

# **Rapid Prototyping Laboratory** **Safety Procedures**

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# Rapid Prototyping Laboratory Safety Procedures

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## **I. GOAL**

The objective of this manual is to protect HTG employees, RP laboratory personnel, and visitors from exposure to hazardous chemicals and situations that may endanger their health and safety. A conscious effort by all RP Laboratory personnel to follow these guidelines is essential to achieve a safe work environment.

The RP Model Services management and supervision serve as role models for their technical staff and other laboratory support personnel. They must insist that appropriate laboratory procedures be followed at all times. Support personnel working in proximity should also be informed about potential hazards and what to do in the event of an accident or emergency.

To ensure a safe work environment everyone involved in RP laboratory operations must be safety conscious. Safety becomes part of the work attitude through repeated discussions, meaningful in-service training and the demonstrated commitment of HTG Management. It is in everyone's best interest to carry out RP laboratory work in accordance with good health and safety practices.

The policy of the HTG RP Model Services Laboratory is as follows:

**NO EMPLOYEE, CONTRACTOR, OR VISITOR SHALL PERFORM ANY OPERATION, PROCEDURE, INSTRUCTION OR RESEARCH IN A MANNER WHICH JEOPARDIZES THE HEALTH OR SAFETY OF ANY PERSON WITHIN THE RP LABORATORY.**

HTG RP Model Services also has a commitment to protecting the environment. Hence, all chemical waste must be disposed of in accordance with applicable laws and with environmentally sound procedures that minimize their potential harm. When appropriate, every effort shall be made to reduce, reuse, or recycle any chemicals to remove them from the waste stream.

## **II. ENSURING LABORATORY SAFETY**

### ***A. HTG Management Responsibility***

It is the responsibility of HTG Management to ensure a safe working environment. Essential to an effective safety program is the understanding of the relevant activities and safety issues of the RP Laboratory. An on-going program of assessment and procedures will be the responsibility of HTG and, specifically HTG RP Model Service Management. Primary issues of HTG RP Management include:

Work with HTG and RP Model Services employees to develop and implement appropriate laboratory safety and hygiene policies and practices specific to their area;

1. Assist with monitoring the procurement, use, and disposal of the unit's chemicals.
2. Assure that the appropriate audits, inventories and inspections are performed.
3. Assist HTG and RP Model Services Management in developing precautions to ensure adequate facilities.

The HTG RP Model Services Management and Supervision shall ensure that:

1. Appropriate safety and emergency procedures have been developed and are followed.
2. Adequate emergency equipment is available and in working condition.
3. All personnel receive training in use of emergency equipment.
4. Information on any special or unusual hazards in non-routine procedures is provided for any affected HTG employee, visitor or contractor..
5. The appropriate safety orientation has been given to all HTG RP Laboratory personnel.

### **III. SAFE LABORATORY PRACTICES**

#### ***A. General Principles***

Everyone in a HTG RP laboratory should observe the following rules:

1. Understand and utilize the safety procedures that apply to the work being performed. Determine the potential hazards (physical, chemical, or radiation), and the appropriate safety precautions to be followed, before beginning any task.
2. Be familiar with emergency procedures, the location and use of emergency equipment, and how to obtain help.
3. Be aware of types of protective equipment available. Use the proper type of personal protective equipment for the particular task.
4. Call attention to unsafe conditions or work practices so that appropriate corrections can be implemented.
5. Never consume food or beverages, or smoke in areas where chemicals are being used or stored. Do not apply cosmetics or insert contact lenses while in the laboratory or chemical storage area.
6. Always adhere to appropriate waste disposal procedures.
7. Be certain that all chemicals are correctly and clearly labeled. Post the designated warning signs or labels when specific hazards, such as radiation, flammable materials, or other special hazardous conditions exist.
8. Check all burners are off before leaving the laboratory. No hot plate shall be left unattended while in operation.
9. Remain out of the area of a fire, chemical spill, or personal injury unless your assistance is required to help meet the emergency.
10. Use laboratory equipment only for its designated purpose.
11. Carefully position and secure equipment. Take the necessary steps to avoid the accidental jarring of an apparatus or piece of equipment. Use caution in handling hot objects.
12. Keep laboratory hallway doors closed, the RP Laboratory Area is a temperature/humidity controlled area.

