UNSW THE UNIVERSITY OF NEW SOUTH WALES	**An Introduction to Dangerous Goods Guideline**
UNSW Guideline	
Control number	OHS428
Linked UNSW Policy	This guidelines details actions and processes pursuant to the UNSW OHS Policy
Responsible Officer	Director, Human Resources
Authorisation	Director, Human Resources
Contact Officer	Manager, OHS and Worker's Compensation
Effective Date	1 January 2007
Superseded Documents	Guidelines for the storage of dangerous goods at UNSW, 30 April 2002
Review	This guideline will be reviewed in accordance with the UNSW OHS Management System Review Procedure
File Number	TRIM 2007/1225

1. Purpose

This guideline provides explanatory information relating to dangerous goods that should be read prior to the Guideline for the Storage of Dangerous Goods.

2. Scope

The information supplied here will mostly benefit laboratory or workshop supervisors / staff who are storing dangerous goods.

3. Definitions

Dangerous goods are substances or articles that pose a risk to people, property or the environment, due to their chemical or physical properties.

Explosive Precursors are substances that can be used as ingredients in a mixture that could trigger an explosion.

Cryogens are gases that have been cooled such that they exist in their liquid phase (eg. liquid nitrogen is stored at -196^{0}C)

4. Guidelines

There are 9 classes of dangerous goods which are defined by the Australian Dangerous Goods Code (ADG). The classification criteria used in the ADG is based on the United Nations Recommendations for the Transport of Dangerous Goods. See The 9 Classes of Dangerous Goods for examples of substances within each class.

Within some classes there are further divisions into sub classes eg. within the Class 2 for Gases there are Flammable gases (Class 2.1). Other Classes are further divided into Packing Groups; ie Packing Group I (greatest danger), Packing Group II (medium danger) and Packing Group III (least dangerous).

The following is a brief summary of hazards and controls for each class of dangerous goods (excluding Class 6.2 Infectious Substances (See UNSW Bio-Safety procedure) and Class 7 Radioactive Substances (See UNSW Radiation Safety procedures)).

EXPLOSIVES

1. **Class 1 – Explosives**

The Explosive Act (2003) and accompanying Explosives Regulation (2005) make it illegal to be in the possession of explosives or explosives pre-cursors without a license (in force since January 1st 2006). The only substance currently listed as an explosive precursor is Security Sensitive Ammonium Nitrate (SSAN).

If either of these types of dangerous goods are required as part of a research project then licenses must be obtained from Workcover. See "Information Sheet for Explosives and SSAN".

2. **Explosive and Unstable Chemicals that are not Class 1**

The following chemical groups are most commonly associated with explosions but are not Class 1 Explosives.

Acetylide	**Hypohalitenitrate**
Amine Oxide	**Nitrite**
Azide	**Nitro**
Diazo	**Ozonide**
Diasonium	**Peracid**
Fulminate	**Nitrogen Halides**
Halates	**Perhalates**
n-Haloamine	**Peroxides**
Hydroperoxide	

Many chemicals are prone to react violently , either spontaneously or due to environmental contact. This often results in explosion or fire.

A risk assessment is essential to properly identify the hazards and explosive capability of these chemicals.

Your risk assessment needs to identify whether your substances are:

- Friction or shock sensitive;
- Capable of strong exothermic reactions;
- Capable of producing unstable reactants;
- Touch sensitive detonators;
- etc

Possible precautions could include:

- temperature control;
- safety screens;
- remote control operation;
- control of flow rates or degree of agitation; etc

See the List of some Common Unstable Chemicals and is reproduced from AS2243.2 Safety in Laboratories – Chemicals

Class 2 - Gases
There are three sub classes within this class as can be seen in The 9 Classes of dangerous goods information sheet.

Class 2.1, the flammable gases can easily be ignited. Examples include Hydrogen, Acetylene, Methane and LPG.

Fire will result if the gases are present in a mixture with air such that they reach their flammable range. The following table lists some common flammable gases and their corresponding flammable range.

Gas	Flammability Range	
	LEL	UEL
Hydrogen	4	75
Acetylene	2	85
Carbon Monoxide	12	75
LPG	2.2	9.5

Class 2.2 gases are inert but can displace Oxygen (known as asphyxiants). Such gases include Nitrogen, Helium and Carbon dioxide.

