1.0 Introduction

This document is intended as a guide to the Queen's University requirements for handling and storing flammable and combustible material in Laboratories. This procedure does not apply to the storage or use of flammable and combustible liquids in non-laboratory areas.

For information regarding flammable and combustible liquids handling in non-laboratory environments, refer to the “General Flammable and Combustible Liquids Handling Procedures” (SOP-Chem-03).

2.0 Applicable Legislation

Ontario Fire Code (O.Reg 213/07)
Ontario Occupational Health and Safety Act (R.S.O. 1990)
National Fire Protection Code of Canada
National Fire Protection Association Guidelines
ULC/ORD-C30 “Safety Containers”
ULC/ORC-C1275 “Storage Cabinets for Flammable Liquid Containers

3.0 Definitions

Flammable Liquid:
A liquid having a flash point below 37.8\(^0\) C and having a vapour pressure not exceeding 40 psi at 37.8\(^0\) C. Flammable liquids are also termed Class I, which are further subdivided in to Class IA, Class IB and Class IC.

Class IA: Flash point below 22.8\(^0\) C and a boiling point below 37.8\(^0\) C
Class IB: Flash point below 22.8\(^0\) C and a boiling point at or above 37.8\(^0\) C
Class IC: Flash point at or above 22.8\(^0\) C and below 37.8\(^0\) C

Combustible Liquids:
A liquid having a flash point at or above 37.8\(^0\) C. Combustible liquids can be subdivided into Class II, Class IIIA and Class IIIB.

Class II: Flash point at or above 37.8\(^0\) C and below 60\(^0\) C
Class IIIA: Flash point at or above 60\(^0\) C and below 93.3\(^0\) C

Flash Point:
The minimum temperature at which a liquid gives off vapour in sufficient concentrations to form an ignitable mixture with air near the surface of the liquid.
Fire Separation:

    Refers to a construction assembly (i.e. wall, door, etc.) that acts as a barrier against the
    spread of fire. The construction assembly may or may not have a fire-resistance rating
    or a fire-protection rating.
    A laboratory must be separated from other parts of a building by a fire separation having
    a fire resistance rating of 1 hour.

**Note:** When a liquid having a flash point at or above 37.8°C is being processed, stored,
handled or used at temperatures at or above its flash point, it must be treated as a flammable
(Class I) liquid.

### 4.0 Purchasing

Individual investigators or departments may purchase flammable liquids directly from external
suppliers **ONLY** if the flammable liquids are in glass or metal containers of 5 litre capacity or
less.

### 5.0 Dispensing

5.1 The dispensing of flammable and combustible liquids from containers larger than 5 litres
must be performed in the Botterell Hall Dispensing Room (loading dock area). This presently
is the only approved dispensing room on campus. Dispensing from containers larger than 5
litres in any other area is **PROHIBITED**.

5.2 Containers **SHALL** be grounded at all times during the dispensing process.

**Note:** The interdepartmental transportation of flammable and combustible liquids requires
care. Glass bottles (Winchesters) require special care when handling and it is recommended
that a safety bottle carrier be used.

### 6.0 Storage

Storage limits are applicable to a lab that has a 1 hour fire separation rating. If unsure about
your lab’s rating contact Physical Plant Services. Labs that do not have a 1 hour fire
separation will not be able to store the maximum quantities of flammable and combustible
liquids and should contact EH&S.
6.1 The storage, handling and use of flammable or combustible liquids in a glass or plastic container, with a capacity greater than those listed in subsection 6.2, is permitted only if the required liquid purity would be affected by storage in a metal container, or if the liquid would cause excessive corrosion of the metal container.

6.2 Properly stoppered or closed containers may be kept on laboratory shelves if they are of a capacity of 1 litre or less for flammable liquids and of a capacity of 5 litres or less for combustible liquids. These containers may be replenished from Winchesters and/or 5 litre safety containers only. Decanting should be conducted in a fumehood.

6.3 Safety containers (20 liter maximum) containing flammable or combustible liquids are allowed to stand in the open laboratory and store rooms, provided they are protected from accidental tipping. Safety containers must conform to the ULC/ORD-C30 “Safety Container” guidelines.

6.4 Except as permitted in subsections 6.1 and 6.2, all other bottles or containers of flammable or combustible liquid must be stored in an Approved flammable liquids storage cabinet when not in immediate use. It is preferable to store all flammable or combustible liquid, regardless of container type, in a flammable liquid storage cabinet when not in use.

