Procedure for Transporting Chemicals on Campus
York University

Purpose

Provide a procedure for safe transportation of chemicals on campus and preventing potential incidents during chemical transportation.

Scope

This procedure applies to the transportation of all toxic, flammable, corrosive, reactive, or other hazardous chemicals used in a laboratory setting and on any other area of the workplace. This includes movements between store rooms and laboratories, between different laboratories, and within individual laboratories. It also includes movement of chemicals between buildings that are in close vicinity and/or connected in some way e.g. through a tunnel with each other. Laboratory faculty, students, and staff participating in the on-campus transportation of chemicals are expected to follow this procedure.

Note: If chemicals need to be transported between buildings that are at a considerable distance from each other, DOHS (ext. 55491) must be contacted for advice.

Exclusion

This procedure does not apply to chemical transportation in which professional moving services are contracted, or to off-campus location. If chemicals must be transferred between campuses or to an off-campus location, the Department of Occupational Health and Safety must be contacted for assistance in complying with applicable regulations e.g. Transportation of Dangerous Goods Regulations. Please refer to York University Program on Transportation of Dangerous Goods for specific requirements: http://www.yorku.ca/dohs/documents/YU_TDG_Program.pdf

Note: This procedure does not apply to radioactive materials transportation. For information on transporting radioactive materials, call DOHS at ext. 55491.

Responsibilities

- **Occupational Health & Safety**
  To provide laboratory faculty, students, and staff with advice and assistance necessary to safely transport chemicals on campus.
• **Principal Investigators/Laboratory-Area Supervisors**
  
a. To ensure their students and staff have received information and training necessary to safely transport chemicals on campus.
b. To provide equipment necessary to safely transport chemicals on campus.
c. To enforce the requirements outlined in this procedure.

• **Faculty, Students, and Staff**

To apply or follow requirements provided in this procedure.

• **Science Stores and Other Stores**

Providing loaner equipment, including carts and bottle carriers to individuals making chemical pickups.

**Procedures**

1. Individuals transporting chemicals must be familiar with the hazards presented by the chemicals being transported, and know how to react or respond in the event of a release or spill. Material Safety Data Sheets (MSDSs) are a good source for this information.

2. Individuals transporting chemicals must be trained in WHMIS Level II Training and other related training (e.g. compressed gas safety etc.) as needed.

3. Individuals transporting chemicals must wear appropriate Personal Protective Equipment (PPE):
   - A lab coat and safety glasses must be worn while transporting chemicals.
   - Lab appropriate attire, including long pants and closed-toed shoes, must also be worn while transporting chemicals.
   - A pair of chemical resistant gloves must be available and used as-needed. To prevent the spread of contamination from laboratories into public spaces, do not wear gloves in public, unless a spill or other incident dictates the precaution. If gloves must be worn, either be escorted by another person to open and close doors and press elevator buttons or only wear glove on one hand and use the other to open doors.
   - Additional personal protective equipment may be required if deemed necessary based on a risk assessment.
4. Chemicals must be transported in break-resistant secondary containers that are capable of containing all materials in the event of breakage or spill. Secondary containers are defined as commercially available bottle carriers made of rubber or plastic, with carrying handle(s). If necessary, a small amount of packing material (shipping peanuts, vermiculite, or cardboard inserts), that is compatible with the chemical(s), should be used to prevent bottles from tipping over or breaking during transport.

**Bottle Carrier**

**Secondary Container for Acid Bottles**
5. If you are transporting many chemicals at once, an easily maneuverable cart with raised edges of at least several inches in height on all four sides must be used (see picture below). Chemicals are to be loaded onto the lowest shelf of the cart to maintain the lowest center of gravity and minimize the risk of bottles falling. Two people must be in attendance to prevent cart from tipping as it is moved over uneven terrain and changes in elevation.
6. Incompatible chemicals must be carefully segregated by moving incompatibles at different times and/or by using separate secondary containment vessels. Refer to Appendix 1 for chemical incompatibility list.

7. Plan your route to minimize travel time and distance. Be familiar with uneven surfaces, ramps, and blind corners along your route. Use added caution when moving material up or down grade.

8. Freight, not passenger, elevators must be used when transporting chemicals. If it is necessary to use a passenger elevator, restrict to low-use times such as early in the morning or late in the afternoon. If this is not possible, be sure to warn passengers or prohibit passengers from riding with you.

9. Chemicals must be attended at all times while being transported to avoid any potential misuse or loses.

10. Transport on paved paths and sidewalks rather than streets or roads.

11. If a chemical spill occurs, a chemical spill kit must be obtained to clean up the spill. If the spill is unmanageable and/or if a personal injury or exposure occurred, contact 911 and/or York Security (ext. 33333 or 41673653333) as needed.

12. Do not transport chemicals in personal vehicles.

13. Compressed gas cylinders must be transported using special compressed gas cylinder handcarts. When transporting cylinders across asphalt, uneven terrain or between buildings, it is recommended that two people are in attendance to prevent tipping and unanticipated jolting of the gas cart. Cylinders must be securely attached to the cart and valve protection caps must be in place. Refer to YU Program on Compressed Gas Cylinder Safety for details: http://www.yorku.ca/dohs/documents/YU-Compressed-Gas-Cylinder-Safety-Program.pdf
**Cart for Transporting Gas Cylinders**

14. Transport cryogenic materials only in approved storage vessels (e.g. dewar flasks with pressure relief mechanisms). Use appropriate PPE including eye protection in the form of a face shield or goggles, heavy gloves, heavy apron, and closed-toe-shoes. Never transport in the passenger compartment of a vehicle due to the hazard from asphyxiation.
## Appendix 1: Chemical Segregation and Storage Chart
(Source: Columbia University, USA)

