ethylene oxide1	75-21-8	NTP	AT	ORC	1	yes	
Ethylene thiourea	96-45-7	NTP			2B	yes	
Ethyleneimine1(aziridine)	151-56-4		AT				
N-methyl-N-nitrosourea	684-93-5	NTP			2A		
Fluorine	7782-41-4		AT				
Formaldehyde	50-00-0	NTP	AT	ORC	2A		
2-(2-Formylhydrazino)-4-(5-nitro-2-furyl)thiazole	3570-75-0				2B		
Furan	110-00-9	NTP	AT				
2[2-(2-Furyl)-3-(5-nitro-2-furyl)acrylamide]	3688-53-7				2B		
Glu-P-2 (2-Aminodipyrido[1,2-a:3',2'-d]imidazole)	67730-10-3				2B		
Glycidaldehyde	765-34-4				2B		
Grignard Reagents	various						yes
Grisofulvin	126-07-8				2B		
Halothane	151-67-7					yes	
HC Blue No. 1	2784-94-3				2B		
Heptachlor	76-44-8				2B		
Hexachlorobenzene	118-74-1	NTP			2B		
Hexachlorocyclohexanes	608-73-1	NTP			2B		
Hexachloroethane	67-72-1	NTP			2B		
Hexafluroactetone	684-16-2		AT				
Hexamethylphosphoramide	680-31-9	NTP			2B		
Hexone (MIBK)	108-10-1						yes
Hydrazine	302-01-2	NTP			2B		yes
Hydrochloric Acid, anhydrous	7647-01-0		AT				
Hydrofluoric Acid, anhydrous	7664-39-3		AT				
Hydrogen Bromide	10035-10-6		AT				
Hydrogen Chloride	7647,01,0		AT				
Hydrogen Cyanide,anhydrous	74-90-8		AT				
Hydrogen Flouride	7664-39-3		AT				

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Hydrogen Peroxide(>52%by weight)	7722-84-1		AT				
Hydrogen Selenide	7783-07-5		AT				
Hydrogen Sulfide	7783-06-4		AT				
Hydroxylamine	7803-49-8		AT				yes
Indeno[1,2,3-cd]pyrene	193-39-5	NTP			2B		
IQ (2-Amino-3methylimidazo[4,5-f]quinoline)	76180-96-6				2A		
Iron (finely divided)	7439-89-6						yes
Iron, Pentacarbonyl	13463-40-6		AT				
Iron-dextran complex	9004-66-4	NTP			2B		
Isoprene	78-79-5				2B		
Isopropylamine	75-31-0		AT				
Isopropyl ether	108-20-3						yes
Ketene	463-51-4		AT				
Lasiocarpine	303-34-4				2B		
Lead Chromate (Cr+6)	7758-97-6	NTP					
Lead compounds (inorganic)	various	NTP			2B	yes	
Lithium	7439-93-2						yes
Lithium aluminum hydride	16853-85-3						yes
Lithium carbonyl compounds	various						yes
Magenta, manufacture of	632-99-5				1		
MeA-a-C(2-Amino-3-methyl-9H-pyrido[2,3-b]indole)	68006-83-7				2B		
Medroxyprogesterone acetate	71-58-9				2B		
MeIQ (2-Amino-3,4-dimethyimidazo[4,5-f]quinoline)	77094-11-2				2B		
MeIQx (2-Mino-3,8-dimethylimidazo[4,5-f]quinoxaline)	77500-04-0				2B		
Melipan	3771-19-5				2B		
Melphalan (l-phenylalanine mustard)	148-82-3	NTP			2A		
Melphan		NTP			1		
Mercury Compounds	various		AT			yes	
Merphalan	531-76-0				2B		
Metalorganic compounds	various						yes
Methacrylaldehyde	78-85-3		AT				
Methacryloyl Chloride	920-46-7		AT				
Methacryloyloxyethyl Isocyanate	30674-80-7		AT				
Methanesulfonyl Chloride	124-63-0		AT				
Methoxyflurane	76-38-0					yes	
Methoxyprogesterone acetate					1		
Methyl acetylene	74-99-7						yes
Methyl Acrylonitrile	126-98-7		AT				
Methylazoxymethanol acetate	592-62-1				2B		
2-Methylaziridine	75-55-8				2B		
Methyl Bromide	74-83-9		AT				
Methyl Chloride	74-87-3		AT				
Methyl Chloroformate	79-22-1		AT				
Methyl chloromethyl ether	107-30-2			ORC	1		
5-Methylchrysene	3697-24-3				2B		
Methylcyclopentane	98-37-7						yes
Methyl Ethyl Ketone Peroxide (>60%)	1338-23-4		AT				yes

