PHOENIX FIRE CODE SUMMARY

HOW TO COMPLETE A HAZARDOUS MATERIAL INVENTORY STATEMENT

REFERENCE FIRE CODE SECTION *Phoenix Fire Code* (2006 ed.), Section 2701.5.2.

SCOPE OF THIS FIRE CODE SUMMARY A step-by-step explanation on how to fill out a Hazardous Materials Inventory Statement in order to meet the reporting requirements contained in the Fire Code.

OVERVIEW

Section 2701.5.2 of the Phoenix Fire Code requires that all permit applications for hazardous materials include a Hazardous Materials Inventory Statement, or "HMIS". HMIS documents the information required by the Fire Department and is part of the Hazardous Materials Permit Application which can be obtained at: http://phoenix.gov/fire/prevention/specialhazards/index.html. Click on "Hazardous Materials Permit Application".

WHAT IS A HAZARDOUS MATERIAL?

A hazardous material is any chemical, whether solid, liquid or gas, which possesses physical hazards or health hazards as listed in the chart below:

PHYSICAL HAZARD		HEALTH HAZARD
Combustible Liquid	Organic Peroxide	Toxic
Cryogenic	Oxidizer	Highly Toxic
Explosive	Pyrophoric	Corrosive
Flammable Gas (includes Level 2 & 3 aerosols)	Unstable Reactive	
Flammable Liquid	Water Reactive	
Flammable Solid		

If a chemical has a physical or health hazard characteristic as defined in the Fire Code, it MUST be reported on the HMIS. To determine if a chemical has physical or health hazards, refer to the Material Safety Data Sheet (MSDS) for that substance.

In general, any material that has an NPFA 704 hazard rating of a "4," "3," or "2" or has a special hazard rating such as water reactive (~~W~~), corrosive (COR or CR) or oxidizer (OXY) should be included. Pesticides, fungicides or herbicides with a U.S. E.P.A. warning label of "Danger" or "Warning" should also be reported. All compressed gases, liquefied compresses gases and cryogenic fluids should be reported.

HOW DO I COMPLETE THE HMIS?

The HMIS is divided into several columns labeled as follows:

- Chemical
- Concentration (Conc. %)
- Chemical Abstract Service Number (CAS No.)
- Chemical Classification per Phoenix Fire Code (PFC Classification)
- Physical State (Solid, liquid, gas)
- Amount (Storage, Use-Closed, Use-Open)
- Placard requirements per NFPA 704

To complete the HMIS:

1. List the name of all hazardous materials under the heading **Chemicals**. While one can list the proprietary name (Ex., "Micro Super XP 2000"), it is easier for our Inspectors to evaluate an HMIS if the generic name of a chemical is used (Ex. "methyl alcohol").

2. Next, list the **Concentration** of the substance below the heading "Conc **%**." If a product is in a pure state, it should be indicated as "100%." If it is a weaker solution, write the concentration as indicated on the MSDS. If the product is a mixture of several chemicals, write "MIX."

3. Write in the **Chemical Abstract Service** (CAS) number under the heading "CAS No." Every chemical made has an associated CAS number. This can be found in the MSDS. If the product is a mixture, list the two or three primary chemicals found in the product and their corresponding concentration in the column "Conc. %".

4. Determine the **PFC Hazard Classification** for each chemical. To do this, you will need to review to the MSDS for the product in question, and then cross-reference the information to the definitions contained in the Fire Code for each hazard classification. (This is described more fully in the next section).

5. Determine the **Physical State** of a product. Most chemicals will be listed as a solid, liquid or gas. There are a few exceptions:
   - Aerosol products should be listed as "aerosol."
   - Some products, such as propane or chlorine, may be listed as "liquefied gas".
   - Cryogenic fluids should be listed as "cryogen".
   - Compressed gases should be listed as "compressed gas".

6. Next, place the **Amount** of hazardous material under the sub-column "Storage," "Use-Closed" or "Use-Open." They are defined as follows:
   - **Storage (Section 2702)—** The keeping, retention or warehousing of hazardous materials in closed containers, tanks, cylinders, or similar vessels; or vessels supplying operations through closed connections to the vessel.

