

مركز أبوظبي للصحة المهنية
ABU DHABI OCCUPATIONAL SAFETY AND HEALTH CENTER

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Abu Dhabi Occupational Safety and Health System Framework

(OSHAD-SF)

Code of Practice

Cop 28.0 – Hot Work Operations

(e.g. Welding and Cutting)

Version 3.0

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ABU DHABI PUBLIC
HEALTH CENTRE

مركز أبوظبي
للصحة العامة



Important Note:

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1. Introduction

- (a) This Code of Practice (CoP) applies to all employers within the Emirate of Abu Dhabi. This CoP is designed to incorporate requirements set by Abu Dhabi Occupational Safety and Health System Framework (*OSHAD-SF*) and Sector Regulatory Authorities in the Emirate of Abu Dhabi.
- (b) This CoP establishes the requirements and standards so that the risks associated with hot work operations are assessed, that control measures are implemented in accordance with the hierarchy of controls and that control measures are taken to prevent injury, illness and disease to persons who might be exposed to risks arising from those activities.
- (c) This CoP specifies precautions to be taken prior to and during hot work (including welding and cutting), to prevent the possibility of fire or explosion, which may result in harm to persons or property. In particular, such precautions apply to hot work during manufacturing, construction, maintenance, repairs, demolition and where plant or equipment contains flammable, combustible or explosive material.
- (d) 'Hot Work' is a general term referring to grinding, welding, thermal or oxygen cutting or heating, and other related heat-producing or spark-producing operations.
- (e) 'Welding' has been defined as the fusion of two pieces of metal, rendered plastic or liquid by heat or by pressure, or by both. There are many different welding processes, but the two most commonly used in the construction industry are gas welding and electric arc welding.
- (f) 'Hazardous Area' has been defined as an area in which flammable liquids, vapours or gases, combustible liquids, dusts or fibres, or other flammable or explosive substances may be present.

2. Training and Competency

- (a) Employers shall ensure that OSH training complies with the requirements of:
- (i) *OSHAD-SF – Element 5 – Training, Awareness and Competency;*
 - (ii) *OSHAD-SF – Mechanism 7.0 – OSH Professional Entity Registration; and*
 - (iii) *OSHAD-SF – Mechanism 8.0 – OSH Practitioner Registration.*
- (b) In accordance with *OSHAD-SF – Element 1 – Roles, Responsibilities and Self-Regulation* Section 3.2.5 employers shall ensure employees required to implement the requirements of this CoP are trained in hot work operations (welding and cutting), and understand the risks associated with using the equipment and the control measures put in place by employers.
- (c) Training for employees shall be competency-based and include:
- (i) systems of work needed for the safe hot work operations;
 - (ii) types and selection of correct welding and cutting equipment;
 - (iii) type, selection and use of PPE; and
 - (iv) care, maintenance and inspection of welding and cutting equipment.
- (d) Employers shall conduct additional retraining whenever a periodic inspection reveals, or there is reason to believe, that there are deviations from or inadequacies in the employee's knowledge of the correct hot work operations.
- (e) Employers shall maintain a record of the required training that contains the following information:
- (i) name and ID number;
 - (ii) Emirates ID number;
 - (iii) subject(s) of training;
 - (iv) date(s) of training; and
 - (v) person(s) providing the training.

3. Requirements

3.1 Roles and Responsibilities

3.1.1 Employers

- (a) Employers shall undertake their roles and responsibilities in accordance with the general requirements of *OSHAD-SF – Element 1 – Roles, Responsibilities and Self-Regulation* Section 3.2.5.
- (b) Employers shall undertake their specific roles and responsibilities in accordance with the following:
 - (i) hot works plant and equipment (eg. welding and cutting equipment) shall be appropriate for the task and maintained in good working condition;
 - (ii) all work involving the use of hot works plant and equipment is appropriately planned, organized and appropriately supervised;
 - (iii) those involved in use of hot works equipment are trained and competent;
 - (iv) all hot works equipment is inspected on a daily basis by a competent person;
 - (v) implement an appropriate medical surveillance program in accordance with *OSHAD-SF – CoP 5.0 – Medical Surveillance*;
 - (vi) conduct appropriate occupational air monitoring in accordance with *OSHAD-SF – Element 7 – Monitoring, Investigation and Reporting* and take the appropriate actions to reduce exposures to employees working in the area and monitor their health; and
 - (vii) employees using hot works equipment are provided with the particular personal protective equipment necessary to protect them from the hazards in accordance with the requirements of *OSHAD-SF – CoP 2.0 – Personal Protective Equipment*. For example, appropriate protective clothing for welders may include: a shield or helmet with a filtered lens; fire resistant gloves; a leather apron; boots; leather spats; a felt skull-cap or beret and preferably overalls.

