Weld Australia

TGN-SW07

Weld Australia
Technical Guidance Note

Health and Safety in Welding: Guides and Forms

www.weldaustralia.com.au

Foreword

This Technical Guidance Note contains the pop-out guides and forms referenced within Weld Australia's Technical Note 7 *Health & safety in welding* and Technical Note 22 *Welding electrical safety*.

It is designed to be read in conjunction with these Technical Notes, and, to assist users in their application.

This edition of the Technical Guidance Note includes the July 2021 update to the *Welding electric shock injury and electrocution report form* originally published in Weld Australia's Technical Note 22 (see also Weld Australia's Technical Guidance Note TGN-SW03).

Users are encouraged to apply the guidelines and forms in their workplace where welding and related activities are utilised.

Edition

This Technical Guidance Note was first published in November 2020 and was revised in August 2021.

Future Revisions

This Technical Guidance Note will be revised from time to time and comments aimed at improving its value to industry will be welcome.

Disclaimer

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About Weld Australia

Who We Are

Weld Australia represents the welding profession in Australia. Our members are made up of individual welding professionals and companies of all sizes. Weld Australia members are involved in almost every facet of Australian industry and make a significant contribution to the nation's economy.

Our primary goal is to ensure that the Australian welding industry remains both locally and globally competitive, both now and into the future.

A not-for-profit, membership-based organisation, Weld Australia is dedicated to providing our members with a competitive advantage through access to industry, research, education, certification, government, and the wider industrial community.

Weld Australia is the Australian representative member of the International Institute of Welding (IIW).

Our Vision & Mission

Our vision is to facilitate the growth of a world class welding industry in Australia.

Our mission is to create opportunities for our members and advocate welding policies and practices which protect the Australian public.

Our Value Proposition

Weld Australia generates revenue through its commercial activities which is then reinvested back into the welding community for the benefit of members.

Weld Australia brings individual and company members together to deliver:

- A forum for the exchange of ideas and the sharing of resources
- A voice to promote the interests of the welding community and shape the market for welding services
- Specialist technical problem solving and a conduit between industry and research organisations
- A pathway for learning and career development and the opportunity to benchmark against world's best practice

Our Services

Weld Australia provides:

- Events and Seminars
- Technical Publications
- Technical Support and Advisory Services
- Project Management
- Professional Development
- Qualification and Certification

Real Solutions to Real Problems...

Weld Australia has a team of highly qualified welding engineers and technologists available to provide expert advisory services on all welding related matters. With expertise in a wide range of industries, ranging from biotechnology to heavy engineering we have a unique capability to solve your welding problems.

Our advice can help you substantially increase the operational life of your plant and equipment and thereby reduce your maintenance and repair overheads.

Further Information

For further information about Weld Australia and how we can help your business, visit: www.weldaustralia.com.au.

Introduction

The following forms and guides from Weld Australia's Technical Notes 7 and 22 have been reproduced in this Technical Guidance Note.

1. Pre-start inspection of welding equipment
2. Recommended Oxy-Fuel Gas Daily Inspection and Pre-Start Check List
3. Weld fume and the risk of cancer
4. Ultraviolet radiation and the risk of cancer
5. Guidance on the management of safety in industrial radiography
6. Welding and minimising the risk of electrocution: Industry best practice
7. Welding and minimising the risk of electrocution: Use of older power sources
8. Welding electric shock injury and electrocution report form (*revised*)
9. Job safety and environmental analysis form
10. Hot work permit form
11. Confined space entry permit form (for hot work in a confined space)

Each document is a stand-alone document and users may copy the document for use in their workplace where welding and allied processes are used.

A *Safe work method statement (SWMS)* form has not been included in this Guidance Note. When required, the use of Safe Work Australia's example form published as part of the *Safe work method statement for high risk construction work information sheet*, or a form similar to that published in Technical Note 7 (formatted for welding and related activities), is recommended.

Recommended MMAW Power Source Daily Inspection and Pre-Start Check List

Item	Description of Inspections to Be Carried Out
Power supply	Disconnect and isolate the power supply to the welding machine prior to performing these pre-start checks.
Plug & primary cable supply to the welding machine	Check the power supply cable and plug is for the rated current for the welding machine, and for any damage to plug. Special attention should be given to any cuts, burns, abrasions, and fraying or other damage to the cable insulation, which may expose live wires. Ensure the mains supply cable is located away from welding cables and connections. Ensure the cable is securely anchored onto welding machine and plug.
Power source	Inspect the welding machine for obvious damage to the cabinet, power switches, indicator lights or controls.
Welding cable connections	Ensure that welding cable connections to the welding machine are in good condition; contact surfaces are clean and are properly tightened. If terminal posts are used ensure only brass washers and the correct insulated type brass nut is used. Any unused terminal posts must have an insulated brass nut in place. Ensure that all connections are fully insulated and cables are firmly anchored to fittings. • For A.C. welding machines check that electrode and work return cables are correctly connected to the welding machine. • For D.C. welding machines check polarity and ensure electrode and work cables are correctly connected for the procedure in use and that any other D.C. welding machines in the vicinity are connected with the same polarity.
Welding cables (Electrode and work return cables)	Examine all cables (leads) for damage such as cuts or abrasions, burns, damaged insulation or frayed wires or any other damage that may expose live wires. Electrode and work return cables should be of similar length. Electrode and work return cables should be of the same current carrying capacity and rated for the maximum current rating and duty cycle of the welding activity. Building steelwork must not be used as a work return path.
Welding cable extension connections	Check that both the male and female connections are fully insulated with clean contact surfaces and all fittings are tightened properly with no conductors exposed.
Electrode holder	Check that the electrode holder is in good condition and is fully insulated. The electrode holder must be rated for the maximum current rating and duty cycle of the welding activity. Cracked or damaged electrode holders must be taken out of service immediately.
Work return clamp	Check that the work return clamp or connection is securely connected to the work return cable and the job close to the welding activity.
Engine drive welding machines	Check that all exhaust fume emissions are dispersed away from the work area and any other personnel working in the immediate vicinity. Do not use in an enclosed area or building.
Voltage reduction device (VRD)	If a voltage reduction device (VRD) is used ensure that the indicator lights or voltmeter are functioning and indicating low voltage (Safe ⟶ green) and high or welding voltage (Unsafe ⟶ green flashing or red) condition as the welding machine is operated in a normal welding cycle. *Note: This check is done with power on.*
Electrical inspection tag	Check that a current electrical inspection tag, traceable to your equipment maintenance register, is attached to the welding machine.

Notes

- If on completion of this pre-start checklist you are unsure of the safety of any part of this equipment - DO NOT USE. Isolate the equipment and notify your supervisor immediately so that remedial action can be taken.
- Residual current devices (RCD's) do not usually require daily or pre-start testing, however they should be tested by pressing the "Test" button at least every three months (the RCD is working correctly if the power goes off).
- Fumes are generated by hot work. Take adequate precautions to limit exposure to fumes from welding consumables or surface coatings and contaminants.
- Ensure that you have all necessary Personal Protective Equipment in place, in good order and dry, before turning on the welding power source.

