University of Hawaii EHSO
Hazardous Waste Generator Training:
UH Manoa

William Harris
Occupational Health and Safety Specialist
UH Manoa
Objective: COMPLIANCE and SAFETY

• Leave here today with the “BIG 5!”
  
  • Establish a “Waste Accumulation Area”
  
  • Provide complete labels – include full names, relative % and the word ‘Waste”
  
  • Segregate waste by hazard class
  
  • Provide secondary containment
  
  • If in doubt – CALL EHSO!
HAZARDOUS WASTE GENERATOR TRAINING: What We’ll Cover

- EHSO Contacts and Sources for More Information
- Regulatory Overview
- Enforcement
- What is a Hazardous Waste?
- Types of Waste, including P-Coded waste
- Hazardous Material Management Plan and Attachments
- Waste Storage and Generator Responsibilities
- Hazardous and Non-Hazardous Waste Disposal
- Waste Minimization
- Audits/Inspections
- Emergency and Spill Procedures
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Hazardous Material Management Officer
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Honolulu, HI 96822
Fax: 956-3205
University of Hawaii Environmental Health and Safety Programs
Hazardous Waste Regulations

- **Resource Conservation and Recovery Act**
  - RCRA (pronounced "rick-rah") gave EPA the authority to control hazardous waste from the "cradle-to-grave."
  - Regulated the generation, transportation, treatment, storage, and disposal of hazardous waste.
Where are the Requirements Found?

- Federal EPA Regulations:
  40 Code of Federal Regulation (CFR)
  sections 260 to 280

- State of Hawaii Regulations:
  Hawaii Administrative Rules (HAR)
  Title 11, sections 260 to 281
## Hazardous Materials, Hazardous Waste and Pollution Regulations

<table>
<thead>
<tr>
<th>AGENCY</th>
<th>REGULATIONS</th>
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<tbody>
<tr>
<td>EPA</td>
<td>Hazardous Waste, Clean Water Act, Clean Air Act</td>
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<tr>
<td>HI DOH</td>
<td>Hazardous Communication, Laboratory Safety</td>
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<tr>
<td>OSHA</td>
<td>Hazardous Materials Transportation</td>
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<td>HIOSH</td>
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*EPA: Environmental Protection Agency*  
*HI DOH: Health and Industries Division of Health*  
*OSHA: Occupational Safety and Health Administration*  
*DOT: U.S. Department of Transportation*
The EPA and DOH are serious about enforcing hazardous waste regulations.

In FY 2002, the EPA:
- Issued over 4 billion dollars in clean-up orders.
- Handed out 26 million dollars in administrative fines.

Sent 674 cases to the U.S. Justice Department for criminal prosecution.
Civil and Criminal Penalties

Civil penalties are up to

$ 32,600

per day/ per item

Criminal penalties are up to

$ 50,000 and/or 5 years in prison

per day/ per item
Recent HI DOH Enforcement Actions

- The *University of Hawaii* was assessed a fine of **$1.8 million** in 1998 and 1999.

- Hazardous chemicals buried for years in the basement of the Honolulu campus's main chemistry building, plus other discards elsewhere.
HI DOH Enforcement

- Inspectors will review all chemicals, *wastes and unused materials*, in your laboratory.

- So - How do we comply?
Hazardous Waste Training Requirements

- EPA regulations requires that **annual training** be given to employees handling hazardous waste.

- UH policies require that employees purchasing, handling or disposing of chemicals have training.
Hazardous Materials and Waste Plan

- The HMMP outlines the basic requirements for the management of hazardous materials and disposal of hazardous waste.

- These requirements are based on the federal, state and county regulations.

- Copies of the plan are available from EHSO or online at: www.hawaii.edu/ehso
AUDIT PROGRAM

- Audits assist in ensuring laboratories and facilities that are safe and protective of the environment.

- EHSO will perform periodic visits to review implementation of applicable safety, health and environmental policies and requirements.
AUDIT PROGRAM

- Use of personal protective equipment
- Showers and eyewashes
- Ventilation hoods
- Hazardous material storage and inventories
- Hazardous waste storage
- Material Safety Data Sheets
- Emergency plans
HOW ELSE DO WE COMPLY?

We control waste production and properly manage waste stored on site:

1. **Control** amounts and types of hazardous materials coming onto the facility

2. **Manage** and control the amount of waste produced

3. **Minimize** the amount of waste produced through reuse/recycling and using less hazardous or non-hazardous alternatives
Hazardous Waste Management

Control

COMPLIANCE

Manage  Minimize
Approvals: Approval to Purchase Form

- Certain chemicals are very hazardous and expensive to dispose:
  - Examples: Carbon monoxide, Lithium Aluminum Hydride
  - Attachment 1 must be filled out prior to purchase
Attachment 1: Approval to Purchase Form

UNIVERSITY OF HAWAII AT MANOA
PROCUREMENT AUTHORIZATION FOR HAZARDOUS MATERIALS

An approved (signed) copy of this form must accompany any purchase order or requisition for the procurement of the hazardous materials listed on page two of this form.

