



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Information Sheet 2

Electrical Engineering Safety – Basic Welding Practices

***Mine Health and Safety Act 2004
Mine Health and Safety Regulation 2007
Occupational Health and Safety Regulation 2001***

Information Sheets are developed by the Inspectors of Electrical Engineering in response to issues identified during site electrical engineering audits at extractive mines and questions raised by the mine operators. They are provided as guidance material for mine operators in the development of electrical safety standards.

Original issue 13/05/2009

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INFO SHEET 2 BASIC WELDING PRACTICES.DOC



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CLASSIFICATION OF WELDING AREA (Environment)

Category A environment is an environment where-

- a) The risk of an electric shock or electrocution by arc welding is low;
- b) Normal work practice is used; and
- c) It is not possible for a welder or any other worker to be in contact with the work piece, in the event of being in contact with a live part of the welding circuit.

These **Category A** environments require considerable effort to insulate the welder and others from the work piece. The type of work would typically be bench-top welding where the work piece is small and /or is a repetitive operation in an area such as a workshop. Under some conditions a category A environment could become a category B environment. e.g. change of weather conditions – cool at start (in the morning) and increased temperature during the day causing the welder operator to sweat freely,

Note: *It is not envisaged that a Category A environment will exist at a mine site.*

Category B environment is an environment where there is a significant risk of the welder contacting the work piece or other parts of the welding circuit. Such an environment may be found where the ambient temperature is less than 32^oC and,

- a) Freedom from movement is restricted, so that an operator is forced to perform welding activities in a cramped position (e.g. kneeling, sitting, lying), with physical contact with conductive parts (e.g., the work piece); or
- b) There is a high risk of accidental or unavoidable contact by the operator with conductive element, which may or may not be in a confined space as defined in AS/NZS 2865.

In **Category B** environments it is recognised that there is an an increased risk of electric shock and include general fabrication activities, large work pieces, steel structures, inside pressure vessels, processing tanks and conductive confined spaces. Under some conditions, e.g. hot weather and/or working in direct sun light, a category B environment could become a category C environment.

Category C environment is where the risk of an electric shock or electrocution by arc welding is greatly increased due to low body impedance of the welder operator and a significant risk of the welder operator contacting the work piece or other parts of the welding circuit.

Category C environments include, but are not limited to, trenches, underground welding tasks, and splash zones.



PURPOSE

HAZARDS:

The hazards that you and others could be exposed to when carrying out welding tasks

Hazards to consider for Category B Areas.	
1. Electric shock from the power supply equipment and cables	2. Electric shock from the welder output power - The electrode and work piece are to be regarded as electrically alive
3. Radiation burns to eye or body from welding arcs.	4. Fire to the surrounding environment
5. Eye injury due to flying materials	6. Slips trips and falls around work site.
7. Asphyxiation or illness – due to inhalation of gasses created during welding.	8. Burns – due to heating of work piece, weld spatter, hot molten material or ignition of clothing
Additional hazards to consider for Category C Areas.	
1. Electric shock – Perspiration resulting in lower body electric resistance.	2. Easily becoming part of the welding circuit



EQUIPMENT AND REQUIREMENTS To consider for safe welding

Considerations for Category B Areas	
<ol style="list-style-type: none"> 1. Power supply protected by an RCD. 3. Welding equipment that has current inspections 5. Fit for purpose PPE 7. Welding machine fitted with a Hazard Reduction Device–HRD (VRD or Hand piece trigger switch fitted to MIG and similar type welders) 9. For confined spaces – confined space permit (Refer AS2865) and hot work permit. 	<ol style="list-style-type: none"> 2. Ventilated work place. 4. Clean and dry work area 6. Arc barrier screen(s) 8. Welding equipment in good condition 10. Insulation material – rubber mats, duckboards etc.
Additional Considerations for Category C Areas	
<ol style="list-style-type: none"> 1. Safety equipment required for confined space work. e.g. rescue gear, electrode lead whole current switch, gas detection equipment (flammable gas, deficiency of oxygen etc.) 	<ol style="list-style-type: none"> 2. For confined spaces - Ventilation fan to cool the welder operator



ELECTRIC WELDING PREPARATION STEPS

Preparation Steps – Category B Areas

1. Welder operator to be dressed in dry fireproof clothing that covers the legs and arms.
2. Welder operator has steel cap rubber soled safety footwear. The steel cap of the footwear is to be totally covered.
3. Welding gloves are to be in good condition, dry and fitted to both hands.
4. Leads and components (electrode holders, cable connectors and earth clamps etc.) have been inspected for damage. Damaged leads and components have not be used but tagged out of service and removed for repair or discarded.
5. Leather cushions, rubber matting, wooden duckboards or other means will be used to insulate the welder operator from any damp floor areas any exposed parts of the work piece.
6. Where necessary, welding arc screen(s) are in position.
7. The welding machine is fitted with a **Hazard Reduction Device**.
8. If a VRD is fitted, test the VRD for correct operation. (Open circuit voltage should not exceed 25Vac / 35Vdc volts)
9. Welding machine is powered from an outlet protected by an RCD.
10. The welding machine is to have an “S” in a square on the nameplate to identify compliance with AS 60974.1. If the marking is not on the nameplate, the welding machine is not suitable for a category B environment.
11. For confined space welding activities - A permit for confined space entry is required.
12. An observer is to be present for confined space tasks.
10. Where required, apply a Hot Work Permit

Additional Preparation Steps – Category C Areas

12. The work piece is to be isolated and tagged and locked out.
13. Check leads for correct size and lengths – voltage drop.



ELECTRIC WELDING PROCESS STEPS

Process Steps – Category B Area

1. The work piece is to be connected to the work lead by a suitable attachment. e.g. work lead clamp
2. The work area is to be kept tidy & free from tangled leads, discarded off-cuts & electrode stubs
3. Welding gloves are to be worn whilst welding activities occur and while changing electrodes.
4. Insulation mats or material to be positioned.
5. While tacking two pieces together, the arc is to be struck on the piece connected to the work lead.
6. The electrode holder or gun is not to be placed on the work piece where it may short circuit, but placed in an area isolated from the work piece.
7. Before replacing electrodes the power to the welding machine is to be turned off.
8. The power to the welder is to be switched off and the disused electrode removed from the electrode holder:
 - Before the welder operator leaves the work area
 - When ever the leads have to be moved.
9. At completion of work, clean up area and store welding equipment away. Report any defects to supervisor.
10. If an operator or other experiences an electric shock the supervisor is to be informed and electric shock protocol is to be applied.

Additional Process Steps – Category C Area

1. Consider the use of secondary gloves to be worn under the welding gloves- added personal protection against electric shock.
2. If the gloves become damp through perspiration or water, replace the gloves with dry ones
3. Where required, insulation mats or material to be positioned.
4. For confined space work, use a fan, or similar system, to keep the welder operator cool.
5. Position the observer at an electrode whole current switch and maintain vigilance on the welder operator.