- **Use-Closed** (Section 202)— The sue of a solid or liquids hazardous material involving a closed vessel or system that remains closed during normal operations where vapors emitted by the product are not liberated outside of the vessel or system and the product is not exposed to the atmosphere during normal operations; and all used of compressed gas. Examples of closed systems for solids and liquids include product conveyed through a piping system in to a closed vessel, system or piece of equipment.
- **Use-Open** (Section 202)— The use of a solid or liquid hazardous material involving a vessel or system that is continuously open to the atmosphere during normal operations and where vapors are liberated, or the product is exposed to the atmosphere during normal operations. Examples of open systems for solids and liquids include dispensing from or into open beakers or containers, dip tank and plating tank operations.

7. The final column lists the **NFPA 704** labeling for the chemical listed. The NFPA 704 contains a simple and easily understood marking system to alert firefighters of the presence of a hazardous material in occupancy. It is divided into three parts, each receiving a number from 0 to 4 to indicate the relative risks of a chemical. "H" stands for health hazard, "F" stands for flammability and "R" stands for reactivity. Most of the time, the NFPA labeling can be found near the end of the MSDS.

WHAT CAN I EXCLUDE ON THE HMIS?

The following can be excluded from the HMIS:

- Copier toner
- Correction fluid
- Cleaning products intended for consumer use
- Solder & solder flux
- Automotive batteries
- Level 1 Aerosols
- Construction material such as sand, cement and asphalt

HOW DO I DETERMINE THE PFC CLASSIFICATION OF A HAZARDOUS MATERIAL?

When a hazardous material meets one of the definitions contained in the Phoenix Fire Code that hazardous materials classification should be written under "PFC Classification." For example, unleaded gasoline meets the definition of a "Class I-B Flammable Liquid." Therefore, under the column labeled "PFC Classification," unleaded gasoline would be listed as "Flammable Liquid I-B."

If a chemical has more than one physical or health hazard property, then ALL hazard classification for that chemical should be listed.)

Physical Hazards—Definitions

Aerosols—An aerosol, per Phoenix Fire Code Section 2802, is a product that is dispensed from an aerosol container by a propellant. Many of the propellants used are liquefied compressed flammable gases and are highly flammable. In a fire, these containers can rupture causing the container to fly through a building, spreading flames throughout.

Aerosols are further subdivided by Level 1, 2, or 3, depending on the flammability of the propellant. The Fire Code highly regulates the storage of Level 2 and 3 aerosols. If the combined quantity of Level 2 and 3 aerosols is less than 500 pounds, they do NOT need to be reported on the HMIS. Larger quantities must be listed on the HMIS.

One cannot usually determine the aerosol classification by reading the label. However, the cartons are usually marked, such as "LEVEL 2 AEROSOL". Note: If no classification is marked on the carton, treat it as a Level 3 Aerosol.

Combustible Liquid—A combustible liquid, per Phoenix Fire Code Section 3402, is defined as a liquid which has a closed cup flash point at or above 100°F. Combustible liquids are further subdivided as follows:

Class II—Flash point at or above 100°F and below 140°F.

Class IIIA—Flash point at or above 140°F and below 200°F.

Class IIIB—Flash point at or above 200°F.

Combustible liquids should be reported on the HMIS in "**gallons**".

Compressed Gas—A compressed gas, per Phoenix Fire Code Section 3002, is any material which is a gas at 68°F or less at 14.7 psia pressure and has a boiling point of 68°F or less at 14.7 psia. (The boiling point is the temperature at which a liquid turns to a gas. For example, the boiling point of water is 212°F.) The state of a compressed gas may be as follows:

- Liquefied (ex. Propane or carbon dioxide)
- Non-liquefied (ex. Argon)
- In solution (ex. acetylene)

Compressed gases may be further classified as non-flammable, flammable, oxidizing, pyrophoric, toxic, highly toxic or corrosive (see below).

Compressed gases are reported on the HMIS in "**cubic feet**."

Cryogenic—A cryogenic fluid, per Phoenix Fire Code Section 3202, is any material that has a boiling point lower than -130°F at 14.7 psia. Cryogenic fluids can further be classified as flammable, non-flammable or oxidizer. Examples include liquefied oxygen and liquefied nitrogen.