**Think, Act, and Encourage Safety.**

## ***B. Health and Hygiene***

The following practices should be observed:

1. Wear appropriate eye protection, such as safety glasses, goggles, and/or a face shield when performing or observing specific post-processing activities. Contact lenses should not be worn in the RP laboratory.

*In the event that a chemical is splashed into the eye, a contact lens may serve to trap and concentrate the chemical, thereby increasing the potential for eye damage. In some cases, the lens may dissolve or in some way become "glued" to the eye.*

*"Soft" contact lenses can absorb organic solvent vapors and thus potentially damage the eye.*

*There may be exceptional situations in which contact lenses must be worn for therapeutic reasons. In these situations, employees who MUST wear contact lenses MUST inform their supervisor so that appropriate safety precautions can be devised.*

2. Use protective apparel, such as gloves, gowns, lab coats, and other special clothing or footwear as needed. Wearing shorts, tank tops, halters, sandals, or clothing that exposes a large amount of unprotected skin is strictly prohibited. It is imperative that the possibility of skin contact with chemicals be minimized.
3. Confine long hair and loose clothing when in the RP laboratory.
4. Wearing of personal jewelry and ornamental garments while working with chemicals in the RP Laboratory is discouraged as these items tend to retain trace amounts of chemical, even after washing.
5. Large jewelry (wedding rings, engagement settings, costume jewelry, necklaces, chains) which interfere with effective use of protective apparel (glove fit, glove puncture) shall not be worn while performing work in the RP Laboratory.
6. Do not use mouth suction to pipette chemicals or start a siphon. A pipette bulb, aspirator or vacuum-assisted pipette must be used.
7. Avoid exposure to gases, vapors, particulates, and aerosols. Use of fume hood whenever such exposure is likely. Appropriate safety equipment must be used when work is not conducted inside a fume hood.
8. Frequently and thoroughly wash hands during the day, immediately before eating and always before leaving the laboratory.
9. Avoid the use of solvents for washing the skin. Specific solvents remove the natural protective oils from the skin and can cause irritation. Additionally, some solvents can facilitate skin absorption of toxic chemicals or have their own potentially adverse health effects.
10. Do not attempt to identify chemicals by smell or taste.
11. Minimize your potential for exposure by protecting against inhalation, ingestion, and absorption of chemicals.

### ***C. Food, Beverages, and Chemical Contamination***

The contamination of food, drink and smoking material is a potential route for exposure to hazardous chemicals. Food and beverages must be stored, handled and consumed in designated. Smoking is prohibited in all RP Laboratory areas.

1. Well defined areas must be established for storage and consumption of food and beverages. No food will be stored or consumed outside of this area.
2. Consumption of food or beverages, or smoking is not permitted in areas where laboratory operations are conducted or chemicals are handled.
3. Glassware or utensils used for laboratory operations must never be used to prepare or consume food or beverages. Laboratory refrigerators and hot plates are not to be used for food storage.

### ***D. Housekeeping***

There is a definite relationship between safety performance and orderliness in the RP laboratory. Where housekeeping standards are lax, safety, morale and job performance inevitably deteriorate. The work area must be kept clean, with chemicals and equipment properly labeled, maintained, and stored.

1. Work areas must be kept clean and free from obstructions. Cleanup will follow the completion of any equipment, laboratory session, or as soon as possible.
2. Spilled chemicals must be cleaned immediately and disposed of properly. Disposal procedures must be followed and all laboratory personnel be informed of them. Chemical accidents and spills are to be attended to promptly. Contact Security (Phone 651-4885) if the spill presents a health risk or is beyond your cleanup capabilities.
3. Unknown chemicals and chemical wastes are to be disposed of promptly using the appropriate procedures. Waste must be deposited in appropriate receptacles.
4. Floors are to be cleaned regularly and kept free of clutter. Keep isles established for emergency egress.
5. Stairwells and hallways may not be used for storage.
6. Access to exits, emergency equipment, valves, controls, alarms, and electrical panels must not be blocked.
7. Used sharp instruments, such as X-acto blades, razors, and scalpel blades, must be stored in puncture-proof containers while awaiting disposal.

### ***E. Laboratory Equipment Maintenance***

Improperly functioning equipment may provide a false sense of safety and create hazardous situations.