Within Class 2.2, some gases can have a subsidiary risk (secondary risk) of also being an oxidising gas. Their dangerous goods symbol is 2.2/5.1. The most common oxidising gas is obviously Oxygen.

Class 2.3 are the toxic gases. These can have lethal effects at very low concentrations. Examples of toxic gases include; Carbon monoxide, Hydrogen sulphide, Silane.

Main Hazards of Class 2 Gases (excerpts from AS4332)

- **Pressure:** since they are stored in cylinders.
- **Flammability:** When mixed in the correct proportion of air, flammable gases will burn. If the concentration builds up in a confined space then an explosive mixture will form. Some gases *eg.* H_2 will auto-ignite without needing a spark. Some gases have an odour added to detect if there is a leak *eg.* LPG and acetylene.
- **Reactivity:** Some gases decompose and generate heat, *eg.* acetylene.
- **Toxicity:** Toxic gases can cause damage either by inhalation or by contact with skin or eyes.
- **Asphyxiation:** Some gases may displace O_2 from the atmosphere. Any lowering of O_2 concentration to below 18% is dangerous. Asphyxiant gases, such as CO_2 and N_2, may cause death if released in confined spaces, such as cool rooms. An estimate of the oxygen concentration which would remain in the atmosphere of the room should be made assuming a complete container failure. Suitable safety devices such as oxygen monitors, including an alarm, may be required in certain situations
- **Oxygen enrichment:** Too much O_2 in the atmosphere will increase the chance of a fire without there being an obvious fuel or ignition source.
- **Temperature:** When a gas cylinder is vented the change in pressure causes the gas to cool considerably, which may cause damage to people *eg.* frostbite or any piping or equipment.

Additional Hazards of Gases if involved in a Fire

Gases present the following specific hazards during a fire:

- Cylinders can rupture catastrophically.
- Cylinders can become projectiles.
- Cylinders can be knocked over by the pressure of water from a hydrant.
- A released gas of Class 2.1 will feed the fire.
- A released gas having a subsidiary risk of Class 5.1 will make the fire burn more vigorously.
- A released gas of Class 2.3 can present a hazard to persons, and the turbulence and buoyancy associated with the fire could result in the dispersion of the toxic gas.
- Some Class 2.2 gases may release toxic fumes in a fire.
- Smoke and water run-off from fires may present a hazard to persons and the environment.
- The maximum capacity of a vacuum insulated container for keeping cryogenic liquids shall not exceed 160 L.

The appropriate Australian Standard to read for the generic safe handling of gases is "AS4332: The Storage and Handling of Gases".

Cryogenic gases are to be handled in accordance with "AS1894 The storage and handling of non-flammable cryogenic and refrigerated liquids"

Class 3: Flammable Liquids

Flammable liquids are classified on the basis of their flash points and boiling points.
The flash point is the temperature at which the vapour from a flammable liquid becomes flammable.

Class 3 is further divided into three packing groups (PG's); PGI representing greatest danger.

The physical and chemical properties section on the MSDS lists the important key indicators of flammability of these substances eg. flash point, auto-ignition temperature, boiling point, lower explosive limits (LEL's) and upper explosive limits (UEL's)

The LEL is the % concentration of vapour in air below which, the material will not ignite. The UEL is the % concentration of vapour in air above which, the substance will not ignite. The range between the two is called the flammable range. Vapors form an explosive mixture in air within this range.

The following table is an example of 5 commonly used flammable liquids and the characteristics that earned them their dangerous goods class and packing group.

Substance	Flash Point ^{0}C	Auto Ignition temperature ^{0}C	Boiling Point ^{0}C	LEL %	UEL %	Packing Group
Carbon Disulphide	-30	90	46.3	1.3	50	I
Di-Ethyl Ether	-40	160	34.6	1.7	48	I
Ethanol	13	392	78	3.5	19	II
Acetone	-20	465-538	56	3	13	II
Xylene	27	500	138	1	7	III

The ease at which many commonly used flammable substances may be ignited and the spontaneous flammability of some of them may lead to serious incidents.