Recommended Oxy-Fuel Gas Daily Inspection and Pre-Start Check List

Item	Description of Inspections to Be Carried Out
Gas Cylinders	Check cylinders are secured against falling over and in an upright position before making any connections. Check cylinder labelling. Check there is no mechanical damage.
Cylinder Valve	Inspect the valve for damage. If the valve appears to be damaged DO NOT OPEN. You may not be able to close it again. Do not crack cylinder valve – uncontrolled discharge of gas can be hazardous. Remove dust protection cap manually. Clean seat with a clean dry cloth prior to fitting gauges. USE NO OIL!
Regulators	Check type, rating and condition. When fitting regulators to cylinders ensure they are not contaminated with oil or grease. Face the front of the gauges and ensure the rears of the gauges are directed away from others when opening the cylinder valve. Use only oxygen compatible o–rings and thread tape.
Flash Back Arrestors	FBAs should be fitted at both the regulator and blowpipe ends of hoses and be suitable for the gas flow requirements. Check current inspection tag or sticker.
Hoses	Check correct type hoses are fitted. Oxygen – BLUE. Acetylene – RED. LPG – ORANGE. Check hoses for damage particularly at junctions to fittings where mechanical fatigue damage occurs. Maximum length of standard hoses is 15 metres. Use larger diameter hoses for increased length or high draw rate attachments e.g. heating torches. Refer to and follow recommendations of equipment manufacturers.
Blowpipe	Ensure the blowpipe is in good condition, the body is true, valves open and close fully, threads and seats are in good condition. Use only oxygen compatible o–rings and thread tape.
Tip	Check the tip condition, seats are in good condition, face is flat and clean, holes are open and free of contamination, tip is the right size and type for the job in hand. Set regulator pressures to suit tip and plate thickness. Ensure the required flow rate of acetylene tips is within the safe draw rate of the acetylene cylinder/s (1/7th/hr)
Purging and Pressurising	• Ensure blowpipe valves are closed and regulator pressure adjusting knobs are wound all the way out (anti-clockwise). • Slowly open cylinder valves (one full turn only on fuel gas). • Wind regulator adjusting knobs in until required line pressure is indicated. • Individually open the blowpipe valves and allow gas to run through the line, readjust pressure to achieve correct pressure when gas is flowing, then close the blowpipe valve before opening the other one.
Pressure Test	• With the system purged and pressurised and blowpipe valves closed, close the cylinder valves. • Observe the regulator valves for one minute. Note any anti-clockwise movement of the cylinder pressure or regulated pressure gauges. • Open the cylinder valves. Note any clockwise movement of the cylinder pressure or regulated pressure gauges. • A change in the cylinder pressure gauge or regulated pressure gauge indicates a leak. • Find and eliminate all leaks. Use a soapy water technique to find leaks.
Lighting Up	• Use approved lighting flint (not matches or cigarette lighter). • Light fuel gas with medium flow. If the flame is burning off the tip, reduce the fuel gas flow until the flame is coming off the tip. • Open oxy feed blowpipe valve to achieve the required flame.
Shutting Down	• Shut down fuel feed blowpipe valve. • Shut down oxy feed blowpipe valve. • Close cylinder valves and depressurise the hoses and blowpipe. • Wind regulator adjusting knobs all the way out (anti-clockwise).
Storage	• Store in approved storage areas only. • Keep different gas types separated and empty and full cylinders segregated. • Be aware of mandatory requirements for storing gas cylinders.
Transport	• Transport in secure upright position. • Be aware of mandatory requirements for transporting gas cylinders.
Inspection Tag	Check that a current inspection tag, traceable to your equipment maintenance register, is attached to the equipment.

Notes

- If on completion of this pre-start checklist you are unsure of the safety of any part of this equipment - DO NOT USE. Isolate the equipment and notify your supervisor immediately, in order that remedial action can be taken.
- Fumes are generated by hot work. Take adequate precautions to limit exposure to fumes from welding consumables or surface coatings and contaminants.
- Oils, greases and other organic compounds may become highly flammable or explosive in the presence of pressurised oxygen. Ensure all fittings are clean and dry before assembly. Ensure there is no opportunity for contamination of parts.
- Ensure that you have all necessary Personal Protective Equipment in place, in good order and dry, before turning on the oxy-fuel gas equipment.

Weld Fume and the Risk of Cancer

Introduction

In March 2017, the International Agency for Research on Cancer (IARC) reclassified welding fume from Group 2B *Possibly Carcinogenic to Humans* to Group 1 *Carcinogenic to Humans*.

Their assessment was subsequently published in IARC's Monograph 118 in July 2018.

The International Institute of Welding (IIW) through their Commission VIII experts, are evaluating the findings published by IARC and a position statement is being prepared.

Weld Fume

Following discussions with Commission VIII, Weld Australia advises that current fume management recommendations remain valid and recommends that the guidelines published within Technical Note 7 and Weld Australia's *Fume minimisation guidelines* be followed.

Recommendations

In compliance with National and State WHS Regulations, conduct a risk assessment to ensure that the welder and people working nearby, are protected from exposure to fume from welding and welding-related processes (including thermal cutting, gouging etc.). The following actions should be considered in the risk assessment:

1. Where practicable, remove the welder from the source of the fume by mechanising or automating the welding process.
2. In conformance with Weld Australia's *Fume minimisation guidelines*, arrange the work piece so that the welder's head is not in the plume. Note that:
   (i) Unless welding in the horizontal (PC or 2G), overhead (PD, PE, 4F, 4G) or vertical (PF, PG, 3F, 3G) position, the welder's head is likely to be positioned within the plume, and fume management methods or personal protective equipment (PPE), or a combination of both, may be required.
   (ii) Whilst all welding processes generate fume, the plume may not be visible to the welder, or with some processes, the observer.
3. Relying on a light cross-draught in the vicinity of the welder's face to ensure that the fume is either drawn or blown away from the welder's breathing zone can be unreliable. Whilst mechanically assisted ventilation (e.g. a fan) can be utilised, cross draughts sufficient to disperse fume may cause weld quality issues. Other fume management equipment such as fume extractors (e.g. fixed, downdraft or portable) may be required.
4. Utilise personal protective equipment such as respirator masks and air fed helmets if alternative methods of fume control are not reasonably practicable.

Care should be taken to ensure that other workers are not exposed to the fume by allowing it to accumulate in areas away from the welding or welding related process.

Specialist advice may also be sought from an occupational hygienist e.g. www.aioh.org.au, particularly in the preparation and implementation of the risk assessment, and the verification of the application of the controls.

Ultraviolet Radiation and the Risk of Cancer

Introduction

In March 2017, the International Agency for Research on Cancer (IARC) evaluated ultraviolet light from arc welding and classified it as *Carcinogenic to Humans* (Group 1). Their assessment was subsequently published in IARC's Monograph 118 in July 2018.

The IARC assessment of data relating to welder's exposure to ultraviolet radiation has confirmed an increased risk of skin cancers and ocular (eye) cancers. The classification of ultraviolet light from arc welding as *Carcinogenic to Humans* (Group 1) is consistent with previous evaluations of ultraviolet radiation as a human carcinogen published in Monograph 100D in 2012.

Recommendations

In addition to and in support of any control measures recommended by the Australian workplace safety regulators, Weld Australia recommends members ensure welders avoid all direct exposure to ultraviolet radiation from arc welding processes. Recommended control options include:

1. Wearing of approved protective clothing specifically designed for welding (see ISO 11611), and, covering all exposed areas of the skin with clothing that incorporates a high UPF rating (see AS/NZS 4399).
2. Use of suitable darkened eye filters (or auto darkening face shields) e.g. conforming with AS/NZS 1338.1.
3. Regular application of sunscreen with a high SPF factor (see AS/NZS 2604) in conformance with the manufacturer's instructions is recommended to reduce the adverse effects of UV on exposed skin.

Guidance on the Management of Safety in Industrial Radiography

Introduction

The person conducting a business or undertaking (PCBU) where radiography is performed, has overall responsibility for safety. The radiographer has specific responsibilities for the safe use of his equipment.

Guidance is given herein to assist the Australian welding and fabrication industry in:

a) ensuring that radiography can be conducted on site with minimum disruption to work, and

b) outlining the communications required for safe and efficient conduct of radiography.