1. Equipment and hand tools must be inspected before each use for conditions which may pose safety concerns. Service schedules depend on both the possibility and consequences of failure.
2. Maintenance plans include a lock out/tag out procedure to ensure that a device cannot be restarted while repairs are being conducted.

### ***F. Sharp Instruments***

Accidents involving sharp instruments are a leading cause of RP laboratory injuries. Further, sharp instruments tend to produce punctures in protective apparel (gloves, aprons) which may unnecessarily expose employee to chemical exposure.

Proper disposal of sharp instruments will prevent injury to housekeeping and trash removal personnel who may be injured if sharp instruments are improperly disposed of in normal office trash receptacles.

1. Careful handling and storage procedures must be used to avoid inadvertent injury to employee, visitors, and contractors.
2. Damaged items are to be discarded or repaired as practical.
3. Proper blade removal and replacement techniques are mandatory to avoid injury.
4. Segregate post process tools which are used for support removal ("pre-post-cure") from tools used in final finishing. **AVOID MIXING TOOL SETS TO AVOID INADVERTENT CONTAMINATION.**
5. Carefully wash all sharp instruments (blades and handles) after use to remove resin and/or solvent contamination.
6. After use, account for all blades, sharp instruments, and tools to prevent inadvertent injury, tool loss, and promote good housekeeping.
7. **DO NOT DISCARD SHARP INSTRUMENTS IN REGULAR OFFICE TRASH.**
8. Designated "USED BLADES" waste containers must be used to dispose of sharp instruments.

### ***G. Protective Apparel and Equipment***

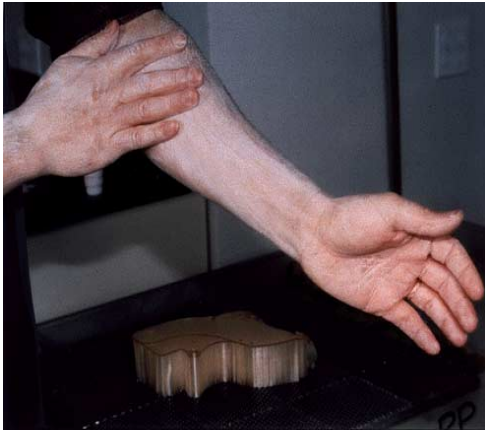
A variety of specialized clothing and equipment is available for use in the laboratory. The proper use of these items will minimize or eliminate exposure to the hazards associated with most laboratory procedures. All laboratory personnel must be familiar with the location and proper use of protective apparel, safety equipment and emergency procedures.

A false sense of security may be realized simply by wearing clothing such as long sleeved shirts and work trousers. Often droplet exposure of to SL resins, TPM Solvent, and other laboratory liquids wicks through clothing, only to create skin contact on the inside of the garment. Proper use of protective apparel and equipment is essential to reduce chemical exposure risk.

Prolonged and/or repeated short-term dermal exposure to SL resins (acrylate, vinyl, or epoxy), solvents, and other laboratory chemicals may result in allergic reactions. Refer to MSDS for each material handled for more information. **USE OF APPROPRIATE PROTECTIVE EQUIPMENT IS MANDATORY TO MINIMIZE DERMAL, RESPIRATORY, AND OTHER CHEMICAL EXPOSURE POTENTIAL.**

Recommended protective equipment for each RP Laboratory operation are as noted in subsequent sections. Most all protective apparel in the RP Laboratory is intended for short-term use. This includes surgical-style nitrile gloves, vinyl and Tyvek® oversleeves/coveralls, and other equipment. If in doubt concerning usage and expected life of protective equipment, employees should discuss specific issues with HTG RP Laboratory supervision.

Complete skin protection may be achieved by using the protective equipment and procedures noted on the following page.



*1. Apply solvent-resistant Barrier Lotion to hands, forearm, and elbow.*



*2. Don nitrile gloves on both hands.*



*3. Slip Oversleeve over arm, leaving elastic end near base of finger joints*



*4. Don a second pair of nitrile gloves, pulling glove cuff over the oversleeve elastic gather.*



*5. Properly-prepared for work; note gloves, oversleeves, apron and face shield.*



*6. Remove soiled gloves and oversleeves, rolling inside out into a ball. Discard of contaminated garments appropriately.*

#### ***H. Warning Signs and Labels***

RP Laboratory areas have specific hazards which must be posted with warning signs. Further, chemical containers must be labeled to properly identify contents.

