



6001 University Boulevard
Moon Township, Pennsylvania 15108

Safety Policy Manual – Section 4.0

Policy No. LS 1.2 **“CHEMICAL HYGIENE”**

Department: Safety
 Section: 4.0 – Lab Safety Management

Title: Chemical Hygiene Policy
 Number: LS 1.2

I. PURPOSE:

- A. This policy outlines Robert Morris University’s compliance with the requirements of the Federal Occupational Safety and Health Administration (OSHA) Standard for Occupational Exposure to Hazardous Chemicals in the Laboratory (29 CFR 1910.1450), and details uniform procedures and work practices to ensure that all laboratory personnel who work in a laboratory area are properly informed about the hazardous chemicals used during work activities in the laboratory, the risks involved, and the procedures or precautions to follow to minimize potential exposure to those chemicals.

II. SCOPE & APPLICABILITY:

- A. This policy applies to all Robert Morris University personnel engaged in the “laboratory use” of hazardous chemicals. This program does not apply to:
 - 1. Uses of hazardous chemicals which do not meet the definition of “laboratory use”.
 - 2. Laboratory uses of hazardous chemicals which provide no potential for personnel exposure.

III. REFERENCES:

- A. OSHA 29 CFR 1910.1450; Occupational Exposure to Hazardous Chemicals in Laboratories
- B. The National Research Council publication on “Prudent Practices”.
- C. OSHA 29 CFR 1910.106; Flammable and Combustible Liquids.
- D. NFPA 45, Fire Protection for Laboratories Using Chemicals.

IV. DEFINITIONS:

- A. Chemical Hygiene Program: A written program developed and implemented which sets forth procedures, equipment, personal protective equipment and work practices capable of protecting employees from the hazards of hazardous chemicals in the laboratory.
- B. Hazardous Chemical: Any chemical which presents a **physical** or **health hazard**.
- C. Health Hazard: A chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed persons.
- D. Laboratory: Means a facility where the “laboratory use of hazardous chemicals” occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.
- E. Laboratory Use of Hazardous Chemicals: Means handling or use of such chemicals in which all the following conditions are met:
 - 1. Chemical manipulations are carried out on a laboratory scale;
 - 2. Multiple chemical procedures or chemicals are used;

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3. The procedures involved are not part of the production process, nor simulate a production process; and
 4. Protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposure to hazardous chemicals.
- F. Physical Hazard: A chemical for which there is scientific evidence that it is a combustible liquid, compressed gas, explosive, flammable material, organic peroxide, oxidizer, pyrophoric, unstable (reactive) or water-resistant substance.

V. PROCEDURE:

A. Standard Safety Precautions:

1. Because few laboratories are without hazards, the following safety precautions for handling all laboratory chemicals will be utilized by Robert Morris University laboratory faculty and staff to minimize exposure and operate under the assumption that any mixture of hazardous chemicals is more toxic than the most toxic component. Laboratory personnel are instructed to follow proper work practices and utilize personal protective equipment as appropriate. However, the following precautions are utilized when working with such chemicals:
2. **Eye contact:** Promptly flush eyes with water for a prolonged period (approximately 15 minutes) and seek medical attention.
3. **Skin contact:** Promptly flush the affected area with water for a prolonged period (approximately 15 minutes) and remove any contaminated clothing. Use a safety shower when contact is extensive and seek medical attention as determined necessary.
4. **Ingestion:** Encourage the victim to drink large amounts of water or as instructed by the substance MSDS and seek medical attention. The Pittsburgh Poison Center may be contacted for additional information at 412-681-6669.
5. **Clean up:** Promptly clean up spills using appropriate protective apparel and equipment, and properly dispose of waste. Specific procedures are identified in the University's "Spill Clean-Up Policy" found in section HM1.6 of this policy manual.
6. Do not smell or taste chemicals.
7. Inspect gloves and test glove boxes before use.
8. Do not allow release of toxic substances in cold rooms and warm rooms, since these have recirculated atmospheres.
9. Use only those chemicals for which the design of the available ventilation system is appropriate.
10. No eating, drinking, smoking, applying cosmetics, etc. in areas where laboratory chemicals are present. Always wash hands and exposed areas when leaving the area.
11. Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur. Use equipment only for its designated purpose.

