

JEWELLERY AND METAL CRAFT

Handling and using chemicals is an integral part of jewellery and metal work. These are several groups of chemical hazards that artists need to guard against:

1. Those relating to the use of metals and alloys:
2. The by-products arising from casting, welding, soldering and other heat processes;
3. Those from use of solvents, colourants and corrosive substances.

Table 13 lists common jewellery and metal craft materials, their possible health effects and effects and suggested control measures.

TABLE 13: JEWELLERY AND METAL CRAFT

HAZARDS	RISKS	CONTROLS
Silvers, gold - Native metal - Salts	No major problems, silver may cause discolouration of the skin. May be toxic.	General: (1) Eliminate or substitute less toxic materials.
Gold chloride	Allergies, chronic inhalation, ingestion causes anaemia, liver, kidney and nervous system damage.	(2) Use local exhaust ventilation whenever possible for all chemical processes.
Silver chloride, equipment nitrate	Corrosive, can cause blindness, ingestion.	(3) Use personal protective (respirator, gloves).
Copper, zinc, bronze alloys, plastics	Fumes cause flu-like symptoms several hours after exposure, which lasts about 24 hours. This is most likely if you have had no exposure for several days. Known as zinc shakes, welders fume fever, plastic fume fever, etc. No long-term effect. Also occurs occasionally with many other materials.	
Cadmium and cadmium solders	Fumes extremely toxic, causing both acute and chronic lung disease and kidney disease.	Use cadmium free solders
Beryllium	Serious acute and chronic lung disease, ulcerations.	Eliminate beryllium alloys.
Scrap or "found" metals	May contain mercury antifouling compounds that can cause mercury poisoning.	
Colourants: metals and their salts	Vary widely in toxicity, but assume all are capable of heavy-metal poisoning.	

HAZARDS	RISKS	CONTROLS
Nickel compounds, alloys (these can release highly toxic nickel carbonyl during casting, heat (processing))	Probable carcinogen, lung damage, skin allergy. Repeated exposure can cause damage to liver, kidney, heart.	Eliminate nickel alloys. Use local exhaust ventilation.
Bone	Allergic reactions to dust.	
Pickling compounds	Burn skin, irritant to lungs and mucous membranes.	
Mould materials: silica sand, silica flour, French chalk (talc), investment casting plaster, binding agents	Silicosis of lungs. Asbestos Asbestos in talc. Allergies.	
Resins eg soldering flux	lung allergies, skin diseases.	
Polyurethane decomposition products. Polystyrene foam	Acute lung and skin irritation.	Use local exhaust ventilation.
Wax	Fumes can cause acute lung and mucous membrane irritation. Flammable.	Use local exhaust ventilation.
Solvents and degreasers	Dermatitis, nervous system and liver damage, flammable, drowsiness, narcosis.	Use local exhaust ventilation. Use effective personal protective equipment (gloves, respirator).
Cutting oils	Dermatitis, acne, lung disease, falls due to slippery floors.	
Glues and epoxy resin	Skin allergies, solvent effects.	
Grinding and buffing compounds	Dermatitis; wheels may contain silica and formaldehyde resins, causing silicosis and lung allergies.	Use local exhaust ventilation.
Soldering	Resin flux fumes can cause allergic sensitivity. Lead, tin fumes.	
Asbestos insulation	Lung disease and cancer.	Eliminate or encapsulate.

Heat Processes

Heat processes used include:

- ?? brazing and soldering,
- ?? metal casting,
- ?? forging
- ?? welding

Forging/Casting

Molten metals produce metal fume which is easily inhaled. Fumes and gases are released when pouring molten metal(s) into moulds, as a result of the thermal decomposition of old binders. Depending on the binders these may include formaldehyde, acrolein, sulphur dioxide, isocyanates and carbon monoxide.

Welding/Soldering/Brazing

See sculpture section.

Heat processes should be well ventilated, preferable with local exhaust ventilation (canopy hoods, side draft extraction work benches, etc.). Protective equipment should always be used - gloves, safety shoes, face and eye protection, leather apron).

NB Silver solders may contain a proportion of cadmium. Cadmium fumes are highly toxic and can cause severe lung damage.

Solvents

The following individual or class of solvent may be used in jewellery and/or metal craft. See solvents table for further detail.

- ?? Alcohols: methyl, ethyl, glycerol.
- ?? Aliphatic hydrocarbons: petrol, kerosene, turpentine, mineral spirits.
- ?? Aromatic hydrocarbons: toluene, xylene, styrene, nitro-benzene.
- ?? Halogenated hydrocarbons: chloroform, methylene chloride, trichlorethane, perchlorethylene.
- ?? Ethers: glycol ethers or cellosolves.
- ?? Aldehydes, ketones, esters: ketone, ethyl acetate.

Acids and Alkalis

The most commonly used alkalis and acids used in jewellery and metal craft are listed below:

- ?? Sodium hydroxide,
- ?? Hydrochloric acid,
- ?? Nitric acid,
- ?? Hydrofluoric acid,
- ?? Sulphuric acid.

All are corrosive, skin, eye, respiratory tract irritants. Concentrated acids and alkalis can cause serious chemical burns and eye damage. Use only in fume cupboards; wear eye/face protection, gloves, plastic apron, etc.

TABLE 14: RESPIRATOR SELECTION CHART

Respiratory protection is recommended where the artist or craftsperson is exposed to an atmosphere that is or may be injurious to health and where other methods to prevent or control the hazard are unsuccessful.

The "hierarchy of controls" should be used as outlined in the safety and Hazard Audit (Appendix 1) and detailed in the section on controls, before resorting to respiratory protection.

Respirators may be air purifying (powered or non-powered) ie. contaminated air is drawn through a filter (gas, particulate or combination of both) before entering the breathing system; or it may be air supplied via an air-line or self contained tanks. Air purifying half mask respirators are the type most suitable for most art/craft activities and are available in disposable and non disposable form. Half mask respirators are not suitable for highly toxic or oxygen deficient atmospheres. Disposable types are not suitable for solvent, vapour and gas contaminated atmospheres.

The following table provides general guidance to the type of respirator and filter that should be used where the artist is exposed to harmful levels of contaminant. Where there is doubt about the types of contaminant, err on the safe side and use a combination filter ie. gas, vapour, particle filter.

Craft Materials or Disciplines	Associated Hazardous Materials	Suggested Respirator/Filter
Metal Soldering casting welding forging	Solders containing lead, zinc, borax and fluorides produce toxic gases. Cadmium solder produces toxic fumes. Resin fluxes. Moulds of silica or asbestos.	Particulate filter for fumes, dusts. Gas filter for gases, vapours or combination.
Painting spraying pigment, mixing	Pigments containing cadmium, lead, nickel, cobalt, organic compounds. Solvents, Asbestos (pastels, gouache) Pigments, binders, driers	Particulate for waterbased paints. Combination for solvent based paints. Air supplied full face piece type for isocyanate (2 pot mix) paints. Particulate for powders, dust.
Plastics, rubber	Vapours from mixing and heating processes. Monomers, solvents and additives.	Combination for particles, solvent vapours and gases.
Printmaking	Pigments containing cadmium, lead compounds, nickel, cobalt, zinc, asbestos. Toxic and flammable solvents. Acids.	Particulate filter for rosin dust. Gas filter for solvents and acid gas filter for etching.
Sculpture Media clay plaster stone wax (see also: metal, plastic wood)	Some oil-based modelling clay. Stone containing asbestos or silica. Flammable waxes release toxic fumes when heated. Solvents.	Particulate filter for wood, metal, stone, plastic, dusts. Gas filter for solvent vapours, plastics. High efficiency particle filters for lead fumes and dust.
Textiles fibre dyes batik	Vegetable moulds. Solvents. Mordants. Corrosive vat and acid dyes. Direct dyes (azo, coal tar, aniline). Toxic waxes.	Particulate filter for dye powders, fibres. Gas filter for mordants, solvents.

Craft Materials or Disciplines	Associated Hazardous Materials	Suggested Respirator/Filter
Wood work	Glues, paints, strippers, finishers and solvents. Timbers/dusts.	Particulate for dusts. Gas filter for solvents, glues.
Biological materials plants feathers bone shells ivory	Poisonous plants. Plants containing toxic pesticides. Toxic glues, lacquers, paints, varnishes, dyes, solvents. Untreated animal material.	Particulate filter for dusts, moulds.
Ceramics clay glazes firing	Many clays contain silica. Glazes containing lead, cadmium, chrome, zinc, asbestos, silica, uranium oxides. Gases and metal fumes released during kiln firing especially in salt glazing and Raku firing.	Particulate filter for dusts, glaze powder, glaze spraying. Acid gas filter for kiln work. Combination for special processes eg. Raku.
Enamelling	Corrosive acids. Some enamels contain silica, nitrobenzene, lead. Silver solders containing cadmium.	Acid gas filter for etching. Gas for solvents.
Glass Glassblowing Stained glass	Fluxes and stabilisers. Colourants (metal compounds). Corrosive acids. Lead Came. Carbon monoxide. High temperatures. Infra-red radiation.	Particulate filter for dusts. Acid gas filter for etching or combination.
Leather	Dyes and glues. Chromium poisoning. Improperly cured and stored hides especially from middle and far eastern countries	Particulate filter for dusts. Gas filter for solvent based glues.
Graphic Arts	Solvents from spray adhesives - (toluene, xylene). Aerosols. Rubber solution - (petroleum ethers). Solvents. Pigments.	Particulate filter for water based air brush. Gas filter for solvent based air brush. Gas filter for adhesives, fixatives.
Photography and Photoprocesses	Chemicals in: - Developers - Stop baths - Fixers - Intensifiers - Hardeners and stabilisers	Particulate filter when making solutions from powders. Gas filter for vapours.

