HAZARD COMMUNICATION PROGRAM 2011-2012

Purpose

The Federal Occupational Safety and Health Regulations require employers to provide information regarding hazardous chemicals to its employees, who may be exposed to such chemicals in their workplace, laboratories, classrooms, etc. In addition, New York State has enacted Right-To-Know legislation to protect employees from potential hazards associated with chemicals in the workplace. This procedure is intended to provide the Hamilton College community with the guidance necessary to comply with these requirements.

Authority

These procedures are based upon requirements of federal law, generally recognized best EHS management practices, and/or criteria established by the National Institute of Occupational Safety and Health (NIOSH).

Objectives

- To protect the health and welfare of Hamilton College employees, and the greater Hamilton College community;
- To provide employees with the necessary information concerning health and non-routine activities; and
- To comply with Title 29, Part 1910.1200 of the Code of Federal Regulations (CFR), otherwise known as the Hazard Communication Standard (HCS)—click HERE to go directly to the standard.

Exemptions

1. As per the HCS, the following are exempt from inclusion in this program:

- Any article which is formed to a specific shape or design during manufacturing and does not release or otherwise result in exposure to a toxic substance under normal conditions of use;
- Products intended for human consumption;
- Retail and cafeteria food sale operations and all other retail trade operations, exclusive of processing and repair activities;
- Any food, food additive, color additive, drug or cosmetic, or distilled spirits, wines, malt beverages, or pesticides.

2. Chemical Usage in a Laboratory Setting

- While many elements of this written program are useful and/or required for minimizing unwanted occupational exposure to hazardous chemicals regardless of the work setting, the use of chemicals in a laboratory setting is principally regulated by OSHA's Lab Safety Standard, and the Hamilton College Chemical Hygiene Plan (CHP) which implements this standard. So, it is the CHP which is the principal management program regarding chemical usage in a laboratory setting, and should be referenced accordingly.

3. Chemical Usage by Students

While students working with chemicals in an academic setting are not technically considered employees (unless they are paid in some capacity by the college—like a teaching assistant or work-study student), the rules/requirements/procedures outlined herein shall be an integral part of the academic learning and research environment at Hamilton to provide for the protection of all college personnel and students.

Responsibilities

The functional implementation of this Hazard Communication Program at Hamilton College mandates the following procedural responsibilities:

- Primary responsibilities for implementing these procedures will rest with the various Hamilton College departments, supervisors and instructors who are in the best position to know the daily tasks of those under their direction, and the chemicals with which they would actually or potentially have to work with;
- Program coordination, initial and department/supervisor training, and auditing functions shall be provided by the Office of Environmental Protection, Safety & Sustainability; and
- Funds and other resources necessary for the implementation and administration of this procedure, including departmental chemical inventorying, new employee training, container labeling and other related activities, shall be the responsibility of each department in cooperation with the Office of Environmental Protection, Safety & Sustainability.

Scope

This written compliance program, in accordance with the aforementioned purpose, authority, objectives, exemptions, and responsibilities, will be made available upon request to employees, their designated representatives, and to all local, state, and federal officials, and will be accomplished by outlining the following:

- A system for maintaining a comprehensive chemical product inventory;
- A system for properly labeling chemical containers and the according chemical storage areas;
- A system for collecting and maintaining Material Safety Data Sheets (MSDS's) for all chemical products on the college property;
- The implementation of an employee training program to educate employees on how they can protect themselves from potential chemical hazards during both routine and non-routine activities;
- A system for maintaining the required documentation; and
- Providing access to this written program to contract workers employed by Hamilton College, or to emergency authorities in need of chemical information.

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SECTION 1
CHEMICAL PRODUCT INVENTORY

Each Hamilton College department that uses hazardous chemicals shall compile and maintain a chemical product inventory exclusive to its department, which shall be updated every time a new chemical product is put into use by the department. This inventory should include, but is not limited to:

- The chemical name, trade name or the common name used on the MSDS and/or container label;
- The chemical manufacturer or distributor; and
- The internet link to the chemical's MSDS on the manufacturer's website (where available).

On a regular or at least annual basis, all college departments should submit revised chemical product inventories to the Office of Environmental Protection, Safety & Sustainability, located in the Phillip Spencer House, which shall be the central depository for the comprehensive chemical product inventory, inclusive of all Hamilton College departments. This central inventory will be updated every January, or more often as needed. The inventory shall be retained by the college for 30 years as required by the HCS.

SECTION 2
LABELING

All Hamilton College departments that use hazardous chemicals shall maintain a chemical product labeling system in accordance with the HCS. When hazardous substances are received by the according departments, the responsible personnel shall examine the containers to determine and ensure the labels provide the following information:

- The identity of the hazardous substances they contain;
- Appropriate graphic or written warnings of the physical and health hazards associated with those substances; and
- The name of the chemical manufacturer or distributor.

When hazardous substances are transferred into portable containers, the responsible personnel shall ensure that the portable containers are adequately labeled with a HAZCOM label. While a number of different strategies are available to achieve the minimum HAZCOM labeling requirements under the HCS, Hamilton College will primarily use the NFPA labeling system to graphically convey information regarding flammability, reactivity, health hazards and other special hazard information (if applicable).

Exceptions

General Labeling Exceptions
In instances where an individual transfers a hazardous chemical into a portable container for his or her immediate use, the portable container would not need to be HAZCOM labeled. However, if the portable container and its contents are not completely used up, and/or the container is temporarily stored in a location where others may gain access to it, the HAZCOM labeling requirements would apply.