NAME: ________________________________
(Principal Investigator)

DEPARTMENT: __________________ PHONE NO., EXT: ____________________

LOCATION: __________________ PURCHASE ORDER NO.: ______________
(Where chemical will be used)

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Solid/liquid/gas</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Signature of Principal Investigator: ____________________ Date: ______________

PLEASE SEND THE COMPLETED FORM TO: EHSO 2040 East-West Road Attention: Hazardous Materials Management Officer. The Hazardous Materials Management Officer may be contacted at 956-3198 or FAX 956-3205, if you have questions.

FOR EHSO USE ONLY

EHSO APPROVAL: ____________________ Date: ____________________
(Hazardous Materials Management Officer)

APPROVAL NO. ____________________

LIST OF CHEMICALS REQUIRING ENVIRONMENTAL HEALTH & SAFETY OFFICE (EHSO) APPROVAL TO PURCHASE

Because the following chemicals are highly toxic, explosive, water reactive or for other reasons very difficult and expensive to dispose of (disposal costs can be more than $1000 per container) their use needs to be minimized and monitored. Contact Tim O’Callaghan, at EHSO (956-3198) for further information.

Arseine
Methyl Amine
Boron Trichloride
Methyl Bromide
Boron Trifluoride
Methyl Chloride
Bromine Chloride
Methyl Lithium
Butyl Lithium
Nitric Oxide
Carbon Monoxide
Nitrogen Dioxide
Carbonyl Sulfide
Nitrogen Trifluoride
Cesium
Phosgene
Calcium Hydride
Phosphine
Chlorine
Phosphorus
Chlorine Trifluoride
Picric Acid
Chloropirrolin
Picryl Sulfonic Acid
Cyanogen
Picric Acid
Cyanogen Chloride
Potassium
Diborane
Rubidium
3,5-Dinitrophenol
Silane
2,4-Dinitrophenylhydrazine
Silane Dichloride
3,5-Dinitrosalicylic Acid
Sodium
Ethylene Oxide
Sulfur Dioxide
Fluorine
Trinitroaniline
Hydrogen Bromide
Trinitrobenzene
Hydrogen Chloride
Trinitroresol
Hydrogen Cyanide
Trinitronaphthalene
Hydrogen Fluoride
Trinitrophenol
Hydrogen Sulfide
Trinitrotoluene
Lithium
Urea Nitrate
Lithium Aluminum Hydride
Vinyl Chloride
Lithium Hydride

Attachment (1)
Page 2 of 2
Approvals: Approval to Use Form

- Certain chemicals additionally pose significant hazards requiring an agreement and use plan
  - Explosives, Water reactives or pyrophorics, Flammable or poison gases, Peroxide forming, Highly toxic (LC50/LD50), Flam Liquids over 60 gallons
  - Attachment 2 must be filled out prior to use
Attachment 2: Approval to Use Hazardous Materials

Must be filled out (along with names, amounts and safe use plan) and submitted to EHSO if working with:

- **Explosive materials**
- **Water Reactive Chemicals**
- **Flammable or Poison Gases**
- **Organic Peroxides or Peroxide Formers**
- **Highly Toxic Materials**
- **Flammable Liquids in excess of 60 gallons**
Hazardous Waste Identification and Classification

What is a waste?

A waste is:

- A useless by-product of an operation
- Any material which can no longer be used
How Do I Determine if a Product is Hazardous?

- Read manufacturers labels

- Review the Material Safety Data Sheet
  - Products that are flammable, corrosive, toxic/poison, reactive, oxidizer, mutagen, carcinogen, etc will be considered a hazardous waste when disposed of.

- Contact UH EHSO to ask for assistance!
Hazardous Waste Bullseye

Acute Hazardous Waste (P-Coded)
RCRA Hazardous Waste
Non-RCRA Hazardous Waste
Non-Hazardous Waste

Examples
Sodium Azide, Osmium Tetroxide
Flammable, Corrosive, Reactive, Toxic and Listed Waste
DOT regulated materials
Non-regulated materials
Highly Toxic or P-coded Waste

All Cyanides
Ammonium vanadate
Arsenic oxides
Arsenic acid
Carbon disulfide
Osmium tetroxide
Sodium azide
Thallium compounds
Pesticides (Aldrin, Aldicarb, Carbofuran, Heptachlor, Methomyl Parathion)
P-Coded Waste: Clarification