PRECAUTIONS FOR KINDERGARTEN, PRIMARY AND SECONDARY ART TEACHERS

Some art materials may be threatening the health of primary and secondary school children. Since children have a greater susceptibility to toxic materials than adults, teachers should take care in selecting art materials. Many materials with a non-toxic label may contain toxic materials. Material Safety Data Sheets (see Appendix 3) should be requested for all products being used or proposed to be used in schools and competent assessment made of the product's possible toxic effects.

Children can absorb toxic materials into their bodies by the inhalation of dusts, sprays or solvent vapours. These toxic materials can affect the respiratory system causing lung cancer, asthma or emphysema. Other ways to absorb materials are through ingestion, for example children putting coloured pencils and paint brushes in their mouth, or through cuts and infections in the skin. The art room should be kept very clean and should have good ventilation with a constant supply of fresh air. The table below lists art materials which should not be used with children under 12 years of age, together with possible substitutes.

Children over 12 should only be allowed to use more advanced techniques if the proper precautions are taken. These include:

1. Teach the students the hazards of, and precautions for, the safe use of art materials.
2. Have good ventilation in the art room with a constant supply of fresh air. Local exhaust ventilation should be provided for dark rooms, kilns, welding, spray work, screen printing and for any other process where general ventilation is inadequate.
3. Wear proper protective clothing, aprons, gloves, and goggles.
4. Clean the work area during and after use of art materials.
5. Store solvents in their own containers. Do not decant into other containers. Flammable liquids should be stored in flammable storage cabinets.
6. Do not grind toxic pigments. Used prepared paints only.
7. When using power equipment, inspect cords and plugs. Make sure the equipment is properly earthed and used with earth leakage circuit breakers.
8. Do not use lead glazes or lead frits. Many non-lead glazes are available.
9. Fumes and gases from all types of kilns are dangerous. All kilns should have proper ventilation

TABLE 15: PRECAUTIONS FOR KINDERGARTEN, PRIMARY & SECONDARY ART TEACHERS

Art Materials That Children Under 12 Should Not Use.	Substitutes
1. Clay in dry form. The dry powder contains silica which is easily inhaled and may cause respiratory problems.	1. Clay is safe in wet form only (wet clay cannot be inhaled).
2. Glazes or frits that contain lead.	2. Use poster paints instead of glazes.
3. Solvents (eg. turpentine, toluene, rubber cement and its thinner).	3. Use water-based paints and other materials.
4. Cold water dyes or commercial dyes.	4. Use vegetable dyes, onion skins etc.
5. Permanent markers which may contain toluene or other toxic solvents.	5. Use only water-based markers.
6. Some instant papermaches may contain asbestos fibres or lead from pigments in coloured printing inks.	6. Make papermache from black and white newspaper and white paste (flour and water paste).
7. Aerosol sprays.	7. Use brushes and water-based paints in splatter techniques.
8. Powdered tempera colours. (Their dusts may contain toxic pigments).	8. Use only liquid colours or the teacher can pre-mix the pigments.
9. Arsenic, cadmium, chrome, mercury, lead or manganese pigments.	9. More adequate labelling is needed on art materials to know which colours are safe to use.
10. Pastels that create dust.	10. Use crayons or cra-pas which are oil-based.
11. All photographic chemicals.	11. Use blueprint paper and make photo-grams using direct exposure to sunlight.
12. Lead solder and stained glass.	12. Use coloured cellophane and black paper to stimulate lead.
13. Epoxy and instant glues and solvent-based glues.	13. Use water-based white glue or paste.
14. Solvent-based silk screen and other printing inks.	14. Use paper stencils and water-based inks.

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The National Health and Medical Research Council issued a number of Occupational Health Guides, some of which have now been revised and reissued by *Worksafe Australia*, and are available from Australian Government Publishing Service in your capital city. Ones which may be relevant to the art worker and teacher are:

Some facts about lead glazes for workshops and studio potters, 1973.

- Welding (Fumes and Gases), 1979
- Occupational diseases of the skin, 1980
- Silica (silicosis), 1978
- Industrial organic solvents, 1984.

There is a lot of information on chemical hazards held on computer files. Services such as TOXLINE and MEDLINE, which abstract papers from the Anglo-Saxon medical and scientific literature, are available in Australia through Worksafe Australia and the National Library and can be accessed through public libraries.

Many chemical databases are available in Australia on compact disc and government and private organisations are providing information in CD format. These can often be accessed through Departments of Labour or OH&S Commissions in your State, often via the internet - many of the organisations listed below have web sites.

The more useful databases are:

1. WORKSAFE-DISC, available from Worksafe Australia;
2. CCINFO, a multi-series CD set, available from the Canadian Centre for Occupational Health & Safety (see under *Organisations*);
3. OSHROM, a set of 3 databases, NIOSHTIC, HSELINE & CISDOC, available through Aldis P/L, Private Bag No 16, Port Melbourne, Vic, 3207.

OTHER USEFUL BOOKS AND GUIDES

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ORGANISATIONS THAT CAN HELP

Australia

ACT WorkCover, 1st Floor, North Building, London Crct, Canberra, ACT 2601; ph: 02-6205-0200.

ACTU National Occupational Health and Safety Unit, 5/393 Swanston St., Melbourne 3000; ph: 03-9664-7310.

Australia Council, 181 Lawson St., Redfern, NSW 2016; ph: 02-9950-9000

Australasian Faculty of Rehabilitative Medicine, 145 Macquarie St., Sydney, NSW 2000; ph: 02-9256-5402.

Australian Chamber of Commerce & Industry, 4/55 Exhibition Street, Melbourne, Vic, 3000, ph: 03 9289 5289.

Australian Institute of Occupational Hygienists, 3/34 Carrick Drive, Tullamarine, Vic 3043; ph: 03-9335-2577.

COMCARE Australia -Risk Management Division, 187 Thomas St., Haymarket, NSW 2000; ph: 02-9289-9511.

CSIRO, 314 Albert St., east Melbourne, Vic 3002; ph: 03-9418-7333.

Department Employment Industrial Relations and Training (Tas) Occupational Health and Safety Branch, 81-89 Brisbane St, Hobart, Tas, 7000, ph: 002-337 701.

Department of Training and Industrial Relations (Qld), Workplace Health Branch, Forbes House, 30 Makerston Street, Brisbane, Qld, 4000, ph: 07-3227 4725.

Department of Industrial Affairs (SA), Occupational Health and Safety Services Branch, 45 Pirie Street, Adelaide, SA, 5000, ph: 08-8207 1853.

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Ergonomics Society of Australia, Canberra Business Centre, Bradfield St., Downer, ACT 2602; ph: 02-6242-1951.

IHS Australia, 660 Chapel St., South Yarra, Vic. 3141, ph: 03 9826 6886

International Labour Office, 58a Gipps St., Collingwood, Vic. 3066; ph: 03-9417-5361, see also below.

National Health and Medical Research Council, PO Box 9848, Canberra, ACT, 2601, ph: 02-6289-7646.

Standards Australia, 1 The Crescent, Homebush, NSW, 2140, ph: 02-9746 4700.

Victorian Trades Hall Council, Occupational Health and Safety Centre, Trades Hall, Box 93, Victoria Street, Carlton South, Vic, 3053, ph: 03-9662-3511.

Work Health Authority, Minerals House, 66 The Esplanade, Darwin, NT, 0801, ph: 08-8999-5010.

WorkCover Authority (Vic), OHS Division, World Trade Centre, Melbourne, Vic, 3000, ph: 03-628 8188.

WorkCover Authority of NSW, Information and Education Services 400 Kent St., Sydney, NSW. 2000; ph: 02-9370-5303/5269.

WorkCover Corp. (SA) - OHS Division, 100 Waymouth St., Adelaide, SA. 5001; ph: 08-8233-2222.

WorkCover Queensland, WCB Building, 280 Adelaide St., Brisbane, Qld. 4001; ph: 07-3235-9500.

Workers Health Centre, Ground Floor, 133 Parramatta Road, Granville, NSW, 2142, ph: 02-9897-2466.

Workplace Standards Authority (Tas), 30 Gordons Hill Rd., Rosny Park, Tas. 7018; ph: 03-6233-8428.

Worksafe Australia, (National Occupational Health and Safety Commission) 92 Parramatta Road, Camperdown, NSW, 2001, ph: 008 252 226, 02-9577 9555. (Worksafe Publications are available from the Australian Government Publishing Service in your capital city).

Worksafe Western Australia, West Centre, 1260 Hay St., WA, 6005, ph: 09-327 8777.

