

Safe Operating Procedures for the Storage, Transport and Use of Flammable Solvents

Risk Category. MEDIUM

HAZARD

The main hazard is associated with the flammability of the substance, classified as, Flammable, Highly Flammable, Extremely Flammable but several are also described as harmful or toxic.

A Flammable Liquid is one with a flash point less than 55 °C, a Highly Flammable liquid is one with a flash point less than 21°C and an Extremely Flammable is one with a flash point less than 0 °C and a boiling point of 35 °C or less.

(A highly flammable solid is one which is spontaneously combustible in air at ambient temperature or one which readily ignites after brief contact with a flame or one which evolves highly flammable gasses in contact with water or moist air).

Lower and Upper Explosive Limits. These limits define the range of concentrations in mixtures with air (or oxygen depending on definition) that will propagate a flame and cause an explosion. The lower values of these limits are usually well above the levels legally allowed as ambient in laboratories and workplaces but can easily be exceeded following a spillage. The upper limits of the flammability range offer little margin of safety because, when a solvent is spilled in the presence of a source of ignition, the lower level will be reached quickly and fire or explosion will occur before the upper limit is attained.

Ignition Temperature. The ignition (auto ignition) temperature of a substance is the minimum temperature required to initiate or cause self-sustained combustion independent of the heat source. A spark is not necessary for ignition when a flammable vapour reaches its auto ignition temperature.

Sources of ignition. The most common source of ignition in the laboratory are gas flames and heating elements but there are a number of less obvious electrical sources such as refrigerators, stirrer motors, heat guns, microwave ovens etc. It must also be remembered that vapours from flammable liquids are denser than air and can spread over bench and floor surfaces to sources of ignition that are apparently remote.

RISK

Solvents are in constant use and the risk of fire is always significant with all the dangers that entails to personal safety and property damage.

Persons likely to be affected.

Technical staff (including storekeepers), post graduates, academic staff, under graduates, cleaners, porters, clerical staff and visitors. The general public may be affected but only in a major incident or unwanted persons.

Procedures

Before any new work is started involving flammable liquids a COSHH assessment and a risk assessment, with relevance to DSEAR, must be completed.

To keep the risk as low as possible the volume of solvent must be kept to a working minimum both for storage and in use in laboratories.

Sources of ignition must be identified and where possible disconnected or removed to prevent sparks when solvents are being poured. Electrical items, which are not in use, must be switched off and the plug disconnected at the socket.

Naked flames must not be used in an area where flammable solvents are in use.

Bulk storage of flammable solvents is to be in a suitable enclosed lockable area a room preferably away from the main building. The area is to be marked with a specified "EX" sign at the point of entry.

There should be adequate ventilation for normal working where pouring of the solvent is carried out and if possible a means of increasing the air flow in the case of a significant spillage. External doors should be left open during pouring operations to aid the flow of air. If possible the floor of the room in should be in the form of a well sufficient to contain a major spillage of solvent.

All electrical equipment – lights, exhaust fan motors etc.- should be constructed so as not to produce sparks whilst in operation.

Lifting equipment to be kept lubricated to prevent sparks.

The quantity of solvent to be kept to a minimum working level, drawing extra stocks from suppliers on a "call off" basis. (The University now operates on a purchasing agreement so ordering large quantities in for the year should not be necessary).

Certain solvents are supplied in 200 litre drums. They are dispensed into 2.5 litre glass bottles (Winchesters) for use in the laboratories. The dispensing must only be done by trained solvent store operatives and no one else. The screw tops on the bottles must not be tightened fully so that vapours may escape as the solvent reaches room temperature. (The amount of vapour will be minimal and should not cause an increased risk).

Other solvents may be in "pre-packed" Winchesters or metal cans. (These metal cans are usually 5 litres and may be heavy enough to fall under the manual handling regs).

To obtain the solvents a stores request form must be completed and presented to the storekeeper (and where necessary the relevant customs and excise book signed). The solvent can then be collected at a time specified by the storekeeper from the designated collection point.

Collecting the solvents a Winchester carrier or appropriate bottle carrier must be used to transport the solvents to the laboratory. Remember the manual handling regs. and if several Winchesters are to be collected use a laboratory trolley to transport them. Keeping the bottles in a carrier whilst on the trolley will prevent them knocking against each other, reducing the risk of breakage. Under no circumstances should the bottles be carried by the neck or cradled in your arms.

Passenger lifts must not be used to convey the solvents between floors, goods lifts only should be used.

Storage in the laboratory the Winchester of flammable solvent must be stored in a metal solvent cabinet or in a vented cupboard below a fume cupboard. In either case the doors must be labelled with a flammable solvent sign. Winchesters of solvent must be put away at night and not stored in or on the workbench.

Solvents must not be stored with incompatible materials such as conc. nitric acid (oxidising agent).

The solvent may be transferred to a 500 ml reagent bottle for use in the lab. Any container of flammable solvent larger than 500 ml must be stored in the appropriate cabinet.

It is an offence to keep more than 50 litres of flammable solvent in total in a single laboratory. This includes waste solvent.

Work with flammable solvents under normal circumstances must be carried out in a fume cupboard away from possible sources of ignition. This includes the transfer from one container to another and the storage container returned immediately to its cabinet.

Waste solvent must be disposed of correctly into the appropriate container, which should have a vented screw cap and which must be emptied into the correct waste drum in the solvent store. Flammable solvents must never be poured down sinks.

Waste solvent is as flammable as pure solvent and should not be left in the open laboratory.

Maintenance schedules are not applicable except for periodic testing of portable electrical equipment lab. trolleys and any stores lifting equipment. Bottle carriers should only be used if they are in good condition.

Solvents may be used in large quantities in several departments and this is unlikely to change so the flammability risk will remain but with constant vigilance on the part of the users the explosion risk may be reduced.

Emergency Procedure

Personal injury or fire:-

Assess the situation and do not endanger yourself or others.

If in your opinion it is safe to tackle the fire with a CO2 extinguisher then do so. If not or the fire reignites evacuate the room closing the door behind you and set the emergency procedure into operation.

Where personal injury is involved summon a qualified first aider who will take care of the injured until the emergency services arrive.

Spillage, no fire:-

Serious – toxic or large quantities. Evacuate and ventilate the affected area closing doors and eliminating source of ignition if it is safe to do so. **DO NOT SWITCH OFF LIGHTS** etc. as they may cause a spark. Set the emergency procedure into operation. Go to the Porter's Lodge and advise the emergency team, and or the fire brigade, of the nature of the incident. **DO NOT ATTEMPT TO CLEAN UP A MAJOR SPILLAGE BY YOURSELF.** If it can be tackled without the need to call the emergency services then personnel trained in the use of breathing apparatus may be needed.

Minor. Ventilate the affected area and eliminate any sources of ignition. The liquid may be absorbed onto absorption material and as appropriate transferred to a fume cupboard to evaporate or to a suitable sealed container for waste disposal. Personnel trained in the use of breathing apparatus may be needed. In a well ventilated area such as a laboratory where fume cupboards ensure frequent air changes the best procedure may be to turn off sources of ignition, ventilate, evacuate and secure the room.