- Pure P coded material = P Waste
- P coded material and water only = P Waste
  - This means any rinsate water for P-coded bottles MUST be turned in!
- P coded material with other chemicals = Regular Hazardous Waste!
<table>
<thead>
<tr>
<th>Type of Hazardous Waste</th>
<th>Common Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic solvents</td>
<td>Acetone, Xylene, Alcohols, Benzene, MEK, Acetonitrile, Hexanes, Acetates, Toluene</td>
</tr>
<tr>
<td>Chlorinated solvents</td>
<td>Methylene chloride, Carbon tetrachloride, Chloroform</td>
</tr>
<tr>
<td>Bases</td>
<td>Sodium hydroxide and other hydroxides, amines</td>
</tr>
<tr>
<td>Acids</td>
<td>Hydrochloric, sulfuric, phosphoric, acetic acid; ferric, stannous and zinc chloride</td>
</tr>
<tr>
<td>Photography solutions</td>
<td>Photograph or x-ray development chemicals containing silver or hydroquinone</td>
</tr>
<tr>
<td>Carcinogens and Mutagens</td>
<td>Formaldehyde, Ethidium Bromide</td>
</tr>
<tr>
<td>Flammable Solids</td>
<td>Paraformaldehyde, Naphthalene, Sulfur, Charcoal</td>
</tr>
<tr>
<td>Reactive</td>
<td>Hydrides, Reactive Metals</td>
</tr>
<tr>
<td>Oxidizers</td>
<td>Nitrates, Nitrites, Chlorates, Chromates, Permanganates, Persulfates, Iodates, Hydrogen Peroxide 30%</td>
</tr>
<tr>
<td>Pesticides</td>
<td>Chloropyrifos, DDT, Paraquat</td>
</tr>
<tr>
<td>Toxics</td>
<td>Acrylamide, Aniline Dyes, Arsenic, Barium, Cadmium, Chromium, Glutaraldehyde, Lead, Mercaptoethanol, Mercury, Phenol, Selenium</td>
</tr>
<tr>
<td>Oils</td>
<td>Vacuum pump oil, mineral oil</td>
</tr>
<tr>
<td>Aerosols and Gases</td>
<td>All aerosol and gas containers</td>
</tr>
</tbody>
</table>
## Common Hazardous Wastes - Shops

<table>
<thead>
<tr>
<th>Type of Hazardous Waste</th>
<th>Common Product/Activity Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignitable petroleum solvent, naptha, stoddard solvent, mineral spirits</td>
<td>Parts washers, degreasing equipment, metal cleaning, dry cleaning</td>
</tr>
<tr>
<td>Xylene (xylol), toluene (toluol), paint thinners</td>
<td>Paint thinners, metal cleaning, wipedown before painting</td>
</tr>
<tr>
<td>Alcohols, acetone, MEK</td>
<td>Cleaning</td>
</tr>
<tr>
<td>Sodium hydroxide, lye, naval jelly</td>
<td>Aqueous parts washers, hot tanks, strippers, metal cleaning</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>Paint stripping, metal cleaning</td>
</tr>
<tr>
<td>Acids (hydrochloric, sulfuric, phosphoric)</td>
<td>Metal cleaning, etching</td>
</tr>
<tr>
<td>Photography solutions</td>
<td>Photograph or x-ray development</td>
</tr>
<tr>
<td>Inks and ink sludges</td>
<td>Printing</td>
</tr>
<tr>
<td>Perchloroethylene (PERC), tetrachloroethylene</td>
<td>Dry cleaning, metal cleaning, electronic parts cleaning</td>
</tr>
<tr>
<td>Pesticides</td>
<td>Pesticide application, seed treatment</td>
</tr>
<tr>
<td>Paint filters, paint dust</td>
<td>Paint booths, sand blasting</td>
</tr>
<tr>
<td>Aerosols</td>
<td>Painting, lubricating</td>
</tr>
<tr>
<td>Epoxies</td>
<td>Fiber glass, adhehsives</td>
</tr>
<tr>
<td>Oil-based paints, stains, enamels, lacquers</td>
<td>Wood staining, painting, finishing</td>
</tr>
</tbody>
</table>
Shock Sensitive/Explosive (SHOX) Compounds

- Monitor peroxide forming and shock sensitive compounds frequently to ensure chemicals do not become unstable

- Examples include Ether, Picric acid, THF, Benzoyl peroxide

- See the EHSO website for more information
WASTE STORAGE AND DISPOSAL TOPICS

• Waste Storage Areas
• Waste Storage Time Limits
• Labeling
• Waste Containers
• Secondary Containment
• Waste Segregation by Hazard Class
• Waste Disposal
SATELITE ACCUMULATION AREA

- **SAA Definition**: Designated area at or near the initial point of waste generation where small amounts of waste are produced.

- Designate accumulation area with signage: "WASTE ACCUMULATION AREA"

- Wastes must be stored together in a single area.
  - Exception for flammable liquids, which may be stored separately in the lab flammable liquid storage cabinet.
SATELITE ACCUMULATION AREA

- Waste storage area must be able to be secured in a locked area.
- Do not store waste in the hallway or outside.
- Waste can not be accumulated for labs on other floors or from other research groups.
SATELITE ACCUMULATION AREA

- Waste can be stored indefinitely as long as the quantity limits are not exceeded and containers remain in good condition.