Containers holding flammable liquids need to be kept closed when not in use and work with flammable liquids should be conducted in a fume cupboard. This way the vapours from the liquids can be safely extracted and directed away from potential ignition sources. Some substances are very volatile, meaning they can enter their vapour phase very quickly. They can be identified by having low boiling points and high vapour pressure. An example is Diethyl ether which is the main reason it's a packing group I substance.

The vapour from these volatile liquids can be readily transported around the room creating an obvious potential fire risk if ignition sources are present. Ignition sources include the obvious one such as bunsen burners but they also include switches, pumps, hot plates and any other electrical devices. Anything which is capable of producing a spark can ignite the flammable vapour which will make it's way back to the flammable liquid in its container, setting the contents alight. A fire can easily spread out of control if there are other sources of combustion present in the room (eg. paper, boxes, other flammable liquids etc.)

Some substances have low auto-ignition temperatures meaning they can ignite without any source of ignition. Carbon disulphide has an auto ignition temperature of 100^{0}C. If it was not used in a fume cupboard, the vapour could rise up to the fluorescent lighting in the laboratory and easily ignite.

Flammables should never be heated by direct flame. Steam or water baths and heating mantles must be used instead. Distillation operations involving flammable liquids require close and continuous attention. They should never be left unattended. Safety screens and face shields should be used when handling very reactive reagents or mixtures and all potential ignition sources removed.

As with all dangerous goods, maintain minimum stocks in the laboratory. Purchase in the smallest containers practicable and keep the largest quantities in a dedicated chemical store.

Flammable liquids must not be poured down the sinks. Many are lighter than water, if immiscible with it, and these vapours may travel through the plumbing system and flash back from an ignition source.

In laboratory upgrades or new facilities design, the use of spark proof electric fittings and intrinsically safe equipment may be required if large scale flammable liquid work is planned. A risk assessment will help with this determination.

The appropriate standard for flammable liquids is "AS1940: The Storage and Handling of Flammable and Combustible Liquids".

Class 4:. Flammable Solids

There are 3 Sub classes of Flammable Solids: Class 4.1, Class 4.2 and Class 4.3

4.1 Flammable Solids
Flammable solids in powdered or finely divided form can form flammable or explosive mixtures with air. Some become flammable by:

- Friction or impact
- Reaction with water or mist air
- Contamination with combustible material
- Decomposition on heating and exposure to sunlight.

Picric acid is a Class 4 flammable substance. It must be stored in >30% water. If it is allowed to dry out it becomes explosive. Contact the OHS unit if you come across bottles of picric acid that appear to have dried out.

Other flammable powdered metals are very dangerous: eg. mixing powdered Aluminium and Iron Oxide (rust) into a mixture called "Thermite" will cause a reaction resulting in a temperature that can melt steel.

4.2 Substances liable to spontaneous combustion.
Are liable to spontaneous heating, or heating up in contact with air, and are then able to catch fire. Example: Sodium Sulfide.

4.3 Substances dangerous when wet.
These materials become spontaneously flammable or give off flammable gases in dangerous quantities. Example: CaC_2 (calcium carbide) when wet will produce C_2H_2 (acetylene).

Sodium metal is another example of a substance which is dangerous when wet and needs to be store under a hydrocarbon oil such as paraffin.

There is no Australian Standard that deals specifically with class 4 substances. Users should consult the individual MSDS' for the substances.

Class 5: **Oxidising Substances**

This class is further broken down to Class 5.1 Oxidising Agents and Class 5.2 Organic Peroxides

Class 5.1: Oxidising agents are in themselves not necessarily combustible, but may cause or contribute to, the combustion of other material. Example: Sodium peroxide mixed with water will cause a strong exothermic reaction; mixing sodium peroxide with charcoal will spontaneously ignite. **The appropriate standard is "AS4362 The Storage and Handling of Oxidising Agents".**

Class 5.2: Organic peroxides are thermally unstable substances and may undergo a self-accelerating decomposition. They may also be liable to explosive decomposition, burn rapidly, be sensitive to impact or friction, and react dangerously with other substances.
The appropriate standard is "AS2714 The storage and handling of hazardous chemical materials—Class 5.2 substances (organic peroxides)".
Example: Benzoyl peroxide.