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Methyl Fluoroacetate	453-18-9		AT				
Methyl Fluorosulfate	421-20-5		AT				
Methyl Hydrazine	60-34-4		AT				
Methyl Iodide	74-88-4		AT				
Methyl I-butyl ketone (Hexone)	108-10-1						yes
Methyl Isocyanate	624-83-9		AT				
Methyl Mercaptan	74-93-1		AT				
Methyl Vinyl Ketone	79-84-4		AT				
Methylamine, anhydrous	74-89-5		AT				
Methylmercury Chloride	115-09-3		AT		2B		
Methylmercury compounds	various				2B		
Methyltrichlorosilane	75-79-6		AT				
5-Methoxy psoralen	484-20-8				2A		
8-Methoxy psoralen 7 UV light		NTP			1		
4,4'-Methylene bis(2-chloroaniline) (MOCA)	101-14-4	NTP			2A		
4,4'-Methylene bis(2-methylaniline)	838-88-0				2B		
Methylene Chloride	75-09-2	NTP		ORC	2B		
4,4'-Methylenedianiline	101-77-9			ORC	2B		
Methyl methanesulphonate	66-27-3				2B		
2-Methyl-1-nitroanthraquinone	129-15-7				2B		
N-Methyl-N-nitrosourethane	615-53-2				2B		
N-methyl-N'-nitro-N-nitrosoguanidine	70-25-7				2A		
N-methyl-N-nitrosourea	684-93-5				2A		
methylthiouracil	56-04-2				2B		
Metronidazol	443-48-1				2B		
Mineral oils	8012-95-1	NTP			1		
Mirex	2385-85-5				2B		
Mitomycin C	50-07-7				2B		
Monocrotaline	23291-96-5				2B		
5-(Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2-oxazolinone	139-91-3				2B		
Mustard gas	505-60-2	NTP			1		
Nafenopin	3771-19-5				2B		
1-Napthylamine	134-32-7	NTP		ORC	3		
2-Napthylamine	91-59-8	NTP		ORC	1		
Nickel acetate	373-02-4	NTP					
Nickel and Nickel compounds	7440-02-0	NTP			1		
Nickel carbonate	3333-67-3	NTP			1		
Nickel Carbonyl	13463-39-3	NTP	AT		1		
Nickel Hydroxide	12054-48-7	NTP			1		
Nickel oxide	1313-99-1	NTP			1		
Nickel subsulfide	12035-72-2	NTP			1		
Nickel tetracarbonyl	13463-39-3						yes
Nickelocene	1271-28-9	NTP					
Niridazole	61-57-4				2B		
Nitric Acid (>94.5% by weight)	7697-37-2		AT				
Nitric Oxide	10102-43-9		AT				
Nitrilotriacetic acid	139-13-9				2B		

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
5-Nitroacenapthene	602-87-9				2B		
Nitroaniline (para)	100-01-6		AT				
2-Nitroanisole	91-23-6				2B		
Nitrobenzene	98-95-3				2B		
4-Nitrobiphenyl	92-93-3			ORC			
6-Nitrochrysene	2043937				2B		
Nitrofen (technical-grade)	1836-75-5				2B		
2-Nitrofluorene	2043937				2B		
1-[5-Nitrofurfurylidene)amino]-2-imidazolidonone	555-84-0				2B		
N-[4-(5-Nitro-2-furyl)-2-thiazolyl]acetamide	531-82-8				2B		
Nitrogen Dioxide	10102-44-0		AT				
Nitrogen mustard	51-75-2				2A		
Nitrogen mustard N-oxide	126-85-2				2B		
Nitrogen Oxides(NO,NO2,N204,N203)	10102-44-0		AT				
Nitrogen Tetroxide (nitrogen peroxide)	10544-72-6		AT				
Nitrogen Trifluoride	7783-54-2		AT				
Nitrogen Trioxide	10544-73-7		AT				
Nitromethane	75-52-5		AT				yes
2-Nitropropane	79-46-9				2B		
1-Nitropyrene	5522-43-0				2B		
4-Nitropyrene	57835-92-4				2B		
N-Nitrosodiethylamine	55-18-5	NTP			2A		
N-Nitrosodimethylamine	62-75-9	NTP		ORC	2A		
N-Nitrosodi-n-butylamine	924-16-3				2B		
N-Nitrosodi-n-propylamine	621-64-7				2B		
3-(N-Nitrosomethylamino)propionitrile	60153-49-3				2B		
4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone (NNK)	64091-91-4				2B		
N-Nitrosomethylethylamine	57629-90-0				2B		
N-Nitrosomethylvinylamine	4549-40-0				2B		
N-Nitrosomorpholine	59-89-2				2B		
N-Nitrosonornicotine	16543-55-8				2B		
N-Nitrosopiperidine	5632-47-3				2B		
N-Nitrosopyrrolidine	35884-45-8				2B		
N-Nitrososarcosine	13256-22-9				2B		
Ochratoxin A	303-47-9				2B		
Oestrogens, non-steroidal					1		
Oestrogens, steroidal					1		
Oil Orange SS	2646-17-5				2B		
Oleum (65-80% fuming sulfuric acid)	8014-94-7		AT				
Oral contraceptives, combined					1		
Oral contraceptives, sequential					1		
Osmium Tetroxide	20816-12-0		AT				
Oxygen Difluoride (fluorine monoxide)	7783-41-7		AT				
Ozazepam	604-75-1				2B		
Ozone	10028-15-6		AT				
Panfuran S (containing dihydroxymethylfuratrizine)	794-93-4				2B		
Pentaborane	19624-22-7		AT				