1. Use standard signs and symbols that have been established for special situations (i.e. "GLOVES REQUIRED", "SAFETY GLASSES REQUIRED", fire hazard and laser operations).
2. Post signs that show location of emergency spill equipment.
3. Waste containers must be labeled to indicate the type of waste that can be safely deposited.
4. HTG RP Laboratory Supervision ensure that all chemicals in the RP Laboratory are labeled.

### ***I. Unattended Operations***

It is often necessary to conduct RP laboratory procedures over extended periods of time or to run equipment continuously.

1. Such unattended operations must be assessed in advance for safety.
2. Contingency plans must provide for potential hazards which may result from interruptions of utilities, such as electricity or water.
3. TPM parts washer and rinse tanks may be run unattended, however must be unloaded immediately upon cycle completion. Do not start the wash tanks with SL parts and leave the plant, unexpected malfunction of these washers may result in SL model damage or other problems.

### ***J. Working Alone***

Frequently laboratory work is performed on weekends and off-shift hours where few HTG employees are present in the R&D Building. Avoid working alone in a laboratory. If this is not possible:

1. Arrange with a co-worker to check in with you periodically.
2. On nights, weekends, and holidays contact Security (651-4885) and arrange for an officer on patrol to check in at your lab periodically.

### ***K. Laboratory Security***

For the protection of employees, visitors and contractors, HTG RP Laboratories must be locked when unattended.

## **IV. FACILITY AND OPERATIONAL SAFETY RULES**

### ***A. Laboratory Fume Hoods***

Laboratory fume hoods are provided over fume and dust areas, such as TPM wash tank and sanding tables. Fume hoods over these areas must be in operation when performing these tasks prevent the release of fumes and dust into the laboratory.

### ***B. Bead Blast Cabinet Grounding***

Operation of the glass bead blast cabinet for post process surface finishing requires user to wear a static discharge armband. Static electricity accumulates within the work piece during bead blasting and will cause significant electrical shock to the operator if not properly grounded.

In unusually low humidity conditions, the operator should apply skin lotion to the arm area where the static discharge band will be worn to assure grounding has been achieved.

### ***C. Resin Filling Procedures-SLA-500***

Great care must be taken during resin filling of the SLA-500 to minimize chemical exposure risks. Resin filling of the SLA-500 involves chemical exposure risks to skin and eyes by direct contact (splashing, dripping) and lungs by fume inhalation. Great care must be exercised when filling the SLA-500, as full resin cans weigh as much as 40 pounds (18 Kg).

1. Before initiating resin fill procedures, the operator must wear a long sleeved shop coat, safety glasses, and nitrile gloves.
2. Clean the SLA-500 build chamber using isopropanol and cloth wipes. Apply isopropanol from safety bottle to cloth wipes OUTSIDE the SLA-500 build chamber (preferably over the part transit cart). Carefully clean all metal shrouds, windows, recoater blade, and door jambs. TAKE GREAT CARE TO AVOID CONTAMINATING LASER POWER SENSORS. Avoid inhalation of resin and isopropanol fumes. Wear organic vapor respirator if prolonged exposure is anticipated.
3. Install clean SLA-500 build platform, taking care to avoid splashing resin from the platform spring release.
4. Close Build chamber door and wipe door handles and outside of door with isopropanol and a clean wipe. Remove and properly discard gloves when finished.
5. Start next build from SLA-500 console, allowing the build platform to enter resin. When prompted to fill resin vat, the operator must wear new nitrile gloves, shop coat, and safety glasses.
6. Remove resin can from safety cabinet, avoid back straining by lifting can with your legs.
7. Dispense resin from the can by pouring "overhand." This method reduced splashing and uncontrolled pouring. Check with laboratory supervision regarding "overhand" resin dispensing. Stop pouring when resin fill alarm sounds.
8. Place resin can in safety cabinet, remove gloves, close build chamber door, and acknowledge SLA-500 resin fill alarm. Make certain no resin contamination exists on door handles, keyboards, or floor areas.