World Health Organisation, 58a Gipps St., Collingwood, Vic. 3066; ph: 03-9417-5361, see also below.

Overseas

American Conference of Governmental Industrial Hygienists, D-5/6500 Glenway Ave., Cincinnati, Ohio, US 45211; ph: 513-742-2020. [netsite]

British Standards Institution, Chancellors Rd., Hammersmith, London, GB W6 9RS; ph: 181-741-1231.

Canadian Centre for Occupational Health and Safety, 250 Main Street East, Hamilton, Ontario, Canada, LK8N 1H6, (produces CCINFO, a set of CD databases); ph: 905-572-2981. [netsite]

Department of Labour, New Zealand, Occupational Health and Safety Centre, Aurora House, 4/66 The Terrace, Wellington, NZ; ph: 4-495-4308.

Health and Safety Executive (GB), 1 Chepstow Place, London, GB W2 4TF, (produces HSELINE, a bibliographic database); ph: 71-221-0870. [netsite]

International Labour Office, Vincent House, Vincent Square, London, GB SW1P 2NB, (produces CISDOC, a CD bibliographic database); ph: 71-828-6401; Geneva CH, CH1211, ph: 22-799-6111. [netsite]

National Board of Occupational Safety and Health (Sweden), S-171 84, Solna, SE; ph: 468-730-9000.

National Institute for Occupational Safety and Health (US), 4676 Columbia Parkway, Cincinnati, Ohio, USA. 45226, (produces NIOSHTIC, a CD bibliographic database); ph: 51533-8287.

Occupational Safety and Health Authority (US), Publications Office, 200 Constitution Ave., Washington DC US, N3101; ph: 202-219-4667. [netsite]

Swedish Council for Work Life Research (formerly Swedish Work Environment Fund), Box 1122, S-111 81, Stockholm, Sweden; ph: 8-791-0300

World Health Organisation, H1211 Geneva 27, Switzerland; 58a Gipps St., Collingwood, Vic. 3066; ph: 03 9417 5361. [netsite]

APPENDIX 1: SAFETY AND HAZARD AUDIT

The purpose of this safety audit is to allow someone with minimal training in hazard identification to identify health and safety problem areas in their workplace and to provide an indication of the appropriate control for the problem.

A wide range of hazards are encountered in the art and crafts. They can be broadly divided into two groups: the physical environment eg. noise, manual handling etc., and the chemical environment.

The control of hazards may require a blend of strategies, however the control should attempt to maximise intrinsically safer, 'safe place' controls and minimise reliance on behavioural or 'safe person' controls.

The following is a hierarchy of control strategies:

1. Eliminate the hazard at source (by a change of process or design);
2. Replace the hazard with a safe(er) substitute;
3. Reduce the hazard using engineering controls:
 - * prevent the hazard reaching the workers with local exhaust ventilation,
 - * machine guarding,
 - * containment,
 - * improve design of tools, equipment and furniture,
4. Reduce the hazard by administrative and organisational methods:
 - * improve work organisation,
 - * modify the workplace,
 - * isolate the worker from the hazard.
 - * provide education and training.
5. Provide personal protective equipment - this should be properly fitted, regularly updated and replaced as required.

Many controls are self-evident once awareness of the hazard is appreciated, for example dust control in foundries, workshops.

This audit is designed as an educational tool, to be used flexibly and to be modified as need, or its short comings, dictate.

SAFETY AND HAZARD AUDIT

Institution/Firm/Enterprise

Date

Department

Department Head/Supervisor

Technical Staff

I Organisation and Administration

Response

1. Has management made a clear commitment to OHS?
Is there a safety policy? Is it readily available?
Where? Is the safety policy prominently displayed?
Are resources committed to maintaining OHS programs?
2. Is there a properly constituted safety committee
(representative, meets regularly, agenda and minutes
issued).
3. Is there a safety officer or co-ordinator - does he/she
play an effective role in safety management eg.
communication, promotion of safety and health
programs?
4. Are standing instructions displayed prominently and up
to date? (may include instructions for use of equipment,
safety systems, permit to work, smoking policy, fire
and emergency procedures etc.).
5. Is there a system of accident reporting? Does the report
form enable information to be gained on how and why an
accident occurred?
Can the accident report be developed to include illness and
dangerous occurrences eg. recurrent headaches or dizziness
may indicate exposure to a solvent - is this a ventilation
problem or a personal sensitivity? Are there cases of dermatitis?
- it isn't generally considered an "injury" but it is a significant
occupational risk in a range of visual and performing arts.
Are accident/illness reports completed?
Are the accident/illness report analysed? (records
of problems can provide valuable information for hazard
identification and musculo-skeletal injuries; strains, sprains
overuse injuries? This may indicate incorrect training,
insufficient warm up, work on concrete floors).
6. Is there a purchasing policy to assess new equipment
and materials for compliance with standards and to
minimise or eliminate hazards from materials/equipment?
7. Are responsibilities and tasks for OHS activities clearly allocated?
8. Is OHS performance monitored?

Comments/suggested improvements

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II Education and Training

Response

1. Is education and training in general behaviour and hazard awareness carried out?
Are staff/safety co-ordinator/safety committee representative adequately trained in health and safety problems particular to the arts?
2. Is health and safety an integrated component of art instruction (verbally and in course syllabuses)?
3. Are there first aid stations/officers in the department?
Are first aid kits regularly checked? By whom?
4. Is there proper instruction in the use of tools, equipment, machinery, electrics etc? Is education and training ongoing with new processes or new chemicals? Is there training in the use of PPE?
5. Are instructors and technicians adequately trained and registered/certificated?
6. Is there proper instruction in warm up exercises? In reducing stress (physical and mental)?

Comments/Suggested Improvements

III Hazard Control

1. Is there provision of safe access and egress (see also fire control)? Are emergency exits clearly visible and sign posted?
Are emergency exits kept unlocked when the building is in use?
Are exitways kept clear of obstacles?
Are passageways clearly marked for safe movement of people and materials?
Are proper handrails and barriers provided for stairs, floor openings and any area where people could fall?
2. Are materials, equipment and tools safely and correctly stored?
3. Are all dangerous parts of machinery adequately guarded?
Are emergency stop buttons accessible from locations where an operator might get caught?
Is there appropriate personal protective equipment (PPE) provided (goggles, ear muff etc.)?
4. Are there adequate facilities for materials handling, ie. lifting and transport of heavy and bulky loads (sets, props, equipment etc.)?
5. Are work areas kept clean and free of obstructions?

6. What is the condition of electrical equipment?
Is equipment regularly maintained and checked?
Are electrical cables checked for wear or damage?
Is electrical equipment connected to earth leakage circuit breakers?
Is low voltage equipment (12-32V) used in damp or wet areas?
Do trailing cables pose a risk?
7. Are the hazards associated with stage equipment, sets and lighting addressed? Are lighting units securely chained to rails?

Comments/Suggested Improvements

IV Fire Control

1. Are combustible and flammable materials safely stored eg. flammable chemicals (solvents, turpentine etc.) in a fire proof safety cabinet; paper, solvents, paints away from sources of ignition? Are large quantities of flammable materials eg. greater than 4 gallons or 20 litres stored in a purpose built storage area and away from general work areas? Do sets and stage equipment pose a fire risk?
2. Are stair wells maintained free of flammable materials?
3. Are means of escape marked and kept clear?
Are fire hoses accessible in an emergency?
4. Is there provision of adequate fire extinguishers of types appropriate to the risk?
Are the fire extinguishers labelled for their suitability in fire fighting?
Are the fire extinguishers clearly sign posted? (with a sign at a height that allows identification across a crowded room).
Are fire blankets available in high risk areas? eg. foundry tapping operations.
5. Are there written procedures "In case of Fire" on display?
6. Are regular fire drills held?
Do these include the use of fire extinguishers and other fire fighting equipment?

Comments/Suggested Improvements

V Chemical, Toxic, corrosive, Gas and Dust Hazards.

1. Are there safe storage, labelling handling and disposal procedures for toxic and corrosive substances? (if no, see supplement on chemicals).
2. Is dust control effective; does dust accumulate on work surfaces and equipment? (see also ventilation).
3. Are appropriate hazards warning notices posted eg. Hazchem signs for LPG, welding gases, solvent stores etc.
4. Is there a hazardous materials register:- is it kept up to date?
Are there Material Safety Data Sheets (MSDS) available for all chemicals and flammables? (MSDS sheets provide detailed information on physical and chemical properties, precautions for use, first aid treatment, protective equipment and procedures for dealing with spills).
Are personnel fully acquainted with MSDS and trained to take necessary action in an emergency?
Is there liaison with local hospitals? (in the event of an accident).
Are antidotes to poisons available on site and at local hospitals?
5. Are emergency showers available and working? (these should be available in areas where there are risks of chemical spills or splashes or where clothing could catch alight).
6. Are eye wash stations provided in areas where chemicals or dusts could get into the eyes?
Are they regularly maintained?
7. Are extraction systems working effectively?
Is an operator or other person(s) subjected to fumes, vapours, aerosols, or dusts from spraying, welding, painting, printing etc. (warning signs that levels may be too high are: vapours can be smelt, headaches, nausea, lethargy).
8. Are there adequate disposal procedures for chemical wastes? Does disposal meet with the requirements of the local authorities?