The information given here is necessarily very general. It is strongly advised that details of the work are discussed with the radiography provider well in advance.

What is Radiography, and Why is Safety an Issue?

Radiography involves the use of a beam of radiation to create an image that shows the internal structure of an otherwise opaque object. The radiation can damage living tissue and precautions must be taken to ensure no-one is exposed to hazards by the process.

Job Organisation and Planning

The person conducting a business or undertaking must assign responsibility for the work to an individual in his or her employ who has sufficient knowledge of and authority within the worksite, and ensure the radiographer is aware of who is assigned and how he or she may be contacted while work is being performed.

The radiographer needs to know what components and what parts of each component are to be inspected by radiography, the material it is made of and its thickness, and what acceptance standard applies. In some instances, detailed discussion may be required so the radiographer has a clear idea of the intent of the inspection.

The radiographer will need to have sufficient access to both sides of the components.

Safety Precautions

An area around the work site – the 'radiation zone' – will need to be vacated of all personnel. Work should be planned for the day in such a way that this can occur with minimum disruption. The radiation zone may be several tens of metres across depending on the situation and the type and strength of the source of radiation, which can vary considerably. Signs and barriers usually need to be erected to ensure that people do not inadvertently enter the radiation zone.

Concrete blocks and other building materials offer very little shielding from the radiation, so the radiation zone extends beyond any wall, floor or ceiling that falls within it. Likewise, pressure vessels and ducts offer negligible protection to any occupant. The radiographer must be assured that any part of the radiation zone that cannot be reasonably monitored visually is not occupied while the radiation beam is active. It may be necessary for the owner to provide assistance to achieve this. Particular care must be taken if the radiation zone crosses a property alignment, and it may then be necessary to make suitable arrangements with the neighbours in advance. Where the radiation zone extends into public property it may be necessary to make arrangements with local authorities.

Each situation will be different, and in many instances, there may be a way around a particular problem. For example, the radiation beam can often be mostly directed away from a sensitive area, but this will depend on the geometry, size and mobility of the component and the nature of the inspection.

Welding and Minimising the Risk of Electrocution: Industry Best Practice

Introduction

Unless a welder can be isolated from the power source, they can be at risk of receiving an electric shock. Power for an electric shock can come from either the mains powered primary circuit including input cables, or, from contact with the secondary output circuit. Devices are available to reduce the risks of receiving a fatal electric shock up to and including isolation of the welder from the circuit.

Minimising the Risk of Electrocution from the Primary Power Circuit

All power sources should have their covers removed by a qualified electrician at least on an annual basis to remove dust and other conductive contaminants within, verify all connections and cables are in good condition, any VRD within is functioning correctly, and the power source is safe for ongoing use. Mobile welding power sources should be inspected more frequently, at least on a quarterly (3 monthly) basis.

Connection to mains power via a residual current detector or RCD (also referred to as a core-balance relay or earth-leakage device (ELD)) may reduce the consequence of electric shock in the event of a power supply fault, and are highly recommended for all welding power sources. Note that AS/NZS 3000 requires that RCDs be fitted to all single and 3 phase circuits of up to 32A capacity (higher amperage RCDs are available).

Prior to use, all welding power sources should be subjected to a pre-start safety inspection including verifying that all plugs, cables and switches are in good condition and in working order. Damaged or defective equipment must not be used.

Minimising the Risk of Electrocution from the Secondary Circuit

As the secondary voltage available at the power source outlet produces a voltage capable of inflicting a fatal electric shock, wherever possible, the welder should be isolated or insulated from direct contact with the secondary or output circuit of the welding power source. This can be achieved by:

a) The welder standing on wooden duckboards or rubber insulating mats, and or wearing rubber soled safety boots in good condition;

b) If required to kneel or lie on the workpiece, use a fibreglass or similar insulating mat to work off or lean on to avoid direct contact with the workpiece;

c) Wear clothing and gloves suitable for welding i.e. hole-free and dry. Clothing and PPE that dampens from perspiration, sweat, or water/moisture exposure must be replaced with dry clothing and dry PPE. Welders working at ambient temperatures higher than 25°C in humid conditions, especially ≥70% relative humidity or dew point ≥19°C, are particularly at risk. These humid conditions should be managed as a Category C environment (see AS 1674.2).

If MMAW, GTAW, air-carbon arc and allied processes have to be performed, the use of hazard reducing devices (HRDs) is recommended to either eliminate the open circuit voltage (OCV) or reduce the OCV to a safe level.

(i) For cool and dry (low humidity) Category A or Category B environments, the maximum OCV should be limited to 25V RMS for AC or 35V ripple free for DC output welding power sources. A VRD may be required.

(ii) For warm/hot or humid Category B or higher risk Category C environments, Weld Australia recommends that the OCV not exceed 12V DC, or alternatively, for VRDs operating at higher OCV's, use of an additional HRD is recommended i.e. an inline switch operated by the welder or a welding safety person to disconnect power to the electrode holder prior to the welder changing electrodes. This removes the handling of the "live" circuit and therefore eliminates the risk of electric shock. The use of AC power sources should be avoided.

NOTE*: Most wire feed processes such as GMAW and FCAW meet Category C requirements as there is OV DC at the welding torch until the welder activates the wire feed trigger switch.*

Where a number of welding power sources are used in close proximity, especially on the same workpiece, all AC MMAW power sources must be connected to the same phase pair and with the same phasing, and, for DC power sources, all welders must use the same polarity. Phasing and polarity faults can lead to OCVs between electrode holders being double the permitted levels and placing the welder(s) at a high risk of receiving a severe (or fatal) electric shock.

Welding and Minimising the Risk of Electrocution: Use of Old Power Sources

Introduction

Unless a welder can be isolated from the power source, they can be at risk of receiving an electric shock. Power for an electric shock can come from either the mains powered primary circuit including input cables, or, from contact with the secondary output circuit. Devices are available to reduce the risks of receiving a fatal electric shock up to and including isolation of the welder from the circuit.

Minimising the Risk of Electrocution from the Primary Power Circuit

All power sources should have their covers removed by a qualified electrician at least on an annual basis to remove dust and other conductive contaminants within, verify all connections and cables are in good condition, any VRD within is functioning correctly, and the power source is safe for ongoing use. Mobile welding power sources should be inspected more frequently, at least on a quarterly (3 monthly) basis.

Connection to mains power via a residual current detector or RCD (also referred to as a core-balance relay or earth-leakage device (ELD)) may reduce the consequence of electric shock in the event of a power supply fault, and are highly recommended for all welding power sources. Note that AS/NZS 3000 requires that RCDs be fitted to all single and 3 phase circuits of up to 32A capacity (higher amperage RCDs are available).

Prior to use, all welding power sources should be subjected to a pre-start safety inspection including verifying that all plugs, cables and switches are in good condition and in working order. Damaged or defective equipment must not be used.

Minimising the Risk of Electrocution from the Secondary Circuit

As the secondary voltage available at the power source outlet produces a voltage capable of inflicting a fatal electric shock, wherever possible, the welder should be isolated or insulated from direct contact with the secondary or output circuit of the welding power source. This can be achieved by:

a) The welder standing on wooden duckboards or rubber insulating mats, and or wearing rubber soled safety boots in good condition;

b) If required to kneel or lie on the workpiece, use a fibreglass or similar insulating mat to work off or lean on to avoid direct contact with the workpiece;

c) Wear clothing and gloves suitable for welding i.e. hole-free and dry. Clothing and PPE that dampens from perspiration, sweat, or water/moisture exposure must be replaced with dry clothing and dry PPE. Welders working at ambient temperatures higher than 25°C in humid conditions, especially ≥70% relative humidity or dew point ≥19°C, are particularly at risk. These humid conditions should be managed as a Category C environment (see AS 1674.2).