Cryogenic fluids are reported on the HMIS in "**gallons**."

Explosive—An explosive, per Phoenix Fire Code Section 3302, is any chemical compound, mixture

or device, the primary or common purpose of which is to function by explosion. This includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, igniters and display fireworks and all material within the scope of USC Title 18: Chapter 40.

Explosives are further subdivided in the Fire Code as high explosives (ex. dynamite), low explosives (ex., black powder), mass-detonating explosives, and includes UN/DOT Class I explosives, Division 1.1 through1.6.

Explosives are reported on the HMIS in "**pounds**."

Flammable Gas—A flammable gas, per Phoenix Fire Code Section 3502, is any material which is a gas at 68^0F or less at 14.7 psia pressure (has a boiling point of 68^0F or less at 14.7 psia) and which:

- Is ignitable at 14.7 psia when in a mixture of 13% or less by volume with air, or;
- Has a flammable range at 14.7 psia with air of at least 12%, regardless of the lower limit.

In some cases, a flammable gas may be listed as a "flammable liquefied gas" if under pressure, it is partially a liquid at a temperature of 68^0F and is flammable.

Flammable gases are reported on the HMIS in "**cubic feet**."

Flammable Liquid– A flammable liquid, per Phoenix Fire Code Section 3402, is defined as a liquid which has a closed cup flash point below 100°F. Flammable liquids are further subdivided as follows:

- Class IA—Flash point below 73°F and a boiling point below 100°F.
- Class IB—Flash point below 73°F and a boiling point at or above 100°F.
- Class IC—Flash point at or above 73°F and below 100°F.

Note: Flammable liquids do not include compressed gases or cryogenic fluids.

Flammable liquids should be reported on the HMIS in "**gallons**".

Flammable Solids—Flammable solids, per Phoenix Fire Code Section 3602, are materials, other than a blasting agent or explosive, that is capable of causing fire through friction, absorption or moisture, spontaneous chemical changes, or retained heat from manufacturing or processing, or which has an ignition temperature below 212°F, or which burns so vigorously and persistently when ignited as to create a serious hazard (Refer to CPSC15 CFR; Part 1500.44).

Examples of flammable solids include magnesium or sodium metal and lithium hydride. They react explosively with water, can cause toxic combustion by-products and often required specialized fire extinguishing agents to control.

Organic Peroxide—Organic peroxides, per Phoenix Fire Code Section 3902, are reactive substances which contain a double oxygen bond. They can present as an explosion or deflagration hazard, be shock sensitive or decompose into unstable compounds. They are divided into five

classes, depending on their degree of (in)stability. The Fire Code regulates Class I through Class IV organic peroxides.

An important characteristic of organic peroxides is their temperature sensitivity. The S.A.D.T., or "self-accelerating decomposition temperature," is the temperature at which organic peroxide begin to decompose. This process can become uncontrollable and result a violent container rupture or fire.

Oxidizer—An oxidizer, per Phoenix Fire Code Section 4002, is a material that readily yields oxygen or other oxidizing gas that react to promote or initiate combustion. Examples include oxygen, bromine, chlorine and fluorine.

Oxidizers are divided into four classes, depending on their degree of (in)stability: A Class 4 oxidizer is the most dangerous and can undergo an explosive reaction upon contamination or exposure to thermal or physical shock. It can also cause spontaneous ignition of combustible. A Class 1 oxidizer slightly increases the burning rate but does not cause spontaneous ignition on contact with combustible materials.

Oxidizers can exist as a solid, liquid or gas and should be listed in the HMIS in "**pounds**," "**gallons**" or "**cubic feet**," depending on its state. They are NOT flammable substances, but enhance the rate of combustion. They may also be corrosive, toxic, unstable and water reactive.

Pyrophoric—A pyrophoric material, per Phoenix Fire Code Section 4102, is a chemical which ignites in air at or below 130°F. Pyrophoric materials are commonly used in semiconductor fabrication and include silane, phosphine and diborane. Other pyrophorics include Grignard reagents, alkali metals and metal hydrides.