Class 5.2 Organic Peroxides

These are organic peroxides which are divided into 7 classes depending on the level of their hazard. AS2714 deals with levels B,C,D,E,F. Level A is too dangerous to be transported and level G is quite harmless. Organic peroxides can take any form, solid, liquid or paste.

Hazards of Class 5.2 Organic Peroxides

Organic peroxides are notoriously reactive and unstable substances. Their specific chemical structure and their formulation (with additives or diluents), influence their degree of stability in terms of behaviour to impact on, friction, static electricity, contaminants and heat. These properties of organic peroxides require them to be stored in safe locations, at a temperature that is safe for each specific substance, away from sunlight and with appropriate segregation from other materials. A material safety data sheet (MSDS) should be obtained from the supplier for each specific organic peroxide that is stored.

Reactivity Class 5.2 Organic Peroxides with other chemicals

Organic peroxides are violently reactive with the following incompatible materials (contaminants):

- strong acids and bases;
- resins;
- combustible material,
- oxidising and reducing agents,
- metals and metal compounds.

These contaminants cause the dissociation and decomposition of organic peroxides to accelerate.

Sensitivity of Class 5.2 Organic Peroxides to heat

Because organic peroxides are sensitive to heat, careful attention needs to be paid to the temperature at which each specific substance is to be stored. The so-called 'selfaccelerating decomposition temperature' (SADT) of a specific organic peroxide is given in its MSDS.

Health hazards of Class 5.2 Organic Peroxides

Organic peroxides are toxic and may have a corrosive action on the skin, mucous membranes and eyes: in some cases corneal damage can be serious, even after brief contact.

Storage and decanting of Class 5.2 Organic Peroxides

The following practices shall be strictly observed when storing, or decanting from, containers in minor storages:

- The containers must be stored on surfaces that are not liable to attack or damage by the contents if spilt.
- The containers need to be stored away from direct heat and ignition sources, eg, hotplates, heating appliances, naked flames.
- Each organic peroxide must be stored below the maximum or recommended storage temperatures given in its MSDS. Note that some organic peroxides require refrigeration during storage.

Summary Considerations for Class 5.2 Organic Peroxides

Organic peroxides present certain specific hazards, as follows:

- They may be flammable, toxic, corrosive or unstable.
- When heated, they may give off fumes or smoke, which may be flammable or toxic, or both.
- When contaminated, they may be highly unstable.
- They are sensitive to heat and may present a fire hazard. When subjected to excessive heating, they can decompose with evolution of more heat; in some cases the decomposition is accompanied by violent explosion.
- Some may react violently with other chemicals causing them to be sprayed over a wide area.
- Suitable non-combustible, inert absorbents, *eg.* clean vermiculite or sand, must always be available where liquid oxidising agents, are kept or handled. These absorbents need to be clearly identified, and stored in a laboratory spill clean-up kit.
- Equipment suitable for sweeping up leaks and spills of solid oxidising agents, and for sweeping up absorbent that has been used to absorb leaks and spills of liquid oxidising agents, *eg.* a broom or brush, need to be located in the area where organic peroxides are stored.
- Clean, sealable (and where appropriate, vented) waste bins, made of plastic or other appropriate material compatible with the oxidising agents being dealt with, must be available for the containment of absorbed spills. It is advisable that such waste bins be filled to not more than two-thirds of their capacity. This waste requires special labelling to ensure that waste contractors are aware of the hazards.

Note: Some substances have the ability to form organic peroxides over time during storage eg. Diethyl ether, (a Class 3 Flammable liquid). These substances take on the explosive capability of Class 5.2 Organic Peroxides. Such substances have expiry dates and must be either disposed of or rendered safe before this date has elapsed.

Substances which have this ability need to have the date they were purchased and first opened recorded on the label.

They need to be disposed of before they expiry date. Ensure that this information is recorded on the waste request form so that the contractors can prepare accordingly.

The list of Substances that can form Organic Peroxides lists some substances that have expiry dates of 3 months and some for 12 months.

See also the section on Explosives which talks about common unstable chemicals, many of which belong to this class.

Class 6*:* Toxic Substances
Class 6.1 Toxic Substances are substances liable to either cause death or serious injury or to harm human health if swallowed, inhaled or through skin contact.