3.1.2 Employees

- (a) Employees shall undertake their roles and responsibilities in accordance with the general requirements of *OSHAD-SF – Element 1 – Roles, Responsibilities and Self-Regulation* Section 3.2.7.
- (b) Employees shall undertake their specific roles and responsibilities in accordance with the following:
 - (i) employees shall inspect work equipment before use, report any activity or defect relating to the equipment which they believe is reasonably foreseeable to endanger their safety or the safety of another person; and
 - (ii) employees shall use safety devices provided to use with the welding and cutting equipment by employers in accordance with training or instruction received in the use of the work equipment or other device.

3.2 Planning and Assessment

- (a) Employers shall ensure that no hot works are allowed to be undertaken, outside of a designated area, unless a specific Hot Work Permit to Work is in place.
- (b) The Hot Work Permit to Work shall be in line with the requirements of *OSHAD-SF – CoP 21.0 – Permit to Work Systems*.
- (c) Employers shall evaluate each site or operation to determine if hazards are present and the hot works equipment shall be assessed using risk management practices as required by *OSHAD-SF – Element 2 – Risk Management*.
- (d) Employers shall ensure the following:
 - (i) assessment of the various risks and establishment of systems of work which are safe to both contractors and the public;
 - (ii) that effective procedures and control measures are in place which are implemented in order to manage the hot work operations;
 - (iii) that for the Building and Construction Sector the management of hot work requirements are included in the Pre-Tender Safety and Health Plan in accordance with *OSHAD-SF – CoP 53.0 – OSH Management During Construction Work*; and
 - (iv) that associated safe systems of work, and site rules are included in the Safety and Health Construction Management Plan (OSH -CMP) in the case of the Building and Construction Sector in accordance with *OSHAD-SF – CoP 53.0 – OSH Management During Construction Work*.
- (e) When assessing the various risks employers shall consider if there are specific hot work related hazards such as:
 - (i) fire and explosion;
 - (ii) burns;
 - (iii) fumes, gases and ventilation;
 - (iv) electricity; and
 - (v) radiation.

3.3 Hot Work

3.3.1 General Requirements

(a) Employers shall ensure the following:

- (i) material safety data sheets for electrodes, fluxes and coatings are made available to employees required to perform welding activities;
- (ii) the protection of welders and other persons in the vicinity of the work from burns caused by sparks, hot metal, etc.;
- (iii) the erection of screens for the protection of persons in the vicinity of the welding work from harmful radiation rays produced by the process;
- (iv) the use of welding booths, where reasonably practicable;
- (v) gas systems (eg. cylinders, regulators, hoses, etc) are in good working order;
- (vi) all welding-associated waste is placed in a hot waste crate located as close as reasonably practicable to where the welding activities are carried out. Such hot waste includes slag, shot crucibles and metal off-cuts; and
- (vii) in areas where welding work is performed, competent First Aiders with relevant experience. This shall include, but is not limited to:
 1. persons overcome by welding fumes or gases;
 2. burns; and
 3. "welding flash" eye injuries.

3.3.2 Designated Hot Work Area(s)

- (a) A designated hot work area is a permanent location designed for hot work. These areas do not normally require a permit to perform hot work.
- (b) Where it is reasonably practicable to do so, employers shall ensure that all hot works are undertaken within a designated hot works area.
- (c) Access / Egress to the designated area shall be restricted for non-authorized person(s).
- (d) A designated hot work area shall be:
 - (i) of non-combustible, fire-resistive construction, essentially free of combustibles and flammables;
 - (ii) appropriately segregated from adjacent areas;
 - (iii) equipped with automatic fire protection or fire extinguishers;
 - (iv) inspected and approved by management; and
 - (v) have appropriate ventilation.