- Maximum storage limit amount is 55 gallons of “normal” hazardous waste and 1 quart of Acutely Toxic (P-Coded) waste.
Satellite Accumulation Limits

55 Gallons of Normal Waste

1 Quart of P-Coded Waste

If above quantities are exceeded, generators must:

a) Label waste with the accumulation start date &

b) Have waste removed by EHSO within 3 days
Housekeeping

- Waste accumulation areas should be neat and orderly.
- Waste containers should be accessible. Accumulation areas should have a clear access aisle.
HAZARDOUS WASTE LABELS

- All hazardous waste containers must be labeled with the word “WASTE”

- The complete chemical name of the waste must be on the container. Abbreviations for waste containers are not acceptable.
HAZARDOUS WASTE LABELS

- Chemical names must be specific such as *methyl alcohol* or *hydrochloric acid*.

- Generic chemical names such as waste solvent, waste alcohol or waste acid are not acceptable.
HAZARDOUS WASTE LABELS

- The percentage or ratio of each major chemical constituent must be on the label.

- Alternatively, a separate waste log may be kept with amounts. Label “Waste Container 1” and have the log nearby. Apply the appropriate percentage to the label once the bottle is full.
Waste Containers

- Ensure containers are not damaged, rusted or leaking
- Remove contamination from the exterior of all containers
Waste Containers

- Containers used for wastes must be compatible with the waste

- **Do not** use food, detergent or other containers that aren’t designed for holding chemical wastes

- Acid and base solutions should be in glass containers
  (Exception is Hydrofluoric acid)
Waste Containers

- Closed Containers:
  - All hazardous waste containers must remain closed except when waste is being added to them

- Overfilling:
  - Do not fill bottles past the shoulder
Waste Containers

- Waste containers should not be stored on their sides

- Do not stack waste containers

- Empty containers may be disposed in the refuse or recycled if totally empty
  - Deface original labels

- Empty p-coded waste containers must be triple rinsed
Waste Container Lids

- Ensure containers have a secure closure (screw caps)
- Containers with corks, rubber stoppers, parafilm or foil covers are not considered compliant
Waste Container Lids

- Completely close waist containers. Lids must be tight.

- Evaporation of excess waste is not permitted.

- Lids must be compatible with the waste.
Leaking Waste Containers

- Clean-up spills and drips immediately.

- Spill residue should be collected as a hazardous waste.
Secondary Containment

- Secondary containment is plastic, metal or rubber trays used to contain spills or drips.
- Containment reduces the cost and time associated with cleaning up spills!
Secondary Containment

- Secondary containment is **REQUIRED FOR ALL** chemical **WASTE** containers and should be used for all other liquid chemicals that are:
  - Within 4’ of drain (in a hood or sink)
  - On the floor
  - Over 55 gallons
  - And to segregate incompatibles

- Secondary containment(s) need to enclose at least 100% of the volume of the largest container or 25% of the total volume, considering displacement.
Segregate Waste by Hazard

Class

- **T** = Toxic (phenol, acrylamide, heavy metals, chlorinated solvents)
- **R** = Reactive
- **I** = Ignitable (solvents)
- **C** = Corrosive (acids and caustics)
- **S** = Stuff (oxidizers, unknowns)
Common Segregation Issues

- Oxidizers stored with flammables
- Acids stored with bases
- Water-reactives stored with liquids
- Waste must also be segregated by hazard
Unknwonms

Unknwonms pose a very serious risk. Assume that all unknowns are extremely dangerous.

Label “Unknown Waste” and segregate from other containers.

EHSO will analyze the unknown. The charge is $70 to your program per each unknown.
Hazardous Waste Management: Problems

What’s Wrong With These Pictures?
Incompatibles stored together

- Flammable liquids
- Hydrochloric acid
No labels, no secondary, contaminated exterior
Cracked, leaking containers
Poor housekeeping, containers stored on side, labels degraded
Waste storage outside
Improper Waste Disposal
Container with a degraded label
Leaking, no secondary, degraded condition
Hazardous Waste Disposal Procedure

- Attend the hazardous waste generator training within the past year.

- Submit a correctly completed copy of the Excess Hazardous Materials/Hazardous Waste Turn in Form. ONLINE ONLY!

- All waste containers must be properly labeled, sealed and in good condition. Leaking or broken containers will not be accepted.

- Incompatible waste must be segregated by hazard class.

- Waste must be placed in boxes before pick-up by EHSO. Cardboard boxes are acceptable.
The excess hazardous material and hazardous waste turn in form is a vital part of waste disposal documentation and regulatory compliance. The basic form has two pages.

The first page provides information on the waste generator and the generation site, while the second page provides certification signatures of the authorized generator, and EHSO personnel.
Waste Turn-in Form

Excess Hazardous Materials and Hazardous Waste Turn in Form

This form is to be used for the turn in of excess hazardous materials or hazardous waste to the Environmental Health and Safety Office (EHSO) for reuse or disposal. Please refer to the Hazardous Materials Management Program requirements for information on the types of materials accepted and the proper disposition of other materials. This form can be duplicated as necessary. See the attached sheet for information on completing the form.