#### ***D. Part Unloading Procedures-SLA-500***

Completed build platforms must be tilted within the build chamber to recover any uncured photopolymer. Any resin drained back to the vat is reusable and prolongs the useful life of post process solvents such as TPM and isopropanol. Efficient recovery of SL photopolymer is achieved by tilting the build platform against the elevator arm shroud, using a rolled-up wipe between the platform and shroud to avoid resin contact with the shroud.

1. Wear safety glasses, shop coat, and nitrile gloves when tilting and unloading build platforms to avoid skin or eye contact with resin.
2. Avoid sudden release of the build platform lock, as uncontrolled resin spray will result if the lock is snapped.
3. Take special care to avoid clothing contact with SL resin when manipulating build platforms. Remove any clothing IMMEDIATELY which becomes contaminated with photopolymer.
4. After proper draining is achieved (approximately 30 -45 minutes), carefully remove the tilted platform from the SLA-500 build chamber and place the platform on the service cart for transport to post-processing.
5. Wipe up any incidental resin drips from build chamber shrouds, recoater bar, door jambs, windows, floor, and floor mats using clean wipes and isopropanol.

#### ***E. Automatic Parts Washers***

Automatic Parts washers provide unattended resin stripping from parts still attached to the build platform. Parts not attached to a build platform may become damaged if attempted to clean using the oscillating cycles of the parts washers

1. Full coverage face shields are required when operating the parts washers.
2. Check gloves for punctures and tears prior to using TPM tank.
3. Skin contact with Tripropylene Glycol Monomethyl Ether (TPM) or rinse water must be avoided as SL resin is contained in these tanks.
4. Post Process Room ventilation must be activated when TPM or rinse tanks are in operation.
5. Proper face and skin protection must be used when performing routine maintenance and filter changes.
6. Personal respiratory protection must be used if working directly with TPM in excess of 15 minutes
7. Care must be exercised to prevent splashing TPM or water during cycle start.
8. Operator must assure parts will not strike tank cover during cycling. Should the height of the build platform exceed 12 inches, carefully cycle TPM and rinse tanks with the covers open.
9. Excessively large or difficult to clean parts must be washed in TPM by hand and rinsed similarly. Great care must be exercised to prevent splashing of TPM while scrubbing SL models. Change nitrile gloves every 10 minutes to avoid TPM permeation and skin contact.
10. Wash hand and forearm skin thoroughly immediately following using parts washers.
11. Wash or discard any soiled Laboratory garments.

### ***F. Handling “Uncured” SL Models***

Uncured SL models refers to models which have not been processed through the UV Post Cure Apparatus (PCA). Typically, models may have been through TPM and water rinse, yet are not ready for handling where direct skin contact may occur. To avoid direct skin contact with uncured SL models:

1. Process uncured parts as soon a practical
2. Identify and protect uncured models by covering with absorbent cushion materials
3. Place a temporary sign indicating hazard as practical.

### ***G. Finishing Cured SL Models***

Sanding and finishing cured SL models generated sanding dusts and creates eye hazards from potentially flying objects.

1. Finishing must be performed in a well lighted, well ventilated area.
2. Eye protection during wet or dry finishing operations is mandatory; Safety glasses with side shields or face shields must be worn.
3. When dry sanding, a dust mask must be worn to prevent inhalation of sanding dust.
4. When wet sanding with isopropanol, proper skin protection (nitrile gloves) and a chemical vapor respirator must be worn.
5. Check protective garments periodically for tears or cuts. Replace damaged protective garments immediately.
6. Separate finishing tools used for rough breakout from those used for final finishing.
7. Thoroughly clean and safely store all finishing tools when work is complete.

### ***H. Ultra Violet Radiation/Laser Safety***

Ultraviolet (UV) radiation is employed within the RP Laboratory to solidify photo-sensitive resin in the stereolithography process. Opportunities for Ultraviolet (UV) radiation exposure within the RP Laboratory are limited, provided equipment is in good working condition and safety devices have not been defeated. However, it must be understood **UV light will cause significant eye damage if UV light enters the eyes.** The following guidelines are provided to assure proper protection against UV radiation exposure.