6.5 Except as permitted in subsection 6.12, a maximum volume of 300 litres, of which not more than 50 litres can be flammable liquids, is allowed in the open area of the laboratory. This is the total amount and includes waste flammable liquids in Safety Containers (10 or 20L red solvent cans).

6.6 Containers for flammable or combustible liquid shall be labeled in accordance with WHMIS regulations. Labelling must be with easily legible type, which contrasts any other printed matter on the container.

6.7 Flammable and combustible liquids must be segregated by chemical group, where possible, in all storage areas. (Note: includes organic acids such as Acetic Acid, Formic acid, etc.)

6.8 Containers shall be stored such that they are not subject to excess heat, excess cold, or direct sunlight.

6.9 Storage volumes greater than those listed in subsection 6.5 must be stored in an approved flammable liquid storage cabinet. The maximum storage in a single cabinet is 500 litres, of which not more than 250 litres can be flammable liquids.
6.10 Storage cabinets must conform to the ULC-C1275 “Storage Cabinets for Flammable Liquid Containers” guidelines.

6.11 Except as permitted in subsection 6.12, the maximum number of cabinets in a single laboratory (Fire Compartment) is three. This allows storage of 1500 litres, of which not more than 750 litres can be flammable liquids.

6.12 If the laboratory is located below grade (e.g. basement area), the maximum volume of flammable liquids that may be stored is 250 litres. If you are unsure as to whether your laboratory is considered below grade, contact the Department of Environmental Health & Safety.

6.13 All flammable liquid storage cabinets must be labelled with conspicuous lettering to indicate the cabinet contains flammable liquids and open flames must be kept away.

6.14 The Department of Environmental Health & Safety must approve any room being used for storage of flammable and/or combustible liquids in volumes greater than those listed in these procedures. Flammable and combustible liquid storage rooms must meet stringent requirements outlined in the Ontario Fire and Building Codes.

6.15 Approved and Labelled laboratory-safe refrigerators shall be used to store suitably contained flammable and combustible liquids below room temperature. These refrigerators have all the electrical contacts removed from the storage compartments thereby eliminating the risk of spark and possible ignition of the liquids.

THE USE OF STANDARD, DOMESTIC REFRIGERATORS, REFRIGERATION UNITS, AND/OR FREEZERS FOR STORING ANY FLAMMABLE AND/OR COMBUSTIBLE MATERIAL IS PROHIBITED.

NOTE: The maximum allowable concentration for storage in a domestic refrigerator is 20% flammable or combustible in an aqueous solution. NO EXCEPTIONS!!!

7.0 Spills

7.1 A spill control procedure shall be developed, approved and implemented for any location where flammable and/or combustible liquids are stored, handled, processed or used. The procedure must be based on and compatible with the Queen’s University Spill Response Procedures (SOP-HAZMAT-03) issued by the Department of Environmental, Health and Safety.
7.2 Spill control procedures shall be prominently posted and maintained where flammable and/or combustible material is stored, handled, processed or used.

7.3 Adequate spill control material shall be available and located in close proximity to areas where flammable and/or combustible liquid is stored, handled, processed or used. This is in accordance to the Queen’s University Spill Response Procedures.

8.0 Disposal of Waste Flammable and Combustible Liquids

8.1 To ensure compliance with all applicable government regulations, waste flammable and combustible material must be disposed of in accordance with the Hazardous Waste Disposal Procedures (SOP-Chem-01) issued by the Department of Environmental, Health and Safety. Failure to do so will result in the material being rejected during pick-ups.

8.2 Waste flammable and combustible liquids awaiting disposal must be stored in an Approved disposal container with a maximum capacity of 20 L, see section 6.3, or in containers smaller than 5 L as outlined in section 6.2. The container must be clean and in good condition. The flame arrester must be secured in place and free of debris. Labelling of the safety container must comply with subsection 6.6. In addition, the researcher’s name, department and room number the can is to be returned to must also be clearly displayed.

8.3 Waste liquid in Safety Containers (red solvent cans) is classified as flammable and quantities fall under amounts specified in section 6.5, open areas of the laboratory.

Revision History

July 2005-Revision 1.0 Initial Release
April 2009-Revision 2.0 Section 8.0 Revised