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12. No horseplay or practical jokes that may confuse, startle, or distract another worker.
 13. Do not use mouth suction for pipetting or starting a siphon.
 14. Confine long hair and loose clothing.
 15. Substantial footwear shall be worn at all times in the laboratory. Sandals, perforated shoes, or other shoes and sneakers made of canvas are not to be worn in the laboratory.
 16. Keep the work area clean and uncluttered, with chemicals and equipment properly labeled and stored; clean up the work area upon completion of an operation or at the end of the day.
 17. Ensure that personal protective equipment (glasses, gloves, gowns, respirators, etc.) is worn by all persons, including students and visitors, as appropriate.
 18. Avoid use of contact lenses in the laboratory unless necessary; if they are used, inform the supervisor so that special precautions can be taken.
 19. Remove laboratory coats immediately upon contamination.
 20. Use a hood for operations that might result in the release of toxic chemical vapors or dusts. As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile chemical with the TLV of less than 50PPM.
 21. Use a safety bottle carrier when transporting acids, bases and other hazardous chemicals.
 22. Use safety tins to store flammables in quantities of one gallon or more outside of a flammable storage cabinet.
- B. Purchasing Procedure:
1. No hazardous chemical shall be purchased unless it has previously been approved (i.e., a current MSDS for the product and manufacturer is contained in both the Departmental and Master files) for use by the Department Supervisor or Manager.
 2. Purchasing of hazardous chemicals will require a MSDS with the first shipment, which must be requested on the purchase order. The Department Manager will ensure that MSDSs are received with product shipments and that updates are forwarded to product users and Safety Department.
 3. Should a new manufacturer of a hazardous chemical be approved for use, but the MSDS on file is from a different manufacturer, a copy of the current MSDS must be acquired.
 4. Any change or MSDS update for any approved chemical product or substance received must be forwarded to all departments using the chemical and to Safety Department for inclusion into the MSDS file.
 5. Laboratory personnel must be advised of newly purchased chemicals

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C. Chemical Inventory:

1. A current inventory of workplace chemicals must be maintained for the facility or lab. This inventory will be completed by a representative from each Department using the attached chemical inventory form or an equivalent version (**Attachment A**).
2. The inventory list will be updated as new chemicals are introduced and/or at least annually by the Department. The inventory is to be completed and a copy submitted to Safety Services.
3. Inventories are to be computerized whenever possible. This should make the process of annual updates much easier. A copy of the inventory form can be loaded onto a Department disk by Safety Services.

D. Labeling:

1. The OSHA standard for use of hazardous chemicals in the laboratory (29 CFR 1910.1450) contains specific labeling requirements. Labels must be affixed to all hazardous chemical containers that are shipped and used in the workplace. Labels must not be removed or defaced.
2. If the chemical is produced for another user outside the laboratory, the department or laboratory producing the chemical shall comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).
3. Replacement Labels:
 - a) Replacement labels are to be used when the label on an existing container has been damaged or on secondary containers into which a hazardous chemical was transferred. In the laboratory, replacement labels must contain the following information as a minimum:
 - b) Identity of the hazardous chemical(s) within.

E. Material Safety Data Sheets:

1. Material Safety Data Sheets (MSDS) will be maintained in an undamaged status and be readily accessible to personnel during each work shift. All personnel who are expected to work with, and/or potentially be exposed to hazardous chemicals shall be trained and made aware of the location of the MSDSs and of the information these sheets provide.
2. MSDSs will be maintained within the Department for each chemical used by that Department. A master file of all MSDSs will be maintained by the Safety Department. MSDSs are made available to employees upon request.
3. Upon the completion of the annual chemical inventory or at any time when MSDSs are found missing, the appropriate manufacturer shall be contacted to acquire missing data sheets.