If MMAW, GTAW, air-carbon arc and allied processes have to be performed, the use of hazard reducing devices (HRDs) is recommended to either eliminate the open circuit voltage (OCV) or reduce the OCV to a safe level.

Until such times that fabricators can replace their older power sources with safer and more power efficient alternatives, there are actions open to the fabricator at minimal cost that will reduce the risk of their welders suffering an electric shock. Specifically:

1. External VRDs are available commercially and these should be fitted to older power sources where possible.
2. Where fitment of an VRD is not feasible, ensure 0 volts at the electrode holder whilst changing electrodes. This can be achieved by:
   - (i) Fitting an inline switch to the work lead to be operated by the welder or safety observer; or,
   - (ii) Using an electrode holder with a functional dead man trigger switch.

NOTES:

1. *Older power sources must never be used in a Category C environment unless compliant with AS 1674.2 Category C requirements.*
2. *Category B environments can become Category C without warning and fabricators must ensure that their welders' clothes, gloves and PPE remain dry and electrically non-conductive at all times.*
3. *Most wire feed processes such as GMAW and FCAW meet Category C requirements as there is OV DC at the welding torch until the welder activates the wire feed trigger switch.*

Where a number of welding power sources are used in close proximity, especially on the same workpiece, all AC MMAW power sources must be connected to the same phase pair and with the same phasing, and, for DC power sources, all welders must use the same polarity. Phasing and polarity faults can lead to OCVs between electrode holders being double the permitted levels and placing the welder(s) at a high risk of receiving a severe (or fatal) electric shock.

Welding Current Electric Shock Injury / Fatality Report

Section 1: Victim Information

a	**Location of Occurrence**	_____ _____ _____
b	**Date/Time of Occurrence**	_____/_____/_____ Time: _____am/pm Day Month Year
c	**Date/Time Victim Received Assistance**	_____/_____/_____ Time: _____am/pm Day Month Year
d	**Name/Company ID of Victim**	Male _____ Female _____
e	**Age/Experience of Victim** (Include victim's training, any qualifications and competencies, experience, safety inductions)	Victim's Age _____ Welding Experience and Competency _____ _____ _____ _____ _____
f	**Does the Victim have a Known or Existing Heart Condition?**	Yes _____ No _____
g	**Medical Attention or First Aid Received (Yes/No)**	First Aid _____ Deceased _____ CPR Performed _____ Defibrillator used _____ Hospital transported to _____ Tests: ECG _____ Blood test (enzymes) _____
h	**Victim's description of the incident** (Use the victim's own words)	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

Welding Current Electric Shock Injury / Fatality Report

Section 1: Victim Information (Continued)

i	**PPE Worn by Victim at Time of Incident – list:** **1. Respiratory protection – type** **2. Boots/shoes – type and condition** **3. Eye/Face protection worn** **4. Other**	
j	**Victim's Gloves** **Type and Condition** (Damaged, holes, damp, wet, dry, etc.)	Was victim wearing gloves at time of incident? Yes _____ No_____
k	**Victim's Clothing** **Type** (Fire resistant, cotton, woollen, leathers, hood, etc.) **Condition** (torn, holes, soiled, damp, wet, dry, etc.)	

Other Information

Take photographs of incident setting, condition of gloves, clothing.
Take photographs of the 3 Ps: Parts, People and Positions.

Report if Safety person/Observer present, their proximity and access to power switch, and if CPR trained. Include photographs of the welding machine & settings, cables, electrode holder, work return clamp(s) etc. (Attach all to this report.)

Welding Current Electric Shock Injury / Fatality Report

Section 2: Environmental Conditions

a	**Season** (Spring, Summer, Autumn, Winter, wet, dry, etc)	_____ _____ _____ _____
b	**Weather Forecast** Note if a significant weather change is forecast, especially a cool change. A sudden (large) increase in humidity can occur during a cool change without warning.	_____ _____ _____ _____
c	**Ambient Temperature at Time of Incident** In confined space or work area, or if preheat is in use, measure at work location as it will be considerably above normal ambient.	_____ °C
d	**Weld Preheat and Interpass Temperatures**	Pre-heat in use Yes _____ No _____ Pre-heat temperature specified _____ Interpass temperature specified _____
e	**Work Area** (Australia: see AS 1674.2)	CAT. A _____ (Low risk of contact with the workpiece or circuit) CAT. B _____ (Some risk of contact with the workpiece or circuit, dry work area, low humidity, ambient temperature <32°C, clean & dry clothing/PPE) CAT. C _____ (High risk of contact with the workpiece or circuit, hot or high humidity, wet or damp, low body impedance due to sweat, moisture etc.) Environment with increased risk of electric shock _____ Other (describe work area): _____ _____ _____ _____
f	**Insulating Material between the Welder and Welding Circuit**	_____ (Example: Wooden boards, insulating blanket, mats, etc) Wet _____ Dry _____
g	**Humidity Level** (Measured, or from daily weather report) Note: if outdoors and raining at time of incident indicate humidity at 100%	Rain _____ Mist _____ Fog _____ Snow _____ Sleet _____ Dry _____ Humidity level measured _____ (at time of incident) Humidity level weather report _____

Welding Current Electric Shock Injury / Fatality Report

Section 2: Environmental Conditions (Continued)

h **Water/Saline/Other Substance Welder was Working in or Near**

In facilities where solutions are produced/used, state type and percentage of solution, e.g. potash mills may use a saline solution during process. Other processes may use various solutions – this is important to establish effective body resistance. Use section below to describe.

Welding Current Electric Shock Injury / Fatality Report

Section 3: Injury / Fatality Information

a

Injury ☐ **or**

Fatality ☐

(Describe contact points, include skin colouration, blistering etc.)

Electrode/electrode holder: _____
(Also mark on drawing)

Return lead/work piece contact: _____
(Also mark on drawing)

Workpiece/workbench/machinery/structure: _____

b

Other Injuries
For example, skin burns, eye burn, bone break from fall etc.

_____
_____
_____
_____

c

Contact Area and Current Path Through Body
Describe and mark on drawing (g) below. Indicate if large or small contact area e.g. full palm of hand v/s fingers.

_____
_____
_____
_____

d

Estimated Body Resistance
Consult expert for assistance.

_____
_____
_____
_____

e

Current Flow Duration
Actual duration if known. For example, long contact duration >0.2 sec, short contact duration etc.

_____
_____
_____
_____

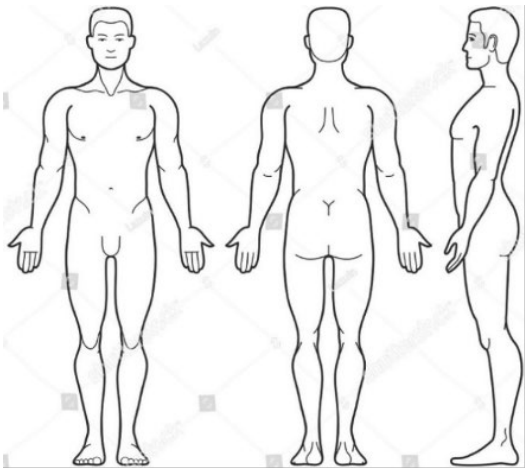
f

Estimated Current Flow Through Body
Consult expert for assistance.
See next page for calculation information.

