



Health and Safety Training in Design and Technology
 Design and Technology Association
 Specialist Extension Level S5HS Oxy-Acetylene Welding and Cutting

**Oxy-Acetylene
 Welding and
 Cutting**

Forename: _____ Surname: _____

School / College/ Institution _____

Course date: / /

These Training and Accreditation Guidelines are based on the following essential publications:

- Health and Safety Training Standards in Design & Technology: TDA/D&T Association 2006
- BS 4163:2014 BRITISH STANDARD Health and safety for design and technology in educational and similar establishments – Code of practice
- Model Risk Assessments for D&T in Secondary Schools and Colleges: CLEAPSS

Please tick against each of the standards below to confirm your knowledge, skills and understanding and that you have completed Assessment Tasks 1 and 2. The RDTHSC/Trainer will sign and date this form on completion

Colleagues must demonstrate, thorough practical activities, their capability in using oxy-acetylene welding and cutting, and their knowledge and understanding of:	Tick
1. The types of equipment, particularly high-pressure manifold and portable systems, safety devices, maintenance and the detection of defects	<input type="checkbox"/>
2. The safety regulations which apply to the storage and use of this type of equipment, particularly overheating cylinders, backfires, blowbacks, leaking components, explosive risks of acetylene, effects of oil and grease in contact with oxygen	<input type="checkbox"/>
3. Assembly methods for equipment, start-up and close-down procedures	<input type="checkbox"/>
4. Methods of lighting, controlling and extinguishing torch	<input type="checkbox"/>
5. Appropriate welding techniques	<input type="checkbox"/>
6. The use of correct personal protection for eyes, face and body	<input type="checkbox"/>
7. Appropriate working environments, ensuring the safety of onlookers and the availability of appropriate fire safety devices	<input type="checkbox"/>
8. The particular precautions when using cutting equipment	<input type="checkbox"/>
9. The dangers of fumes from welding and the need for good ventilation	<input type="checkbox"/>

RDTHSC/Trainer signature: _____

Date: _____



Assessment Task 1

Knowledge and Understanding

1. The types of equipment, particularly high-pressure manifold and portable systems, safety devices, maintenance and the detection of defects

Know that:

- The school should decide whether oxy-acetylene welding and cutting is suitable for use by particular groups of learners, based upon maturity and competence, the level of supervision, local authority/employer and national guidelines
- Learners should be fully instructed in the use of such equipment before being involved in the process e.g. the hazards associated with the process and equipment and the risk control measures that are required
- Learners should be trained and instructed in safe operating methods by a competent person, who has attended a recognised training course
- Learners should be assessed and a record of their competence kept

Understand the process of oxy-acetylene welding:

- The joining of metals by the creation of a joint using a filler (welding rod) of similar composition to the metal being joined
- Know that combustion of the fuel gives rise to hazardous fumes and that the combustion of any fuel, e.g. acetylene, propane, or methane, with oxygen from a cylinder rather than air at normal or increased pressure, gives a hotter flame that is often easier to control

Know that:

- All connections, regulators, valves and hoses should be checked for leaks regularly. (The frequency depends on use. If the equipment is in daily use, a weekly check is required. If used infrequently, check before each use)
- Non-return valves and flashback arrestors must always be fitted
- All welding equipment should be kept free from oil or grease
- Proprietary leak detecting fluids should be used to test for leaks from connections
- Explosions have been caused by gas leaks, backfires, flashbacks and welding on tanks or drums that have contained highly flammable materials
- Welding can present a fire hazard. Careless handling of a lighted blowpipe (torch) or the presence of combustible materials too close to the work area causes fires
- Explosive vapours can form inside containers that have contained flammable liquids
- In the educational environment, the welding, cutting or any other heat processes on closed vessels or tanks should not be undertaken
- Health and safety data supplied by manufacturers of products should be studied and observed

2. The safety regulations which apply to the storage and use of this type of equipment, particularly overheating cylinders, backfires, blowbacks, leaking components, explosive risks of acetylene, effects of oil and grease in contact with oxygen

Know that:

- Gas cylinders ready for use may be kept in the workshop and should be held securely, with the valves uppermost, in a cylinder trolley. When not in use, the equipment should be removed from the workplace to a suitably designated store, agreed with the local fire prevention officer, away from any source of heat. While secure from unauthorised persons, easy access must be assured at all times in case of fire. Spare cylinders, whether full or empty, should be kept in a secure, well-ventilated place, ideally outside
- All regulators, blowpipes and other equipment used for oxy-acetylene or oxy-propane welding should be checked every 12 months by a competent person, and replaced where necessary every five years
- It is essential that the tasks of moving cylinders into and out of trolleys have been assessed under the Manual Handling Operations Regulations to protect those doing so from strain injuries
- Cylinders of acetylene gas and oxygen can explode violently if involved in a fire and oxygen makes a fire burn quicker and more violently
- Acetylene gas leaks can form an explosive mixture inside buildings
- Grease and oil must be kept away from oxygen as spontaneous combustion can take place