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Peracetic Acid (>60%)	79-21-0		AT				yes
Perchloric Acid (>60%)	7601-90-3		AT				yes
Perchloryl Fluoride	7616-94-6		AT				
Perchlorylmethyl Mercaptan	594-42-3		AT				
Peroxyacetic Acid (>60%)	79-21-0		AT				yes
Phenacetin & analgesics	101-93-9				2A		
Phenazopyridine hydrochloride	136-40-3				2B		
Phenobarbitol					2B		
Phenoxybenzamine hydrochloride	59-96-1				2B		
Phenytoin	630-93-3				2B		
Phosgene (carbonyl chloride)	75-44-5		AT				
Phosphine (hydrogen phosphide)	7803-51-2		AT				
Phosphorus, elemental (red or white)	7723-14-0						yes
Phosphorus Oxychloride	10025-87-3		AT				
Phosphorus Trichloride	7719-12-2		AT				
Phosphoryl Chloride	10025-87-3		AT				
Picric Acid	88-89-1						yes
Piperazine Estrone Sulfate (under Conjugated Estrogens)	7280-37-7	NTP					
Polybrominated biphenyls	59536-65-1	NTP			2B		
Polychlorinated biphenyls	1336-36-3	NTP			2A		
Ponceau 3R2B	608016				2B		
Ponceau MX	3761-53-3				2B		
Potassium (elemental)	7440-09-7						yes
Potassium bromate	7758-01-2				2B		
Potassium Cyanide	151-50-8		AT				
Procarbazine hydrochloride	366-70-1				2A		
Progestins					2B		
1,3-Propane sultone	1120-71-4				2B		
Propargyl Bromide	106-96-7		AT				
b-Propiolacetone	57-57-8			ORC	2B		
Propyl Nitrate	627-3-4		AT				
Propylene oxide	75-56-9				2A		
Propylthiouracil	51-52-5				2B		
Pyrophoric Materials	various						yes
Quartz (Crystalline Silica)	14808-60-7	NTP					
Radon	10043-92-2	NTP					
Rubidium	7440-17-7						yes
Saccharin	128-44-9				2B		
Safrole	94-59-7				2B		
Sarin	107-44-8		AT				
Selenium Hexafluoride	7783-79-1		AT				
Shale oils	68308-34-9				1		
Shikimic Acid	138-59-0				2B		
Silane gas	7803-62-5						yes
Silica, crystalline	112945-52-5	NTP			1		
Sodium, elemental	7440-23-5						yes
Sodium amide	7782-92-5						yes