Laboratory Exceptions
In laboratories regulated by OSHA's Lab Safety Standard, certain containers and/or on-going experimental apparatuses may not be easily or practically labeled in accordance with this plan. Examples of such situations include small petrie dishes, flasks, test tubes, beakers, etc. When these kinds of containers are used as temporary chemical storage or experimental devices, they need not be labeled, as long as the laboratory facility fully complies with the college's Chemical Hygiene Plan.

Each department shall ensure that the labels on containers of hazardous substances are not removed or defaced. In the event labels become illegible, they will be replaced.

Appendix A provides guidance on how to properly fill out and affix a HAZCOM label, in accordance with the NFPA labeling system and this written plan.

SECTION 3
MATERIAL SAFETY DATA SHEETS (MSDS's)

Material Safety Data Sheets (MSDS's) are documents that supply information about a particular hazardous substance, chemical or mixture. Manufacturers are required to provide MSDS's when the hazardous materials are sold to distributors or purchasers. MSDS's must be in English, and will typically provide the following information in accordance with the HCS:

1. Chemical product and company identification
2. Composition and information on ingredients
3. Hazards identification
4. First aid measures
5. Firefighting measures
6. Accidental release measures
7. Exposure controls - personal protection
8. Handling and storage
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information

Each department shall maintain updated MSDS files for all materials listed within their departmental chemical product inventory, in a manner such that they are readily accessible for review by any employee, faculty member or student.

On a regular basis, but no longer than annually, departments should submit copies of new chemical product MSDS's to the Office of Environmental Protection, Safety & Sustainability, located in the Phillip Spencer House, which shall be the central depository for the comprehensive MSDS files, inclusive of all Hamilton College departments. This centralized file will be updated every January, or more often as needed. The college shall retain all MSDS's for 30 years as required by the HCS.

Appendix B provides an example of a typical chemical product MSDS that meets the basic OSHA requirements.

SECTION 4
EMPLOYEE INFORMATION AND TRAINING

The Office of Environmental Protection, Safety & Sustainability shall develop a general employee training program to meet the training requirements of the HCS. It is the responsibility of each department to provide its employees training for activities which are unique to that department. The Director of Environmental Protection, Safety & Sustainability is available for assistance in the development of these programs.

Students registered in courses where they may be exposed to hazardous chemicals under normal operating conditions or foreseeable emergencies should be trained before working with or in a work area containing hazardous chemical or materials. This training is the responsibility of the instructor.

Initial/Semi-Annual Employee Hazardous Properties of Chemicals Orientation

Within one month of employment, or at some time earlier where employees may have to work with hazardous chemicals immediately as a part of their employment, each employee will receive initial orientation training in accordance with this program. Each Hamilton College department will be responsible for coordinating this initial training internally, or with the assistance of the Office of Environmental Protection, Safety & Sustainability. Additional categorical or chemical-specific training for those employees routinely using hazardous chemicals as per the sections that follow will further be the responsibility of each Hamilton College department. This training will be repeated semi-annually for all employees using hazardous chemicals.

This initial orientation training shall include, but is not limited to, the following:

- The basic requirements of the Hazard Communication Standard, and the location and availability of Hamilton College's written hazard communication program;
- An overview of the physical, chemical, and biological hazards found in the workplace;
- Routes of exposure and general safe work practices;
- Personal protective equipment;
- General guidelines for emergency situations;
- Examples of the hazardous properties associated with select groups of chemicals; and
- Information on interpreting labels and MSDS's, and the relationship between these two methods of hazard communication.

Appendix C provides an example of the format and text of this initial training.

Categorical or Chemical-Specific HAZCOM Training

Categorical or chemical-specific HAZCOM training is required for all employees who routinely utilize hazardous chemicals during the course of their work, and for new chemicals introduced into the workplace. The content and detail to which a training supervisor providing chemical-specific training commits is perhaps the single most important element of HAZCOM training. If extremely hazardous chemicals are to be used, then the required content and detail of the training should be enhanced as appropriate.

This routine HAZCOM training shall include, but is not limited, to the following:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical(s) in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance and odor of the hazardous chemical, etc.);
- The physical and chemical health hazards of the chemical(s);
- The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to the hazardous chemical(s), such as appropriate work practices, emergency procedures, and personal protective equipment; and
- The details of the hazard communication program developed by the employer, including an explanation of the labeling system and MSDS program.

When employees are assigned to non-routine tasks that may expose them to a hazardous chemical for which they have not been trained, they shall be trained in accordance with the above described HAZCOM training. Some examples of non-routine tasks include:

- Confined space entry activities; and
- Repairs of pipes containing hazardous materials.

Appendix D contains a quick-reference HAZCOM Training Form for the chemical substance MSDS provided in Appendix B. This form may be utilized as a tool when conducting categorical or chemical-specific HAZCOM training, and Appendix E provides a blank copy of this form for those reasons.

HAZCOM Awareness Training For Laboratory Personnel

Since laboratories, as noted above, are principally regulated by OSHA's Lab Safety Standard and the Hamilton College Chemical Hygiene Plan (CHP) that implements the standard, certain elements of the HCS do not technically apply in lab settings. Nonetheless, some elements of the HCS and this written program are critical to managing hazardous chemicals at Hamilton College regardless of their location of use/storage. Accordingly, certain sections of this written program, like inventory, MSDS's, and labeling, will be addressed through initial/semi-annual training classes such that laboratory personnel have sufficient competency to maintain compliance with both written programs.

SECTION 5
DOCUMENTATION & ACCESS TO THE HCS PROGAM AND ITS ELEMENTS

Documentation Requirements

MSDS's & Chemical Product Inventories
As noted throughout this written program, MSDS's and departmental chemical product inventories shall be maintained by both the departments using chemicals, and the Office of Environmental Protection, Safety & Sustainability. Once chemicals are no longer in use by a department, the Office of Environmental Protection, Safety & Sustainability will maintain the MSDS on file in accordance with the 30 year time frame.

