SOUTHERN PORTS

ALBANY BUNBURY ESPERANCE

HOT WORK PROCEDURE - ESPERANCE

DOCUMENT CONTROL

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AUDIT

This procedure shall be reviewed / revised

- Where a Risk Assessment / Audit identifies a need to review;
- Following a significant incident involving this procedure; or
- At least every 2 years.

Important Summary Points

- Hot Work includes activities such as grinding, welding, thermal or oxygen cutting or heating, and other related heat or spark producing operations.
- A Hot Work Permit authorised by the Superintendent, Electrical or Mechanical Supervisor, or their delegate shall be obtained by the Permit Holder (the person who is supervising the works) prior to Hot Work being undertaking outside a designated Hot Work Area.
- Hot work may be performed without a Hot Work Permit in designated Hot Work Area such as workshops and emergency services facilities.
- A Hot Work Sentry must be present whenever the hot work is conducted outside a Designated Hot Work Areas.
- A Hot Work Area shall be inspected 30 minutes after the hot work has been competed to ensure that all potential heat sources have been extinguished.

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1. PURPOSE

The purpose of this procedure is to provide information and guidance as to the minimum standards for the prevention of injury or damage as a result of hot work in the workplace. It addresses the assessment of hazards, authorisation and preparation for hot work including sentry duties and the emergency response arrangements to ensure that a safe system of work is maintained.

2. SCOPE

All personnel accessing Southern Ports – Esperance (SP-Esp) and undertaking works are required to comply with this procedure.

Should a Contractors or Port User's standard exceed the requirements outlined in this SP-Esp procedure, then the Contractors or Port User's standards shall apply once a Risk Assessment (RA) has been undertaken and approved.

3. GENERAL INFORMATION

Hot work includes activities such as grinding, welding, thermal or oxygen cutting or heating, and other related heat or spark producing operations. Undertaking hot work in an area where flammable liquids, vapours or gases, combustible liquids, combustible materials, dust or fibres, or other flammable or explosive substances are present creates a significant risk of fire, explosion or production of toxic gases.

Hot Work is work which may create sufficient energy to ignite flammable solids, liquids, gases or combustible dusts.

The following are examples of Hot Work:

- Welding, soldering
- Fires or naked flames
- Non-flameproof electrical equipment requiring batteries, ramset guns, explosive items, radioactive sources, including cameras, radios, mobile phones, torches and pagers (except low energy or totally enclosed devices e.g. hearing aids, watches)
- Power cutting and drilling
- Hand tools that may create a spark
- Work on live electrical conductors and opening live electrical enclosures

All welding, grinding and allied work shall comply with AS 1674 Safety in welding and allied processes.

Hazards associated with hot work.

If effective controls are not implemented to control the hazards or to mitigate the risks associated with the Hot Work the following incidents may occur:

- Fire caused by heat, sparks, molten metal or direct contact with the flame.
- Explosion when cutting up, repairing or working in the vicinity of drums, tanks, pipes, vessels, which contain or may have contained flammable materials.
- Fire/explosion caused by a gas leak, backfire or flashback.
- Fire/burns from the misuse of oxygen.
- Burns from contact with the flame, explosions or hot metal.
- Crush or impact injuries resulting from explosion or when handling cylinders.

4. PROCEDURE

4.1. Risk Assessment.

A risk assessment shall be conducted on proposed Hot Work undertaken at SP-Esp. A Job Hazard Analysis (JHA) shall be conducted by the personnel undertaking hot work outside designated Hot Work Areas to identify the hazards present and those that the hot work may introduce into the work area, assess the risks and to identify the required controls to mitigate the hazards.

A Hot Work Permit authorised by the Superintendent, Electrical or Mechanical Supervisor, or their delegate shall be obtained by the Permit Holder (the person who is supervising the works) prior to Hot Work being undertaking outside a designated Hot Work Area.

4.2. Designated Hot Work Areas

Hot work may be performed without a Hot Work Permit in the following designated Hot Work Areas:

- Fitters workshop,
- Boilermakers workshop & eastern entrance concrete apron,
- Light Vehicle workshop,
- Electrical workshop, and
- Emergency Response Team (ERT) hot firefighting training facility.

4.3. General Requirements

In preparation for Hot Work, the work area shall be inspected and verified as free of combustibles. Consideration should be given to the combustibility of the tools and equipment to be used for the work such as ropes and fabric slings. If combustibles cannot be removed, the potential for ignition must be mitigated by:

- providing screens
- covered with a non-combustible blanket, or
- wetting down the area.

