

ESTATES FACILITIES

HEALTH & SAFETY DOCUMENT	-	CODE of PRACTICE
DOCUMENT TITLE	-	WOODWORKING, SOLDERING & WELDING
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Please Note – the guidance provided in this Code of Practice pertains only to the Estates Facilities Group and its operations. For Imperial College Health & Safety policies and Codes of Practice go to: <http://www.imperial.ac.uk/safety/>.

INTRODUCTION

This Code of Practice sets down the standards for the use of woodworking, soldering and welding equipment within the College. It is intended to assist in meeting the requirements of current legislation and sets out procedures on how to achieve safe systems of work.

Over and above the general duty of care owed by the College to its staff, students and others under the Health and Safety at Work etc. Act 1974, all work related plant and equipment is legislated by The Provision and Use of Work Equipment Regulations 1998 (PUWER). Fumes and other by-products of soldering and welding are legislated by the Control of Substances Hazardous to Health Regulations 2002. The use of personal protective equipment will be covered by the Personal Protective Equipment Regulations 1992.

This Code of Practice provides the following:

- A definition and the scope of the applicable Regulations
- The duties Imposed on the employer/employee/other
- Inspection and maintenance guidance
- Responsibilities of duty holders and employees
- Competence

1. Overview and Introduction to Woodworking /Soldering/ Welding

Provision and use of Work Equipment Regulations 1998 (as amended). (PUWER) places duties on any person who uses, supervises, manages or has any control of equipment used for work purposes. The regulations state that every employer shall ensure that work equipment is so constructed or adapted as to be suitable for the purpose for which it is used or provided. Every employer shall ensure that work equipment is used only for operations for which, and under conditions for which, it is suitable. The regulations require that work equipment is maintained in an efficient state, in efficient working order and in good repair and any maintenance carried out is logged. The regulations also require suitable inspections at regular intervals if machinery is likely to suffer from deterioration or if work equipment depends on the installation conditions. For further guidance please refer to [Estates Facilities' Code of Practice on the Provision & Use of Work Equipment](#).

Control of Substances Hazardous to Health Regulations 2002 (as amended). 'COSHH' provides a legal framework to protect people against health risks from hazardous substances used at work. It applies wherever there is a risk at work of health effects from skin exposure to hazardous substances. For further guidance please refer to the [Estates Facilities' Code of Practice on Substances Hazardous to Health](#).

Personal Protective Equipment at Work Regulations 1992. These 'PPE' regulations concern the design, construction, testing and certification of protective clothing and other types of PPE which may be required to be used when working with substances hazardous to health. They require PPE to be cleaned, maintained, used and stored properly. For further guidance please refer to the [Estates Facilities' Code of Practice on PPE](#).

2. Duties Imposed on the Employer/Employees/Others

PUWER require the risks to people's health and safety from equipment that they use at work, to be prevented or controlled. Generally any equipment which is used by an employee at work is covered by the regulations. Examples of uses of equipment which are covered by the regulations include starting or stopping the equipment, repairing, modifying, maintaining, servicing, cleaning and transporting. To this end we have appointed suitably competent persons to carry out the actions below.

We shall ensure that;

- A suitable and sufficient risk assessment is carried out on any work equipment which carries any significant hazards and risks.
- Any work equipment provided is suitable for use, and the purpose and conditions in which it is used.
- Work equipment is maintained in a safe condition for use so that people's health and safety is not at risk.
- All work equipment is inspected to ensure that it is, and continues to be, safe for use.

Woodworking

Woodworking machinery presents a significant risk during use. Recent Health and Safety Executive (HSE) accident statistics show that accidents involving contact with the dangerous parts of machinery or the material being machined accounted for approximately one quarter of all of the fatal injuries recorded in the woodworking industry, and approximately half of all major injury accidents in the UK.

There is a high risk of injury at the cutters and also from the ejection of work pieces from the machine, the cutters or parts of them. No two pieces of wood are the same; each piece behaves differently when machined or shaped during the production process. Knots and natural changes in the direction of the grain can give rise to 'snatching' and 'kickback' of the work piece.

Suitability of Woodworking Machinery

Woodworking machinery must be suitable, by design, construction or adaptation, for the work it is provided to do. This means in practice that when woodworking machinery is provided, Facilities & Property Management must ensure that it is suitable for the work to be undertaken and that it is used in accordance with the manufacturer's specifications and instructions. If woodworking machinery is adapted it must still be suitable for its intended purpose.