Comments/Suggested Improvements

VI Environment

1. Is the heating/cooling of the work place controlled adequately for comfort? Does the work area require auxiliary heating? (some radiators may constitute a danger where flammable solvents are being used).
2. Do noise levels permit normal speech or telephone conversation?
Do you suffer from tinnitus (ringing, buzzing or hissing in the ears)?
Do you suffer from temporary hearing deficiency after noise exposure?
Are there adequate noise control measures (screens, absorbent panels, personal protectors)?
3. Are the ventilation or extraction systems adequate to prevent irritation from vapours and dusts?
Do people complain of regular headaches, nausea, lethargy?
4. Is adequate lighting provided?
Do people complain of eye strains; headaches; fatigue etc.?
Is lighting adjustable (positions and intensity to a particular work requirement?
Are there problems of reflection or glare from surfaces?
5. Are equipment and work stations adequately (ergonomically) designed for current needs?
Does the work require excessive lifting, pulling or pushing? (do you have to unduly strain in awkward positions?)
Are floor surfaces appropriate for the type of performance? (Many dance injuries occur because of poor floors.)
6. Are there operations that could lead to repetitive strain injuries?
Do you suffer from ache, pain or tiredness due to your work?
Do the symptoms impair your ability to perform normal movements?

A yes answer to these questions may indicate overuse injury.

Comments/Suggested Improvements

VII Hygiene

1. Are there adequate and clean toilet facilities?
2. Are there adequate facilities for makeup and dressing?
3. Is adequate drinking water available?
4. Are there adequate locker facilities?
5. Is there provision of mess rooms or areas for tea/coffee making?
Is there provision for separate smoking areas (away from chemicals)?
6. Are there hand washing facilities in the work areas?
7. Are cosmetics selected and used with health and safety aspects in mind?
Are cosmetic ingredients listed (on the container or separate sheet)?

Comments/Suggested Improvements

VIII Personal Protection

1. Is the selection of personal protective equipment (PPE) adequate for the known hazard? eg are respirator cartridges selected for the appropriate vapour - acid, organic solvent etc.).
Is selection also based on suitability of fit, comfort and ease of maintenance?
2. Is training provided in the use of PPE, does this include correct fitting? eg testing for effective fit of a respirator.
3. Is there regular inspection, cleaning, storage and maintenance of PPE? (eg. are respirators stored in sealable airtight bags?)
Who is responsible?
4. Is the PPE being used?

Comments/Suggested Improvements.

IX Safe systems of work/permit to work systems

1. Are there equipment and processes that require special training in their use eg. kilns, welders, moulders, theatre equipment, fork lifts?
2. Is there a system in operation to ensure that only adequately trained person(s) operate this equipment or process?
3. Are there detailed written operating procedures for these processes or machines?
Do these clearly identify safety and emergency procedures and the PPE to be used?

Comments/Suggested Improvements

APPENDIX 2: HEALTH SURVEY QUESTIONNAIRE

ARTS HAZARD RESEARCH QUESTIONNAIRE

1. Presenting problem: _____
 2. Course code : _____ 3. Age: _____

4. Since commencement of the course, which of the following fields have you actively engaged in for at least 1 hr. per week.

	1-4 hrs	4-12 hrs	over (indicate hrs)
Painting			
Sculpture			
Ceramics			
Photography			
Printing			
Graphics			
Performing Arts (Music & Drama)			

5. Have you or those immediately around you, been working with or exposed to the following materials/chemicals? Please circle or write in particular materials.

	Approx how many hours?	Has there been skin contact?
Solvents & Volatile Chemicals, eg. cleaners thinners, turpentine, ether, acetone spray cans, hydrocarbons,		
Modelling materials, eg. clays, plastics, plaster, cement.		
Plastics, making forming, cutting.		
Foam plastics (polyurethane foam		
Glaze components, eg. glaze (indicate colorant		
Fumes, eg. Raku firing, welding.		
Photographic chemicals		
Paint/Inks: Oils, Acrylic, Water Based.		
Cleaning agents (other than volatile solvents) eg ammonia, chlorine types, metal cleaning types.		
Acids: hydrochloric, nitric, acetic, phosphoric		
Alkalis: sodium hydroxide.		
Petrol or tar based materialise. eg. petroleum ether, Asphaltum		
Lubrication oils		
Abrasives		
Other		

6. Name the materials/chemicals you use frequently.

7. Are you using welding or flame cutting techniques? Yes No

8. Rate on the following scale - Please tick -

	Excellent	V.Good	Good	Fair	Poor
Temperature of work area.					
Lighting: natural, fluorescent, standard, arc					
Ventilation eg. fumes, chemical odours					
Housekeeping, eg. work area cleaned and free of obstructions, spills mopped, tidiness, area hygienic.					

If fair or poor, please comment _____

	All the time	Most of the time	Some of the time	Not at all
9. Are you aware of chemical odours in the work area?				
10. Does the work area have airborne fine dust and power				
11. Do you smoke?				
12. Do other smoke in the work area				
13. Do you eat or drink in the work area?				
14. Do you have easy access to wash your hands?				
15. Do you wash your hands?				
16. Do you use appropriate hand lotion, eg. barrier cream?				
17. Do you use protective gloves when handling materials?				
18. Do you use respiratory protection when using toxic materials.				
19. Are you under extra stress at the moment?	Personal	Financial	Study	

'There are many things that a doctor ... ought to find out from the patient..."you should ask him what sort of pain he has, what caused them, how many days he has been ill, whether the bowels are working and what sort of food he eats". So says Hippocrates in his work *Affections*. I may venture to add one more question: **What occupation does he follow?'**

Ramazzini

**APPENDIX 3: CREATING HAZARDOUS SUBSTANCES REGISTER
(INCORPORATING MATERIAL SAFETY DATA)**

Material Safety Data Sheets (MSDS) are also known as Product Data Sheets or Hazard Data Sheets. They provide information required to govern the introduction of, and allow safe handling of chemicals and mixtures of chemicals in the working environment. The MSDS describes the properties and uses of a chemical product or formulation; health hazard information; precautions for use and safe handling information. The Australian Standard AS1470-1986, *Health and safety at work - Principles and practices*, states under Product Data Sheets the following:

"Product data sheets should be provided for each chemical used in the workplace.

The product data sheet should contain, where appropriate, the following information:

- (a) Physical and chemical data.
- (b) Safety data and instructions.
- (c) Handling instructions.
- (d) Storage conditions.
- (e) Advice on protective clothing and equipment.
- (f) Instructions for cleaning, decontamination and disposal.
- (g) First aid measures.
- (h) Medical treatment advice.
- (i) Firefighting instructions.
- (j) Known long-term and short-term effects of accident exposure and advice of action to be taken following any accidental exposure.
- (k) Sources of additional advice."

The National Occupational Health and Safety Commission (Worksafe Australia) has published a guidance note for the MSDS content and format (available from Australian Government Publishing Service, in your capital city). An example is provided at the end of this appendix.

The information contained in MSDS's should be verified with reference to chemical databases. This information provides the basis for building a hazardous substances register. The register would contain key elements of the MSDS eg.:

- (a) toxicity rating and exposure standards.
- (b) chemical composition where it is a trade named product.
- (c) special precautions for handling.
- (d) first aid measures

Don't treat the information as gospel or static. Get MSDS's updated, say annually, especially for the more hazardous or questionable substances.

MSDS can usually be obtained through the product supplier or manufacturer. It may be advantageous to request that MSDS's conform to the requirements of the Worksafe "Guidance Note". Don't be put off by suppliers who try to pass the buck; request the name, address and telephone number of the manufacturer and be prepared to put your request in writing. If you can't get satisfaction from a supplier or manufacturer look for an alternative source that will supply an MSDS with their product. Most major suppliers of chemicals, however, are more than willing to supply health and safety information but difficulty will be likely when attempting to get information on commercial art products.

Letter proforma for obtaining MSDS

Your address, phone, fax, email, date etc.

Firm's address

Dear Sir/Madam,

The [name of company, organisation or institute] would like to obtain Material Safety Data Sheets, in the **Worksafe Australia format**, for the following materials [used by the Faculty/Department of] and obtained through your firm.

Yours faithfully, etc.

Building the Register

There are a number of ways in which a hazardous chemicals register can be built. The following is one option.

A register of current chemicals is compiled from inventories obtained from faculties/departments etc. (This may be done through the safety officer/committee, if appropriate). MSDS's are requested for these chemicals.

The register of current chemicals is used by the purchasing or ordering department to screen for new chemical orders. In principle a MSDS should be obtained for new chemicals before purchase to enable an evaluation to be made. The screening of new chemical orders should be conducted jointly with the safety officer/committee and the end user, on receipt of the MSDS.

All orders for chemicals should be accompanied with a request for MSDS, unless orders for chemicals are being placed on a very frequent basis. This may involve some duplication of MSDS's but it does ensure that up to date MSDS data is on file.

On receipt, MSDS's are forwarded to the person(s) responsible for the register.

The existence of the data sheet is entered into the register, along with the name of the department using the chemical, the date, plus information of particular importance; toxicity rating, TLV, composition, PPE required etc.