Packing Group I substances have acute lethal effects meaning that if you are exposed to high concentrations of these substances for only a short period of time (this could be minutes), you could die unless someone removes you to fresh air immediately.

Toxic substances should be locked away to prevent their access to unauthorised and untrained people.

All work with toxic substances should be conducted in the fume cupboard or where this is impracticable, (eg. due to container sizes), in a suitable well ventilated area.
A hazardous substances weighing balance should be considered for weighing out toxic material, depending on the risk.

Most carcinogens (substances with the potential to cause cancer), belong to this class 6 category of dangerous goods.

The International Agency for Research on Cancer (IARC), places substances into the following categories on the basis of their carcinogenicity:

Group 1: The agent (mixture) is carcinogenic to humans.
Group 2A: The agent (mixture) is probably carcinogenic to humans.
Group 2B: The agent (mixture) is possibly carcinogenic to humans.
Group 3: The agent is not classifiable as to carcinogenicity in humans.
Group 4: The agent is probably not carcinogenic to humans.

Many toxic substances are also labelled as Poisons under the Poisons and Therapeutic Goods Act and Regulation. Except for Schedule 8 drugs, the requirements for the use and storage of poisons are the same as for toxic substances. The additional requirements for Schedule 8 drugs are outlined in the Procedure for Schedule 8 drugs.

The appropriate standard to use is “AS4452: The Storage and Handling of Toxic Substances”.
Example: Sodium Cyanide (NaCN)

Class 8: Corrosive

Corrosives are substances that, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods. There are several packing groups which relate to the strength of the corrosive.

Health Hazards of Class 8 Corrosives

The primary health hazard presented by corrosive substances arises from their effect on human tissue. Damage to tissue can occur when the corrosive is in contact with the skin or eyes, or when swallowed or inhaled, Corrosive substances may also have toxic or oxidising properties. It is important to note that the corrosive effect of Class 8 substances on tissues may be delayed for some time before symptoms are detected. If treatment is delayed, this can add to the seriousness of injuries which result.

Other Hazards of Class 8 Corrosives

Dependent on their nature, many corrosive substances can react with metals, with natural or synthetic fibres and with some other corrosive substances, *eg.* the reaction of inorganic acids with some metals leading to evolution of hydrogen, the reaction of sodium hydroxide with wool (the material is dissolved), the reaction between acids and bases. Some corrosive substances possess oxidising properties and can react with carbonaceous matter under certain conditions.

In view of such varied behaviour of the substances of this Class, particular attention needs to be paid to the compatibility of substances within the Class with regard to their storage together and to the nature of the personal protective equipment needed when handling them.

Clean-up materials and equipment for Class 8 Corrosives

In order to deal with leaks and spills (whether major or minor), clean-up equipment (including PPE), chemicals for neutralising or decontaminating spills and absorbent materials shall be maintained at every premises on which corrosive substances are kept or handled. A typical list of appropriate items is as follows:

- Adequate quantities of absorbent material, *eg.* sand, fuller's earth or other absorbing substances.
- Calcium hydroxide (hydrated lime), for use on acidic spills.
- Sodium bisulphate, for use with alkaline spills.
- Crushed calcium carbonate (limestone).
- A sufficient number of resealable waste-recovery containers, *eg.* drums, made of materials compatible with the substances being kept and appropriately marked as being for emergency use only.
- Approved containers made of appropriate materials, for the purpose of repackaging the contents of any leaking packages.
- Portable pumps and decanting equipment, Shovels.

<u>Special note on Hydrofluoric acid (HF)</u>

Hydrofluoric acid is one of the most corrosive of the inorganic acids. If it comes into contact with skin it will destroy the skin and subcutaneous destruction will commence. For concentrations greater than 90%, the pain on contact with skin can be immediately excruciating. At 10% concentration, no pain may be immediately felt but the destruction will continue. Any contact with HF, irrespective of concentration should receive treatment immediately.

Safe HF storage is essential and should not be stored in any cupboard made from wood. It will destroy the wood. It will also corrode metal or glass shelving. Special corrosion resistance plastic is required.

Apart from a supply of running water, calcium gluconate gel must be available for first aid treatment. It must be located in the immediate area of use and storage.

All persons who work in a laboratory where HF is used must be properly informed of it's hazards and required safety precautions.