Maintenance

It is important that all parts of the woodworking machinery are maintained so that its performance does not deteriorate to the extent that it puts people at risk.

The extent and complexity of maintenance can vary substantially from simple checks on basic woodworking machinery to integrated programmes for complex machinery. Further guidance can be found in [Estates Facilities Code of Practice on Plant and Equipment](#). In all circumstances, for maintenance to be effective, it needs to be targeted at the parts of work equipment where failure or deterioration could lead to increased risks to health and safety. To achieve this, a number of maintenance management techniques will be used by Facilities & Property Management:

- (a) planned preventive;
- (b) condition-based;
- (c) breakdown.

Training

Facilities & Property Management will ensure that all training schemes include the following elements:

- *General* - Instruction in the safety skills and knowledge common to woodworking processes. This should include aspects of good housekeeping and awareness of the dangers such as 'taking off', 'dropping on' and 'kickback'.
- *Machine specific* - Practical instruction in the safe operation of the machine, including in particular:
 - the dangers arising from the machine and any limitations as to its use;
 - the main causes of accidents and relevant safe working practices including the correct use of guards, protection devices, appliances and the use of the manual brake where fitted.
- *Familiarisation* - On-the-job training under close supervision.

Training may take a number of forms: in-house, external or a combination of both. In all cases care should be taken to ensure that the class of the machine involved and the type of work which the operator is expected to carry out has been adequately covered.

Soldering

There are a number of possible health hazards associated with solder fume when using flux materials such as rosin.

Rosin is used mainly as a flux in the electrical industry where it is heated with the solder to make electrical connections. It can also be used for soldering in plumbing and other pipe-fitting work.

The health hazards associated with soldering are covered by the Control of Substances Hazardous to Health Regulations 2002. For further guidance please refer to [Estates Facilities' Code of Practice on Substances Hazardous to Health](#).

There are a number of respiratory effects associated with solder fumes. Further information can be found in [Appendix 2](#) to the rear of this Code of Practice.

Exposure

Solder fumes can rise vertically and are likely to enter the breathing zone of any solderer. Other people can be put at risk if the soldering work is widespread and general ventilation is poor.

Those responsible for the cleaning and maintaining of soldering equipment and control systems may also find themselves at risk.

Control Measures

We will undertake a risk assessment of the soldering process, identifying how much exposure to fume occurs. A monitoring programme will need to be established.

Further control measures will include:

- The proper use of any control measures provided such as local extract ventilation.
- The maintenance of control measures provided (including Local Exhaust Ventilation (LEV) and any PPE used). In particular LEV should be examined every 14 months by a competent person.
- Where necessary PPE which is suitable for the job will be provided. However this must be a last resort where prevention of exposure cannot be controlled by other means.
- The provision of adequate washing facilities.

Welding

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The health hazards associated with soldering are covered by the Control of Substances Hazardous to Health Regulations 2002. For further guidance please refer to [Estates Facilities Code of Practice on Substances Hazardous to Health](#).

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Oxy-gas Welding and Brazing

When undertaking oxy-gas welding or brazing activities within the College, the following engineering controls will need to be considered:

Ventilation

A good standard of general ventilation will be required, with 5-10 air changes per hour, with a through draught. An adequate capture hood on a flexible arm or mobile unit is required, with an air speed of at least 1 metre per second to clear fumes.

Ideally a manometer or pressure gauge should be fitted to show that the extraction is working.

Any discharge from the welding/brazing activities must be discharged clean and extracted to a safe place outside the College building, away from doors and windows.

A supply of clean air should be coming into the room to replace the extracted air.

Procedures

Prior to brazing or welding activities commencing, all grease and surface coatings should be removed from the materials first, unless they are meant to be welded or cut through.

Work is to be arranged so that the worker's head is out of the fume, with confirmation sought that the extraction is turned on and in an operational condition.

Workers should ensure that the correct nozzle is being used, with the flame kept short as possible. The torch should be extinguished whenever there is a break in the brazing/welding activity.

The work area should always be kept free of combustible materials, with cleaning undertaken on a regular basis.

Maintenance

Manufacturers' guidelines should be followed at all times. Any equipment which is found to be faulty should be taken out of service by Facilities & Property Management immediately. At least once a week Facilities & Property Management should check that the extraction system and gauges are working properly, with daily checks carried out to identify any signs of damage to ducting, fans and air filters.

4. Responsibilities of Duty Holders and Employees

The College has a responsibility to ensure that all woodworking, soldering and welding plant and equipment, which could result in injury, is assessed and adequately controlled. To this end we have appointed suitably competent persons to carry out the actions below.