Facilities in the register should be provided to enter additional information as required and to update periodically (six months or annually).

Data sheets should be copied; with copies to the end user, safety committee/officer etc.

Substances (whether individual chemicals or formulations) can be listed by one or more of four different ways:

- systematic chemical name; this uses an international adopted system for naming individual chemicals;
- generic name: the name applied to a class of chemicals eg. carbon tetrachloride (systematic name) is a member of the class of halogenated hydrocarbons;
- common name eg. sodium chloride is called "common salt";
- product or trade name eg. Kodak Developer D76; contains p-Methylaminophenol sulphate (chemical name) which is commonly named metol or elon, and hydroquinone which is commonly called quinol.

All methods of listing ideally should be used and cross referenced.

An example of a MSDS proforma is shown overleaf.

MATERIAL SAFETY DATA SHEET

Company Details

Company
Address
Telephone Number

(Here you should find the name, address and telephone number of the Australian manufacturer or supplier).

IDENTIFICATION SECTION

Product Name
Trade Name
Other Names
Manufacturer's Code

(Here you should find the name of the product, any other names which the product is called, and identification codes used by the manufacturer or supplier)

U.N. Number
Dangerous Goods Class and
Subsidiary Risk
Hazardous (according to Worksafe Australia
Criteria)
Hazchem Code
Poisons Schedule

(These are different schemes used to classify substances. Here you should find out whether the product has been classified under any of these schemes, eg. hazardous substance, dangerous good).

Use

(Here you should find listed the common uses of the product).

Physical Description and Properties:

Appearance
Boiling Point/Melting Point
Vapour Pressure
Per cent Volatiles
Specific Gravity
Flash Point
Flammability Limits
Autoignition Temperature

(Here you should find data on the specific properties of the product).

Other Properties:

Ingredients

Chemical Entity
CAS Number
Proportion

(Preferably you should find here the precise chemical name of each ingredient, the CAS number which precisely identifies each ingredient, and the exact proportion of each ingredient in the product.

At the very least you should find here:

- 1. the precise disclosure of the name and CAS number of each hazardous ingredient and the exact proportion of each hazardous ingredient in the product.*
- 2. the generic (chemical group) name of other*

ingredients and an approximate guide to their proportions. (eg. 'high (>60%)', 'medium (10-60%)', 'low (<10%)').

HEALTH HAZARD INFORMATION

Health Effects

Acute:	Chronic:	<i>(Here you should find the health hazards of short-term and long-term exposure to the product).</i>
Swallowed	Swallowed	
Eyes	Eyes	
Skin	Skin	
Inhaled	Inhaled	

First Aid

(Here you should find the first-aid instructions)

Swallowed
Eye
Skin
Inhaled
First Aid Facilities

Advice to Doctor

PRECAUTIONS FOR USE

Exposure Standards	<i>(Here you should find exposure limits such as threshold limit values (TLV's) which must not be exceeded).</i>
--------------------	--

Engineering Controls	<i>(Here you should find the general/local exhaust ventilation that is required when you use the product).</i>
----------------------	--

Personal Protection	<i>(Here you should find the specific type of protective clothing and equipment that is required)</i>
---------------------	---

Flammability	<i>(Here you should find the precautions that must be taken to avoid fire hazards).</i>
--------------	---

SAFE HANDLING INFORMATION

Storage and Transport	<i>(Here you should find storage requirements for the product).</i>
-----------------------	---

Spills and Disposal	<i>(Here you should find ways in which you should not dispose of the product, and suitable materials to absorb spills).</i>
---------------------	---

Fire/Explosion Hazards	<i>(Here you should find a description of fire and explosion hazards of the product, and the types of extinguishers you should use).</i>
------------------------	--

OTHER INFORMATION

Contact Point

(Here you should find the direct number and job title of the person you can contact if you want more information.)

Date of Issue

(Here you should find the date that the MSDS was prepared).

APPENDIX 4: EXPOSURE STANDARDS

The following are Occupational Exposure Standards for Atmospheric Contaminants as issued by Worksafe Australia, May 1995, for chemicals that may be found in art materials or produced by art processes.

For further information and for interpretation of some exposure standards (esp. silica and synthetic mineral fibres) see:

National Occupational Health and Safety Commission, **Exposure Standards for Atmospheric Contaminants in the Occupational Environment**, (Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment. Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment), May 1995, Australian Government Publishing Service, Canberra.

Sen = sensitiser (may cause specific immune response)

Sk = skin absorption (where skin absorption may be a major route of entry)

Ch = proposed change

C1 = established human carcinogen

C2 = probable human carcinogen

C3 = suspected human carcinogen

Please note: these Standards are subject to review and change. If you are relying on these Standards check the current edition issued by Worksafe Australia.

SUBSTANCE	TWA		STEL		
	ppm	mg/m ³	ppm	mg/m ³	
Acetic Acid	10	25	15	37	
Acetone	500	1,185	1,000	2,375	
Acrolein	0.1	0.23	0.3	0.69	
Aluminium (welding fumes), as Al	-	5	-	-	
Ammonia	25	17	35	24	
n-Amyl acetate	100	530	-	-	
Aniline and homologues	2	7.6	-	-	Sk
Antimony and compounds, as Sb	-	0.5	-	-	
Arsenic & soluble compounds, as As	-	0.05	-	-	
Barium soluble compounds, as Ba	-	0.5	-	-	
Benzene	5	16	-	-	C1
Bitumen fumes	-	5	-	-	
Borates, tetra, sodium salts, anhydrous	-	1	-	-	
2-Butoxyethanol	25	120	-	-	Sk
Cadmium dusts & salts, as Cd	-	0.01	-	-	C2
Calcium sulphate	-	10	-	-	
Calcium carbonate	-	10	-	-	
Carbon black	-	3	-	-	
Carbon disulfide	10	31	-	-	Sk
Carbon tetrachloride	5	31	-	-	C2, Sk
Catechol (Pyrocatechol)	5	23	-	-	
Ceramic fibres	(see Synthetic mineral fibres)				
Chloroform	10	50	-	-	C3
Chromium, metal	-	0.5	-	-	
CrII, III compounds	-	0.5	-	-	
Chromium VI compounds, water soluble	-	0.05	-	-	Sen
Chromium VI, certain water insoluble	-	0.05	-	-	-C1, Sen
Coal tar pitch volatiles as benzene solubles	-	0.2	-	-	C1
Cobalt as Co metal, dust and fume	-	0.05	-	-	Sen
Copper dusts and mists, as Cu	-	1	-	2	
Cotton dust, raw	-	0.2	-	-	
Cumene	50	245	-	-	Sk
Cyanides, as CN	-	5	-	-	Sk
Cyclohexane	300	1,030	-	-	
Dimethylformamide	10	30	-	-	Sk
Dioxane	25	90	-	-	Sk

SUBSTANCE	TWA		STEL		
	ppm	mg/m ³	ppm	mg/m ³	
2-Ethoxyethanol	5	18	-	-	Sk
2-Ethoxyethyl acetate	5	27	-	-	Sk
Ethyl acetate	400	1,440	-	-	
Ethyl alcohol (Ethanol)	1,000	1,880	-	-	
Ethyl ether	400	1,210	500	1,520	
Ethylene dichloride	10	40	-	-	
Ethylene glycol (vapour)	-	60	-	120	
Fluorides, as F	-	2.5	-	-	
Formaldehyde	1	1.2	2	2.5	C2 Sen
Formamide	10	15	-	-	
Gasoline (see Petrol)					
Glutaraldehyde	0.2	0.82	-	-	Sen
Glycidol	25	75	-	-	
Heptane (n-Heptane)	400	1,640	500	2,050	
Hexane (n-Hexane)	50	176	-	-	
Hydrogen chloride	5	7.5	peak limitation		
Hydrogen cyanide	10	11	peak limitation		Sk
Hydrogen peroxide	1	1.4	-	-	
Hydrogen sulphide	10	14	15	21	
Hydroquinone	-	2	-	-	
Iron oxide fume(FeO), as Fe	-	5	-	-	
Isoamyl acetate	100	532	-	-	
Isoamyl alcohol	100	361	125	452	
Isobutyl alcohol	50	150	-	-	
Isocyanates, all (as-NCO)	-	0.02	-	0.07	Sen
Isopropyl acetate	250	1040	310	1,290	
Isopropyl alcohol	400	983	500	1,230	
Kaolin (containing no asbestos and <1% crystalline silica)	-	10	-	-	
Liquified Petroleum Gas	1,000	1,800	-	-	
Lead, inorganic dusts and fumes, as Pb	-	0.15	-	-	
Lead arsenate	-	0.15	-	-	
Lead chromate	-	0.05	-	-	C2
Man made mineral fibres (see Synthetic mineral fibres)					
Manganese as Dust and compounds (Mn)	-	1	-	-	
Fume (as Mn)	-	1	-	3	