The appropriate standard to use is "AS3780: The Storage and handling of Corrosive Substances".

5. Legal & Policy Framework

OHS Regulation 2001 - Chapter 6
Explosives Act (2003) and Explosives Regulation (2005)
Workcover Code of Practice for Storage and Handling of dangerous Goods

5.1 Associated Documents

UNSW Storage of Dangerous Goods Guideline
UNSW Hazardous Substances and Dangerous Goods Procedure

6. Evaluation and History

Review of this guideline will occur in accordance with the UNSW OHS Management System Review Procedure

6.1 Modifications

Version	Date	Author	Approval	Sections modified	Details of amendments
0.1	01/11/2006	Martina Lavin	Director Human Resources	Whole Document	Created 2 shorter guidelines from one original document. This guideline is an introduction to the 9 classes of dangerous goods. The second one focuses on the storage aspects of dangerous goods. Released for consultation purposes.
1.0	01/01/2007	Martina Lavin	Director Human Resources		No changes from consultation

Appendix 1 – The 9 Classes of Dangerous Goods

Class 1 Explosives **1.1** *eg. Tri Nitro Toluene (TNT)* **1.2** *eg. ammunition* **1.3** *eg. propellant powder, fireworks* **1.4** *present no significant hazard* **1.5** *insensitive substances with mass explosion hazard* **1.6** *extremely insensitive articles – no mass explosion hazard*	
Class 2.1 Flammable Gas Eg. Hydrogen, Acetylene, Propane	
Class 2.2 Non flammable, Non-toxic gas Eg. Nitrogen, Helium, Carbon Dioxide	
Class 2.2 with Subsidiary Risk 5.1 Eg. Oxygen	
Class 2.3 Toxic Gas Eg. Chlorine, Hydrogen Sulphide, Carbon Monoxide, Sulphur Dioxide, Silane, Germane	

Class 3 Flammable liquid Packing Group 1 (greatest danger) eg. ➢ Carbon disulphide, Diethyl ether Packing Group 2 ➢ Acetone, Methanol, Ethanol Packing Group 3 ➢ Xylene, Chloroform, Dichlormethane	
Class 4 Flammable Solids **4.1 Flammable solids** readily combustible and may cause fire due to friction eg. magnesium metal, alkali metals	
4.2 Substances liable to Spontaneous Combustion eg. white phosphorous and potassium metal	
4.3 Substance that in contact with water emit flammable gases which can form explosive mixtures in air eg. white phosphorous, calcuim carbide, magnesium, lithium, sodium	
Class 5.1 Oxidising Substances Oxidising substances are not necessarily combustible may readily liberate Oxygen and increase the violence of a fire Eg. Calcium hypochlorite, ammonium nitrate	
Class 5.2 Organic Peroxides Materials that may be liable to explosive decomposition may burn rapidly and are sensitive to impact or friction. eg. dibenzoyl peroxide	

Class 6.1 Toxic Substances Also divided into 3 packing groups: Packing group 1 (greatest danger, Packing group 2 and Packing group 3) Eg. Ethidium bromide, benzene, mercury, pesticides, arsenic	
Class 6.2 Infectious Substances Eg. vaccines, pathology specimans	
Class 7 Radioactive substances	
Class 8 Corrosive Substances Eg. Hydrochloric acid, Sulphuric acid, Hydrofluoric acid, Sodium Hydroxide, Amines	
Class 9 Miscellaneous Non-specific classification includes substances that have potentially dangerous properties that are relatively minor or are not covered by other classes eg. polychlorinated biphenyls, lithium batteries	

Appendix 2 - Information Sheet For Explosives And Security Sensitive Ammonium Nitrate (Ssan) [1]

1. It is illegal to be in possession of explosives without a licence.
2. From **1st January 2006**, it will also be illegal to possess Security Sensitive Ammonium Nitrate (SSAN), an explosive precursor, without a licence.[2]
3. Existing explosive licences, permits, certificates of competency etc. are valid only until 1st September 2006 (unless they expire earlier).
4. Only "Authorised" Explosives can be handled: if an explosive is not on the Authorised List, it is deemed to be prohibited. *You can apply to have an explosive added to this list.*
5. Licences are valid for 5 years. *Annual notification of storage of either explosives or SSAN is required (if storing).*