Sparks must be contained in the work site for process areas containing flammable or combustible materials. When the spark production period is long or the potential for ignition high, a suitable pressurised welding habitat should be used. It should be pressured with air from a safe source.

All drain openings within a radius of 15 m of the Hot Work location must be covered. All potential sources of flammable vapour and liquid in the area, such as vents, sample points, drains and relief valves, should be checked and made safe.

Earthing of equipment shall be provided when static discharge could result in ignition of flammable materials.

4.4. At Risk Areas

At risk areas which identified at Southern Ports Esperance which includes areas as defined by the Australian Standards 2430 “Classification of Hazardous Areas”. At risk areas include but are not limited to:

- Berth 1 Fuel
- Berth 2 Fuel
- Unleaded fuel tanks

- Diesel fuel tanks
- Spray painting booth
- Sulphur circuit
- Sulphur Shed 5
- Sulphur wastewater treatment plant

4.5. Hazard Controls

Prior to hot work commencing for at risk areas, the plant on which the hot work is being conducted may need to be prepared to mitigate the hazards associated with the work. The preparation may include but not limited to:

- depressurising
- purging
- cleaning
- draining, and
- isolation of sources of potential energy.

Isolation of sources of potential energy shall be conducted in accordance with the Isolation and Tagging Procedure – D16/695.

Depressurising

When depressurising of equipment is required, an assessment of any hazards, protection of the environment, system constraints, conflicting work, personal protection and a means of verification by two independent methods must be considered when undertaking the Job Hazard Analysis for the proposed works.

Purging

Methods of purging should avoid the formation of flammable mixtures. Wherever possible, inert gases such as nitrogen should be used, or where temperature, pressure or chemical compatibility limitations do not preclude their use, water or steam can be used to displace flammable liquids or vapours.

Purging with an inert gas introduces a secondary hazard of oxygen deficiency which must be considered for enclosed or Confined Space entry. Testing and monitoring of the atmosphere shall be conducted by a competent person for hazards identified in the Confined Space Permit or in spaces where purging has been undertaken. The gas testing shall include but not be limited to oxygen content, gases, flammable contaminants, and potentially harmful substances.

Precautions should be taken to prevent backflow or cross contamination during purging. Verification that all flammables have been purged from the equipment must be obtained.

Cleaning

Where cleaning involves entry into a confined space the entry shall be conducted under an authorised Confined Space Entry Permit.

Draining

When draining equipment, consider the protection of the environment, vessel contents, pressure and temperature, vessel internals and the verification of the effectiveness of the draining process.

4.6. Gas Testing

Gas testing should be conducted prior to undertaking hot work to determine if a hazardous atmosphere exists. Gas test shall be conducted during hot works being undertaken in, on or adjacent to potentially hazardous spaces including but not limited to:

- At Risk Areas
- A Hazardous Area or Zone
- An enclose or partially enclose space
- A space that contains residual flammable or toxic product, or
- A space that has been purged with an inert gas, vapour or liquid prior to the work commencing

The gas test equipment alarm levels table below provides guidance on the minimum conditions prior to conducting Hot Work and before entry into a Confined Space.

	LEL (CH_4)	**O_2**	**H_2S**	**CO**	**SO_2**
Safe Entry	Below 5%	20 – 23%	0-9ppm	0-29	0ppm
Low Alarm Level	5%	19.5%	10ppm	30	1ppm
High Alarm Level	10%	23.5%	15ppm	60	2ppm

Should the gas test indicate that the atmosphere exceeds the nominal fresh air calibration results the Permit Holder (competent person supervising the work) shall consult their Supervisor when developing the JHA and determining the appropriate controls to mitigate the hazards for the proposed work.

4.7. Other Work Activities

When preparing for Hot Work the Permit Holder shall determine if incompatible work is being conducted adjacent to the proposed hot work area. Incompatible work includes but is not limited to spray painting, cleaning with flammable solvents or liquids, open pits or sulphur in loading. Incompatible work shall not be conducted within 15 m, in any direction, from a proposed Hot Work area.