Pyrophoric materials may also be water reactive or toxic. They can come as a solid, liquid or gas and should be listed in the HMIS in "**pounds**," "**gallons**" or "**cubic feet**," depending on its state.

Unstable (reactive)—A unstable reactive, per Phoenix Fire Code Section 4302, is a material, other than an explosive, which will vigorously polymerize, decompose, condense or become self-reactive and can undergo other violent chemical changes when exposed to heat, friction or shock, or when exposed to an incompatible material. Unstable reactives range from Class 4 materials, which can readily detonate, to Class 1 materials, which are normally stable, but can become unstable at elevated temperature and pressure. Examples include styrene monomer and toluene diisocyanate (TDI).

Unstable materials can come as a solid, liquid or gas and should be listed in the HMIS in "**pounds**," "**gallons**" or "**cubic feet**," depending on its state.

Water-reactive material—Water reactive substances, per Phoenix Fire Code Section 4402, are materials which explode, react violently, cause ignition of combustibles or produce flammable toxic or other hazardous gases upon exposure to water or moisture. Examples include alkali metals of sodium, potassium or lithium, and compounds containing carbides, nitrides, phosphides and inorganic chlorides.

Water-reactive materials can come as a solid, liquid or gas and should be listed in the HMIS in "**pounds**," "**gallons**" or "**cubic feet**," depending on its state.

Health Hazards—Definitions

Information on the health hazards in chemicals are usually found in the "Health Hazards Data" section of an MSDS. You can then use the toxicology data provided to determine if a chemical is non-toxic, toxic or highly-toxic, according to the IFC definitions described below:

Toxic—A solid, liquid or gas is considered toxic, per Phoenix Fire Code Section 3702, under any of the following circumstances:

- When the median lethal dose (LD_{50}) is more than 50 mg/kg but less than 500 mg/kg when given to albino rats weighing between 200 and 300 grams.
- When the median lethal dose (LD_{50}) is more than 200 mg/kg but less than 1000 mg/kg when administered by continuous contact for 24 hours to the bare skin of a albino rabbits weighing between 2 and 3 kilograms.
- When the median lethal concentration (LC_{50}) in air is more than 200 part per million (PPM) but less than 2,000 PPM by volume of gas or vapor, or more than 2 mg per liter but less than 20 mg per liter of mist, fume or dust, when administered by continuous inhalation for one hour to albino rats weighing between 200 and 300 grams.

Examples of toxic materials include chlorine, hydrogen fluoride and potassium hydroxide.

Highly Toxic—A solid, liquid or gas is considered highly toxic for any of the following:

- When the median lethal dose (LD_{50}) is 50 mg/kg or less when given to albino rats weighing between 200 and 300 grams.
- When the median lethal dose (LD_{50}) is 200 mg/kg or less when administered by continuous contact for 24 hours to the bare skin of a albino rabbits weighing between 2 and 3 kilograms.
- When the median lethal concentration (LC_{50}) in air is more than 200 part per million (PPM) or less by volume of gas or vapor, or 2 mg per liter or less per liter of mist, fume or dust, when administered by continuous inhalation for one hour to albino rats weighing between 200 and 300 grams.

Highly toxic materials are highly regulated in the Fire Code and include fluorine gas, acrolein and sodium azide.

Toxic and highly toxic materials should be listed in the HMIS in "**pounds**," "**gallons**" or "**cubic feet**," depending on its state.

Corrosive—A corrosive material, per Phoenix Fire Code Section 3102, is any solid, liquid or gas which can cause visible destruction or irreversible alteration to living tissue by chemical action at the point of contact when tested on the intact skin of albino rabbits for a period of 4 hours.

Common corrosives include acids and bases. Bases are also called "caustics" or "aklakis"). Acids, such as sulfuric acid or hydrochloric acid, have a low pH. Alkali substances, such as sodium hydroxide and ammonium hydroxide, have a high pH. Any corrosive with a pH of 1 through 4 (an acid) or a pH of 8 through 14 (a base), should be reported on the HMIS.

HOW CAN I GET HELP TO COMPLETE MY HMIS

Completing a Hazardous Materials Inventory Statement is a time-consuming task. If you would like our assistance, please call 602-256-3434 and ask for the Special Hazards Unit for assistance.