<table>
<thead>
<tr>
<th>CLASS OF CHEMICALS</th>
<th>RECOMMENDED STORAGE METHOD</th>
<th>CHEMICAL EXAMPLES</th>
<th>INCOMPATIBLES SEE MSDS IN ALL CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressed Gases - Flammable</td>
<td>Store in a cool, dry area, away from oxidizing gases. Securely strap or chain cylinders to a wall or bench top.</td>
<td>Methane, Acetylene, Propane</td>
<td>Oxidizing and toxic compressed gases, oxidizing solids. <em>Lecture-sized gas cylinders are not to be stored in cabinets with hazardous liquids</em></td>
</tr>
<tr>
<td>Compressed Gases - Oxidizing</td>
<td>Store in a cool, dry area, away from flammable gases and liquids. Securely strap or chain cylinders to a wall or bench top.</td>
<td>Oxygen, Chlorine, Bromine</td>
<td>Flammable gases. <em>Lecture-sized gas cylinders are not to be stored in cabinets with hazardous liquids</em></td>
</tr>
<tr>
<td>Compressed Gases - Poisonous</td>
<td>Store in a cool, dry area, away from flammable gases and liquids. Securely strap or chain cylinders to a wall or bench top.</td>
<td>Carbon monoxide, Hydrogen sulfide</td>
<td>Flammable and/or oxidizing gases. <em>Lecture-sized gas cylinders are not to be stored in cabinets with hazardous liquids</em></td>
</tr>
<tr>
<td>Corrosives – Acids INORGANIC</td>
<td>Store in a separate, lined/protected acid storage cabinet, or in deep corrosion-resistant spill trays. <em>DO NOT store acids directly on metal shelves</em></td>
<td>Inorganic (mineral) acids - Hydrochloric acid, Hydrofluoric acid, Phosphoric acid, Sulfuric acid, Chromic acid, Nitric acid</td>
<td>Flammable liquids, flammable solids, bases, and oxidizers. <strong>Organic acids</strong></td>
</tr>
<tr>
<td>Corrosives – Acids ORGANIC</td>
<td>Store in a separate, lined/protected acid storage cabinet, or</td>
<td>Organic acids - Acetic acid, Trichloroacetic acid,</td>
<td>Flammable liquids, flammable solids, bases, and</td>
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<tr>
<td>Category</td>
<td>Instructions</td>
<td>Examples</td>
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<tr>
<td>Corrosives - Bases</td>
<td>Store in a separate storage cabinet or segregate with a deep, corrosion-resistant spill tray.</td>
<td>Lactic acid, Oxalic acid, Inorganic acids Ammonium hydroxide, Potassium hydroxide, Sodium hydroxide</td>
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<tr>
<td>Explosives</td>
<td>Store in a secure location away from all other chemicals. Do not store in an area where they can fall.</td>
<td>Flammable liquids, oxidizers, poisons, and acids. Ammonium Nitrate, Nitro Urea, Sodium amide, Trinitroaniline, Trinitroanisole, Trinitrobenzene, Trinitrophenol/Picric acid, Trinitrotoluene (TNT)</td>
<td></td>
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<tr>
<td>Flammable Liquids</td>
<td>Store in a flammable storage cabinet. <em>Peroxide forming chemicals must be dated upon opening; e.g. Ether, Tetrahydrofuran, Dioxane</em></td>
<td>Acids, bases, oxidizers, and poisons. <em>Keep away from sources of ignition</em> Acetone, Benzene, Diethyl ether, Methanol, Ethanol, Hexanes, Toluene</td>
<td></td>
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<tr>
<td>Flammable Solids</td>
<td>Store in a separate dry cool area away from oxidizers, corrosives.</td>
<td>Phosphorus, Carbon, Charcoal Acids, bases, oxidizers, and poisons. <em>Keep away from sources of ignition</em></td>
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<tr>
<td>Water Reactive Chemicals</td>
<td>Store in a dry, cool location. Protect from water and the fire sprinkler system, if applicable. Label</td>
<td>Sodium metal, Potassium metal, Lithium metal, Lithium Aluminium hydride, Sodium Hydride Separate from all aqueous solutions, and oxidizers.</td>
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<tr>
<td>Location</td>
<td>Water Reactive Chemicals</td>
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### Oxidizers
- Store in a deep spill containment tray inside a non-combustible cabinet, separate from flammable or combustible materials and reducing agents.
- Sodium hypochlorite, Benzoyl peroxide, Potassium permanganate, Potassium chlorate, Potassium dichromate. The following are generally considered oxidizing substances: Peroxides, Perchlorates, Chlorates, Nitrates, Bromates, Superoxides
- Separate from reducing agents, flammables, and combustibles and organic materials.

### Reducing Agents
- Store in a deep spill containment tray inside a non-combustible cabinet, separate from oxidizers.
- Lithium Aluminum Hydride, Sodium amalgam, Sodium Borohydride, Diisobutyl Aluminum Hydride, Formic Acid, Oxalic Acid
- Oxidizers, Arsenic, Selenides

### Poisons/Toxic
- Store separately in a vented, cool, dry, area in chemically resistant secondary containers.
- Cyanides, heavy metal compounds, i.e. Cadmium, Mercury, Osmium
- Flammable liquids, acids, bases, and oxidizers.

### General Chemicals - Non-Reactive
- Store on general laboratory benches or shelving.
- Agar, Sodium chloride, Sodium bicarbonate, and most non-reactive salts
- See MSDS