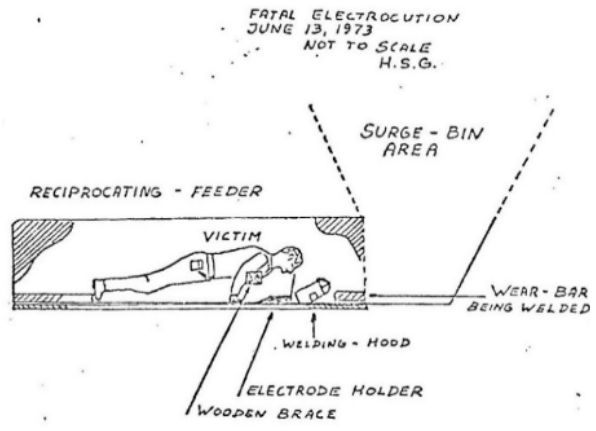
_____
_____
_____
_____

g

Body Contact Drawing



Indicate standing seated lying – draw in contact areas, if prone draw a line indicating front/back contact surface of body with base metal or earth (see reverse).



Example drawing (picture) if water flowing or damp clothing/PPE or wet contaminated surfaces, show that information and describe. Print and attach pictures to report. If possible, have person simulate position of victim, ensuring safety first. See example above.

Welding Current Electric Shock Injury / Fatality Report

Section 3: Injury / Fatality Information (Continued)

Estimated Current Flow Through Body Calculation (see IEC 60479-1)

Take into account sweating, reduced clothing impedance due to moisture, the current path through the body and contact surface area, and, the following:

1. Use 5% of the population values for estimation of impedance.
2. Skin impedance values may not apply if contact with the electrode/workpiece was via a puncture wound or mouth.
3. Clothing impedance values will be very low if:
   a. Welders gloves or clothing is damp; or,
   b. Welder is kneeling, sitting or lying on the workpiece.
4. Clause 5.8 of IEC 60479 1:2018 provides an estimate of current density based on contact point skin colourisation changes.
   NOTE*: With large contact areas, current densities may be low enough not to cause any alterations of the skin in spite of fatal current magnitudes.*
5. Typical total impedances for welder's damp with sweat or moisture, especially when kneeling, sitting or lying on the workpiece are known to vary from <300 ohms to 650 ohms. This may vary with the power source's open circuit voltage and polarity.
6. For general calculation purposes, a value of 500 Ohms is often used in the absence of specific data required to estimate current flow.
7. If the HRD/VRD had not activated at the time of the incident, use the open circuit voltage (OCV) of the power source for the calculations.

Example Calculation:
A welder using the MMAW process, was fatally electrocuted whilst welding was being performed on a raised perforated metal floor. The awkwardness of the job meant that the welder had to be either kneeling with his face close to the floor or lying on his back to afford any view of the job. The electrode had to be bent so it could properly access the parts to be welded. An insulating mat was not used. The welder's gloves and clothing was dirty and soaked with sweat. The welding power source was a portable AC transformer type with an open-circuit voltage of 49 Volts AC. The welding equipment was found to be in good order. From the position adopted it is probable that electrical contact points were either hand and back or face and back.

The investigation determined that 3 days after the incident, there was the equivalent of 10% moisture by weight remnant in the clothing and that the AC impedance of the clothing at the time of test to have been around 350 Ohms. From IEC 60479 1 the total body impedance (hand to hand) at 50VAC is assumed to be 1450 Ohms for the worst case 5% of the population, and 4375 Ohms for the best-case 5% of the population. The deceased was sweating heavily, and this could lower total body impedance by up to 50%.

Assuming that the reduced value of impedance was 1500 Ohms and an impedance face to back was in the order of 20% of the hand to foot impedance, the total body impedance is estimated to be 300 Ohms (20% of 1500). The total impedance of body and clothing is therefore estimated to be 650 Ohms. The resulting current at 50V AC is 77 mA. This is well above the average let-go threshold of 10mA for AC. If the heart-current factor F is taken to be 0.7 – the value for current flow from left hand to back. This results in an equivalent current of 54 mA for the path left hand to both feet. With reference to IEC 60479-1 and assuming a contact time of 1.0 second, under these conditions there is a probability of ventricular fibrillation for around 5% of the population. If the deceased was a member of this percentile band, then a fatal situation can certainly be shown to exist using the known information.

If the moisture content of the clothing at the time of the incident was 15% then the clothing impedance drops to 100 Ohms. If the welder was sweating heavily and had low body impedance, then total body impedance (hand to hand) could be of the order of 800 Ohms, resulting in a face to back impedance of 160 Ohms. The total impedance of body and clothing would then be 260 Ohms; the resultant current 192 mA, equivalent to a left hand to both feet current of 135 mA. From IEC 60479-1; with a contact time of 1 second this implies a probability of ventricular fibrillation for almost 50% of the population.

Welding Current Electric Shock Injury / Fatality Report

Section 4: Welding Machine (Power Source) Data

a	**Make of Welding Machine**	
b	**Model, Name, Type and Designation of Welding Machine** Include welding process details e.g. MMAW, GMAW (MIG), FCAW, GTAW (TIG), Air-carbon arc etc. If DC machine, indicated if "inverter" or "transformer-rectifier" type.	
c	**Nameplate No Load / OCV Voltage(s) AC/DC** Record actual set voltage and type indicted (report "RMS" if AC).	
d	**Settings at Time of Incident** Record all voltage, current, frequency settings – take photo for history. If GTAW (TIG) being used, indicate the start method e.g. scratch, lift, high frequency (HF), etc.	
e	**Actual measured output voltage (OCV/no load) at incident setting and type of voltage AC/DC** Actual duration if known. For example, long contact duration >0.2 sec, short contact duration, etc.	As nameplate and measured output voltage can differ: 1. Record the measured voltage and polarity at the settings at time of incident. 2. If DC, record and verify the voltage output waveform using an oscilloscope or similar (minimum 15kHz capability). 3. Record details of the equipment used to make the measurement.
f	**Voltage Reducing Device and/or Hazard Reducing Device** Consult expert for assistance. See next page for calculation information. Note: VRD may be add–on device, or integral to machine, if integral, option must be selected to "On" position via internal machine settings. Consult operating manual to verify.	HRD/VRD installed Yes _____ No _____ HRD/VRD installed and in use Yes _____ No _____ HRD/VRD functionality verified after event Yes _____ No _____ Type/Make/Model _____ HRD/VRD response time _____
g	**Circuit Contact** Was contact made whilst VRD was active, while welding or VRD disengaged?	Yes _____ No _____

Other Information
e.g. describe the condition of the electrode holder, work return clamp(s) and cables.

Intentionally left blank for your use.

Job Safety & Environmental Analysis Form

Company _____ Date _____

Job Details _____

Location _____

Participants _____

Job Steps	Hazards	Raw Risk	Control Measures	Control Risk	Who/When

Authorised By _____ Participants Signatures _____ _____

Date _____ _____ _____

Hot-Work Permit

If you answer No to any of the following questions and can't address the issue yourself, you must stop and seek advice from your Supervisor.

This Hot Work Permit is required for any welding, thermal or oxy cutting, friction cutting, heating and other fire or spark producing operation in any area not designated as a Hot Work Area.