SUBSTANCE	TWA		STEL		
	ppm	mg/m ³	ppm	mg/m ³	
Mercury elemental (as Hg)	-	0.05	-	-	Sk
Mercury , aryl & inorganic compounds	-	0.1	-	-	Sk
Mercury, alkyl compounds	-	0.01	-	0.03	Sk
2-Methoxyethanol	5	16	-	-	Sk
2-Methoxyethyl acetate	5	24	-	-	Sk
Methyl acetate	200	606	250	757	
Methylacrylonitrile	1	2.7	-	-	Sk
Methyl alcohol (methanol)	200	260	250	310	Sk
Methyl 2-cyanoacrylate	2	9.1	4	18	
Methyl ethyl ketone (MEK)	150	445	300	890	
Methyl ethyl ketone peroxide	0.2	1.5	peak limitation		
Methyl isoamyl ketone	50	234	-	-	
Methyl isobutyl ketone	50	205	75	300	
Methyl isocyanate	(see isocyanates)				
Methylene bisphenyl isocyanate (MDI)	(see isocyanates)				
Methylene chloride	50	174	-	-	C3, Ch
Mineral turpentine	-	480	-	-	
Molybdenum soluble compounds (as Mo)	-	5	-	-	
insoluble compounds (as Mo)	-	10	-	-	
Morpholine	20	70	30	105	Sk
Naphthalene	10	52	15	79	
2-Naphthylamine	-	-	-	-	*C1
Nickel soluble compounds, as Ni	-	0.1	-	-	Sen
Nickel, metal	-	1	-	-	Sen
Nicotine	-	0.5	-	-	Sk
Nitrobenzene	1	5	-	-	Sk
Oil mist, mineral	-	5	-	-	
Oxalic acid	-	1	-	2	
Ozone	(0.1)	(0.2)	Peak limitation		
Paraffin wax (fume)	-	2	-	-	
Pentane	600	1,770	750	2,210	
Perchloroethylene	50	340	150	1,020	C3
Phenol	1	4	-	-	Sk
Petrol / gasoline	-	900	-	-	
Phosgene	0.1	0.4	-	-	
Phosphine	0.3	0.42	1	1.4	

* Human carcinogen - No limit assigned. Permit no contact. Prohibition recommended.

SUBSTANCE	TWA		STEL		
	ppm	mg/m ³	ppm	mg/m ³	
Phosphoric acid	-	1	-	3	
Platinum, metal	-	1	-	-	
Soluble salts as Pt	-	0.002	-	-	Sen
Portland cement	-	10	-	-	
Potassium hydroxide	-	2	peak limitation		
Propyl alcohol	200	492	250	614	Sk
Quartz (see silica)					
Resorcinol	10	45	20	90	
Rosin core solder					
pyrolysis products, as					
formaldehyde	-	0.1	-	-	
Rouge dust	-	10	-	-	
Rubber solvent					
(Naphtha)	400	1,570	-	-	
Selenium compounds,					
as Se	-	0.2	-	-	
Silica, crystalline	quartz, cristobalite, tridymite, fused silica, tripoli, are under review at present no values have been recommended; exposures should be kept as low as workable.				
Silica, amorphous;	diatomaceous earth		Inspirable Fraction		10mg/m3
	fumed silica		Respirable Fraction		2mg/m3
	silica gel		Inspirable Fraction		10mg/m3
	silica fume		under review		
Silver, as Ag metal,	-	0.1	-	-	
soluble compounds, as(Ag)	-	0.01	-	-	
Soapstone-respirable	-	3	-	-	
Sodium hydroxide	-	2	peak limitation		
Sodium metabisulphite	-	5	-	-	
Stoddard solvent	100	525	-	-	
Styrene, monomer	50	213	100	426	
Sulphur dioxide	2	5	5	10	
Sulphuric acid	-	1	-	-	(-) Ch
Synthetic mineral fibres (fibreglass, rockwool, ceramic fibres)					
TWA					
0.5 fibres/ml for respirable fibres (generally particles less than 5-7 uM aerodynamic diameter).					
2.0 mg/m3 for inspirable dust.					
Talc (containing no asbestos)					
	-	2.5	-	-	
Tetramethyl lead (as Pb)	-	0.15	-	-	Sk
1,1,1,2-Tetrachloro-					
2,2-difluoroethane	500	4,170	-	-	
1,1,2,2-Tetrachloro-					
ethane	1	7	-	-	Sk

SUBSTANCE	TWA		STEL		
	ppm	mg/m ³	ppm	mg/m ³	
Tetrahydrofuran	100	295	-	-	
Thiram	-	(1)	-	-	Ch
Tin					
Oxide & inorganic compounds except SnO ₄ , (as Sn)	-	2	-	-	
Organic compounds (as Sn)	-	0.1	-	0.2	Sk
Titanium dioxide	-	10	-	-	
Toluene (toluol)	100	377	150	565	
Toluene-2, 4-diiso- cyanate (TDI)	(see isocyanates, all)				
1,1,2-Trichloro - 1,2,2-Trifluoroethane	1,000	7,670	1,250	9,590	
1,1,1 Trichloroethane	125	680	-	-	
1,1,2-Trichloroethane	10	55	-	-	Sk
Trichloroethylene	50	270	200	1,080	
Turpentine (wood)	100	557	-	-	Sen
Uranium (natural) Soluble and insoluble compounds (as U)	-	0.2	-	0.6	
Vanadium, as V ₂ O ₅ respirable dust and fume	-	0.05	-	-	
Vegetable oil mists (except castor oil, cashew nut or similar irritant oils)	-	10	-	-	
Vinyl chloride, monomer	-	5	13	-	C1
Vinyl toluene	50	242	100	483	
Welding fumes (not otherwise classified)	-	5	-	-	*
White spirits	-	790	-	-	
Wood dust (certain hard woods as beech and oak)	-	1	-	-	Sen
Soft wood	-	5	-	10	Sen
Xylene (o-, m-, p-isomers)	80	350	150	655	
Zinc chloride fume	-	1	-	2	
Zinc chromate (as Cr)	-	0.01	-	-	C1
Zinc oxide (fume)	-	5	-	10	
(dust)	-	10	-	-	
Zirconium compounds (as Zr)	-	5	-	10	

* Substance of variable composition, see Guidance Notes.

APPENDIX 5: "RIGHT TO KNOW" INFORMATION AND GENERAL DUTY OF CARE

The Victorian Occupational Health and Safety Act, 1985 provides under Part III, Duties of employers, (section 21) and Duties of manufactures, &c. (s.24) a general right to know, viz;

Section 21(e) states that an employer contravenes the Act if they fail

“to provide such **information**, instruction, training and supervision to enable the employees to perform their work in a manner that is safe and without risks to health.”

Section 24 (3) states:

"A person who manufacturers, imports or supplies any substance for the use at a workplace shall-

- (a) ensure, so far as is practicable, that the substance is safe and without risks to health when properly used;
- (b) carry out or arrange for the carrying out of such testing and examination as may be necessary for the performance of the duty imposed by paragraph (a); and
- (c) take such action as is necessary to **ensure that there will be available in connexion with the use of the substance at the workplace adequate information about the results of any relevant tests which have been carried out on or in connexion with the substance and about any conditions necessary to ensure that it will be safe and without risks to health when properly used.**"

(Author's emphasis)

Similar provisions are contained in the New South Wales Occupational Health and Safety Act, 1983 (Part III, Section 15.2 and Section 18.2).

APPENDIX 6

ARTS HAZARD FACT SHEET NO. 1

CONTROL OF HAZARDOUS SUBSTANCES

IN THE VISUAL AND PERFORMING ARTS

A Guide To Recent And Proposed New Legislation

This fact sheet deals with the following topics:

- ?? Proposed national legislation and guidelines covering provision of information and labelling;
 - ?? Material Safety Data Sheets;
 - ?? National scheme for the assessment of chemicals and their hazards;
 - ?? Control of hazardous substances;
 - ?? Dangerous Goods classification;
 - ?? Hazchem Code.
-

There have been recent changes to a number of States' legislation to assist in the control of hazardous substances used in the workplace. Worksafe Australia has **issued National Model Regulations and Code of Practice to Control Workplace Hazardous Substances**, to assist in standardising new legislation. Some states have incorporated these model regulations into their own legislation. These changes have direct relevance to the artist working in teaching institutions and in their own studio.

The Model Regulations and Code of Practice has two principle focal points:

- ?? provision of information about chemicals
- ?? assessment and control of hazardous chemicals

Hazardous substances are defined by a classification system adopted by Worksafe and listed in their **List of Designated Hazardous Substances**. This is the book to use to find out which individual ingredients in art materials are hazardous, their toxic effects and precautions to adopt.

Provision of Information

Finding out about the possible toxic effects of materials and substances that the artist uses is a vital step in the process of learning how to use it safely.

Unfortunately health and safety labelling on materials - this is the first place to look for health hazard information - is usually non-existent and there is no legislation to cover the labelling of art materials such as paints, inks, glazes, etc.

Ideally a label should warn of all the dangers or potential hazards in handling, storage, use and disposal, using warning symbols and signal words, where appropriate.

Labelling

To help overcome this problem Worksafe Australia has issued a **National Code of Practice for the Labelling of Workplace Substances** (1994). It is intended to follow this with a guidance note for the labelling of non-hazardous substances, so that hazardous and non-hazardous substances can be readily identified by the end user.

If such proposed changes are applied to art materials (as has become law in the United States) it will make the selection of safer art materials very much easier for artists and art teachers.