4.8. Hot Work Sentry

The nominated Hot Work Sentry is responsible for monitoring the safety of all personnel when the potential for a fire may be present. A Hot Work Sentry must be present whenever the hot work is conducted outside a Designated Hot Work Area. The duties of the Hot Work Sentry include:

- ensuring that the initial emergency response equipment is available and serviceable including but not limited to the appropriate fire extinguishers, process water or fire hose rolled out and water is proved
- remove combustible material, install fire blankets and conduct pre-wetting in accordance with the Hot Work Permit
- stopping the work and notifying the Permit Holder of any change in conditions or incompatible activities which may affect the work, for example but not limited to spray painting
- preventing the taking of samples, venting or opening of piping or equipment in the immediate area of the Hot Work where such action would release flammable dust, liquids or vapours
- undertake an inspection of the work area 30 minutes after the hot work has been competed to ensure all potential heat sources have been extinguished

- on completion of the work, ensuring that any firefighting equipment is returned to its original location and condition
- initiates the emergency response, when required, by notifying the Terminal Superintendent of any fire or incident on VHF radio CH 1, or other pre-planned means, and
- initiates extinguishment of the fire, if safe to do so.

Where Hot Work is being conducted in a Confined Space one standby person may assume the roles of both Hot Work Sentry and Confined Space Standby Person, if determined safe to do so in the JHA or SWI for the work.

When the duties of a Hot Work Sentry and a Confined Space Standby Person are undertaken by the same person the responsibilities shall include the requirements of the Confined Space Entry Procedure D20/415.

5. EMERGENCY RESPONSE

Appropriate firefighting equipment, such as extinguishers and fire or process water hoses must be made available at the hot work site. Fire extinguishers shall be serviceable and appropriate for the hazard. The nominated process water or firefighting hoses should be run out, pressurized and water shall be proved prior to commencing the Hot Work.

Personnel must be familiar with the procedure for initiating an emergency response. In the event of an emergency initiate local emergency response and immediately notify the Shift Terminal Superintendent who will assume the role of Incident Controller and escalate the emergency response in accordance with the SP-Esp Emergency Response Plan and Procedures.

6. GENERAL REQUIREMENTS – WELDING, CUTTING AND ALLIED PROCESSES.

6.1. Compressed Gas Cylinders

Compressed gas cylinders must be checked on arrival at SP-Esp. The storage and separation of cylinders on site is to be undertaken in accordance with the Explosives and Dangerous Goods (Dangerous Goods Handling and Storage Regulations) 1992.

All cylinders shall be secured in a suitable stable trolley in the workplace, and in compliant containment cages for storage or transport of cylinders around the site. Oxygen/acetylene and liquified petroleum gas equipment must have flashback arrestors at the hand piece and at the regulator.

6.2. Cylinder Use

All compressed gas cylinders shall be kept in an upright position and firmly secured to a trolley or, if in a fixed installation, to a wall by chains or other appropriate means.

Each gas shall be identified by its correct name, to avoid dangerous mix ups. Ensure cylinders are identified and that the correct gases are selected prior to use. The use of gas shall be only for its intended purpose, e.g. oxygen should never be used for dusting, to provide ventilation or to support breathing.

The manufacturer's "start-up" and "turn off" procedures shall always be followed particularly for LPG equipment. The start-up process shall include but not be limited to:

Cylinder valves shall be opened slowly, so that the cylinder pressure indicator on the regulator moves up slowly. It is preferable not to open cylinder valves more than ¾ of a turn. Quick opening may cause a rapid rise in temperature causing ignition.

Opening & closing of cylinder valves shall only be carried out with approved keys or wheels. Keys shall be kept on the valve spindle or close by so that the valve can be turned off in an emergency.

Cylinder valves must be fully closed off when not in use.

Protective caps shall be used to protect valve seats and outlets to ensure gas tight connections are always achieved. The protective cap shall be kept over the valve when the cylinder is not in use.

"Cracking" of cylinders by momentarily opening the valve shall be carried out in order to remove dust from the valve seat. The operator shall wear the appropriate PPE and should face away from the cylinder(s) and ensure that grease, oil, acid, salt, heat or flame does not come into contact with oxygen, which may cause a spontaneous combustion.

Damage to valves or outlets and severe denting must be reported and the cylinder shall not be used until advised by the gas supply company. If a leaking valve cannot be tightened on the spot, the cylinder shall be removed to a safe location.

Gas cylinders shall be protected from excessive heat. Notices prohibiting smoking and naked flames shall be displayed where gas cylinders are used or stored.

In the event of a fire external to a hose, fitting or hand piece, close the cylinder valves, if safe to do so. Immediately notify the Shift Terminal Superintendent and initiate an emergency response.

6.3. Cylinder Handling

All gas cylinders shall be handled with extreme care. Cylinders shall be secured for transport and storage in an upright position with their regulators removed and not in a closed compartment. Cylinders shall not be moved whilst regulators are attached unless the cylinder is correctly attached to a certified and approved trolley or cage.