Dept/Org: ___________________________ Date: ___________________________
Name: ___________________________ Phone: ___________________________
Location: ___________________________ Page: ___ of ___

List of Materials:

<table>
<thead>
<tr>
<th>Item No#</th>
<th>Chemical Name</th>
<th>Quantity</th>
<th>** Physical State</th>
<th>For EHSO Use</th>
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</thead>
<tbody>
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</table>

Generator Certification: I certify that the information provided is complete and accurately describes, to the best of my knowledge, the material to be turned in.

______________________________  ___________________________
Signature                        Date

EHSO Approval:

Hazardous Materials Management Officer  ___________________________
Date

Material Acceptance: The material submitted for turn in has been inspected and determined to match the list above and is labeled and packed in accordance with University Hazardous Materials Control and Hazardous Waste Disposal requirements.

______________________________  ___________________________
EHSO Representative                  Date

11/1/2001

Attachment (5)
Page 1 of 5
**Weight and Volume Conversion Tables**

The following tables are provided for convenience to those using the waste turn in form. Numbers are approximations and have been rounded off.

**Weights:** Convert grams to pounds  
1 gram = 0.0022 pounds  

<table>
<thead>
<tr>
<th>Item No#</th>
<th>CHEMICAL NAME</th>
<th>Quantity</th>
<th>Physical State</th>
<th>For EHSO Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<5 grams  
0.01 pounds (per instructions all weights less than 5 grams or 0.01 pounds are to be reported as 0.01 pounds)

| 5 grams | 0.01 |
| 20 grams | 0.04 |
| 40 grams | 0.09 |
| 100 grams | 0.22 |

| 10 grams | 0.02 |
| 30 grams | 0.07 |
| 50 grams | 0.11 |
| 500 grams | 1.10 |

**Volumes:** Convert liters to gallons  
1 liter = 0.2642 gallons  

<table>
<thead>
<tr>
<th>Item No#</th>
<th>CHEMICAL NAME</th>
<th>Quantity</th>
<th>Physical State</th>
<th>For EHSO Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

≤ 40 ml  
0.01 (per instructions all volumes ≤ 40 ml are reported as 0.01 gal.)

| 50 ml | 0.01 |
| 100 ml | 0.03 |
| 200 ml | 0.05 |
| 400 ml | 0.11 |
| 600 ml | 0.16 |
| 800 ml | 0.21 |
| 1 liter | 0.26 |
| 2 liters | 0.53 |
| 3 liters | 0.79 |

| 1.5 liters | 0.40 |
| 2.5 liters | 0.66 |
| 4 liters | 1.06 |

0.5 pints (8 oz)  
0.06 gallons

1 pint (16 oz)  
0.13 gallons

1 quart (32 oz)  
0.25 gallons
Completing the Turn-In Form Correctly

1. You must be certified in the training program.

2. Name of the person signing the form must appear on the name line.

3. Provide complete “CHEMICAL NAMES.” Provide % of each mixture.

4. Ensure correct and complete spelling

5. Quantities must be in lbs and gal
Properly Completed Form

Excess Hazardous Materials and Hazardous Waste Turn in Form

This form is to be used for the turn in of excess hazardous materials or hazardous waste to the Environmental Health and Safety Office (EHSO) for reuse or disposal. Please refer to the Hazardous Materials Management Program requirements for information on the types of materials accepted and the proper disposition of other materials. This form can be duplicated as necessary. See the attached sheet for information on completing the form.

Dept/Org: Chemistry    Date: 2/14/02
Name: Paracelsus    Phone: 6-1212
Location: Bilger Basement    Page: 1 of 2

List of Materials:

<table>
<thead>
<tr>
<th>Item No#</th>
<th>Chemical Name</th>
<th>Quantity</th>
<th>** Physical State</th>
<th>For EHSO Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acetone</td>
<td>.25 gal</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Copper Sulfate</td>
<td>1.5 lbs</td>
<td>s</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sodium Arsinate Solution</td>
<td>0.5 lbs</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sodium Hydroxide</td>
<td>0.6 lbs</td>
<td>s</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Chloroform 60%, Phenol 40%</td>
<td>2.0 gal</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Unknown (May Be Acid)</td>
<td>0.13 gal</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Hydrochloric Acid, 6 molar</td>
<td>0.5 gal</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Nitric Acid Concentrated</td>
<td>1.0 gal</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Halogenated Solvent, methanol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>30%/ Methylene Chloride 60%</td>
<td>0.23 gal</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Acetic Acid</td>
<td>0.66 gal</td>
<td>L</td>
<td></td>
</tr>
</tbody>
</table>

*Item No# = List the Item Number and mark the individual containers with the same Item Number.

**Physical state = S (Solid), L (Liquid), G (Gas/Aerosol)

Generator Certification: I certify that the information provided is complete and accurately describes, to the best of my knowledge, the materials to be turned in.

Paracelsus 2-14-02

EHSO Approval: Hazardous Materials Management Officer  Date

Material Acceptance: The material submitted for turn in has been inspected and determined to match the list above and is labeled and packed in accordance with University Hazardous Materials Control and Hazardous Waste Disposal requirements.

11/1/2001
IMPORTANT WASTE TURN-IN FORM

ISSUES

• Form must be readable, with no chemical formulas and correct spelling of chemical names.