1. Specific location of the hot work		
2. Hot work covered by the permit		
3. Equipment to be used *(e.g. oxy-acetylene cutting equipment, arc-welding equipment, grinders). Ensure equipment is well maintained.*		
4. Is a Safe Work Procedure (SWP) and/or Pre-job Risk Assessment available and has it been communicated to the work party? *The Responsible Officer (R.O.) shall ensure that risk assessment has been carried out and communicated to the work party.*	☐ Yes	☐ No
5. Have hot-work hazards been identified and controls put in place to eliminate the risks associated with the hazards? *The R.O. shall ensure that appropriate controls have been put in place to eliminate the risks associated with the hazards.*	☐ Yes	☐ No
6. Fire fighting equipment – to be laid out at the worksite *(List the type, size, quantity and location of firefighting equipment allocated to the site as a result of risk assessment).*		
7. Is the equipment approved for use at the site for the work you are doing?	☐ Yes	☐ No
8. Are flashback arrestors fitted to both ends of the hoses on oxy-fuel gas equipment?	☐ Yes	☐ No
9. Arc Welding Is there a HRD fitted to welding power sources that have an open circuit voltage exceeding extra low voltage?	☐ Yes	☐ No
a. Have the ambient temperature and humidity been measured at the work place?	☐ Yes	☐ No
b. Changes in ambient temperature and humidity whilst arc welding are monitored? *Temperature and humidity changes must be monitored throughout the hot work.* NOTE: Ambient temperatures >25°C and/or humidity ≥ 70% can cause a rapid build up of sweat in the welder's clothing, gloves and PPE.	☐ Yes	☐ No
c. Is it raining or is rain predicted? *If rain is likely, welding must cease unless the welder remains dry and protected.*	☐ Yes	☐ No

Hot-Work Permit (Continued)		
d. Are processes in place to ensure the welder's clothing, gloves and PPE remains dry and in good condition? *Clothing, gloves and PPE that dampens or is damaged must be replaced.*	☐ Yes	☐ No
e. Has the welding environment been assessed? *See AS1674.2. Welding environment category (A, B or C) must assessed and monitored – the conditions may change to Category C without warning.*	☐ Yes	☐ No
f. Is the welder insulated from the workpiece? *The welder shall be insulated from the workpiece using dry, non-flammable insulated mats to prevent contact with the workpiece whilst welding.*	☐ Yes	☐ No
10. Is the required PPE for the hot work available and in good order?	☐ Yes	☐ No
11. How long will the area be monitored by the firewatcher after the hot work is completed? *This will depend on the nature of the work, combustible materials, and other matters identified in the risk assessment.*	_____ Hours	
12. Are SDS Sheets available for the welding equipment and materials being worked on, and possible products of the hot-work process?	☐ Yes	☐ No
13. In the event of an emergency, is the procedure available and understood?	☐ Yes	☐ No
14. Competent Personnel *Competent personnel only shall be used for hot work*		
a. Is a firewatcher required? *Firewatchers shall be stationed in the area near the hot work and shall follow the procedure specified in AS 1674.1 Clause 3.6*	☐ Yes	☐ No
b. If required, has a firewatcher been organised?	☐ Yes	☐ No
c. Is the work party trained in the correct and safe use of the hot-work equipment?	☐ Yes	☐ No
d. Is the work party trained in the use of the fire protection equipment?	☐ Yes	☐ No
e. Will the hot work affect a designated confined space?	☐ Yes	☐ No
f. Are confined space trained personnel required? *If Yes: Use Confined Space Permit*	☐ Yes	☐ No
15. ISOLATION AND PREPARATION OF THE WORK AREA Determine whether the following items have been isolated, removed, or checks made: NOTE: All questions are to be answered and initialled by the issuing responsible officer. 'N/A' means 'not applicable'.		
a. Have drains, pits and depressions been checked, isolated and sealed?	☐ Yes	☐ No
b. Have combustible materials been removed from the work area or made safe? *All combustible materials should be removed from within* **15 m** *(around, above and below) of the hot work.*	☐ Yes	☐ No
c. Where it is not possible to remove combustible materials, has the area been controlled? Has the area been cleaned?	☐ Yes	☐ No
d. Have tanks, valves, vents and pipelines been blanked off or effectively isolated?	☐ Yes	☐ No
e. Is ventilation adequate? *Consider the possibility of changing conditions and ensure that airflow is adequate*	☐ Yes	☐ No

Hot-Work Permit (Continued)		
f. Are spark and flash screens in place?	☐ Yes	☐ No
g. Have leaks from valve and pump glands, flanges and the like been controlled?	☐ Yes	☐ No
h. Have pressure relief valves been vented to safe areas?	☐ Yes	☐ No
i. Has contaminated ground been covered?	☐ Yes	☐ No
j. Is the fire equipment adequate, checked and laid out ready for use?	☐ Yes	☐ No
k. Is the fire protection equipment within range (10m) of the proposed work	☐ Yes	☐ No
l. Is the fire pump or fire brigade on standby?	☐ Yes	☐ No
m. Is the wind direction satisfactory for hot work to be done?	☐ Yes	☐ No
n. Has product movement been stopped in the area of hot work?	☐ Yes	☐ No
o. Has the site of the hot work been isolated and roped off?	☐ Yes	☐ No
p. Have all mechanical/electrical/hydraulic energies been isolated and tagged?	☐ Yes	☐ No
q. Have all unnecessary power cables and gas hoses been removed from the immediate work area?	☐ Yes	☐ No
r. Do Automatic Fire Systems need to be isolated? *The R.O. must be notified if the system is to be isolated.*	☐ Yes	☐ No
16. ATMOSPHERE Atmospheric testing may be required at the work site and to monitor atmospheres within closed spaces affected by hot work		
a. Is atmospheric testing required?	☐ Yes	☐ No
b. Is continual monitoring required?	☐ Yes	☐ No
c. Equipment make and model *(Ensure the test equipment is capable of determining the gases that may be present)*		
d. Serial No.		
e. Date of last equipment check *(Gas testing equipment should be challenge tested on calibrated gas mixtures on a regular basis)*		
f. Time of test (*If continual monitoring is required a separate table should be used to record results of tests)*		
g. Results of tests *(If continual monitoring is required a separate table should be used to record results of tests)*		
h. Percentage of L.E.L. (*Ensure the concentration of any flammable gas and flammable vapour is less than 5% of its lower explosive limit (L.E.L.))*		

Hot-Work Permit (Continued)

i. Is hot-work safe to proceed?	☐ Yes	☐ No

17. SPECIFIC CONDITIONS AND PRECAUTIONS

a. The following conditions and precautions were observed

b. This permit is valid from _____ am/pm on ___/___/___ to _____ am/pm on ___/___/___

c. Name of contractor performing the work

d. Order or contract no.

e. Name and signature of firewatcher (where required):

_____ (Print Name) _____ (Signature)

f. Permit received by:
I have read and understood this permit and agree to carry out the work observing all the conditions of this permit.

_____ (Print Name) _____ (Signature)

g. Person in charge of location
I have read and understood this permit and agree to carry out the work observing all the conditions of this permit.

_____ (Print Name) _____ (Signature)

h. Responsible Officer (R.O.)
The work area described above is, in my opinion, in a safe condition for the work described to be done, provided the precautions listed are fully observed

_____ (Print Name) _____ (Signature)

i. Return permit:
I accept the work as defined in section 2 and 3 of this permit has been completed and I cancel this permit
This permit was cancelled by:

_____ (Print Name) _____ (Signature)

This permit was returned to: At: am/pm on ___/___/___

_____ (Print Name) _____ (Signature)

The worksite has been inspected by me at the expiry/cancellation of this hot-work permit and declared safe for normal operations to resume.

_____ (Print Name) _____ (Signature)

THIS HOT-WORK PERMIT SHOULD BE PROMINENTLY DISPLAYED ON THE WORKSITE

Confined Space Entry Permit

If you answer No to any of the following questions and can't address the issue yourself, you must stop and seek advice from your Supervisor.

A Confined Space Entry Permit is required for entry into a confined space as defined in WHS regulations and AS 2865. This permit may be used for hot work in confined spaces for any welding, thermal or oxy cutting, friction cutting, heating and other fire or spark producing operations in a confined space not designated as a Hot Work Area.