Training Records
Appendix F contains a training recordkeeping form that will be used by the Office of Environmental Protection, Safety & Sustainability when conducting training for those who are receiving either initial/semi-annual Employee Hazardous Properties of Chemicals Orientation, or HAZCOM Awareness Training for Laboratory Personnel. These training records will be kept indefinitely by the Office of Environmental Protection & Safety. For those departments required to conduct categorical or chemical-specific HAZCOM training, this same form in Appendix F can be used to document an employee's attendance to the training class, but a copy of the actual MSDS, or some other summary of the chemical (like the Appendix D/E Quick Reference Training Form) should be used to specify the target of the training. These training records shall be maintained by the departments performing the training class.

Access to the Written Hazard Communication Program and its Elements

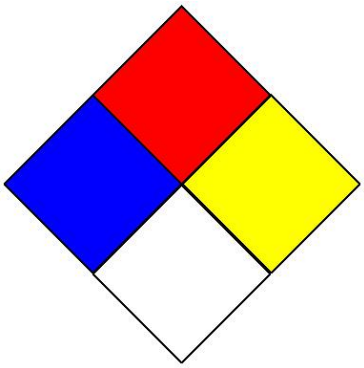
All college employees and students have immediate access to this written program via the Office of Environmental Protection & Safety's webpage. A quick link to this webpage is as follows:
Hamilton EHS Website

Additionally, Hamilton College provides a supplemental MSDS access tool (to supplement hard copy MSDS's from the manufacturer) through a network subscription to Chemwatch. The 140,000+ MSDS's available on the Chemwatch database are accessible over the internet at this LINK by any person on campus with a Hamilton College network connection. Back up CD's with the same information is available during network outages, through the Science Stockroom Coordinator, the Chemistry or Biology Lab Directors, or the Director of Environmental Protection, Safety & Sustainability.

Finally, any employee or student wishing to have a copy of the OSHA Hazard Communication standard may receive a copy by request to the Director of Environmental Protection, Safety & Sustainability, or they may view this link:
OSHA Hazard Communication Standard--29 CFR 1910.1200

APPENDIX A
LABELING GUIDANCE

In accordance with the OSHA HCS and the Hamilton College Hazard Communication Program, affixed Haz Com labels should utilize the NFPA diamond format as follows:



The Red section of the diamond, corresponding to Fire Hazard rating, should be assigned a number from 0 to 4 based upon the flashpoint of the chemical as follows:

- 4—FP below 73 degrees F
- 3—FP below 100 degrees F
- 2—FP above 100 degrees F but below 200 degrees F
- 1—FP above 200 degrees F
- 0—Will not burn

The Yellow section of the diamond, corresponding to Reactivity rating, should be assigned a number of 0 to 4 based upon the reactivity data of the chemical as follows:

- 4—Chemical may detonate
- 3—Chemical may detonate in the presence of shock and/or heat
- 2—Chemical is prone to violent chemical change
- 1—Chemical is unstable if heated
- 0—Chemical is stable

The Blue section of the diamond, corresponding to the Health Hazard rating, should be assigned a number of 0 to 4 based upon information found within the MSDS as follows:

- 4—Deadly
- 3—Extremely dangerous
- 2—Hazardous
- 1—Slightly hazardous
- 0—Normal material

The White section of the diamond, corresponding to Specific Hazards associated with the chemical, can use the symbols as follows:

- **OX**—Chemical is an oxidizer
- **ACID**—Chemical is an acid
- **ALK**—Chemical is an alkali or caustic
- **COR**—Chemical is a corrosive, pH < 2 or > 12.5

- **~~W~~ (W with a line through it)—**Chemical is a water reactive compound

Additionally, the label should identify in written form:
- The hazardous substance within the container; and
- The name and address of the chemical manufacturer or distributor (if applicable).

Labels that conform to this guidance are readily available in a host of shapes and forms, and can satisfy every type of container used in a diversified workplace. Please contact the Office of Environmental Protection, Safety & Sustainability for information about the different types of labels as such.

Additionally, the college has prescriptive access to the Chemwatch software over the internet and by disc, to facilitate hazardous chemical information access. Information regarding chemical labeling, MSDS's and the NFPA ratings necessary to complete a HAZCOM label can be retrieved by any employee or student on the network by logging accessing the Chemwatch website at this LINK.

APPENDIX B
EXAMPLE MSDS

turtle wax

NFPA RATING
HEALTH = 1
FLAMMABILITY = 2
REACTIVITY = 0

Material Safety Data Sheet
May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

T-525

IDENTITY *(As Used on Label and List)*
BUG & TAR REMOVER LIQUID, T-525

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name TURTLE WAX, INC.	Emergency Telephone Number NA
Address 5655 WEST 73RD STREET	Telephone Number for Information (708) 563-3600
CHICAGO, IL 60638	Date Prepared 7/1/90
	Signature of Preparer *(optional)*

Section II – Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% *(optional)*
PETROLEUM DISTILLATES (CAS #64475-85-0)	5 MG/M³	5 MG/M³	NA	15.0%
PETROLEUM DISTILLATES (CAS #92045-37-9)	5 MG/M³	5 MG/M³	NA	10.0%
MONOCYCLIC TERPENES (CAS #8006-64-2)	100 PPM	100 PPM	NA	7.0%

Section III – Physical/Chemical Characteristics

Boiling Point	NA	Vapor Pressure (mm Hg.)	NA	Vapor Density (AIR = 1)	NA
Specific Gravity (H_2O = 1)	0.932	Melting Point	NA	Evaporation Rate (Butyl Acetate = 1)	NA
Solubility in Water	40%				
Appearance and Odor	WHITE WATERY EMULSION. ODOR: SOLVENT.				

