



# Electrical Engineering Safety

## Decision Sheet 12.2

### Selection of Welding Machines

***A basis for consistent application of Electrical Engineering Safety issues at NSW mines***

*Decision Sheets are developed by the Inspectors of Electrical Engineering in response to issues raised or questions asked by others in the DPI, in particular Mine Safety Operations and from our external clients. They are for use by any staff in Mine Safety Operations, but primarily by Electrical Engineering staff. They can be distributed externally to the DPI.*

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PREPARED BY: THE ELECTRICAL TEAM

APPROVED BY: J F WAUDBY SENIOR INSPECTOR OF ELECTRICAL ENGINEERING

Ph: 02 4931 6641

Fax: 02 4931 6790

Email: [john.waudby@dpi.nsw.gov.au](mailto:john.waudby@dpi.nsw.gov.au)

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## Preamble

Some welding machines are inherently safer than others, for example dc welders are recognised as safer than ac welders. Risk controls known as hazard reduction devices (HRD's) are now commonly used as an effective risk control.

## Issue

Welding machines can be a source of electric shock and they are widely used. Further, welding operations are often carried out at mines where the environment can increase the risk of electric shock or electrocution (Most mine situations are Cat C environment to AS 1674.2 -2007). Selection of the safest welding machine and HRD arrangements is critical.

Category C Environment (Clause 1.3.6.3 of AS 1674.2-2007)

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

*NOTE: Low body impedance is likely in the presence of water, moisture or heat, particularly **where the ambient temperature is above 32°C**. In wet, moist or hot locations, humidity or perspiration considerably reduces the skin resistance of human bodies and the insulating properties of personal protective equipment accessories and clothing.*

Category C environments include, but are not limited to, coffer dams, trenches, underground mines, etc. (Clause 2.2 (c) AS1674.2-2007). There are many areas at surface mines that readily become Category C environments.

When the weather is hot, when high preheat temperature is employed or when the vessel is exposed to the sun, many Category B environments become Category C environments. (Clause 2.2 (b) Note 2 AS1674.2-2007).