1. Specific location of the hot work		
2. Hot work covered by the permit		
3. Equipment to be used *(e.g. oxy-acetylene cutting equipment, arc-welding equipment, grinders). Ensure equipment is well maintained.*		
4. Is a Safe Work Procedure (SWP) and/or Pre-job Risk Assessment available and has it been communicated to the work party? *The Responsible Officer (R.O.) shall ensure that risk assessment has been carried out and communicated to the work party.*	☐ Yes	☐ No
5. Have hot-work hazards been identified and controls put in place to eliminate the risks associated with the hazards? *The R.O. shall ensure that appropriate controls have been put in place to eliminate the risks associated with the hazards.*	☐ Yes	☐ No
6. Fire fighting equipment – to be laid out at the worksite *(List the type, size, quantity and location of firefighting equipment allocated to the site as a result of risk assessment).*		
7. Is the equipment approved for use at the site for the work you are doing?	☐ Yes	☐ No
8. Are flashback arrestors fitted to both ends of the hoses on oxy-fuel gas equipment?	☐ Yes	☐ No
9. Arc Welding Is there a HRD/VRD fitted to welding power sources that have an open circuit voltage exceeding extra low voltage?	☐ Yes	☐ No
a. Have the ambient temperature and humidity been measured at the work place?	☐ Yes	☐ No
b. Changes in ambient temperature and humidity whilst arc welding are monitored? *Temperature and humidity changes must be monitored throughout the hot work.* NOTE: Ambient temperatures >25°C and/or humidity ≥ 70% can cause a rapid build up of sweat in the welder's clothing, gloves and PPE.	☐ Yes	☐ No
c. Is it raining or is rain predicted? *If rain is likely, welding must cease unless the welder remains dry and protected.*	☐ Yes	☐ No
d. Are processes in place to ensure the welder's clothing, gloves and PPE remains dry and in good condition? *Clothing, gloves and PPE that dampens or is damaged must be replaced.*	☐ Yes	☐ No

Confined Space Entry Permit (Continued)		
e. Has the welding environment been assessed? *See AS1674.2. Welding environment category shall be deemed Category C unless proved otherwise.*	☐ Yes	☐ No
f. Is the welder insulated from the workpiece? *The welder shall be insulated from the workpiece using dry, non-flammable insulated mats to prevent contact with the workpiece whilst welding.*	☐ Yes	☐ No
10. Is the required PPE for the hot work in a confined space available and in good order? *Also consider the need for respiratory protection, personal atmospheric monitoring equipment etc.*	☐ Yes	☐ No
11. How long will the area be monitored by the firewatcher after the hot work is completed? *This will depend on the nature of the work, combustible materials, and other matters identified in the risk assessment.*	_____ Hours	
12. Are SDS Sheets available for the welding consumables, cleaners, antispatter etc and materials being worked on, and possible products of the hot-work process?	☐ Yes	☐ No
13. In the event of an emergency, is the procedure available and understood?	☐ Yes	☐ No
14. Competent Personnel *Competent personnel only shall be used for hot work in a confined space*		
a. Is a firewatcher required? *Firewatchers shall be stationed in the area near the hot work and shall follow the procedure specified in AS 1674.1 Clause 3.6*	☐ Yes	☐ No
b. If required, has a firewatcher been organised?	☐ Yes	☐ No
c. Is the work party trained in the correct and safe use of the hot-work equipment?	☐ Yes	☐ No
d. Is the work party trained in the use of the fire protection equipment?	☐ Yes	☐ No
e. Will the hot work affect a designated confined space?	☐ Yes	☐ No
f. Is the work party trained in the correct and safe confined space procedures?	☐ Yes	☐ No
g. Has a trained observer/stand-by person been organised? *Refer to WHS Regulations, AS 1674.2 and AS 2865*	☐ Yes	☐ No
15. ISOLATION AND PREPARATION OF THE WORK AREA Determine whether the following items have been isolated, removed, or checks made: NOTE: All questions are to be answered and initialled by the issuing responsible officer. 'N/A' means 'not applicable'.		
a. Have drains, pits and depressions been checked, isolated and sealed?	☐ Yes	☐ No
b. Have combustible materials been removed from the work area or made safe? *All combustible materials should be removed from within* **15 m** *(around, above and below) of the hot work.*	☐ Yes	☐ No
c. Where it is not possible to remove combustible materials, has the area been controlled? Has the area been cleaned?	☐ Yes	☐ No
d. Have tanks, valves, vents and pipelines been blanked off or effectively isolated?	☐ Yes	☐ No
e. Is ventilation in use and adequate? *Consider the possibility of changing conditions and ensure that airflow is adequate*	☐ Yes	☐ No

Confined Space Entry Permit (Continued)		
f. Are spark and flash screens in place?	☐ Yes	☐ No
g. Have leaks from valve and pump glands, flanges and the like been controlled?	☐ Yes	☐ No
h. Have pressure relief valves been vented to safe areas?	☐ Yes	☐ No
i. Has contaminated ground been covered?	☐ Yes	☐ No
j. Is the fire equipment adequate, checked and laid out ready for use?	☐ Yes	☐ No
k. Is the fire protection equipment within range (10m) of the proposed work	☐ Yes	☐ No
l. Is the fire pump or fire brigade on standby?	☐ Yes	☐ No
m. Is the wind direction satisfactory for hot work to be done?	☐ Yes	☐ No
n. Has product movement been stopped in the area of hot work?	☐ Yes	☐ No
o. Has the site of the hot work been isolated and roped off?	☐ Yes	☐ No
p. Have all mechanical/electrical/hydraulic energies been isolated and tagged?	☐ Yes	☐ No
q. Have all unnecessary power cables and gas hoses been removed from the immediate work area?	☐ Yes	☐ No
r. Do Automatic Fire Systems need to be isolated? *The R.O. must be notified if the system is to be isolated.*	☐ Yes	☐ No
16. ATMOSPHERE Atmospheric testing may be required at the work site and to monitor atmospheres within closed spaces affected by hot work		
a. Is atmospheric testing required?	☐ Yes	☐ No
b. Is continual monitoring required?	☐ Yes	☐ No
c. Equipment make and model *(Ensure the test equipment is capable of determining the gases that may be present)*		
d. Serial No.		
e. Date of last equipment check *(Gas testing equipment should be challenge tested on calibrated gas mixtures on a regular basis)*		
f. Time of test (*If continual monitoring is required a separate table should be used to record results of tests)*		
g. Results of tests *(If continual monitoring is required a separate table should be used to record results of tests)* Oxygen _____% Other gases _____ (less than_____) Other gases _____ (less than_____) Other gases _____ (less than_____) Other airborne contaminants_____		
h. Percentage of L.E.L. (*Ensure the concentration of any flammable gas and flammable vapour is less than 5% of its lower explosive limit (L.E.L.))*		

Confined Space Entry Permit (Continued)

j. Is hot-work safe to proceed in the confined space?	☐ Yes	☐ No
i. Is hot-work safe to proceed?	☐ Yes	☐ No

17. SPECIFIC CONDITIONS AND PRECAUTIONS

a. Conditions for entry are as follows (specify requirements, if needed):

With supplied air respirator?	☐ Yes	☐ No
Without supplied air respirator?	☐ Yes	☐ No

b. The following conditions and precautions were observed and in use. *(Consider the need for fume control, intrinsically safe equipment, communication equipment etc.)*

c. Emergency response procedures in place?	☐ Yes	☐ No
d. Emergency equipment available?	☐ Yes	☐ No

e. This permit is valid from _____ am/pm on ___/___/___ to _____ am/pm on ___/___/___

f. Name of contractor performing the work

g. Order or contract no.

h. Name and signature of firewatcher (where required):

_____ (Print Name) _____ (Signature)

i. Name and signature of observer/stand-by person (where required):

_____ (Print Name) _____ (Signature)

j. Permit received by:
I have been advised of and understand the risk control measures and precautions to be observed with the entry and tasks in the confined space, and, agree to carry out the work observing all the conditions of this permit.