Knowledge and Understanding

3. Assembly methods for equipment, start-up and close-down procedures (See Assessment Task 2)

4. Methods of lighting, controlling and extinguishing torch (See Assessment Task 2)

5. Appropriate welding techniques (See Assessment Task 2)

6. The use of correct personal protection for eyes, face and body

Know that:

- Users of welding equipment and observers should be protected against glare and sparks by appropriate goggles or shields. Goggles, which reduce the risk of radiation reaching the eyes, should be worn as a matter of habit since they will also protect against spitting of flux or spatter of molten metal. Eye protection for welding should have the following codes on each lens where X is the manufacturer's mark: 4 or 5 X 1 or 2F or S9
- Chipping or cleaning welds can lead to eye injuries. Goggles or shields should also be utilised when chipping or cleaning welds
- Sparks can cause burns to skin, eyes and clothes
- Hot metal components can cause burns
- Suitable protective clothing (gloves, aprons and substantial footwear) should be worn to minimise risks of spark burns and clothing damage
- Protective clothing should be kept free of oil and grease

7. Appropriate working environments, ensuring the safety of onlookers and the availability of appropriate fire safety devices

Know that:

- Suitable warning signs indicating the presence of flammable gasses under pressure, conforming to BS EN ISO 7010, should be displayed at entrances to workshops. Educational establishments should inform the local fire service of the presence of such gases on the premises
- It is essential that welding areas be separated from other work areas by fixed or portable screens that protect persons not wearing eye protection goggles
- Welding areas should be kept free of combustible materials and flammable liquids. Particular care should be taken if welding is done in mixed materials workshops where plastics and timber might be present. All welding should cease 30 minutes prior to the end of the working day
- A fire extinguisher and fire blanket should be readily available
- Welding should not take place directly onto a dense concrete or non-refractory base, as these materials can disintegrate explosively when heated
- Observers must be well away from the work, wearing heatproof aprons and eye protection.

8. The particular precautions when using cutting equipment (See Assessment Task 2)

9. The dangers of fumes from welding and the need for good ventilation

Know that:

- A good level of general ventilation should be provided. Concentrations of welding fumes should be avoided. It is essential that a risk assessment is carried out and suitable control measures and local exhaust ventilation provided if required
- Zinc oxide fume, commonly emitted when welding galvanised steel, is toxic. This operation will not be routine in a school workshop but may be required for an occasional task that can be done outside
- Welding through painted surfaces, particularly those containing lead compounds, produces toxic fumes. Painted surfaces should be stripped before welding in case the paint contains lead
- The combustion of the fuel acetylene gives rise to gases, consisting mainly of carbon dioxide with the addition of oxides of nitrogen where an oxidising flame is used, and carbon monoxide if the flame is slightly reducing. Carbon dioxide, with traces of nitrogen oxides, carbon monoxides and freshly formed metallic oxides, is toxic and may lead to operatives developing metal fume fever

Assessment Task 2

Practical Skills

1. Assembly methods for equipment, start-up and close-down procedures

Through demonstration and practical experience, know:

- How to assemble an oxy-acetylene system, the colour codes used, right and left handed threaded connections and the appropriate keys and spanners
- That oil or grease must not be allowed to come into contact with oxygen regulator valves or fittings
- That proprietary leak detecting fluids must be used to test for leaks from connections
- How to ignite the torch, lighting acetylene first, and how to shut down by shutting off the acetylene first
- That welded materials should be put in a safe place to cool, in order to minimise the risk of burns.

2. Methods of lighting, controlling and extinguishing torch

Through demonstration and practical experience, know:

- The correct working pressure for oxygen and acetylene and the control of gas velocity
- How to turn on, set and adjust the regulators
- Flame types, setting and adjustment, lighting the blowtorch and extinguishing the flame
- Safety procedures for closing down.

3. Appropriate welding techniques

Following demonstration and instruction, colleagues should demonstrate a variety of welding techniques, including:

- Preparation of butt, fillet, lap and corner joints and gap setting for correct penetration
- Effective shape of fillet, leg length and throat thickness
- Leftward and rightward welding
- Restarting to avoid craters
- Distortion control
- Visual recognition of faults and defects in welding joints
- Brazed and bronze welded joints
- Oxy-acetylene cutting – limited to low and medium steels.

Further welding exercises involving the various techniques used for ferrous materials should be undertaken in order to ensure the production of welds of an acceptable standard and to demonstrate competence in using the equipment. Exercises should include:

- Deposition of fusion runs with or without filler rod, preparation of edges, correct gap setting and tacking
- Brazing of fillet and lap joints using 1.6 – 3.00 mm low carbon steel
- Oxy-acetylene cutting by hand of square and bevelled edges.

Supplementary materials

- The space-allocation diagram indicates the clear working space required on either side of the welding bench. Where equipment is next to one another, dimensions can be overlapped, as indicated by the shaded zone on the diagram. Distances in front of the bench are assumed to adjoin circulation routes. A 200mm space has been allowed at the back of the bench for cleaning and maintenance.

Welding bench