F. Chemical Storage:

1. Storage of laboratory chemicals presents an ongoing safety problem. Attention to the hazards associated with a specific chemical must be understood. Additionally, the reactivity of the chemical itself must be considered. The following safety precautions shall be utilized:

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2. General Laboratory Storage:

- a) Storage of hazardous chemicals in the laboratory will be limited to those quantities necessary for routine lab activities.
- b) Chemicals will be stored so that incompatible chemicals are stored separately (characteristics, classification, and compatibility). **Attachment B** (Chemical Compatibility Guide) provides examples of incompatible chemicals and guidance on proper storage/segregation.
- c) Chemicals should be stored at or below eye level. Chemicals will be arranged so those larger items, especially those in breakable containers, are stored closer to the floor.
- d) Ensure that cabinet and refrigerators used for chemical storage are designated for their intended purpose. For example, flammable liquids are stored in flammable storage cabinets which are constructed and labeled in accordance with OSHA and/or NFPA requirements.
- e) Compressed gas cylinders will be securely anchored to a wall or bench top and must be capped when not in use.

3. Chemical Storage Rooms or Cabinets:

- a) Bulk quantities of hazardous chemicals should be stored in the designated chemical storage room(s) or designated storage cabinets.
- b) The department manager conducts routine (weekly) inspection of these storage areas.
- c) Chemical storage rooms or cabinets are constructed and maintained in accordance with the requirements for the storage of flammable and combustible liquids.
- d) Storage rooms are not to be used for the preparation or repackaging of chemicals.

G. Engineering Controls

- 1. The engineering controls installed in the laboratory are intended to minimize employee exposure to chemical and physical hazards. All lab employees are responsible for notifying management of deficiencies in the proper operation of such controls. If an employee is unsure of the operation of a control device, he or she should contact their Supervisor and the Chemical Hygiene Officer (who is the Chair of the Lab Safety Subcommittee).
- 2. Laboratory Hoods:
 - a) Laboratory Hoods will be utilized for all chemical procedures which may result in the release of hazardous vapors, fumes, or dusts. As a rule of thumb, hoods will be used for all procedures involving appreciably volatile substances and having a permissible exposure limit (PEL) less than 50 ppm.
 - b) All chemical hoods will be properly labeled. These hoods will also be inspected at least annually by Facilities Maintenance (HVAC) or contracted vendor to verify proper function. Hood face velocity will be maintained between 75 and 125 feet per minute.

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- c) All biological hoods will be properly labeled. These hoods will be inspected by Facilities Maintenance or a contracted vendor at least annually. Hood face velocity will be maintained between 75 and 125 feet per minute.
 - d) Employees will confirm hood ventilation performance prior to opening chemical containers inside the hood.
 - e) The hood sash is to be kept closed or as far as necessary to maintain safe operation.
 - f) Hoods are not intended for chemical “storage”. Chemicals and equipment inside the hood will be kept to a minimum.
 - g) The hood will be left operating when it is not in active use if hazardous chemicals are contained inside the hood or if it is uncertain whether adequate general laboratory ventilation will be maintained when the hood is non-operational.
 - h) Under no circumstance will the hood be used as a means to dispose of volatile chemicals.
3. Glove boxes:
- a) Exhaust air from glove boxes and isolation rooms will be passed through scrubbers or similar treatment before being released into the regular exhaust system.
 - b) All glove boxes will be inspected annually by Facilities Maintenance (HVAC) to verify proper function.
4. Safety Showers:
- a) Safety showers will be inspected, tested, and flushed on a regular basis to ensure proper operation/function. Testing will be completed by Facilities Maintenance and records will be maintained as part of the “preventative maintenance” work order files.
5. Eyewash Fountains:
- a) Eyewash fountains will be inspected, tested and flushed on a regular basis to ensure proper operation and function. Testing will be completed by Facilities Maintenance and records of such inspections maintained.
6. Fire Extinguishers:
- a) Fire extinguishers are inspected every month. In addition, annual maintenance inspections of extinguishers are conducted. All servicing is coordinated through the Facilities Department in accordance with the University’s Fire Safety Management Plan.
7. Chemical Spill Containment Kits:
- a) Departments/Labs shall provide the appropriate spill containment kits, which are utilized in accordance with the “Chemical Spill Clean-Up Policy” found in section HM 1.5 of this manual. All personnel must be familiar with their location and proper use.