Section IV – Fire and Explosion Hazard Data

Flash Point (Method Used)	110°F TCC	Flammable Limits NA	LEL NA	UEL NA
Extinguishing Media	CARBON DIOXIDE, CHEMICAL FOAMS, WATER SPRAY			
Special Fire Fighting Procedures	NA			
Unusual Fire and Explosion Hazards	NA			

Section V – Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	NA
Incompatibility *(Materials to Avoid)*			NA
Hazardous Decomposition or Byproducts			NA
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	NA

(Reproduce locally) OSHA 174, Sept. 1985

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Section VI – Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
Health Hazards *(Acute and Chronic)*	DIZZINESS, ANESTHETIC EFFECT	IRRITANT	CONTAINS PETROLEUM DISTILLATES. MAY BE HARMFUL OR FATAL IF SWALLOWED.
Carcinogenicity:	NTP? NA	IARC Monographs? NA	OSHA Regulated? NA

Signs and Symptoms of Exposure: EYE IRRITANT, RESPIRATORY IRRITATION, HEADACHE, DIZZINESS, ANESTHETIC EFFECT

Medical Conditions Generally Aggravated by Exposure: NA

Emergency and First Aid Procedures

EYE CONTACT: WASH THOROUGHLY WITH WATER FOR 15 MINUTES.

SKIN CONTACT: WASH WITH SOAP AND WATER.

INGESTION: DO NOT INDUCE VOMITING. CALL PHYSICIAN.

INHALATION: REMOVE FROM EXPOSURE. IF BREATHING IS STOPPED, RESUSCITATE AND ADMINISTER OXYGEN.

Section VII – Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled

ELIMINATE ALL SOURCES OF IGNITION. USE OIL ABSORBENT MEDIA.

Waste Diosposal Method: INCINERATE

Precautions to Be Taken in Handling and Storing: NA

Other Precautions: NA

Section VIII – Control Measures

Respiratory Protection *(Specify Type)*: SUPPLIED AIR RESPIRATORY SYSTEM

Ventilation				
	Local Exhaust	YES	Special	NA
	Mechanical *(General)*	NA	Other	NA

Protective Gloves	NA	Eye Protection	SPLASH GOGGLES

Other Protective Clothing or Equipment: NA

Work/Hygienic Practices: NA

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☆ U.S.G.P.O.: 1966 – 491 – 529/45775
Form No. 1428

APPENDIX C
REFERENCE HAZCOM CHEMICAL SAFETY INFORMATION

1. GENERAL CONSIDERATIONS

Chemicals are a part of every aspect of our lives. A minute does not go by that we do not use something that contains chemicals, or chemicals were used in the manufacturing process. The chemicals you use in the work place only present potential health and physical hazards when they are mishandled, improperly used, incompatible mixtures combined, improperly stored or labeled.

Depending upon the chemical and the level of exposure, health hazards can vary from minor skin irritations to serious chemical burns, nerve damage, different forms of cancer and even death. Physical damage may include fires, explosions, property and environmental damage.

Hazard awareness is recognizing and understanding the potential injuries and illnesses or physical damage the chemicals can cause. The communication of this information is essential for your being aware of, understanding and respecting the potential hazards. This knowledge is important for the decisions you make concerning how you use the chemicals and the safe work practices you follow. Working with chemicals may involve exposure because of the hazardous properties of the chemicals, which can be summarized into three broad categories:

- physical
- chemical
- biological

It should be noted that many hazards may be present at any one time. It is important to understand the fundamentals of each of these properties and their relationships so that effective safety practices may be employed to reduce the risk to the public and remedial response personnel. Some hazards that may be encountered at this work site are toxic substances, flammable materials, explosive materials, corrosive materials, biological agents, excessive noise, heat or cold stress, oxygen deficient work areas, and radioactive materials.

2. PHYSICAL PROPERTIES

Physical Hazards. Chemical compounds possess inherent properties, which determine the type and degree of the hazard they represent. Evaluating risks of an incident depends on understanding these properties and their relationship to the environment.

- Solubility. The ability of a solid, liquid, gas or vapor to dissolve in a solvent is solubility. An insoluble substance can be physically mixed or blended in a solvent for a short time but is unchanged when it finally separates. The solubility of a material is important when determining its reactivity, dispersion, mitigation and treatment. Solubility is generally given in parts per million (ppm).
- Density. The density of a substance is its mass per unit volume, commonly expressed in g/cc.
- Specific gravity. Specific gravity is the ratio of the density of a substance to the density of water. If the specific gravity of a substance is greater than 1 it will sink in water. The substance will float in water if its specific gravity is less than 1.
- Vapor density. The vapor density is the density of a gas compared to the density of air. If the density of a gas is greater than that of air then the gas will tend to pocket and settle into the lowest points. If the vapor density is close to air or lower than air then the gas will disperse. If the vapor or gas displaces oxygen in the low spots then it can become an asphyxiant problem. If the gas or vapor is an explosive, when it pockets it will become an explosive hazard.
- Flashpoint. If the ambient temperature in relation to the material of concern is right, then it may give off enough vapor at its surface to allow ignition by an open flame or spark. The minimum

temperature at which a substance produces sufficient flammable vapors to ignite is its flashpoint. If the vapor does ignite, combustion can continue as long as the temperature remains at or above the flashpoint. The relative flammability of a substance is based on its flashpoint. An accepted relation between the two is:

- Highly flammable: Flashpoint <100 F
- Moderately flammable: Flashpoint >100 F & <200 F
- Relatively inflammable: Flashpoint >200 F

3. CHEMICAL PROPERTIES

Chemical Hazards. Hazardous conditions which may exist as a result of the chemical nature of substances may be summarized as fire hazards, explosive hazards, corrosive hazards, and chemical reactivity.