3.3.3 Fumes and Gases

(a) Employers shall ensure the following:

- (i) appropriate control measures are utilized to reduce as far as reasonably practicable, the exposure level of personnel to harmful fumes and gases. These control measures include but are not limited to:
 - 1. removal of rust inhibitors, paints, degreasers and other coatings prior to welding;
 - 2. segregation of degreasing operations from welding tasks; and
 - 3. positioning of welders away from welding fumes.
- (ii) employees required to perform welding work are monitored for any adverse side effects on their health, related to exposure to welding fumes and gases, as per the requirements of *OSHAD-SF – CoP 5.0 – Medical Surveillance*;
- (iii) appropriate ventilation is provided in all locations where welding work is carried out which may consist of:
 - 1. general ventilation;
 - 2. dilution ventilation (eg. diluting the concentration of contaminants in the atmosphere with fresh air); or
 - 3. local exhaust ventilation (LEV).
- (iv) the determination of the type of ventilation to be used takes into consideration that, in most instances, general or dilution ventilation by themselves are not sufficient. In addition, the design of local exhaust ventilation shall ensure that the ventilation inlet point is as close as reasonably practicable to the actual welding work.

Note: Refer to *OSHAD-SF – CoP 52.0 – Local Exhaust Ventilation*.

3.3.4 Electricity and Radiation

- (a) Employers shall ensure electrical and radiation hazards are eliminated or significantly reduced through adherence to the following:
- (i) all cord-connected electrical welding machines shall be tested in accordance with the manufacturers specifications;
 - (ii) electrical welding machines shall only be connected to circuits protected by residual current devices (RCDs) and shall be appropriately earthed; and
 - (iii) personnel performing welding activities shall ensure that electric cables are not damaged by sparks, hot metal, etc.

3.3.5 Preventing Fire

(a) Employers shall ensure the following fire precautions are taken:

- (i) move the work-piece to a safe location for carrying out the hot work process;
- (ii) remove any combustible materials (such as flammable liquids, wood, paper, textiles, packaging or plastics) from within 10 meters of the work;
- (iii) ventilate spaces where vapors could accumulate, such as vehicle pits or trenches;

- (iv) protect any combustible materials that cannot be moved, from close contact with flame, heat, sparks or hot slag. Use appropriate guards or covers such as metal sheeting, mineral fiber-boards or fire retardant blankets;
- (v) check that there are no combustible materials hidden behind walls or partitions which could be ignited, particularly if prolonged welding or cutting is planned;
- (vi) use guards or covers to prevent hot particles passing through openings in floors and walls (doorways, windows, etc);
- (vii) maintain a continuous fire watch during the period of the work, and for at least an hour afterwards; and
- (viii) keep fire extinguishers nearby.

3.4 Hazardous Areas

- (a) Employers shall ensure prior to the commencement of hot work in hazardous areas, the following precautions are taken, to prevent any fire, explosion, injury or other danger developing during the performance of the hot work:
 - (i) a "Hot-Work Permit" shall be obtained before any work is carried out in a hazardous area where flammable or explosive gases and dusts may be present;
 - (ii) when the responsible person is satisfied that the hot work may safely proceed, that person shall issue a "Hot-Work Permit", in accordance with *OSHAD-SF – CoP 21.0 – Permit to Work Systems*;
 - (iii) identify and control any fire hazard (including the presence of flammable or combustible liquids, gases, vapors, dusts, fibers or substances) within 10 m from the hot work;
 - (iv) ensure the appropriate ventilation of the hot-work area;
 - (v) appropriately locate the equipment, including emergency firefighting equipment;
 - (vi) isolate the area where the hot work is to be performed;
 - (vii) ensure the provision of a safe entry to and exit from the hot-work area;
 - (viii) the testing for the presence of any flammable gas or flammable vapor in the atmosphere within the area and in any pipe, drum, tank, vessel and piece of equipment adjacent to or involved in the hot work;
 - (ix) ensure the concentration of any flammable gas or flammable vapor, as determined by the testing required is less than 5% of its Lower Explosion Limit (LEL);
 - (x) if specified by the hot-work permit, a firewatcher shall be stationed in the area near the hot work, for the safe conduct of the hot work and shall ensure that no condition arises that will lead to a hazardous situation in the hot-work area;
 - (xi) the site or work area shall be secured overnight and at the expiry of a hot-work permit period;
 - (xii) at the completion of a job, the equipment shall be returned to its normally secure mode and the firefighting equipment that has been brought to the hot-work site shall be returned to its normal storage; and
 - (xiii) at the completion of a job the "Hot-Work Permit" shall be signed off.