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H. Administrative Controls:

1. The laboratory manager/supervisor is responsible for the safe operation of their area. All activities and procedures require approval by the Chemical Hygiene Officer and the employer before implementation.
2. Laboratory employees shall implement/follow established guidelines (Standard Operating Procedures) during all analytical procedures.
3. Worker exposure monitoring is conducted in all laboratory areas where:
 - a) OSHA and/or other regulating agencies require chemical specific monitoring,
 - b) Where it has been determined to be useful as a “best management practice”, and
 - c) Wherever Laboratory personnel suggest concerns regarding specific chemical use.
4. Workers are responsible to ensure that all chemicals are properly labeled as specified in the “labeling section” (V.D) of this policy.
5. Personnel are provided with personal protective equipment and sufficient wash stations to protect themselves from the potential hazards of laboratory chemicals.

I. Personal Protective Equipment:

1. Laboratory personnel are to wear the appropriate personal protective equipment (PPE) when there is the potential for direct or indirect exposure to hazardous chemicals, blood or infectious material, physical hazard, etc. The need to wear personal protective equipment can be determined through a PPE Hazard Assessment as required by the Personal Protective Equipment Policy (SM1.9) found in the Safety Management Plan section. Assessments are conducted by Department Heads.
2. Lab Coats: Lab coats (preferably fluid resistant) are worn only in the laboratory area and are to be closed to protect the employee’s clothing from potential splash or exposure.
3. Aprons: In areas where there is a reasonable probability that chemical splashes could occur, an impervious apron appropriate for the task will be worn.
4. Hand Protection:
 - a) Protective Gloves are provided and worn as appropriate to protect employees from potential chemical, blood, or infectious material. The material safety data sheet and manufacturer is consulted to determine the appropriate type of protective gloves to use when handling a given chemical. The Safety Department can also be contacted to provide information regarding appropriate glove selection.
 - b) Thermal resistant gloves are worn during work activities involving hot or cold materials and materials contained in exothermic reaction vessels. The type of gloves used will be a non-asbestos material replaced when damaged or deteriorated.
5. Eye and Face Protection: Safety glasses, goggles, or chin-length face shields or splash guards meeting ANSI Z87.1 criteria will be worn to prevent splashes or sprays of chemicals, blood, or infectious material if there is potential for eye, nose or mouth contamination.

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6. Respiratory Protection: Where the use of respirators is necessary to maintain exposure below permissible exposure limits, Robert Morris University will provide such equipment at no cost to the employee. All respiratory equipment is selected and provided in accordance with the University's Respiratory Protection Policy found in Section 3.0 of this manual (Policy No. HM 2.4).
7. Foot Protection: Substantial Footwear is required in the laboratory area(s). Sandals, perforated shoes, non-substantial footwear, and bare feet are prohibited.

J. Medical Surveillance:

1. Many factors can occur in the laboratory which could contribute to employee exposure incidents. Regardless of the cause, medical examinations and consultation will be performed under the direct supervision of a licensed physician without cost to the laboratory personnel, without lost pay, and at a reasonable time and place. Laboratory personnel will be provided a medical evaluation or consultation upon any of the following:
 - a) Whenever signs and symptoms associated with exposure to a hazardous chemical develop.
 - b) Whenever environmental/worker exposure monitoring reveals an exposure level to be routinely above OSHA or other established exposure limits.
 - c) Whenever an event takes place in the work area, such as a chemical spill, leak or explosion resulting in hazardous chemical exposure.
2. If it has been determined that a medical examination is needed, based upon any of the above occurrences, the laboratory will provide the following information to Employee Health and/or the attending physician:
 - a) Identity of the hazardous chemical(s) to which the employee may have been exposed.
 - b) A description of the conditions under which the exposure occurred, including quantitative exposure data (if available).
 - c) A description of the signs and symptoms of exposure.
 - d) A copy of the MSDS for the chemical(s) involved.
 - e) A copy of the OSHA standard (29 CFR 1910.1450).
3. The relevant laboratory will request that the physicians provide a written opinion that will not reveal specific findings of diagnosis unrelated to the exposure but will include:
 - a) Recommendations for further medical follow-up.
 - b) Results of the medical examination and any associated test.
 - c) Any medical conditions that are found during the examination that may place the employee at increased risk because of exposure to hazardous chemicals used in the workplace.