• “Unknown Waste” is an acceptable name if the contents of the container are not known.

• Amounts must be specified in pounds or gallons and the proper physical state of the material must be specified.

• The form must be signed by an authorized person whose name must appear on the “Name” line on page one of the form.
The cost of hazardous waste disposal for the Manoa Campus is borne by EHSO with no charge to the generator of the waste, *except for the following*:

1. Unknown Waste - $70 per unknown

2. Radioactive Mixed Waste – up to $30,000 for 10 pounds

3. Compressed Gas Cylinders - $500 to $5000 per cylinder

4. Dioxin or Dioxin Contaminated Materials - $1,000 per pound
NON-HAZARDOUS WASTE

Trash disposal only for waste specifically listed as non-hazardous in Table 1

**TABLE 1: Non-Hazardous Waste**

<table>
<thead>
<tr>
<th>Non-Hazardous Waste (e.g., sucrose, glucose, mannose)</th>
<th>Silica Gel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td>Alumina (aluminum oxide)</td>
</tr>
<tr>
<td>Naturally occurring Amino Acids</td>
<td>Calcium Fluoride</td>
</tr>
<tr>
<td>Citric Acid and its Sodium, Potassium, Magnesium, Calcium and Ammonium Salts</td>
<td>Lactic Acid and its Sodium, Potassium, Magnesium, Calcium and Ammonium, Salts</td>
</tr>
<tr>
<td>Sodium, Potassium, Calcium, Strontium, and Ammonium Sulfates</td>
<td>Sodium, Potassium, Calcium, Magnesium, Strontium and Ammonium Phosphates</td>
</tr>
<tr>
<td>Sodium, Potassium, Magnesium and Ammonium Chlorides</td>
<td>Sodium, Potassium, Magnesium, and Calcium Borates</td>
</tr>
<tr>
<td>Silicon Dioxide</td>
<td>Sodium, Potassium, Ammonium Acetates</td>
</tr>
<tr>
<td>Boron, Magnesium, Copper Oxides</td>
<td>Sodium, Potassium, Magnesium, Calcium, and Ammonium Carbonates</td>
</tr>
</tbody>
</table>
NON-HAZARDOUS WASTE AND DRAIN

**Drain disposal** only for waste listed in Table 2

- Hazardous waste is not permitted down the drain
- Do not exceed daily limits of allowed items
- **Do not dilute to meet % limits!!**

<table>
<thead>
<tr>
<th>TABLE 2: Drain Disposal Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethidium Bromide Solutions: &lt;0.01% by weight and &lt; 2 quarts per day per laboratory.</td>
</tr>
<tr>
<td>Phosphate Buffer Solutions: &lt;10% by weight and &lt; 1 quart per day per laboratory</td>
</tr>
<tr>
<td>Salt Solutions: &lt;10% by weight (sodium, potassium, lithium, ammonium: chlorides, carbonates, phosphates, sulfates, or acetates) &lt; 2 quarts per day per laboratory.</td>
</tr>
<tr>
<td>Dyes or Stains: Small amounts of from slides as part of laboratory experiments.</td>
</tr>
<tr>
<td>Alcohol Solutions (methyl, ethyl, isopropyl only): &lt; 10% by volume and &lt; 1 quart per day per laboratory.</td>
</tr>
<tr>
<td>Dilute formaldehyde Solutions: &lt; 3% by weight and &lt; 1 quart per day per laboratory.</td>
</tr>
<tr>
<td>Sugar Solutions: &lt; 10% by weight and &lt; 2 quarts per day per laboratory</td>
</tr>
<tr>
<td>Amino Acids and their Salts in solution: &lt;10% by weight and &lt;2 quarts per day per laboratory</td>
</tr>
<tr>
<td>Citric and Lactic Acids and their Salts in solution: &lt;10% by weight and &lt;1 quart per day per laboratory.</td>
</tr>
</tbody>
</table>
Specific Information on the Disposal of Various Materials/Waste

- **BATTERIES**
  - Household → Trash
  - Lead-acid → EHSO (if used for research)
  - Ni-Cad/Lithium/Mercury Containing → EHSO
  - Mark “WASTE BATTERIES”

- **BIOLOGICAL MATERIALS**
  - See Biohazardous Waste Disposal Guidelines
  - www.hawaii.edu/ehso/bio
Specific Information on the Disposal of Various Materials/Waste

- COMPRESSED GASES
  Arrange for disposal with vendor

- CONTROLLED SUBSTANCES
  Substances controlled by the Drug Enforcement Agency (DEA) such as chloral hydrate, barbitols and metabolic steroids cannot be accepted by EHSO.

  These materials can only be disposed of by a DEA permit holder or someone registered with the State Narcotics Control Board.
Specific Information on the Disposal of Various Materials/Waste

- **FLUORESCENT BALLASTS & TRANSFORMERS**
  - If unlabeled, assume they contain PCB’s.
  - Hold for disposal. Contact EHSO if leaking.
  - Ballasts can not be stored on-site longer than 9 months.
  - Mark with “Out of Service Date.” Other special storage procedures apply.
Specific Information on the Disposal of Various Materials/Waste

- **FLUORESCENT LIGHT TUBES**
  - Gray-end tubes contain small amounts of Mercury.
  - Must be stored in a box and protected from breakage.
  - Box must be marked “WASTE LAMPS” with accumulation start date.
  - Maintenance staff will dispose of accordingly.