Fire hazards.

- Combustibility—is the ability of a material to act as a fuel, that is, to burn. Materials that can be readily ignited and sustain a fire are considered to be combustible, while those that cannot are called noncombustible. Three elements are required for combustion to occur: fuel, oxygen, and heat. The concentration of the fuel and the oxygen must be high enough to allow ignition and maintain the burning process. Combustion is a chemical reaction that requires heat to proceed. Heat is supplied by the ignition source and is maintained by the combustion, or it must be supplied from an external source. The relationship of these three fire components form a triangle. If one leg of the triangle is removed, then the fire can be extinguished. For example, water applied to a fire removes the heat, thereby extinguishing the fire. When a material generates enough heat by itself to self-ignite and combust, spontaneous combustion occurs, either as a fire or explosion (e.g. diesel greater than 140 degrees Fahrenheit is combustible.)
- Flammability—is the ability of a material (liquid or gas) to generate a sufficient concentration of combustible vapors under normal conditions to be ignited and produce a flame. It is necessary to have a proper fuel-to-oxygen (oxygen) ratio (% fuel in air) to allow combustion. A flammable material is considered highly combustible if it can burn at ambient temperatures. But a combustible material is not necessarily flammable because it may not be easily ignited or the ignition maintained. Pyrophoric materials will ignite at room temperature in the presence of a gas or vapor or when a slight friction or shock is applied.

The substances listed below are either easily ignited (pyrophorics), require little oxygen to support combustion, have low flammability limits and explosive limits and a wide flammable and explosive range.

- *Flammable liquids*—Aldehydes, ketones, amines, alcohols, aliphatic/aromatic hydrocarbons.
- *Flammable solids*—Phosphorous, dusts of magnesium, zirconium, titanium, aluminum and zinc.
- *Water Reactive Flammable Solids*—Potassium, sodium, lithium.
- *Pyrophoric liquids*—Organometallic compounds, dimethyl zinc, tributyl aluminum.

Some of the hazards related to fires and explosions can cause physical destruction due to shock waves, heat, and flying objects. Secondary fires can be created as well as other flammable conditions. Toxic or corrosive compounds may also be released to the surrounding environment as well.

Explosives

An explosive is a substance that undergoes a very rapid chemical transformation producing large amounts of gases and heat. The gases produced, for example, nitrogen, oxygen, carbon monoxide, carbon dioxide, and steam, due to the heat produced, rapidly expand to velocities exceeding the speed of sound. This

creates both a shockwave (high pressure front) and noise. The main categories of explosives are listed below.

- *High or detonating*—produces a shock wave followed by combustion.
- *Primary high explosive*—detonation occurs in a short time. Examples: lead azide, mercury fulminate, and lead styphnate.
- *Secondary high explosive*—needs a booster to detonate. Examples: Tetryl, cyclonite, dynamite and TNT
- *Low or deflagrating*—Explosive rate very fast. Combustion followed by a shock wave. Examples: smokeless powder, magnesium, and molotov cocktail.

Corrosive Hazards

Corrosion is a process of material degradation. Upon contact, a corrosive material may destroy body tissues, metals, plastics, and other materials. Corrosivity is the ability of material to increase the hydrogen ion concentration of a material or to transfer electron pairs of or from itself or another material. A corrosive material is a reactive compound or element that produces a destructive chemical charge in the material it is acting on. Common corrosives are:

- *Acids*—Acetic acid, nitric acid, hydrochloric acid, sulfuric acid.
- *Bases*—Potassium hydroxide, sodium hydroxide, calcium hydroxide.
- *Halogens*—bromine, chlorine, fluorine, iodine.

Skin irritation and burns are typical results when the body contacts an acidic or basic corrosive material. The measure of an acid or a base is the pH scale. The pH scale ranges from 0 to 14 with a pH <7 being acidic and a pH>7 being basic. The lower the pH of the acid the more acidic is the material, and the higher the pH of the base the more alkaline is the material. A pH of 7 is considered neutral.

Chemical Reactivity

- Reactivity hazards. A reactive material is one that undergoes a chemical reaction under specified conditions. Generally, the term "reactive hazard" is used to refer to a substance that undergoes a violent or abnormal reaction in the presence of water or under normal ambient atmospheric conditions. Among this type of hazard are the pyrophoric liquids which will ignite in air at or below normal room temperature in the absence of added heat, shock or friction, and the water-reactive flammable solids which will spontaneously combust upon contact with water.
- Compatibility. If two or more hazardous materials remain in contact indefinitely without reaction, they are compatible. Incompatibility, however, does not necessarily indicate a hazard. For example, acids and bases (both corrosive) react to form salts and water, which may not be corrosive.

The compatibility of materials must be determined before the materials are used or stored. Some examples of incompatibilities are sulfuric acid and plastics (toxic gas or vapor is produced), Acids and metal (flammable gas or vapor is produced), chlorine and ammonia (chlorine gas is created, toxic gas). There are many other incompatibilities that may be found. Check to make sure that the materials used for a project are compatible.

All of the hazards listed above will be found on the material safety data sheet (MSDS). The MSDS is a short technical report that provides you with the known hazards of a specific material. The MSDS explains how to properly use the material, handle any problems related to the material and how to store the material. Know what the MSDS says for the materials that you work with.