1. Guards and panels shall be installed and in good working order.
2. Removal of guards, optical maintenance and laser tuning shall be performed by trained personnel.
3. UV-Filtering (300-400 nM UV light) eye protection shall be worn by lab personnel in the area while laser/optical maintenance is performed.
4. Measures must be taken during laser/optical maintenance to restrict non-essential personnel from UV laser light exposure.
5. Upon completion of maintenance, assure all guards and safety devices are in re-installed and in good working order.

### ***I. Coloring/Painting Cured SL Models***

1. Coloring and painting of cured SL models must be performed in a well lighted, well ventilated area.
2. Care must be exercised to avoid splashing of colorant dyes during mixing or dispensing.
3. Close attention to colorant temperature is essential to avoid damage to the work piece and potential scalding injury. Do not allow colorant solution to exceed 120° F. Use a thermometer to test colorant temperature during heat-up and prior to immersion of part into colorant
4. Remove colorant from heat source prior to immersion of part to assure temperature will not rise beyond safe limits.
5. Painting of SL Models must be performed in designated paint booths using appropriate eye, skin, and respiratory protection.

### **V. HANDLING CHEMICALS IN THE LABORATORY**

For each chemical used and/or stored within the RP Laboratory, a Material Safety Data Sheets (MSDS) shall be available for employee review. Employees using chemicals within the RP laboratory are REQUIRED TO HAVE REVIEWED PERTINENT MSDS SHEETS PRIOR TO WORK START.

#### **A. Acute and Chronic Exposure**

Recommendations for handling procedures for chemicals begin with the admonition that, even for substances with no known significant hazards, it is prudent to observe safe laboratory practices. Minimize exposure by working in a laboratory fume hood, wearing eye and hand protection, and laboratory coat or apron.

The toxicity of a substance is determined by its ability to damage or interfere with the structure or function of living tissue. An acute exposure is one which can cause damage as the result of a single or short duration exposure.

Chronic exposure is one which causes damage after repeated or long duration exposure, or becomes evident only after a long period of latency.

With any chemical, it is imperative that the Material Safety Data Sheet be consulted before it is used. The MSDS will list precautions for proper handling and limits for exposure.

#### **B. Procurement**

1. Before a substance is purchased and received, information on its proper handling, storage and disposal should be known.
2. No containers will be accepted without a proper identifying label.
3. Whenever possible, a less hazardous or toxic chemical should be substituted.

#### **C. Transport**

Transporting hazardous chemicals from one location to another can be safely accomplished when:

1. Unbreakable containers or glass bottles, protected with bottle carriers, are used for flammable or corrosive liquids.
2. The lids for such containers are periodically inspected to ensure their integrity.
3. Leaking containers are not transported without secondary containment.

## **D. Storage**

The correct storage of chemicals is extremely important to maintaining a safe working environment. Problems related to chemical storage can be significantly reduced by following the principles of LIMITING and SEGREGATING.

1. Toxic substances should be segregated from other chemicals in a well-defined area.
2. Chemicals must be stored in their original container with original labeling. In the event secondary containers are used, proper labeling of the secondary container is required.
3. Stored chemicals should be examined at least on an annual basis for deterioration, container integrity, and possible replacement.
4. The amount of chemicals stored should be as small as practical.
5. Storage on bench tops shall be limited to safety wash bottles of 1 quart or less.
6. Do not store bottles on the floor.
7. Avoid exposure of chemicals to heat and direct sunlight.
8. A periodic chemical inventory should be conducted with unneeded chemicals properly disposed of through appropriate hazardous waste.

## **E. Designated Area**

The purpose of the Designated Area is to focus attention on the particularly hazardous substance or operation that exists and to ensure that the necessary protective measures are observed by all persons in the vicinity. Designated Areas must be identified by appropriate signs.

## **F. Approval**

Prior approval must be obtained from the appropriate source (Model Services Safety Coordinator and/or Laboratory Management and Supervision.) before laboratory procedures can be undertaken involving the following:

1. newly introduced hazardous chemical substance of moderate chronic or high acute toxicity.
2. Working with substances of known chronic toxicity. Prior consultation can ensure that appropriate measures are taken to establish safety protocols, minimize exposure, and establish proper waste disposal procedures.