- **REFRIGERANT**
  - Contact EHSO
Specific Information on the Disposal of Various Materials/Waste

- **GLASS**
  - Place broken glass in a puncture resistant container (i.e. cardboard box with bag) and label “Broken glass”
  - Glassware contaminated with hazardous chemicals should be rinsed to decontaminate them and then disposed of as non-contaminated glassware.
  - Specific procedures and drop-off locations for intact glass recycling

- **HAZARDOUS CHEMICALS AND HAZARDOUS WASTE**
  Submit to EHSO via Waste Turn-in Form
Specific Information on the Disposal of Various Materials/Waste

- LABORATORY ANIMAL CARCASSES
  Remove chemical preservatives (i.e., Ethanol)
  → Submit liquid to EHSO
  Carcasses → follow requirements of the Biosafety Program

- MERCURY
  Found in light switches, barometers, thermometers
  Submit to EHSO for disposal
SPECIAL WASTES

- OILS AND Transformer FLUID
  Motor Oil from UH vehicles → UH Trans. Services
  Motor Oil → Local vendors
  Pump Oil → Collect for Hazardous Waste Disp.

- Label ALL OILS “Used Oil”
Specific Information on the Disposal of Various Materials/Waste

- **PAINT WASTE**
  - Latex → Dry out, dispose in regular trash
  - Oil based/enamels → Submit to EHSO

- **PHOTOGRAPHIC WASTE**
  - Waste can contain silver, a EPA regulated compound
  - Collect for disposal or use a serviced silver recovery system
Specific Information on the Disposal of Various Materials/Waste

- POTENTIAL ASBESTOS ITEMS
  - Gloves
  - Ceiling tiles
  - Floor tiles
  - Insulation
  - Chemical Hood Panels
  - Other building products
Specific Information on the Disposal of Various Materials/Waste

- **RADIOACTIVE MATERIALS**
  Contact Radiation Safety Office

- **SHARPS**
  Chemically contaminated → treat/rinse → sharps container
  Biologically contaminated → check Biosafety requirements

- **SCIENTIFIC EQUIPMENT**
  Remove hazardous components (mercury, radiation sources, PCB transformers, asbestos) → Submit to EHSO

Contact Work Coordination for bulk pick-up
ITEMS WHICH CANNOT BE ACCEPTED UNDER THE HMMP

- Controlled Substances
- Metal Sharps
- Radioactive
- Materials
- Biohazardous Materials
Shipping Hazardous Materials?

DOT Regulations Apply:

HAZMAT Shipping Basics

- DOT Training
- IATA Training (air)
- Shipping Papers
- Labeling
- Packaging

PENALTIES: $32,500 per violation, can be $500,000!!

CALL EHSO FOR HAZMAT SHIPPING QUESTIONS!!

- Explosives: Common fireworks, sparklers, ammunition or other explosives.
- Flammable liquids: Fuels, oil-based paints or paint products, perfumes/colognes, gasoline-powered weed trimmers and generators.
- Corrosives: Liquid and solid drain cleaners, wet cell batteries, and products containing mercury.
- Miscellaneous: Chemical and First Aid Kits, Consumer Commodity, Dry Ice, Engines internal combustion and Lithium batteries. Dry Ice, also known as Carbon Dioxide Solid, is often used as a coolant for foodstuffs, chemicals, and medical shipments.
HAZARDOUS WASTE MINIMIZATION

Buy Chemicals in Smaller Amounts

Recycling and Redistribution

The UH Swap Meet
Transfer Equipment and Materials between Departments at the University of Hawai‘i

<table>
<thead>
<tr>
<th>Date Posted</th>
<th>Item</th>
<th>Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul 15</td>
<td>Toner Cartridges</td>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Jul 12</td>
<td>Computer Speakers</td>
<td>Computer Equipment</td>
<td>2</td>
</tr>
<tr>
<td>Jul 9</td>
<td>Slide storage cabinets, Multiplex</td>
<td>Office Equipment</td>
<td>2</td>
</tr>
<tr>
<td>Jul 7</td>
<td>Apple PowerMac G3/266 (beige CPU only)</td>
<td>Computer Equipment</td>
<td>1</td>
</tr>
<tr>
<td>Jul 7</td>
<td>Apple Toner Cartridge M5002</td>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Jul 7</td>
<td>BASF ZDD MAC Formatted Diskettes</td>
<td>Other</td>
<td>5</td>
</tr>
<tr>
<td>Jun 29</td>
<td>Murata Fax Machine</td>
<td>Office Equipment</td>
<td>1</td>
</tr>
<tr>
<td>Jun 22</td>
<td>Glacial Acetic Acid</td>
<td>Surplus Chemicals</td>
<td>Several 2.5 L bottles</td>
</tr>
<tr>
<td>Jun 18</td>
<td>work bench/table</td>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>
Hazardous Waste Minimization

Materials

Conversion to Non-Hazardous Material

Acid + Base $\rightarrow$ pH 7
Emergency Spill Procedures

- All laboratories and facilities must have a spill and emergency plan in place and provide information and training to individuals working in their areas of responsibility.