All materials should have a label on them. This is the first and easiest place to look to see if a material is hazardous. Labels should tell you any precautions that must be taken when handling the material. Read

the label on the materials that you use and abide with the cautions and warnings. If a material is not properly labeled, notify your supervisor so that the problem is corrected.

4. BIOLOGICAL PROPERTIES

Biological hazards/agents are living organisms that can cause sickness or death to exposed individuals. Biological hazards can cause infection or disease to persons who are exposed. Biological hazards may involve plants or animals including microorganisms. Biological hazards, such as disease causing agents, may be present at a hazardous waste site or involved in a spill. Like chemical hazards, they can be dispersed throughout the environment via wind and water.

Many biological agents require a carrier to inoculate a person. For instance, rabid rodents at a landfill may be a biological hazard. Deer carry ticks that may have Rocky Mountain Spotted fever; prairie dogs will not. The same personal protective requirements for a response to a chemical hazard apply to biological hazards. Body coverings and respiratory protective equipment might have to be utilized. Especially important is the need to maintain personnel cleanliness. Before eating, drinking or smoking residual contamination should be washed off.

Bloodborne Pathogen hazards are a subset of biological hazards, which are regulated by a program that is beyond the scope of hazard communication training. Those individuals who may come into contact with bloodborne pathogens need to be trained in accordance with this standard.

5. HAZARDOUS MATERIAL PROTECTION

Routes Of Exposure:

- Inhalation - Breathing contaminated air (e.g. welding fumes.)
- Skin Absorption - Contact with harmful liquids, gases, solids or contaminated clothing, equipment, medications, cosmetics, etc. A good example is solvents. Materials can also enter through an open wound.
- Ingestion - Eating or drinking contaminated foods, water or medications. (Remember food and cigarettes can become contaminated by your unwashed hands, gloves, equipment. Good hygiene practices are very important.)
- Injection - A contaminated material can be injected into some part of the body.

Protection from potentially hazardous materials include the following:

- Use good personal hygiene. This is the simplest control measure to chemical hazards.
- Know what protective equipment is required for the specific job you are doing. Ask your supervisor what risks you might encounter and what hazardous substances you are working with.
- Know what potential explosive and or flammable conditions may exist with the job you are doing.
- Have all confined spaces checked for explosives, hydrogen sulfide and oxygen deficiency. Know what hazards are involved with confined spaces.
- Know where emergency equipment is located and how to use it. For example know where the nearest fire extinguisher is from your work area.
- Know the standard operating procedures for rescue and emergency situations.
- Know the proper method for decontamination when working with hazardous materials.
- Use the buddy system when at all possible. Keep communication lines open when working with hazardous materials.
- Stay out of contaminated areas if you are not properly trained, equipped, or authorized to enter. Do not take chances with life-threatening materials or situations.

Personal Protective Equipment:
Different types of protective equipment will be required depending on the substances to be handled, the existing conditions, and the particular situation. Personal protective equipment includes a variety of special suits, hard hats, goggles, face shields, aprons, boots, gloves, and respirators. Each is designed to protect you from certain hazards. It is important for you to know the advantages and disadvantages of all the equipment you may use or need. Use all equipment as instructed and follow all written procedures for the specific equipment.

Standard Operating Procedures for Emergency Situations:
Standard operating procedures exist for any unexpected event such as an accident, fire, explosion, etc.

If you know or suspect that you have been contaminated with a hazardous substance, **TELL YOUR SUPERVISOR**. You should know the general symptoms of over-exposure to toxic substances. These include:

- Irritation of skin, eyes, nose, throat, or respiratory tract
- Changes in complexion or skin discoloration
- Headache
- Difficulty in breathing
- Nausea
- Dizziness or light-headedness
- Excessive salivation (drooling)
- Lack of coordination
- Blurred vision
- Cramps and/or diarrhea
- Changes in behavior patterns

You should know the location of emergency eyewash and shower facilities.

For spills and leaks of hazardous materials, limit the leak or spill as quickly as possible. Small spills should be cleaned up immediately. If a valve must be closed to prevent a spill from continuing then do so. If the spill is large, or your skin, eyes or clothing are contaminated, leave the work area immediately. Wash eyes, skin and clothes off with lots of water to remove the material. Get to fresh air. Notify your supervisor or instructor as soon as possible. Unless you have special training and the proper protective equipment, do not try to clean up large spills yourself.

If a corrosive material is splashed in your eyes or on your skin and clothes, deal with it immediately. Wash the affected area with plenty of water (at least 15 minutes with a continuous stream). Remove any contaminated clothing. Get to fresh air if you feel burning in the nose, throat or lungs. Do not vomit if you have swallowed a corrosive material. Drink large quantities of water to dilute the material, and seek immediate medical attention.

6. EXAMPLES OF HAZARDOUS MATERIALS AND THEIR PROPERTIES

Solvents (like acetone, xylene and toluene)
Solvents are among the most common toxic materials in the workplace. Many processes, mixing and cleaning, use or give off solvent vapors. They are also used as thinners in paints and adhesives. Solvents vary in their toxicity from practically non-toxic materials such as the alcohols, ketones, halogenated solvents, to the very toxic such as dimethyl acetamide, methyl acrylate and other materials. Some solvents are also flammable or reactive.

Solvents can cause irritations to the eyes and skin when in high concentrations. Most will dissolve the protective layer of oils on the skin and leave it looking white in the small cracks. They should never be used to clean the skin; if there is a problem with contamination, some form of glove or barrier cream should be used to protect the skin. The early signs of overexposure often include headaches, dizziness, nausea and other related symptoms.