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- d) A statement by the physician that the employee has been informed of the consultation/examination results and any medical conditions that may require further examination or treatment.
- 4. For laboratory uses of OSHA regulated substance, Robert Morris University assures that laboratory employees' exposures do not exceed the OSHA permissible exposure limits as specified in 29 CFR 1910, subpart Z.
- 5. As mentioned in section V.J.4 of this policy, Robert Morris University conducts personal exposure monitoring to determine potential exposure to hazardous chemicals. The following process is used to evaluate exposures:
 - a) Initial Monitoring: Robert Morris University measures personnel exposure to any hazardous chemical regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level or permissible exposure limit.
 - b) Periodic Monitoring: If initial monitoring reveals employee exposures above the action level or permissible exposure limit, Robert Morris University will initiate additional follow-up monitoring in accordance with the relevant standard.
 - c) Termination of Monitoring: Monitoring may be terminated in accordance with the relevant standard.
 - d) Notification of Monitoring Results: Robert Morris University will notify the applicable employee(s) of exposure monitoring results within 15 working days of receiving any monitoring results or sooner if required by specific OSHA regulation.
- K. Special Tasks:
 - 1. **Hazardous Waste Disposal:** Chemical waste collection, handling, storage, and disposal requirements are specified in Robert Morris University "Hazardous Materials & Waste Management Plan" found in this manual. Waste must be properly segregated, containerized, labeled and scheduled for proper disposal.
 - 2. **Emergency Response:**
 - a) All accidents such as spills, personnel injuries, fires, or explosions should be immediately reported to Public Safety at 412-397-2424 (**X2424**) so that the appropriate response personnel can be summoned. Reporting of accidents should be clear and concise, with the notification including:
 - (1) Nature of incident
 - (2) Location of the Incident
 - (3) Name of the Caller
 - (4) Phone Number where Caller can be reached
 - b) All incidents must be reported to the Safety Department within 24 hours of the occurrence.

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- c) All incidents must be documented by completing the **“Incident Investigation & Recordkeeping Form”** found in policy **SM1.1** of the safety policy manual.
- d) Personnel in the immediate scene of the incident should take actions that will mitigate the extent of the incident without jeopardizing their health and safety. When in doubt, warn others in the area, vacate the area, travel to a safe location, and make the phone call to Public Safety.
- e) Incidents (such as spills) that can not be safely contained by laboratory personnel shall be reported to the local **Emergency Response Services - 911**. This should be coordinated through RMU Public Safety.

VI. RESPONSIBILITIES:

A. Laboratory Safety Subcommittee:

- 1. Work with administrators, managers and laboratory employees to develop and assist with the implementation of the chemical hygiene policies and practices.

B. Chemical Hygiene Officer:

- 1. Chair or sit as a member of the Laboratory Safety Subcommittee to provide direct interface with all laboratory activities.
- 2. Monitor the procurement, use, and disposal of hazardous chemicals used in the laboratory.
- 3. Ensure that appropriate audits of laboratory facilities are maintained. Robert Morris University conducts annual audits as a minimum.
- 4. Assist in the development of general laboratory precautions and appropriate facility/laboratory design.
- 5. Keep current with legal requirements concerning regulated substances.
- 6. Focus on ideas to improve the chemical hygiene program and assist in its regular (annual) update.
- 7. Monitor and evaluate the safety and general work practices of laboratory employees.

C. Department and/or Laboratory Manager/Supervisor:

- 1. The Department and/or Laboratory Manager is responsible for the implementation of the Chemical Hygiene Policy including:
 - 2. Ensure all faculty, staff and students know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided.
 - 3. Select and support the efforts of a “Safety Representative(s)” within the Laboratory Departments.