3.5 Electric Arc Welding

(a) Employers shall ensure the following:

- (i) arc cutting and welding equipment is installed and used in accordance with the manufacturers specifications;
- (ii) the current used for electric arc welding is either direct or alternating but, whichever system is used, the voltage be as low as is consistent with efficient welding;
- (iii) welding leads and welding return cables shall meet the following requirements:
 1. insulation is appropriate for resisting hard usage;
 2. are examined at least daily for defects;
 3. for the part of the cable which is connected to the electrode holder it is as flexible as reasonably practicable so as not to hamper the movement of the welder; and
 4. have the welding return section not less than that of the welding lead return.
- (iv) joints between cable sections are made with appropriately constructed insulated cable couplings appropriately shrouded, so that live metal is not exposed if the parts of the connector are separated;
- (v) the welding return is firmly connected to the metal on which welding is taking place, by means of a well-constructed clamp;
- (vi) an electrode holder is fully insulated, so that the live portions cannot be touched accidentally; and
- (vii) when arc welding is suspended for a substantial period of time, such as during lunch periods or overnight, the power source to the equipment is de-energized, the electrodes are removed from the holders and the holders are placed so that accidental contact or arcing cannot occur.

3.6 Gas Welding

(a) Employers shall ensure the following:

- (i) under no circumstances any fittings on oxy-acetylene equipment be allowed to be contaminated with grease or oil;
- (ii) regulators are daily checked, at least daily; as they can fail in two ways - by the controlled forward flow of gas which is known as regulator creep or by the reverse flow of another gas in the gas lines;
- (iii) employees never use equipment fitted with a regulator in which a creep condition is known to exist;
- (iv) the use of the correct color and type of hoses and fittings recommended by the manufacturers specifications;
- (v) copper is never used on acetylene lines as substances are formed which may spontaneously detonate;
- (vi) flashback arresters are fitted to all oxy-acetylene equipment to overcome the danger of flashback;
- (vii) oxy-acetylene equipment is not left near hot equipment or metals which could burn the leads; and
- (viii) there is no smoking when welding or near welding activities.

3.7 Gas Cylinders

3.7.1 Storage of Gas Cylinders

(a) Employers shall ensure the following:

- (i) all cylinders are stacked vertically, whether full or empty, and are secured against falling;
- (ii) full cylinders are kept separate from empty ones;
- (iii) all cylinders are shielded from direct sunlight, or other heat, to avoid the buildup of excess internal pressure which might lead to gas leakage or, in extreme cases, bursting of the cylinder;
- (iv) oxygen cylinders are stored at least 6 meters away from those containing acetylene or LPG, since any mixture of oxygen with one of the fuel gases, which can result from a leakage, could be highly explosive;
- (v) oxygen cylinders are not kept in the same storeroom as LPG or acetylene cylinders; and
- (vi) refer to *OSHAD-SF – CoP 1.0 – Hazardous Substances* and *OSHAD-SF – CoP 49.0 – Compressed Gases and Air*.

3.7.2 Cylinder Handling

(a) Employers shall ensure the following:

- (i) employees hands and clothing are free from grit, grease and oil when cylinders are handled to prevent them from slipping and to prevent grit from getting into the valve, or grease on to the nozzle or valve;
- (ii) nozzles are not used for handling purposes as they are not designed to take such weight or stress;
- (iii) cylinders in use are normally kept and moved in purpose built trolleys;
- (iv) if it is necessary to move cylinders which are not in a trolley, regulators and hoses are detached and a check made that valves are appropriately shut;
- (v) under no circumstances cylinders are rolled along the ground;
- (vi) if cylinders are to be lifted by crane, they are secured in a special carrier and on no account are they to be lifted with chain or wire rope slings;
- (vii) gas cylinders are treated with care and not subjected to shocks or falls;
- (viii) when they are transported in a vehicle around a site, they are secured to prevent injury in the event of any sudden vehicle movement, and when being unloaded from a vehicle, they are not dropped to the ground;
- (ix) acetylene cylinders are always transported and used in the vertical position. If they have been subjected to the horizontal position (accidentally following a fall) they shall be stood upright for 15 minutes to settle out before use; and
- (x) Refer to *OSHAD-SF – CoP 1.0 – Hazardous Substances* and *OSHAD-SF – CoP 49.0 – Compressed Gases and Air*.