Metals and Solid Particulates (like cadmium, galvanized metal, lead, manganese, nickel, zinc)
Metals and other particulate solids can be toxic and are usually given off when welding or grinding. Some, like gypsum dust are only nuisance dusts, while others, like zinc fume from welding cause flu-like symptoms. Others, like asbestos have been linked to cancer and other chronic diseases. Dusts can irritate the skin and be ingested with food, drinks or smoking materials if they aren't washed off the hands and removed from clothing. They may also be carried home to family members and cause problems there if they are not washed off before leaving the work area.

When the welding, brazing, grinding or cutting of metal is performed, care should be taken to avoid breathing the fumes or dusts. Local exhaust ventilation should be used to reduce your exposure. If fumes and dust cannot be controlled with exhaust ventilation, appropriate approved respirators should be used. Approved safety goggles and gloves should be worn when working with metals. Gloves may be necessary to prevent skin sensitization and dermatitis.

Acids (like sulfuric acid, nitric acid, hydrochloric acid)
Sulfuric acids are often found in lead-acid batteries, while hydrochloric (or muriatic) acid is often used as a pool cleaning additive. Acids are considered corrosives and cause material degradation. Acids destroy tissues, metals and other materials. Acids can cause skin irritations in the form of rashes or other types of dermatitis, and more severe problems such as skin or eye burns. When working with acids proper eye and face protection should be worn as well as hand protection, and the appropriate respiratory protective equipment should be donned when other engineering controls are unavailable.

Lubricants, Coolants and Machine Oils
Lubricants, coolants and machine oils are common in machine shops and garages. There are three types: petroleum based (straight oils), water based, and synthetic fluids (which contain no oils). Many cutting oils contain additives to inhibit corrosion, prevent bacterial growth and permit high temperature operation. The fumes and mist from cutting operations can be irritating to the eyes and lungs. Skin exposure can result in acne-like conditions and can cause other problems. Avoid breathing mist and fumes and use gloves and aprons to minimize contact with materials.

Gases (like helium, carbon dioxide, argon, oxygen, hydrogen, liquefied petroleum gas, propane)
Gases present a range of problems. Some, like nitrogen, are simple asphyxiants. They prevent the body from getting enough oxygen by displacing it from the airstream. Some are chemically hazardous, like carbon monoxide, or nitrous oxide, which cause poisoning of the body systems. Some are very toxic, like arsine and phosphine. Some are very reactive and should be dealt with in very careful manners. Other gases, like hydrogen, oxygen and acetylene are explosives and must be treated with great care. All compressed gas cylinders should be secured by chains and stands at all times, and only the proper fittings should be used. Liquefied and petroleum gases are extremely flammable and considered simple asphyxiants.

Plastics, Epoxies, and Polymers
Plastics, epoxies and polymers are a growing group of industrial chemicals. Materials such as polystyrene, polypropylene, acrylates, vinyls and polyurethane are but a few. Although most of these

materials are not toxic in their final form, where they are being molded, extruded, laid up, there can be significant hazards. When burned, these materials can be very hazardous.

Cleaners (bleach, drain cleaner, rug/upholstery cleaners, stain removers)
Cleaners contain acid, alkalis, aromatics, surfactants, petroleum products, ammonia and hypochlorite. Because of these ingredients these materials are considered to be irritants, and can be harmful to you if swallowed or inhaled. Many may cause eye, nose, throat, skin and lung irritation. Some cleaners are flammable and burn easily. Others may be caustic or corrosive and cause severe skin burns. Because many cleaners used in the job area are consumer products commonly found in our homes, you may underestimate the hazard they pose. Protect yourself from these hazards by reading the labels and following the recommended precautions. Wear gloves and eye protection. Avoid inhaling the vapors and mists. Wash your hands and face thoroughly before eating, drinking or smoking.

Specific emergency procedures for each chemical will be detailed on that cleaner's material safety data sheet. In general, if a cleaning chemical gets into your eyes, flush the eyes with clean running water for at least 15 minutes, then seek medical attention. If the chemical gets on your skin, wash the area of contact and seek medical attention.

Do not mix two cleaning chemicals together, unless specifically told to do so by your supervisor. For example, the dangerous gas, chlorine, will be created if you mix bleach and ammonia or bleach and drain cleaner together.

Fuels (like diesel oil, gasoline, propane, kerosene)
The primary hazard posed by fuels is obviously, fire. Fuels are either flammable or combustible. Whether flammable (a material which is easily ignited and burns with extreme rapidity) or combustible (a material capable of fueling a fire), they should be handled with care.

Proper storage and transport of fuels in approved, self-closing, safety containers is extremely important and should be strictly adhered to at all times. When filling portable containers with flammable materials they should be properly grounded and bonded to the container to prevent ignition from static electricity.

Store gasoline in containers marked "gasoline". Store kerosene in containers marked "kerosene". Never use kerosene containers for the transport or storage of gasoline.

Excessive skin contact with fuels can result in dermatitis. Some petroleum products have been shown to cause skin tumors. Inhalation of fuel vapors over a long period of time can cause central nervous system depression, and may aggravate any existing respiratory problems that may exist. Ingestion of fuels can cause poisoning. Do not induce vomiting. If fuels get in your eyes, rinse with clean water for at least 15 minutes and seek medical attention.

7. LABELING

Proper labeling of all chemical containers is another excellent control measure for chemical hazards. Container labels give the name of the chemical in the container, the name/address of the manufacturer and a hazard warning statement and/or graphic hazard statement that warns you of possible dangers. Read the label on all materials with which you work.

Examples of hazard warning statements:

- Danger, will cause death if swallowed
- Warning, causes eye irritation, harmful if swallowed

- Caution, avoid contact with skin and avoid breathing of vapors

Labels and their warnings should be taken seriously since they provide you with the first clue to the hazards posed to your health and safety. They also give information on personal protective equipment required, emergency response and first-aid steps in case of an exposure, proper procedures in case of a spill and emergency phone numbers.