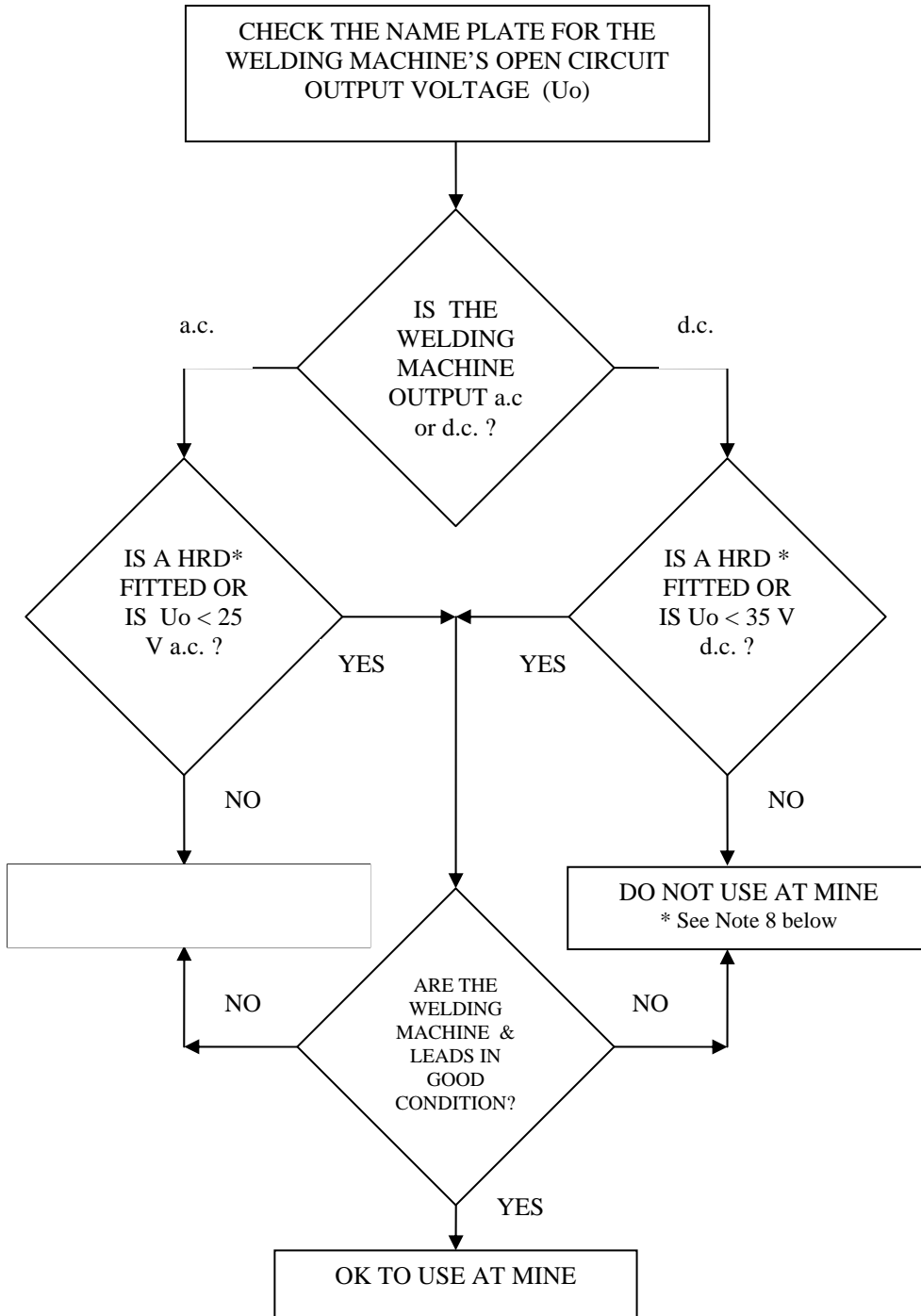


Selection of Welding Machines

Position

A rigorous process for determining the suitability of welding machines must be used at mines in accordance with Figure 1. DC welders are preferred.

Figure 1: SUITABILITY OF WELDING MACHINES



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#### Notes:

1. A Hazard Reduction Device (HRD) can be a VRD, an automatic switching device or trigger switch operated feeder, say as found on GMAW (MIG) and FCAW welding power sources (Refer AS 1674.2 Clause 2.3.3 Note 2 & Clause 3.2.7.3 (b) (iii). See AS 1674.2-2007 Clause 3.2.7.3 for additional requirement on MMAW triggers.
2. "U<sub>o</sub>" is the highest output voltage listed for the welder.
3. If no formal assessment has been documented for the welding task, it is to be assumed that the environment is Category C.
4. Covers should be fitted to wire feeders unless U<sub>o</sub> is less than 25 V a.c. or 35 V d.c. and there are no exposed control / motor wires above 25 V a.c. or 35 V d.c.
5. It is important that the frame of a building or any structure is NOT used as the return lead to the welding power source.
6. The welding power source nameplate "Welding power source Output" section should be checked for a.c. or d.c. - shown below at 6) as ~**50Hz** i.e. an a.c. welding power source. The Open Circuit Voltage **U<sub>o</sub>** (or sometimes **OCV**) shown below at 9) as 48 V, is too high for an a.c. welding power source in a mine unless it has a HRD.
7. The power source shall have a degree of protection that suits the environment in which it is to be used. Box 22) on the nameplate below shows the degree of protection in accordance with AS 60974.1
  - Power sources rated with an IP21 degree of protection as designated by AS 60529, are for indoor use only. *Note: indoor use only means dry, clean and non hazardous condition.*
  - Power sources rated with an IP23 degree of protection as designated by AS 60529, may be used outdoors.



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a) Identification					
1) Manufacturer Address			Trademark		
2) Type		3) Serial number			
4)		5) AS 60974.1			
b) Welding output					
6)	6) $\sim 50$ Hz	10) 15 A / 20.6 V to 160 A / 27 V			
7)	9) $U_0 = 48$ V	11) X	11a) 35%	11b) 60%	11c) 100%
	12) $I_2$	12a) 160 A	12b) 130 A	12c) 100 A	
	13) $U_2$	13a) 26 V	13b) 25 V	13c) 24 V	
c) Energy input					
14) $1 \sim 50$ Hz		15) $U_1 = 230$ V	16) $I_{1max} = 37$ A	17) $I_{1eff} = 22$ A	
22) IP23		23)			

8. Where the welding power source has more than one current setting, there may be two open circuit voltages as shown below. This a.c. welding power source would also require a VRD.



Assume to be a.c. output unless indicated otherwise

9. Where the mine has developed and implemented a risk based safety management plan in compliance with MDG 25, there may be limited applications where CAT B welders can be safely used at a mine without a hazard reduction device.
10. It is not acceptable to have a means (eg switch) to defeat the HRD on a welder for use at a mine. Where metal gouging is required, a power source of sufficient size to operate with a HRD needs to be selected.