Art materials labelling law in the US requires chronic hazard evaluation and chronic health warnings to be indicated in addition to the more usual acute hazard warnings. This is important because chronically hazardous art materials are particularly inappropriate for children and high risk groups such as the elderly, intellectually and physically impaired.

Rules for Using Label Information

1. Do not purchase unlabelled or improperly labelled products.
2. Read labels carefully. Inadequate as many are, they are your first line of defence.
3. Use the manufacturer's name and address to request a material safety data sheet (MSDS) and any additional product information you may need.
4. Exercise a purchasing bias in favour of products bearing good labels and whose manufacturers respond to requests for further information.
5. Follow up MSDS information by looking up information about ingredients or by consulting other experts.
6. Do not rely heavily on the term "non-toxic".
7. Read and follow directions for use. Don't experiment unless experts agree that treating a product in a way other than the label directs will not be dangerous.
8. Follow precautionary advice. If eye damage warnings are given, wear goggles, etc.
9. Demand sufficient information from manufacturers of products labelled "use with adequate ventilation" to plan for ventilation. Get manufacturers recommendations for ventilation in writing if possible.
10. Use products designated for professional or industrial use only in well ventilated and well equipped locations. Never use these products with children or untrained workers.

Chemical Registers and Material Safety Data Sheets

While lack of existing labelling legislation means that the label may not be much help, many States now have occupational health and safety legislation requiring information on hazardous substances be provided to employees and users. In a school or college situation there should be a register of chemicals and hazardous substances and the following information should be provided for each product:-

- ?? Trade name, or serial number of product, as it is known in the college workplace or studio;
- ?? Chemical ingredients and proportions of them in the product;
- ?? Health and safety hazards of the product, both long and short term;
- ?? Standards and regulations applying to the product;
- ?? Workplace environmental monitoring procedures;
- ?? Health and medical monitoring procedures;
- ?? Ventilation requirements, and any special precautions to be taken in handling the product;
- ?? Safe disposal procedures;
- ?? First aid and emergency (spillage and leakage) procedures;
- ?? Name, address and telephone number of supplier;
- ?? Name and designation of person compiling this information.

Much, if not all, of this information should be provided on a Material Safety Data Sheet which is obtained from the supplier/manufacturer.

In addition the register may include information such as:

- ?? workplace location(s) of the substance;

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- ?? the quantity(ies) held on each site;
- ?? special comments eg. mixed storage requirements.

(This additional information is required in Victoria under the 1990 Dangerous Goods Regulations to enable an assessment factor to be determined.)

A MSDS can be used to check:

- ?? That all products are being used in the right way for the right job;
- ?? Whether any improvements should be made to procedures, processes or equipment;
- ?? Whether the correct requirements for storage are met;
- ?? Whether any environmental monitoring should be done;
- ?? That emergency equipment and procedures are adequate.

Worksafe Australia has a national database (available on CD-ROM and on-line). This includes the national collection of MSDS's in the standard Worksafe Australia format.

It should be stressed that the information on a MSDS is an essential component in the identification and control of hazardous art materials.

It should also be part of a college or schools purchasing policy to ensure that MSDS's are obtained for new products. The system can be refined so that before a purchase is made of a new material, the health and safety requirements for its use are addressed. This is a role for a safety officer or advisor.

There are many other sources of information and individual artists will need to use these from time to time. State departments of labour (WorkCover Authorities), health, environmental protection; art/craft associations, artist organisations and trade unions can provide a range of information and services. Don't forget, too, your local and state library.

For art teachers, many State Ministries of Education have occupational health and safety units to advise and assist in dealing with problems.

Finally, a cautionary note on materials labelled "non-toxic". There doesn't appear to be a uniform standard to define what is "non-toxic". In the US it can be applied to substances that do not cause acute effects. However, tests used to determine acute toxicity do not identify chemicals which may cause chronic illnesses or damage, such as allergies, cancer, reproductive system damage, etc.

Assessment

The National Industrial Chemicals Notification and Assessment Scheme (NICNAS), which came into effect in July, 1990 is a scheme to aid in the protection of people at work, public health and the environment from the harmful effects of industrial chemicals. Artists use a wide range of industrial chemicals, particularly in printmaking and photography and in ceramics and sculpture. These include chemicals used in plastics, paints, inks and solvents.

The scheme provides for the notification and assessment (of personal and environmental health effects) of all new industrial chemicals and of selected existing industrial chemicals. Each assessment will be based on a dossier of information on the use and properties of the chemical and will lead to a report recommending appropriate controls and precautions relevant to its manufacture, handling, use and disposal. Reports will be publicly available. In addition, the labelling, safety procedures to be used and information provided to the end users will be reviewed from time to time.

The scheme will assist in providing information to enable a national register of chemicals and collection of MSDS's by Worksafe.

Control of Hazardous Substances

The methods used to control exposure to hazardous substances in the studio should be considered in planning any new course or before undertaking work in the studio. The costs of the control should be considered in the same way and at the same time as decisions are made about the purchase of new equipment and plant and introduction of new processes.

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"Where a substance is listed in the National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment, employers shall ensure that exposure to hazardous substances complies with the relevant exposure standard and, in any case, is reduced as far as is workable.

Control of hazardous substances shall be achieved, as far as is workable, through progressive application of the following hierarchy of control measures:

"(a) Elimination of hazardous substances from the workplace;

(b) Substitution by less hazardous substances;

(c) Isolation of the process to control the emission of hazardous substances;

(d) Engineering controls, including local exhaust ventilation for vapours, gases or particulates, to contain or minimise hazardous substances or processes;

(e) Adoption of safe work practices, including changes to work methods which minimise exposure to hazardous substances; and

(f) Where other effective means of controlling the hazard are not workable, suitable approved personal protective equipment need to be used. In instances where approvals are not issued personal protective equipment conforming to the relevant Australian Standard shall be provided."

While this hierarchy has been primarily developed for industrial settings the following examples of applying the controls shows that it is readily applicable to art teaching environments, commercial and home studios.

Elimination of Hazardous Substances/Processes

Purchasing ready prepared materials, to reduce or avoid inhalation hazards associated with mixing dry materials. For example:

?? Ready prepared clay and glazes that avoids mixing materials and reduces dust.

?? Using ready mixed paints.

Substitution

Can be:

1. Substitution of hazardous substances,
2. Substitution of hazardous processes, eg.:

?? Using non toxic, non flammable propellants in aerosol cans.

?? Using water based paints and screen inks instead of solvent based.

?? Using leadless glazes - substituting lead with borax.

?? Using lead frits instead of unfritted glaze.

?? Using less toxic solvents in cleaning agents eg. using ethanol/methanol instead of methylene chloride or trichloroethane.

?? Using detergent instead of organic solvent for degreasing or cleaning.

?? Substituting 2-pack paint with conventional enamel to eliminate the use of isocyanates.

?? Replacing noisy equipment with quieter equipment.

?? Using fastenings in preference to welding.

?? Dipping an article in glaze/paint rather than spraying.

Isolation

Sometimes a process can be isolated to reduce the number of people exposed, eg.:

?? Specially screened welding areas to prevent welders flash to passers by.

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?? Enclosing noisy machines.

Engineering Controls

- ?? Booths for painting and glaze spraying.
- ?? Extraction systems for use with welding processes.
- ?? Captor hoods and flues for kilns.
- ?? Extraction systems to collect dust from grinding and woodworking machines.
- ?? Local exhaust ventilation (downdraft) for silk screen process.

Adoption of Safe Work Practices

- ?? Regular cleaning of work surfaces, floor, walls, etc. and reduce accumulation of dust.
- ?? Providing means of safe storage and disposal of hazardous materials.
- ?? Prohibiting eating, smoking and drinking in contaminated areas.
- ?? Keeping lids on containers when not in use.
- ?? Adopting permit-to-work and approved user systems.

Personal Protective Equipment (PPE)

There will be a number of situations in art work where PPE will need to be used. Examples are:

- ?? Protection from intense radiation during welding.
- ?? Protection from heat in kiln firing, foundry and metal work processes.
- ?? Protection from fumes and gases during welding.
- ?? Protection from dusts in wood, plastic, stone and ceramics work.
- ?? Hearing protection from noisy machines, loud music.

It is essential when using PPE:

- ?? that it is properly selected and readily available.
- ?? that there are methods available to check adequacy of fit.
- ?? that it is clean and functional.
- ?? that it is adequately maintained.
- ?? that staff/students etc. be trained in appropriate selection and fitting, maintenance and use.

In studios and workshops it will be found that a combination of controls are likely to be required to reduce or eliminate a hazard eg. with welding it may be possible to provide good ventilation but PPE will be required to protect the operator and isolation to protect persons working nearby. Consequently the hierarchy of control provides a goal to aim for and the higher up the hierarchy controls can be implemented the less reliance there is on people orientated controls, such as correct training and using PPE.

Dangerous Goods Classification

Hazardous chemicals and dangerous goods are divided in nine principal classes and sub-classes for purposes of safe handling, transport and control. This is a United Nations system for identifying the primary hazard of various substances.

The classes are shown in Figure 1.