Note: Complex systems for the storage/use/and handling of hazardous materials may require the assistance of an industrial hygienist, chemical engineer, environmental reporting consultant or other qualified individual at your expense.

Last Revised: 06/09/09

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EXAMPLE OF A COMPLETED HAZARDOUS MATERIALS INVENTORY STATEMENT

Chemical	Conc. (%)	CAS No.	PFC Classification	Physical State	Amount			NFPA704		
					Storage	Use Closed	Use Open	H	F	R
Calcium Hypochlorite	90-94	7778-54-3	Class 3 Oxidizer, Class 2 Unstable (Reactive); Corrosive	Solid	Lbs.	Lbs.	Lbs.	3	0	2
Trichloroisocyanuric Acid	100	87-90-1	Class 1 Oxidizer, Class 1 Unstable (Reactive); Toxic	Solid	Lbs.	Lbs.	Lbs.	3	0	1
Sodium Dichloroisocyanurate, dihydrate	100	51580-86-0	Class 1 Oxidizer, Class 1 Unstable (Reactive)	Solid	Lbs.	Lbs.	Lbs.	2	0	1
Sodium Hydroxide pellets	100	1310-73-2	Corrosive	Solid	Lbs.	Lbs.	Lbs.	3	0	0
Potassium Hydroxide pellets	100	1310-58-3	Corrosive, Toxic	Solid	Lbs.	Lbs.	Lbs.	3	0	0
Chromium Trioxide	100	1333-82-0	Class 2 Oxidizer, Corrosive, Toxic	Solid	Lbs.	Lbs.	Lbs.	3	0	2
Gasoline	100	8006-61-9	Flammable Liquid I-B, Irritant	Liquid	Gal.	Gal.	Gal.	1	3	0
Diesel Fuel	100	Mixture	Combustible Liquid II	Liquid	Gal.	Gal.	Gal.	2	2	0
Motor Oil	100	Mixture	Combustible Liquid IIIB	Liquid	Gal.	Gal.	Gal.	0	1	0
Isopropyl Alcohol	100	67-63-0	Flammable Liquid I-B	Liquid	Gal.	Gal.	Gal.	1	3	0
Hexane	100	110-54-3	Flammable Liquid I-B	Liquid	Gal.	Gal.	Gal.	1	3	0
Methyl Ethyl Ketone	100	78-93-3	Flammable Liquid I-B	Liquid	Gal.	Gal.	Gal.	1	3	0
Styrene Monomer	100	100-42-5	Flammable Liquid I-C, Class 2 Unstable (Reactive)	Liquid	Gal.	Gal.	Gal.	2	3	2
Hydrochloric Acid	15-37	7647-01-0	Corrosive	Liquid	Gal.	Gal.	Gal.	3	0	0
Sulfuric Acid	98	7664-93-9	Corrosive, Class 2 Water Reactive, Toxic	Liquid	Gal.	Gal.	Gal.	3	0	2
Sulfuric Acid	12.7-50	7664-93-9	Corrosive, Class 1 Water Reactive, Toxic	Liquid	Gal.	Gal.	Gal.	3	0	1
Sodium Hydroxide, aqueous	2-50	1310-73-2	Corrosive	Liquid	Gal.	Gal.	Gal.	3	0	0
Propane	100	74-98-6	Flammable Liq. Gas	Liq. Gas	Gal w.c.	Gal. w.c.	Gal. w.c.	0	4	0
Acetylene	100	74-86-2	Flammable Com. Gas	Com. Gas	Cu. Ft.	Cu. Ft.	Cu. Ft.	0	4	2
Oxygen, Compressed	100	7782-44-7	Oxidizer Com. Gas	Com. Gas	Cu. Ft.	Cu. Ft.	Cu. Ft.	0	0	0
Oxygen, Liquefied	100	7782-44-7	Oxidizer Cryo. Fluid	Cryogen	Gal.	Gal.	Gal.	3	0	0
Nitrogen, Liquefied	100	7727-37-9	Inert Cryo. Fluid	Cryogen	Gal.	Gal.	Gal.	3	0	0