## **VI CHEMICAL HAZARDS**

### **A. RP Laboratory Chemicals**

#### **1. Handling and Storage**

- a. Isolate, segregate, and clearly label all RP Laboratory chemicals.
- b. Adequate room ventilation must be provided at the work site area.
- c. The appropriate personal protective equipment must be worn as directed by the label or MSDS. If in doubt, contact the RP Laboratory Supervision.
- d. Limit exposure time, changing soiled protective equipment frequently. Nitrile gloves must be changed every 10 minutes while working with liquid solvents
- e. Practice good personal hygiene.
  - hand washing
  - wearing a lab coat, protective oversleeves, and aprons as needed.

## **B. Flammables**

Flammable chemicals represent a major safety concern within the RP Laboratory because of the immediate physical danger that these materials present to all employees. Our primary interest is in reducing the chance of fire involving these materials. Also, many flammable chemicals have associated health risks.

### **1. Handling and Storage**

- a. Use small volumes of solvents (1 Quart or less) when performing routine tasks. Store larger amounts in approved flammable containers. Never store flammables with reactive chemicals or oxidizers.
- b. Transfer solvents in a working laboratory hood or well ventilated area. Smoking and open flames are not permitted within the RP Laboratory.
- c. Use solvents at temperatures 10 to 15 degrees below their flash point, if possible.
- d. Grounding must be provided on all large drums used for storage or dispensing of solvents. All containers must be labeled.
- e. Note the location and type of fire fighting equipment available for the particular need. Flammable liquid fires are Class B fires. Extinguishers that are effective on class A, B, & C fires are available throughout the RP Laboratory.
- f. Remember that flammable liquids may have other health consequences as well. Prudent practices need to be observed in storing and disposing of flammable liquids.
- g. Small quantities (working amounts) may be stored on open shelves and workbenches, but bulk storage (more than one gallon) must be in a designated flammable storage area.

## **VII. BREAKS AND SPILLS**

### **A. Reporting**

1. Report all spills to Security (Phone 651-4885) if the spill presents a health risk or is beyond your cleanup capabilities.
2. ***Life-threatening conditions should be reported to Cincinnati Fire Department (9-911)***
3. Be prepared to name the chemical, the amount, and the location of the affected area.
4. Evacuate the area and let the Environmental Health & Safety Office evaluate the proper procedure for cleaning the spill.

### **B. Personal Safety**

1. Skin, eye or mouth contact: flush the affected area immediately with copious amounts of fresh clean water for at least 15 minutes, then seek medical attention.
2. Chemical contamination of clothing: immediately remove the clothing to avoid soaking through to the skin.
3. Contain chemical spills with sand or an absorbent material. After clean up, wash the contaminated area thoroughly. collect and store contaminated materials in suitable containers for disposal.

## **VIII. LABELING**

### **A. Labeling Requirements**

Every chemical received at HTG's RP Laboratory is labeled with the following information:

1. the identity of the chemical
2. the appropriate hazard warnings
3. the name and address of the manufacturer

DO NOT remove or deface the original label.

### **B. Transfer of Chemicals**

When hazardous chemicals are transferred from their original containers, the new container must be labeled with:

1. the name of the chemical and manufacturer
2. the appropriate hazard warning

### **C. Exceptions to Labeling Requirement**

1. Portable containers intended for same day use by the person performing the transfer.
2. Laboratory-use-only containers such as beakers and mixing pots.

RP Laboratory Management is designated to ensure that all hazardous chemicals used in their department are properly labeled. RP Laboratory Management is also responsible for reviewing the relevant hazards of the chemical and ensuring that the labels are updated.

## **IX. FIRE PREVENTION, CONTROL, AND REPORTING**

### **A. Prevention**

1. Be aware of potential ignition sources including heating elements and electrical sources.
2. Smoking is prohibited in all laboratories.
3. Do not use flammable liquids in the presence of ignition sources.
4. Do not store flammable liquids in areas exposed to direct sunlight.

### **B. Priorities in Case of Fire**

1. Contain the fire. Exit the room and close the door to prevent the spread of smoke and flame.
2. Activate the fire alarm system by pulling the nearest fire alarm box.
3. Dial-9911 and give all information--building, floor, room, etc.--to the person answering. If you are safe, remain on the phone until told to hang up.
4. Evacuate--in all but the most minor of fires it is the policy of Hasbro Toy Group that employees evacuate rather than attempt to fight the fire. All occupants of the building must evacuate during an alarm.
5. Evacuation shall be by the nearest exit. Check the floor evacuation chart.
6. Do not return to your office for personal items.
7. Designated Safety Representatives shall assemble all personnel outside of the building and determine if all have exited. In the event someone is not accounted for, notify Safety or firefighters at the scene.