3.7.3 Cylinder Attachments

- (a) Employers shall ensure the following:
- (i) regulators are always fitted to the cylinders to reduce the gas pressure from that in the cylinder to the working pressure of the blowpipe;
 - (ii) only regulators designed for the gas being used and rated for the current full cylinder pressure are fitted to the cylinders;
 - (iii) the cylinder valve is "cracked open" before the regulator is fitted to the cylinder to blow all the dust and other foreign matter clear;
 - (iv) the adjusting screw of the regulator is always released before the cylinder valve is opened, and the cylinder valve is opened gradually;
 - (v) periodic checks are made to ensure that no gas is leaking from the regulator when the pressure regulating screw is set at zero. Checks for gas leakage from any part of the equipment shall only be made with water containing detergent. Bubbles in the detergent indicate the presence of a leak;
 - (vi) hoses are:
 - 1. kept for one type of gas only, and color coded for identification - red for acetylene or other fuel gases (except LPG), orange for LPG and blue for oxygen;
 - 2. inspected daily before use to see that they are free from cuts, scratches, cracks, burnt or worn patches; and
 - 3. effectively clipped or crimped to the equipment and protected at all times from sharp edges, falling metal, passing traffic and sparks from the welding operation.
 - (vii) gas mixtures arising in use are prevented, eg. if the blowpipe nozzle becomes blocked, non-return valves (flashback arrestors) shall be fitted to each blowpipe inlet connection;
 - (viii) in situations of high risk, flashback arrestors are fitted and examples of such situations include:
 - 1. in a confined space where access is difficult or the means of escape may be endangered by fire/explosion;
 - 2. operations under hot work permit adjacent to live operating plant;
 - 3. near compressed air workings;
 - 4. when employees are under training; and
 - 5. where there is a device in the gas line with significant internal volume, eg. a welding flux container.
 - (ix) blowpipes are dismantled and cleaned at regular intervals; and
 - (x) refer to *OSHAD-SF – CoP 49.0 – Compressed Gases and Air*.

3.7.4 Inspection

- (a) Employers shall ensure the following:
- (i) visual checks are carried by users on welding and cutting equipment before use;
 - (ii) formal inspections are carried out by competent persons at regular intervals and in accordance with the manufacturers' specification and at a minimum;
 - 1. daily inspection and leak test all joints at working pressure;
 - 2. weekly inspection (if in constant use) or before every use;
 - 3. 6 monthly functional test by a competent person; and
 - 4. 5 yearly (or as recommended by the manufacturer) refurbishment or replacement. Elastomers and seals will wear and deteriorate in service and deteriorate out of service. Items stored for one year or over without use shall be inspected as per the annual maintenance inspection.
 - (iii) any welding and cutting equipment that is malfunctioning is immediately removed from service.

4. References

- *OSHAD-SF– Element 1 – ,Roles, Responsibilities and Self-Regulation*
- *OSHAD-SF – Element 2 – Risk Management*
- *OSHAD-SF – Element 7 – Monitoring, Investigation and Reporting*
- *OSHAD-SF– Element 9 – Compliance and Management Review*
- *OSHAD-SF– Mechanism 11.0– Incident Notification, Investigation and Reporting*
- *OSHAD-SF– CoP 1.0 – Hazardous Substances*
- *OSHAD-SF – CoP 2.0 – Personal Protective Equipment*
- *OSHAD-SF – CoP 21.0 – Permit to Work Systems*
- *OSHAD-SF – CoP 49.0 – Compressed Gases and Air*
- *OSHAD-SF – CoP 53.0 – OSH Management during Construction Work*

5. Document Amendment Record

| Version | Revision Date | Description of Amendment | Page/s Affected |
|---------|---------------------------|---|-----------------|
| 3.0 | 1 st July 2016 | Change of Logo | All |
| | | Change from AD EHS Center to OSHAD | throughout |
| | | Change of document title: AD EHSMS RF to OSHAD-SF | Throughout |
| | | Acknowledgements deleted | 2/3 |
| | | Preface Deleted | 4 |
| | | EHS changes to OSH | throughout |
| | | Clause 3.7.1(a)(iv) storage distance updated to 6m. | 10 |

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