8. MATERIAL SAFETY DATA SHEETS

Material safety data sheets, if read and followed, are a powerful means of controlling chemical exposures. MSDS are written by chemical manufacturers for the chemicals they produce or import. The purpose of the MSDS is to communicate information on the recommended safe use and handling procedures for that chemical.

MSDS's may look different, but the Occupational Safety and Health Administration (OSHA) requires that all MSDS's must provide certain categories of information about the chemical substance or mixture:

- Material identification (physical and chemical)
- Hazardous ingredients
- Emergency and first aid procedures
- Recommended control measures
- Physical and health hazards
- Safe handling procedures
- Date of preparation/revision
- Manufacturer's name, address, and phone number
- Primary routes of entry
- National Toxicological Program (NTP) or Annual Report on Carcinogens from the International Agency for Research on Cancer

APPENDIX D
EXAMPLE OF A QUICK-REFERENCE HAZ COM TRAINING FORM

NAME OF PRODUCT: Bug and Tar Remover Liquid, T-525

WHAT IS IT USED FOR: Industrial/Commercial Cleaning Activities

WHAT DOES IT LOOK/SMELL LIKE: White/Watery Emulsion with Solvent Odor

IS IT FLAMMABLE: No, but it is a combustible liquid, FP=110 degrees F

IS IT REACTIVE: No **HOW:** N/A

IS THIS PRODUCT CARCINOGENIC: No **CORROSIVE:** No

ARE THERE ANY INCOMPATIBILITIES: None Listed

NFPA CODE: **FIRE:** 2 **REACTIVITY:** 0 **HEALTH:** 1

WHAT WILL IT DO TO ME IF:

IT GETS ON MY SKIN: can be irritating to the skin

I SWALLOW IT: contains petroleum distillates—may be harmful or fatal if swallowed

IT GETS IN MY EYES: can be irritating to the eyes

I BREATHE IT: can cause dizziness, and anesthetic effects

WHAT FIRST AID SHOULD I USE:

EYES: wash thoroughly with water for 15 minutes

SKIN: wash with soap and water

INGESTION: do not induce vomiting—call a physician

INHALATION: remove from exposure—if breathing has stopped, resuscitate and administer oxygen

WHAT PERSONAL PROTECTIVE EQUIPMENT SHOULD I USE:

EYES: splash goggles when using

SKIN: none listed—use adequate protection as per your supervisor

OTHER: appropriate respiratory protection may be required—see your supervisor

APPENDIX E-1
QUICK-REFERENCE HAZ COM TRAINING FORM

NAME OF PRODUCT:

WHAT IS IT USED FOR:

WHAT DOES IT LOOK/SMELL LIKE:

IS IT FLAMMABLE:

IS IT REACTIVE: **HOW:**

IS THIS PRODUCT CARCINOGENIC: **CORROSIVE:**

ARE THERE ANY INCOMPATIBILITIES:

NFPA CODE: **FIRE:_____** **REACTIVITY:_____** **HEALTH:_____**

WHAT WILL IT DO TO ME IF:

IT GETS ON MY SKIN:

I SWALLOW IT:

IT GETS IN MY EYES:

I BREATHE IT:

WHAT FIRST AID SHOULD I USE:

EYES:

SKIN:

INGESTION:

INHALATION:

WHAT PERSONAL PROTECTIVE EQUIPMENT SHOULD I USE:

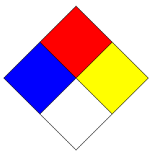
EYES:

SKIN:

OTHER:

APPENDIX E-2
QUICK-REFERENCE HAZCOM TRAINING FORM

Chemical Product Name	Manufacturer

Basic Chemical Product Safety Information		
What does product look/smell like?		
Is product flammable/combustible?		☐Y ☐N
Is product air or water reactive?		☐Y ☐N
Are there any chemical incompatibilities?		☐Y ☐N
Is product corrosive? If so, what is the pH?		☐Y ☐N pH_____
Is the product or any of its constituents a listed carcinogen?		
	What are the NFPA/HMIS Ratings for this product for the purposes of filling out a HAZCOM label on secondary containers?	Flammability:
		Reactivity:
		Health:
		Special Hazard:

Chemical Product Exposure Considerations	
• **What will happen if the product:**	
Gets on my skin?	
Gets in my eyes?	
Is swallowed?	
Is breathed/inhaled?	

	First Aid Measures
	• **First aid measures for each major route of entry:**
Skin Exposure	
Eye Exposure	
Ingestion	
Inhalation	

Personal Protective Equipment (PPE) Controls	
• **Use the following articles of PPE to protect my:**	
Skin	
Eyes	
Respiratory System	
Other	

Other Considerations	
Are any engineering controls required or recommended?	☐Y ☐N Explain:
How are small/incidental spills of the product to be handled?	Explain:
Does the use of this product result in the generation of a hazardous waste?	☐Y ☐N Explain:

APPENDIX F
HAZARD COMMUNICATION TRAINING DOCUMENTATION

The following individuals have been trained in accordance with both the Federal Hazard Communication Standard, and Hamilton College's written hazard communication program (or as indicated below). The training satisfies:

_____ Initial/Semi-Annual Hazardous Properties of Chemicals Orientation

_____ HAZCOM Awareness Training for Laboratory Personnel

_____ Categorical or Chemical-Specific HAZCOM Training
Chemical Class or Identity:_____

Training Instructor Name	Signature	Date of Training

Name (Print)	Signature	Dept.	SS#