### **C. Fire Control Methods**

1. The RP Laboratory has provided ABC Halon fire extinguishers in all necessary locations. These ABC Halon extinguishers are appropriate for all fires.
2. Be aware of the location and methods of use of the fire safety equipment in the laboratory.

### **X. WASTE DISPOSAL**

#### **A. Disposing of Hazardous Waste**

Hazardous waste disposal is a costly problem. Every effort must be made to safely and legally handle this process. The responsibility for identifying and assuring the proper handling of waste lies with each person generating the waste, RP Laboratory Management, and Designated Safety Personnel.

1. RP Laboratory Management must plan for waste disposal before starting any new process.
2. Waste must be labeled promptly and properly. It must be specified identified for disposal purposes.
3. Contact assigned Safety Coordinator to arrange for disposal of all surplus chemicals and chemical waste.

### **XI. INSPECTIONS, AUDITS AND REPORTS**

Regular periodic laboratory inspections are conducted by the Environmental Health and Safety Officer, and Designated Safety Coordinator(s) with the assistance of RP Laboratory Management. The laboratory inspection checklist will be used and all results will be shared with the concerned parties for appropriate corrective action when needed.

### **XII. TRAINING AND INFORMATION**

#### **A. All laboratory personnel shall:**

1. have access to a copy of the HTG RP Laboratory Safety Procedures.
2. be informed of OSHA standard 1910.1450 - occupational exposure hazardous chemicals in laboratories.
3. receive MSDS information about Permissible Exposure Limits (PEL) and symptoms of exposure for any regulated chemicals to which they are exposed.

#### **B. RP Laboratory Management shall:**

1. review the Laboratory Safety Guide/Chemical Hygiene Program with laboratory personnel.
2. arrange for any additional information or specific training for laboratory personnel.
3. Contact Designated Safety Coordinator for assistance as needed.

#### **C. Training shall:**

1. be conducted when personnel are first assigned to a laboratory.
2. be conducted when new hazardous chemicals or procedures are introduced into the RP Laboratory.
3. be conducted at least annually.

### **XIII. MEDICAL EXAMINATION**

Any HTG RP Laboratory employee who is exposed to hazardous chemicals has the right to a medical examination and follow-up treatment, if the physician deems it necessary, under the following circumstances:

1. If symptoms develop that are associated with the hazardous chemical(s) to which they were exposed.
2. When air monitoring reveals an exposure level routinely above the action or permissible exposure level.
3. Whenever an event such as a spill, leak, explosion, or fire occurs which results in the likelihood of a hazardous chemical exposure.
4. Exposed employees must notify their supervisor as soon as possible and an Incident/Injury Report should be filed promptly.

### **XIV. ELECTRICAL SAFETY**

#### **A. General Instructions**

1. All 110-volt outlets in the laboratories must provide ground circuit.
2. All AC-powered electrical devices used in the laboratories must either have grounded power cord and plug or be marked "double insulated" by the manufacturer.
3. Frayed or damaged cords must be replaced; DO NOT tape or splice them.
4. Electrical equipment may not be used when in a damaged condition.
5. Turn the equipment's power switch to the "off" position before connecting to or disconnecting from an electrical outlet.
6. Always unplug equipment by pulling on the plug, not the cord.
7. Do not handle electrical equipment with wet hands or when standing on a wet surface.
8. Locate electrical equipment to minimize the possibility of water or chemical contact
9. Ground-fault circuit interrupters must be used in all instances where electrical equipment is within six feet of a water source.

#### **B. Static Electricity and Sparks Hazards**

Static electricity or sparks can ignite flammable vapors. Protect against this possibility by grounding and bonding containers and equipment.

Some common sources of sparks and electrostatic discharges are:

1. Glass Bead Blast Cabinet
2. Metal tanks and containers
3. Plastic laboratory aprons
4. Devices using Brush Motors
5. Areas with low relative humidity and fiber carpeting