During transportation cylinder valves shall not protrude above the height of the vehicle cab when transporting cylinders without protection for the neck of the cylinder and the cylinder shall never protrude outside the footprint of the vehicle.

Cylinders shall not be lifted by their valves. Trolleys and cages of approved construction (certified and displaying the SWL) shall always be used for moving cylinders or when lifting by crane / forklift.

6.4. Cylinder Storage

All compressed gas cylinders shall be kept in an upright position and firmly secured to a trolley or, if a fixed installation, to a wall by chains or other appropriate means.

There shall be segregated storage areas that comply with the relevant Legislation and Australian Standards for each type of gas. Oxygen cylinders shall be stored separately (3 metres distance) from fuel gas cylinders. Relevant HAZCHEM signs shall be provided on storage areas.

Compressed gas cylinders shall be stored upright in cradles, away from direct sunlight and away from sparks, flame and heat. Adequate ventilation shall be provided within storage areas. Storage areas shall be kept free from all combustible materials. Where practicable, cylinders should be protected from rain and excessive exposure to sunlight or heavy frosts.

Full cylinders shall be kept apart from empty cylinders. Empty cylinders should have the valves closed and be suitably identified, e.g. "MT" in chalk and returned to the "empties" store to avoid confusion.

6.5. Regulators

Damaged or suspect regulators are to be tagged Out of Service, removed from the workplace and then replaced with a serviceable assembly. Grease and oil shall be kept away from regulators. Oily rags and oily hands shall not be used to clean regulators.

6.6. Maintenance and Inspections

All regulators, hoses and flashback arrestor assemblies shall be inspected 6-weekly by a competent person. The inspection outcomes shall be recorded on a Mechanical Workshop Equipment record system.

Records of the periodic inspections and testing shall be maintained in the Maintenance Management System.

7. FLASH BACK ARRESTERS

7.1. General

Flashback arresters shall be replaced annually or type-tested by an independent, qualified, third party for compliance with AS 4603. Where the type is a fixed regulator mounted arrester which shall be subject to an inspection regime as determined by the manufacture.

The replacement flashback arrester in service date or type test date shall be affixed to the flashback arrester.

The flash back arresters should be either BOC or CIGWELD type components and shall comply with AS4839.2001 Flashback Arresters – Safety devices for use with fuel gases and oxygen or compressed air.

Each flashback arrester shall be marked with the following information:

- The number of the Australian standard i.e. AS 4603
- The direction of flow, normally an arrow
- Name of the gas
- The maximum working pressure, ’P max’ expressed in bars or kpa

Safety devices shall be colour coded as follows:

- Blue for oxygen and red for fuel gas service
- The date of manufacture and batch number, by coding, if necessary
- The model or code number relating to the manufacturer’s installation instructions
- The name or trademark of the manufacturer and or the distributor
- The country of manufacture

7.2. Connection Requirements

The design of connections shall prevent interchangeability between fuel gas and oxygen or compressed air. All regulators, hose, valve, gauge assemblies, flash back arresters and blowpipes shall have end connections which comply with AS4267 Pressure regulators for use with industrial compressed gases, AS1335 Hose and hose assemblies for welding, cutting and allied processes, and AS4839.2001 Flashback Arresters – Safety devices for use with fuel gases and oxygen or compressed air.

8. DEFINITIONS

Authorised Gas Tester	A person who is trained and competent to understand the measurement technology, record and interpret the results in an accurate, consistent and reliable manner. Note: Persons conducting pre-entry gas testing of the atmosphere in accordance with a Confined Space permit shall hold a current national unit of competency of Gas Test Atmosphere.
Confined Space	An enclosed or partially enclosed space that is not intended or designed primarily for human occupance, within which there is a risk of one or more of the following: (a) An oxygen concentration outside the safe oxygen range (b) A concentration of airborne contaminant that may cause impairment, loss of conciousness or asphyxiation (c) A concentration of flammable airborne contaminant that may cause injury from fire or explosion: (d) Engulfment in a stored free-flowing solid or a rising level of liquid that may cause suffocation or drowning. Enclosed or partially enclosed spaces that may meet the definition criteria for a Confined Space are: 1. Storage tanks, tank cars, process vessels, boilers, pressure vessels, silos and other tank like compartments; 2. Pipes, sewers, shafts, degreaser and sullage pits, ducts and similar structures; and 3. Any shipboard spaces entered through a small hatchway or entry point, cargo tanks, cargo holds, cellular double bottom tanks, duct keels, ballast and oil tanks, and void spaces.
Hazardous Atmosphere	An atmosphere which contains: • less than 19.5% oxygen or greater than 23.5% oxygen (at atmospheric pressure); and/or • dusts, vapours or gases present in toxic concentrations; and or • flammable and combustible vapours or dusts.
Hot Work Area	Designated area where Hot Work may be undertaken without a Hot Work Permit. The designated Hot Work Areas at Southern Ports – Esperance are the: • Mechanical Workshop & eastern entrance concrete apron, • Electrical Workshop, • Boilermakers and Fitters Workshop, and the • ERT Training Facility.