Entry			Exit		
Name	**Date**	**Time**	**Name**	**Date**	**Time**

Confined Space Entry Permit (Continued)

k. Person in charge of location

I have read and understood this permit and agree to carry out the work observing all the conditions of this permit.

_____ _____

(Print Name) (Signature)

l. Responsible Officer (R.O.)

The risk control measures and precautions appropriate for the safe entry and execution of the tasks in the confined space have been implemented and the persons required to enter the confined space have been advised of and understand the requirements of this written authority. The work area described above is, in my opinion, in a safe condition for the work described to be done, provided the precautions listed are fully observed.

_____ _____

(Print Name) (Signature)

m. Return permit:

I accept the work as defined in section 2 and 3 of this permit has been completed and I cancel this permit

This permit was cancelled by:

_____ _____

(Print Name) (Signature)

This permit was returned to: At: am/pm on ___/___/___

_____ _____

(Print Name) (Signature)

The worksite has been inspected by me at the expiry/cancellation of this confined space permit and declare that:

(i) All personnel and equipment has been accounted for; and,

(ii) All equipment has been checked and restored correctly; and,

(iii) It is safe for normal operations to resume.

_____ _____

(Print Name) (Signature)

THIS CONFINED SPACE PERMIT SHOULD BE PROMINENTLY DISPLAYED ON THE WORKSITE

Weld Australia Technical Notes

TN 1 - The Weldability of Steels

Gives guidance on the preheat and heat input conditions (run size, current, voltage) required for acceptable welds and to avoid cold cracking in a wide variety of steels. The Note is applicable to a wide range of welding processes.

TN 2 - Successful Welding of Aluminium

This note covers the major welding processes as they are used for the welding and repair of aluminium and its alloys. Information is given on the processes, equipment, consumables and techniques. It also provides information on the range of alloys available and briefly covers safety, quality assurance, inspection and testing, costing and alternative joining processes.

TN 3 - Care and Conditioning of Arc Welding Consumables

Gives the basis and details for the correct care, storage and conditioning of welding consumables to control hydrogen and to ensure high quality welding.

TN 4 - The Industry Guide to Hardfacing for the Control of Wear

Describes wear mechanisms and gives guidance on the selection of hardfacing consumables and processes for a wide range of applications. Includes Australian Hardfacing Suppliers Compendium 1998.

TN 5 - Flame Cutting of Steels

Gives a wealth of practical guidance on flame cutting including detailed procedures for efficient cutting, selection of equipment and gases, practices for identifying and curing defective cutting, methods of maximising economy and other important guidance on the use of steels with flame cut surfaces.

TN 6 - Control of Lamellar Tearing

Describes the features and mechanisms of this important mode of failure and the means of controlling tearing through suitable design, material selection, fabrication and inspection. Acceptance standards, repair methods, specification requirements and methods of investigation are proposed. Appendices give details on the mechanism, tests for susceptibility and the important question of restraint.

TN 7 - Health and Safety in Welding

Provides information on all aspects of health and safety in welding and cutting. Designed to provide this information in such a way that it is readily useable for instruction in the shop and to provide guidance to management. Recommendations are given for safe procedures to be adopted in a wide variety of situations in welding fabrication.

TN 8 - Economic Design of Weldments

Principles and guidance are given on methods and procedures for optimising design of weldments and welded joints and connections to maximise economy in welding fabrication. Factors influencing the overall cost of weldments which need to be considered at the design stage are discussed.

TN 9 - Welding Rate in Arc Welding Processes: Part 1 MMAW

Gives practical guidance and information on the selection of welding conditions to improve productivity during manual metal arc welding (MMAW). Graphs are provided showing rates as a function of weld size. The graphs enable a direct comparison of different types of welding electrodes when used for butt and fillet welds in various welding positions.

TN 10 - Fracture Mechanics

Provides theory and gives practical guidance for the design and fabrication of structures, planning of maintenance and assessment of the likelihood of brittle or ductile initiation from flaws in ferrous and non-ferrous alloys. Engineering critical assessment case histories are discussed.

TN 11 - Commentary on the Structural Steel Welding Standard AS/NZS 1554

The Note complements AS/NZS 1554 parts 1 to 7, by presenting background information which could not be

included in the Standard. It discusses the requirements of the Standard with particular emphasis on new or revised clauses. In explaining the application of the Standard to welding in steel construction, the commentary emphasises the need to rely on the provisions of the Standard to achieve satisfactory weld quality.

TN 12 - Minimising Corrosion in Welded Steel Structures

Designed to provide practical guidance and information on corrosion problems associated with the welding of steel structures, together with possible solutions for minimising corrosion.

TN 13 - Stainless Steels for Corrosive Environments (A Joint publication with ACA)

Provides guidance on the selection of stainless steels for different environments. Austenitic, ferritic and martensitic stainless steels are described together with the various types of corrosive attack. Aspects of welding procedure, design, cleaning and maintenance to minimise corrosion are covered.

TN 15 - Welding and Fabrication of Quenched and Tempered Steel

Provides information on quenched and tempered steels generally available in Australia and gives guidance on welding processes, consumables and procedures and on the properties and performance of welded joints. Information is also provided on other fabrication operations such as flame cutting, plasma cutting, shearing and forming.

TN 16 - Welding Stainless Steel

This Technical Note complements Technical Note Number 13 by detailing valuable information on the welding of most types of stainless steels commonly used in industry.

TN 18 - Welding of Castings

Provides basic information on welding procedures for the welding processes used to weld and repair ferrous and non-ferrous castings. It also provides information on the range of alloys available and briefly covers non-destructive inspection, on-site heating methods and safety.

TN 19 - Management of Weld Quality—A Guide to AS/NZS ISO 3834

Provides information on the application of AS/NZS ISO 3834 and its parts to the manufacture of welded structures, supplementing the requirements of both quality management standards and application standards where required, on elements of the welded fabrication process requiring control to ensure a quality product.

TN 20 - Repair of Steel Pipelines

Provides an outline of methods of assessment and repair to a pipeline whilst allowing continuity of supply.

TN 21 - Submerged Arc Welding

Provides an introduction to submerged arc welding equipment, process variables, consumables, procedures and techniques, characteristic weld defects, applications and limitations. Describes exercises to explore the range of procedures and techniques with the use of solid wire (single and multiple arcs) and provides welding practice sheets, which may be used as instruction sheets to supplement demonstrations and class work, or as self-instruction units.

TN 22 - Welding Electrical Safety

Provides information and guidance on welding electrical safety issues (welding equipment, the human body and the workplace), including investigation of welding current related electric shock injuries and electrocution.

TN 23 - Environmental Improvement Guidelines

Provides information and guidance on how to reduce consumption in the Welding and Fabrication industry, while reducing the impact on the environment at the same time.

TN 25 – Welding Specification for the Water Industry

Published with the Water Services Association of Australia. Applies to all metal fabrication and repair work involving welding, carried out by a Water Agency (WA) and its Contractors/Subcontractors. Prescribes weld preparation, qualification of welding procedures and personnel, workmanship and inspection requirements for welds related to the arc welding by manual metal arc and other processes approved by the WA responsible Welding Coordinator.

Notes

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