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Sodium azide	26628-22-8						yes
Sodium cyanide	143-33-9		AT				
Sodium Equilin Sulfate (under conjugated Estrogens)	16680-47-0	NTP					
Sodium Estrone Sulfate (under conjugated Estrogens)	438-67-5	NTP					
Sodium hydride	7646-69-7						yes
Sodium ortho-phenylphenate	132-27-4				2B		
Sodium-potassium alloy	11135-81-2						yes
Soots		NTP			1		
Sterigmatocystin	10048-13-2				2B		
Stibine (antimony hydride)	7803-52-3		AT				
Streptozotocin	18883-66-4				2B		
Strontium Chromate (Cr+6)	7789-06-2	NTP					
Styrene	100-42-5				2A		yes
Styrene oxide	96-09-3				2A		
Sulfallate	95-06-7				2B		
Sulfur Dioxide (liquid)	7446-09-5		AT				
Sulfur Pentafluoride	5714-22-7		AT				
Sulfur Tetrafluoride	7783-60-0		AT				
Sulfur Trioxide	7446-11-9		AT				
Sulfuric Anhydride	7446-11-9		AT				
Talc containing asbestiform fibers	14807-96-6				1		
Tamoxifen	10540-29-1	NTP					
Tellurium Hexafluoride	7783-80-4		AT				
2,3,7,8- Tetrachlorodibenzo-para-dioxin (TCDD)	1746-01-6				1		
Tetrachloroethylene	127-18-4				2A		
Tetrafluoroethylene	116-14-3		AT		2B		yes
Tetrafluorohydrazine	10036-47-2		AT				
Tetrahydrofuran (w/o inhibitor)	109-99-9						yes
Tetrahydronaphthalene	119-64-2						yes
Tetramethyl Lead	75-74-1		AT				
Tetranitromethane	509-14-8				2B		
Thioacetamide	62-55-5				2B		
4,4'-Thiodianiline	139-65-1				2B		
Thionyl Chloride	7719-09-7		AT				
Thiourea	62-56-6				2B		
Thorium dioxide	1314-20-1	NTP					
Tobacco products, smokeless					1		
Tobacco smoke					1		
Toluene diisocyanates	26471-67-5				2B		
ortho-Toluidine	119-93-7				2B		
Toxaphene (polychlorinated camphenes)	8001-35-2				2B		
Treosulphan	299-75-2				1		
Triethylborane	97-94-9						yes
Trichlormethine (trimustine hydrochloride)	817-09-4				2B		
Trichloro (chloromethyl) silane	1558-25-4		AT				
Trichloro (dichlorophenyl) silane	27137-85-5		AT				
Trichloroethylene	79-01-6				2B		

Substance	CAS	National Toxicity Program Carcinogen[1]	Acute Toxin[2]	OSHA Regulated Carcinogen[3]	IARC Group Carcinogen[4]	Reproductive Toxin[5]	Violently Reactive/ Explosive/Peroxide Forming/Pyrophoric[6]
Trichlorofluoroethylene	79-38-9		AT				
1,2,3-Trichloropropane	96-18-4				2A		
Trichlorosilane	10025-78-2		AT				
Tridymite (Crystalline Silica)	15468-32-3	NTP					
Trimethoxysilane	2487-90-3		AT				
Trinitrobenzene	99-35-4						yes
Trinitrotoluene	118-96-7						yes
Tris(1-aziridinyl)phosphine sulfide (Thiotepa)	52-24-4	NTP			2A		
Tris(2,3-dibromopropyl) phosphate	126-72-7				2A		
Trp-P-1 (3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole) acetate	68808-54-8				2B		
Trp-P-2 (3-Amino-1-methyl-5H-pyrido[4,3-b]indole)	72254-58-1				2B		
Trypan blue	72-57-1				2B		
Uracil mustard	66-75-1				2B		
Urethane	51-79-6	NTP			2B		
Vinyl acetate	108-05-4				2B		yes
Vinyl acetylene	689-97-4						yes
Vinyl bromide	593-60-2				2A		
Vinyl chloride	75-01-4	NTP		ORC	1	yes	yes
Vinyl ethers	109-93-3						yes
Vinyl fluoride	75-02-5				2A		
2-vinyl pyridine	100-69-6						yes
4-vinyl pyridine	100-43-6						yes
Vinylidene chloride	75-35-4						yes
Water Reactive Materials	various						yes
Zinc (finely divided)	7440-66-6						yes
Zinc Chromate (Cr+6)	13530-65-9	NTP					
Zirconium (finely divided)	7440-67-7						yes

Notes

In identifying Prior approval for a laboratory, it is necessary to consider the nature of the hazard. For example, mineral oil is a PHS when it is aerosolized and available for inhalation. Elemental materials such as cadmium and lead are PHS when they can be inhaled or ingested. They need not be considered a PHS when their presence is in a non-respirable, solid form (such as a piece of metal), and not being released to the atmosphere.