We will ensure that:

- the work equipment is constructed or adapted to be suitable for the purpose it is used or provided for;
- work equipment is maintained in an efficient state, in efficient working order and in good repair;
- where a machine has a maintenance log, this is kept up to date;
- where the safety of work equipment depends on the manner of installation, it must be inspected after installation and before being put into use;
- all people using, supervising or managing the use of work equipment are provided with adequate, clear health and safety information. This will include, where necessary, written instructions on its use and suitable equipment markings and warnings;
- all people who use, supervise or manage the use of work equipment have received adequate training, which should include the correct use of the equipment, the risks that may arise from its use and the precautions to take;
- take measures to prevent or control the risks to people from parts and substances falling or being ejected from work equipment, or the rupture or disintegration of work equipment;
- the risks from very hot or cold temperatures from the work equipment or the material being processed or used are managed to prevent injury;
- work equipment is provided with appropriately identified controls for starting, stopping and controlling it, and that these control systems are safe.

Appendix 1 – Respiratory and Other Effects of Solder Fumes

When heated, particularly to temperatures above 200°C, rosin-based solder fluxes form fumes containing a range of resin acid particulates and other components as gases. Lower temperatures can significantly reduce the amount of fume produced. Between 250°C and 400°C, particulate fume levels can triple.

Inhalation

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When inhaled, rosin-based solder flux fume can lead to occupational asthma or make existing asthmatic conditions worse. The fume can also cause irritation to the eyes and upper respiratory tract.

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Rosin-based solder flux fume is now regarded as one of the most important causes of occupational asthma in Britain. When the asthmatic effects are fully developed they are permanent and irreversible. Continued exposure, even to very small amounts of fume, may cause asthma attacks and the person affected may be unable to do any soldering with rosin-based fluxes again.

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Typical early symptoms are watery and prickly eyes, runny or blocked nose, a sore throat, coughing, wheezing or breathing difficulties. These may start within minutes of exposure or be delayed for several hours, so that their link to work may not be immediately recognised. However, improvement at weekends and holidays often points to the symptoms being job related.

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The precise constituents of the fume causing occupational asthma and irritation are not known. From a review of scientific evidence it has not been possible to identify a safe level of exposure below which occupational asthma will not occur. Exposure to all rosin-based solder flux fumes should, therefore, be avoided or kept as low as is reasonably practicable.

Skin effects

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On contact with the skin, rosin-based solder flux and its fume can cause dermatitis. Both skin irritants and sensitisers are present in solder fluxes and their fume.

Reactions have occurred from contact with liquid fluxes, flux residues and, to a lesser extent, the fume itself. Hands and forearms are mainly affected, possibly from contaminated workbenches or other surfaces. The fume may also affect the face and neck.

Suitable precautions to avoid skin contact should therefore be taken.

Legal Requirements

As exposure to rosin-based solder flux fumes may be hazardous to health, their use is subject to the Control of Substances Hazardous to Health Regulations 2002 (COSHH). A suitable assessment of the risks to health must be carried out. Where reasonably practicable, exposure should be prevented, or failing that, adequately controlled.

The following Maximum Exposure Limits (MELs) have been set for rosin-based solder flux fumes:

- 0.05 mg m⁻³ (over an eight-hour reference period); and
- 0.15 mg m⁻³ (over a fifteen-minute reference period).

To achieve adequate control, as required by the COSHH Regulations, exposures to rosin-based solder flux fumes should be reduced to as far below the MEL as is reasonably practicable, for example by the provision and use of a suitable local extraction ventilation system.

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If personal protective equipment is necessary, it must be suitable and adequate for the purpose, meeting all relevant requirements of the Personal Protective Equipment at Work Regulations. It should only be used as a last resort when other controls are not feasible or adequate control is not achieved by other means.

Appendix 2 - Guidance Documents Available

Safe Use of Woodworking Machinery

Further guidance can be accessed via the below link to the HSE website:

<http://www.hse.gov.uk/pubns/l114.pdf>

Woodworking Factsheets

A number of additional guidance documents relating to woodworking machinery can be accessed via the link below:

<http://www.hse.gov.uk/woodworking/index.htm>

Solder Fume and You

The following link provides guidance on the possible health hazards from soldering:

<http://www.hse.gov.uk/pubns/indg248.pdf>

Welding

The following link provides information and guidance on the undertaking of welding activities:

<http://www.hse.gov.uk/welding/index.htm>