The application process for obtaining Licences is lengthy and includes:

- Submitting evidence of competency/training;
- Police checks (probity assessment);
- Having a Security Plan (heavy emphasis on ensuring that the explosives and precursors are stored safely and securely);
- Applications for licences to use explosives or SSAN have to be accompanied by an application for an **Unsupervised Handling** licence;

Of the myriad of Licences available (eg. manufacture explosives/import/supply etc.) the most applicable to UNSW are:

- Blasting Explosives Users Licence (form FE05);
- Licence to **Use** Security Sensitive Dangerous Substance (which include SSAN) (form FE02c);
- Unsupervised Handling Licence (form FE01);

Applications have to be made at a Post Office and require a 100 points identification check.

All licences have detailed conditions attached regarding preventing unauthorised use; storing explosives in a specially constructed store (magazine); if storing, keeping records of movements of explosives and precursors in and out of a store (for 5yrs); reporting any theft of explosives; requirements for licensee related to ceasing employment.

Anyone who has access to an area where explosives or precursors are used/stored must have an Unsupervised Handling licence.

Martina Lavin (Risk Management Unit) has copies of the regulations, Work Cover Codes of Practice, various guidance notes, sample security plans, application forms, current authorised explosives list, etc and should be contacted for further information or to help with completing a licence application or site security plan (x52914) or m.lavin@unsw.edu.au

Appendix 3

[1] New Explosives Act 2003 and Explosives Regulation 2005 replace Explosives requirements in the Dangerous Goods Act 1975 and Dangerous Goods (General) Regulation 1999.

[2] Applies to quantities of SSAN in excess of 3kg and the SSAN is in an emulsion, gel, suspension or mixture at greater than 45% concentration. It does not apply to solutions of SSAN. SSAN is the first of probably many Security Sensitive Dangerous Substances (SSDS) to be regulated.

The following list of Unstable Chemicals is from AS2243.2 Safety in Laboratories – Chemicals

Substance	Main Hazard
Acetylene and Acetylides	Acetylides are touch sensitive detonators. Acetylene can form Acetylides if it reacts with salts of silver and copper
Azides and Silvering Solutions	Sodium Azide is the only common stable azide. Use of it in chemical procedures may lead to formation of an explosive axide or explosive hydrazoic acid. Silver azide is touch sensitive.
Azo and Diazo compounds	Dangerously unstable
Chlorates and Perchlorates	Dangerously unstable
Chlorides of Aluminium, Silicon and Titanium	Readily hydrolysed. Any water vapour that comes into contact with them can form hydrogen chloride gas. Resealed bottles or ampules may develop high pressures. Face shields must be worn.
Ethers, Dioxane, Tetrahydrofuran	Prone to aerial oxidation to peroxides. They must not be kept for long periods in part used bottles. Check their expiry date.
Nitro-compounds, Picric acid, Trinitrobenzene	Potentially explosive. Need to be kept wetted.
Nitrogen Halides (eg. chlorine, bromine, iodine)	Reaction between Ammonia and halides produces highly explosive compounds (eg. touch sensitive nitrogen tri-iodide)
Organic Salts of Per-Acids	Reaction between an organic base (eg. pyridine) and an inorganic oxidizing agent (perchromic acid) produces a salt which can be explosive
Peroxides, Benzoyl Peroxide	Concentrated hydrogen peroxide must be handled with care. Excess must be chemically destroyed. Organic peroxides may spontaneously explode violently. Any rise in temperature from room temperature increases the risk of explosion.

Appendix 4
Substances that can form organic peroxide during time in storage (not exhaustive)

3 MONTH EXPIRY DATE	SUBSTANCE
	Divinyl ether
	Isopropyl ether
	Potassium metal
	Sodium amide
	Vinylidene chloride
	Divinyl acetylene

12 MONTH EXPIRY DATE	SUBSTANCE
	Cumene
	Cyclohexene
	Diethyl ether
	Furan
	Methyl acetylene
	Tetrahydrofuran
	Vinyl ethers
	Acrylic acid
	Acrylonitrile
	Butadiene
	Methyl methacrylate
	Styrene
	Vinyl acetate
	Vinyl chloride
	Vinyl pyridine