Figure1 Dangerous Goods Class Symbols

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- Class 1 Explosives eg. fuses and detonators
- Class 2.1 Flammable Gases eg. acetylene
- Class 2.2 Non-Flammable, Non-Toxic Compressed Gases eg. argon, nitrogen
- Class 2.3 Toxic Gases eg. chlorine
- Class 3 Flammable Liquids eg. paint thinners, kerosene, turpentine
- Class 4.1 Flammable Solids eg. polyurethane foam, expanded polystyrene
- Class 4.2 Spontaneously Combustible Substances eg. carbon black
- Class 4.3 Dangerous when wet eg. calcium carbide
- Class 5.1 Oxidising Substances eg. hypochlorite
- Class 5.2 Organic Peroxides eg. MEK peroxide
- Class 6 Toxic and Infectious Substances eg. arsenates, lead, cyanide
- Class 7 Radioactive Substances eg. uranium
- Class 8 Corrosives eg. hydrochloric acid, sodium hydroxide
- Class 9 Miscellaneous Dangerous Goods eg. goods not covered by first 8 classes eg. dry ice

Placarding of Workplaces

Regulations in most States specify the use of HAZCHEM and class labels for the placarding of workplaces, including schools and colleges, if the quantities of the particular class of substance is above a specified amount (exemption limit).

Placards are needed to:

- ?? Alert emergency services, people at the workplace and the general public to the location and nature of chemicals stored.
- ?? Provide information so that employees, emergency service personnel and the public and the environment are protected.

The Storage of Chemicals - guidance note for the placarding of chemical stores and the guidance note for emergency services manifests has been prepared by Worksafe Australia, 1990 to assist in the development of an overall management policy for chemicals storage and usage. Worksafe released in 1998, a draft of the National Standard and Code of Practice for the Storage and Handling of Dangerous Goods, intended to provide a national framework for compatible national DG legislation. This document is available from Worksafe.

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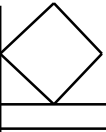
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HAZCHEM CODE

The Hazchem (Hazardous Chemicals) Code is a system developed by the United Kingdom Fire Service. The Code characters (numerals and letters) are intended to inform emergency services of the immediate response action to minimise the hazards to personnel and the effects of spillage.

HAZCHEM SCALE

UN No	
Hazchem	

Notes for Guidance

FOG - In the absence of fog equipment a fine spray may be used.

DRY AGENT - for substances where contact with water is hazardous & must be avoided.

V - Can be violently or even explosively reactive.

FULL - Full body protective clothing with BA

BA - Breathing apparatus plus protective gloves.

DILUTE - May be washed to drain with large quantities of water.

CONTAIN - Prevent, by any means available, spillage from entering drains of water course.

FOR FIRE OR SPILLAGE

- 1 JET
- 2 FOG
- 3 FOAM
- 4 DRY AGENT

P	V	FULL	DILUTE
R			
S		BA	
S	V	BA for FIRE only	
T		BA	CONTAIN
T		BA for FIRE only	
W	V	FULL	
X			
Y		BA	CONTAIN
Y	V	BA for FIRE only	
Z		BA	
Z		BA for FIRE only	

E	CONSIDER EVACUATION
---	---------------------

INTERPRETATION OF THE CODE

The Numeral. The number indicates the equipment or media suitable for firefighting and, where appropriate, for dispersing spillage, as follows.

- 1 - Water Jets
- 2 - Water Fog (if unavailable fine water spray may be used)
- 3 - Foam

4 - Dry Agent (for substances with dioxide, dry chemical or halogenate)

Note: In addition, firefighting media indicated with a lower number eg. if the numeral in firefighting but not water jets.

The First Letter

Letter	Risk of violent reaction or explosion	Initial
P	Yes	Full
R	No	Full
S	Yes	Brea
S	Yes	Brea
T	No	Brea
T	No	Brea
W	Yes	Full
X	No	Full
Y	Yes	Brea
Y	No	Brea
Z	No	Brea
Z	No	Brea

NOTES:

1. Full protective clothing is a minimum chemical splash suit. In the case of some c.
2. Where breathing apparatus is indicated,
3. 'Dilute' indicates that the substance may
4. 'contain' indicates the need to prevent a

The Second Letter. The letter 'neighbourhood of an incident should evacuation is a matter for decision : **Examples.** The code '2W' indicates clothing and the substance may p should not be washed into the drain fog. The code '3YE' indicates that the substance may present a risk c washed into the drains and the exti that may require consideration be letter Y is white on black, then em wear breathing apparatus.

• **Answers to Art Hazards Crossword**

Across Down

- 1. Lead
- 3. Sweeping
- 7. Lung
- 9. Substitutes
- 10. Gloves
- 13. Water
- 14. Secrete
- 17. Silica
- 20. Respirators
- 23. Heart
- 27. Dusts
- 24. Use
- 26. Nerve
- 28. Kiln
- 33. Noise

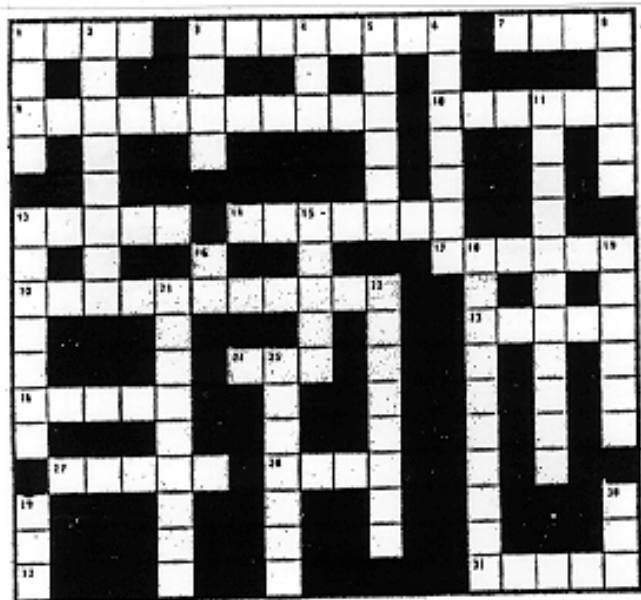
- 1. Last
- 2. Asbestos
- 3. Skin
- 4. East
- 5. Inside
- 6. Goggles
- 8. Gases
- 11. Ventilation
- 13. Warning
- 15. Close
- 19. Asthma
- 16. IR
- 18. Inhalation
- 21. Ingestion
- 22. Solvents
- 25. Smoking
- 29. ABC
- 30. Eye

• **Art Hazards Crossword Puzzle**

Adapted from a puzzle originally published in the Volume 5, Number 3, 1982 issue of Art Hazards News.

Across

1. Toxic metal round in stained glass, pottery, enamelling, painting, etc.
3. A poor housekeeping method that stirs up dust.
7. Occupational diseases of this organ include silicosis, pulmonary oedema, bronchitis and cancer.
9. The first choice in hazard prevention is finding safer _____ for more toxic materials.
10. A type of personal protective equipment to protect hands.
13. _____-based materials are safer replacements for solvent-based materials.
14. Lung irritants can cause lung tissue to mucus to assist in eliminating the irritant from the lungs.
17. A highly toxic substance round in most clays, many stones, sand, and investment plaster.
20. A type of personal protective equipment for protection against airborne toxic chemicals. (plural)
23. A body organ especially sensitive to carbon monoxide, barium compounds and cobalt compounds.
24. "_____ with adequate ventilation" is a warning found on many labels of art materials.
26. _____ damage may be caused by lead, mercury, arsenic, n-hexane, etc.
27. Solid particles that are an inhalation hazard when airborne.



28. A device used to fire pottery which needs local exhaust ventilation because of toxic gases and fumes.
33. May cause permanent hearing damage after several years of sufficient exposure.

Down

1. Respirators should be the _____ resort in prevention rather than the first.
2. Can cause lung cancer, stomach cancer, mesothelioma, and lung fibrosis.
3. _____ contact is one of the ways in which chemicals can affect the body.
4. If you _____ while working, you may ingest your art materials.
5. Art materials can only affect internal organs if they get _____ the body.
6. Personal protective equipment for eye protection.
8. Airborne substances produced during etching, photography, welding, kiln firing, etc.
11. This method should be tried before respirator use.
13. Dizziness, nausea, headaches, etc. are good _____ signals of overexposure to solvent vapours.
15. _____ all containers in order to prevent evaporation of solvents or escape of dusts.
16. Type of radiation that can cause cataracts in glass blowers, potters, enamellists and foundry workers. (abbrev.)
18. The major way in which dusts, gases, vapours, fumes and spray mists can enter the body.
19. An allergic reaction in the lungs caused by cold water dyes, formaldehyde, isocyanates in polyurethane resins, Western red Cedar, molds and many other art materials.
21. Eating, drinking or smoking while working can result in art materials entering the body through this route.
22. Toxic organic _____ are found in paint and lacquer thinners, varnishes, paint removers, degreasers, plastics cements, adhesives, etc.
25. One of the major causes of chronic bronchitis, emphysema, lung cancer, heart disease, etc.
29. Type of fire extinguisher recommended for most art studios.
30. In case of a chemical splash in the _____s, rinse for at least 15 minutes and contact a physician.