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4. Ensure that all hazardous chemicals used by the Department are purchased and inventoried as previously stated. This inventory shall be completed by providing all the information that is requested on the “hazardous substance survey form” (Attachment A).
5. Provide regular, formal, chemical hygiene inspections, including routine inspection of emergency equipment.
6. Know the legal requirements concerning regulated substances.
7. Evaluate and determine the required level of protective equipment and apparel.
8. Ensure that all safety precautions (including proper training, equipment, and facilities) are adequate for the use of hazardous chemicals.
9. Follow up with corrective actions upon notification and evaluation of a laboratory incident.

D. Laboratory Personnel:

1. All laboratory personnel shall attend “initial” and “refresher” training, provided by the Department, regarding the Chemical Hygiene Policy.
2. Plan and conduct each laboratory activity in accordance with the chemical hygiene policy/procedures.
3. Develop and utilize good personal chemical hygiene habits.

E. Safety Department:

1. Provide technical support to all organization levels regarding the requirements of the OSHA standard and associated chemical hygiene policy. This may include providing regulatory interpretation/explanation, evaluating adequacy of engineering controls, and providing recommendations on personal protective equipment.
2. Assist departments with environmental and/or worker exposure monitoring to determine the level of compliance with this standard.

VII. TRAINING & EDUCATION:

- A. All persons who may be exposed to hazardous chemicals in the laboratory are provided training regarding “Occupational Exposure to Hazardous Chemicals in the Laboratory”. This training is provided to department personnel upon his or her initial job assignment and whenever a new hazard is introduced into the workplace. Refresher training is provided as determined necessary. This training covers the following, as a minimum:
 - B. Information and training to ensure that laboratory personnel are apprised of the hazards of chemicals present in their work area.
 - C. The content of this standard (29 CFR 1910.1450) and the Chemical Hygiene Policy. The Appendices of this standard, including “Prudent Practices” is also made available to laboratory employees.
 - D. The location and availability of the Chemical Hygiene Policy.

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- E. The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard.
- F. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory.
- G. The location and availability of known reference material regarding the hazards, safe handling, storage, and disposal of hazardous chemicals used in the laboratory. Reference material includes MSDSs, The American Conference of Governmental Industrial Hygienist – Threshold Limit Values, The Pittsburgh Poison Center, etc.
- H. Methods to detect the presence or release of hazardous chemicals.
- I. The physical and health hazards associated with chemical exposure.
- J. The measures employees can take to protect themselves from these hazards including: work practices/procedures, emergency response, engineering controls, and personal protective equipment.
- K. Informing outside contractors.

VIII. DOCUMENTATION & RECORD KEEPING:

- A. This program is available for review by all employees covered by this standard and their representatives.
- B. This program is reviewed and updated as necessary.
- C. All “Hard Copy” records relating to employee training will be maintained within the employee’s Department.

IX. SIGNATURES:

William J. Katip, Ph.D.
 Senior Vice President for Academic & Student Affairs

Dan W. Kiener
 Senior Vice President for Business Affairs

Implementation Date: March, 2006
 Last Reviewed/Revised: _____

ATTACHMENTS: A - Hazardous Chemical Inventory Form
 B – Chemical Compatibility Guide

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ATTACHMENT A

HAZARDOUS CHEMICAL INVENTORY FORM

Robert Morris University HAZARDOUS CHEMICAL INVENTORY FORM

DEPARTMENT NAME:		DATE
WORKPLACE (BUILDING NAMES(S) COVERED BY THIS INVENTORY):		
NAME OF PERSON COMPLETING INVENTORY:		
CHEMICAL NAME:	MANUFACTURER:	QUANTITY (LBS., GAL., ETC.):

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ATTACHMENT B

CHEMICAL COMPATABILITY GUIDE

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Examples of Incompatible Chemicals

Chemical	Is Incompatible and Should Not Be Mixed or Stored With
Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric and sulfuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury, chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrates, sulfur, finely divided organic or combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	See Chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Carbon tetrachloride	Sodium
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium trioxide	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	Everything
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon

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Examples of Incompatible Chemicals

Chemical	Is Incompatible and Should Not Be Mixed or Stored With
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Sulfuric acid
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxide, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (see also chlorates)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrate	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing agents