Hot Work Sentry	A competent person (employee or contractor) who maintains and continuous monitors an area during hazardous operations to safeguard personnel and equipment. A Hot Work Sentry shall be present during Hot Work which is conducted outside designated hot work areas
Hazardous Zone and Hazardous Area	Hazardous Areas are defined in AS 2430 Classification of Hazardous Areas, as "an area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of potential ignition sources". Hazardous Areas are divided into zones for gas, vapour and dust hazards: Hazardous Areas are divided into zones for dust hazards are: Zone 20. The explosive atmosphere is present for long periods or frequency. Zone 21. The explosive atmosphere is likely to occur in normal operation occasionally Zone 22. The explosive atmosphere is not likely to occur in normal operation but, if it does occur, will persist for a short period only Sulphur Shed – Hazardous Areas are shown on the site Hazardous Area drawing (refer drawing no. TW 1000-01-07).
Hot Work	Hot Work is work which may create sufficient energy to ignite flammable gases, solids, liquids or combustible dusts. All other work is Cold Work. Hot Work includes but is not limited to: • welding, soldering • fires or naked flames • power cutting and drilling • hand tools that may create a spark • spark ignition or non-approved combustion ignition engines in operations areas and tank compounds; and • work on live electrical conductors and opening live electrical enclosures. All welding, grinding and allied work shall comply with AS 1674 Safety in welding and allied processes.
Ignition Source	A source of energy sufficient to ignite a flammable or explosive atmosphere. Such sources include but not limited to flames, incandescent material, electrical sparks, hot surfaces and mechanical impact sparks.
LEL	Lower Explosive Limit – the concentration of a flammable contaminant in air below which the propagation of a flame does not occur on contact with an ignition source.

Permit Authoriser	The Superintendent, Electrical or Mechanical Supervisor or their delegate, authorised by Southern Ports – Esperance, to authorise Permits to Work. This person shall be familiar with the location, operations, equipment and potential hazards in the work area, as well as the work already underway in the area.
Permit Holder	The person to whom the permit is issued, usually the supervisor of the group performing the work and may be a competent employee or contractor.
Purging	The displacement of contaminants from an area, vessel or Confined Space by means of another appropriate material. For example, but not limited to steam, air and nitrogen.
Should, May	Recommended
Must, Shall, Will	Mandatory.
Radiography	The use of a radioactive isotope for inspection and testing of welds, wall thickness or ground density.
Should	Recommended, but discretionary.
Standby Person	A competent person assigned to remain on the outside of, or in close proximity to, a Confined Space, and in continuous contact with those inside, to initiate rescue procedures and operate equipment used for entry to the Confined Space, where necessary. The roles of Hot Fire Sentry and Standby Person for the same work may be filled by the same person if safe to do so.
Permit to Work (PTW) D16/990	A signed statement by an SP-Esp Supervisor and Competent Person that authorises that specific work may be performed by competent personnel under the stated conditions. This form shall be completed and authorised when engaging any contractor to conduct work at SP-Esp.

9. RELATED LEGISLATION AND DOCUMENTS

The applying legislation and documents include, but are not limited to the following:

External Documents

- Mines Safety and Inspection Act 1994 (WA)
- Mines Safety and Inspection Regulations1995 (WA)
- Occupational Safety and Health Act 1984 (WA)
- Occupational Safety and Health Regulations 1996 (WA)
- AS/NZS 1674 Safety in Welding and Allied Processes
- Code of Practice Welding Processes (Safe Work Australia)
- AS/NZS 2430 Classification of Hazardous Areas
- AS/NZS 2865:2009 Safe Work in a Confined Space
- Code of Practice Confined Spaces (Safe Work Australia)
- AS/NZS 1715 Selection, Use and Maintenance of Respiratory Protective Equipment
- AS/NZS 3190 Approval and Test Specifications – Residual Current Devices

Internal Documents:

- Permit to Work D16/990
- Hot Work Permit D16/982
- Job Hazard Analysis D16/390
- Isolation Lockout and Tagging Procedure D16/695
- Confined Space Permit – Esperance D16/654