- Personnel working with hazardous chemicals should be able to answer the question:

  "What would I do if this material spilled?"
Emergency Equipment

Supervisors must inform employees on the location of the following:

- Emergency Shower
- Emergency Eyewash
- Chemical Spill Kit
- Fire Alarm Pull Station
- Fire Extinguisher
- Telephone

Know the location of these in your building!!
Emergency Procedures

a. Spills Clean-Up Procedure → chemicals, biological materials, radioisotopes
b. Fire and evacuation
c. Personal injury
d. Emergency shutdown → power outages
e. Emergency contacts → post near the phone

Procedures are available online at: www.hawaii.edu/ehso/lab/sign

CHEMICAL SPILL CLEAN-UP PROCEDURES

The range and quantity of hazardous substances used in laboratories requires preplanning to respond safely to chemical spills. The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. Spill kits with instructions, adsorbents, reactants, and protective equipment should be available to cleanup minor spills. Location of spill kit: ________________

A minor spill is one that does not spread rapidly, does not endanger people or property except by direct contact, does not endanger the environment, and the laboratory staff is capable of handling safely without the assistance of safety and emergency personnel. All other chemical spills are considered major and EHSO must be notified at 956-8660 (24-Hour #: 956-8911).

In the event of a minor spill the following procedures shall be carried out:

- Attend to anyone who may have been contaminated or hurt.
- Ensure that the fume hood(s) is on. Open windows where possible to increase exhaust ventilation and if the spilled material is flammable, turn off all ignition and heat sources.
- Secure cleanup supplies. Neutralize acids and bases, if possible. Ensure protective apparel is resistant to the spill material.
- Control the spread of the liquid by containing the spill.
- Absorb the liquid by adding appropriate absorbent materials from the spill’s outer edges toward the center.
- Collect and contain the cleanup residues by scooping it into a plastic bucket or other appropriate container.
- Properly dispose of the waste as hazardous waste.
- Decontaminate the area and affected equipment. Ventilating the spill area may be necessary.
- Document what happened, why, what was done, and what was learned. Such documentation can be used to avoid similar instances in the future. Major incidents are almost always preceded by numerous near misses.
General Spill Procedures

- In the event of a spill, attend to anyone who may have been contaminated or injured, if it can be done without endangering yourself.

- Turn on the fume hood(s) and open windows and doors where this can be done without endangering yourself.

- If flammable materials are spilled, de-energize electrical devices if it can be done without endangering yourself.
Chemical Spill Kits

- Spill kits with instructions, absorbents, reactants, and protective equipment should be available to clean up minor spills.

- Spill kits are available from numerous lab supplies.

- Mercury spill kits are required if you work with mercury containing thermometers or equipment.

- Post spill procedures and location of the spill kit in the laboratory.
A Minor Spill

1. Does not spread rapidly

2. Does not endanger people or property except by direct contact

3. Does not endanger the environment

4. The workers in the area are capable of handling safely without the assistance of safety and emergency personnel

All other chemical spills are considered major!
Minor Spills

♦ Wear protective apparel that is resistant to the spilled material.

♦ Neutralize acids and bases, if possible using neutralizing agents such as sodium carbonate or sodium bisulfate.

♦ Control the spread of liquids by containing the spill. Absorb liquids by adding appropriate absorbent materials, such as vermiculite or sand, from the spill's outer edges toward the center.

♦ Paper towels and sponges are not to be used as absorbent material on corrosive chemical or flammable liquid spills.
Minor Spills

♦ Collect and contain the cleanup residue and any materials used to clean up the spill by scooping them into a 5-gallon plastic bucket or other appropriate container and properly disposing of the waste as hazardous waste. Label the container with the chemical name of the spilled material.

♦ Decontaminate the area and affected equipment. Ventilating the spill area may be necessary.

♦ Document what happened, why, what was done, and what was learned. Such documentation can be used to avoid similar instances in the future. Major incidents are almost always preceded by numerous near misses.
Major Spills

If the spill is major immediately contact the facility Hazardous Materials contact, the EHSO at 956-8660, and the UH Security Office 956-6911
Reporting Requirements

- All spills are required to be reported to EHSO even if they are minor and you were able to safety clean them up.

Contact the EHSO to determine whether there are any federal or state reporting requirements.

Some reporting obligations are immediate, or must be made within 24 hours.
SUMMARY

- Leave here today with the “BIG 5!”
  - Establish a “Waste Accumulation Area”
  - Provide complete labels – include full names, relative % and the word ‘Waste’
  - Segregate waste by hazard class
  - Provide secondary containment
  - If in doubt – CALL EHSO!
The End