



WELDING HEALTH AND SAFETY ASSESSMENT TOOL

This detailed assessment tool is for use by employers, health and safety committees, individuals and Department of Labour health and safety inspectors to assist in the auditing of workplaces where electric or gas welding or cutting is carried out.

The aim of the audit is to lead a discussion through the essential elements of welding/cutting safe practice so that

workplace participants may decide where improvements are required.

A briefer tool is available that summarises the essential elements of welding safety under the same headings.

The assessment tool has 20 sections as follows: (You may not need to complete all sections.)

BEFORE ANY WELDING OCCURS

1. Basic hazards of welding
2. Training and certification
3. Process and equipment selection

GENERAL WELDING SAFETY

4. General health and safety
5. Fire prevention and hotwork
6. Personal protective equipment
7. Fume and gas control
8. Local exhaust ventilation

SPECIFIC WELDING SAFETY ISSUES

9. Electrical safety
10. Safe use of welding gases
11. Hazardous substances
12. Metal preparation
13. Welding in confined spaces
14. Hot metal sparks
15. Radiation

GENERAL SAFETY ISSUES

16. Working technique
17. Noise and vibration
18. Manual handling
19. Hand tool fitness and safety
20. Requirements of the Health and Safety in Employment Act 1992

Welding health and safety publications

The Department of Labour has adopted *Health and Safety in Welding 2004* (TN7) published by the Welding Technical Institute of Australia (WTIA) as its standard for welding safety. Copies may be obtained from:

Heavy Engineering Research Association (HERA)
PO Box 76 134 Manukau City
Auckland

A short booklet summarising welding health and safety essentials is available from the Department of Labour. It is designed for use by supervisors and members of industry training organisations (ITOs).

The sections in this assessment tool correspond to those in the booklet.

Before any welding occurs

BASIC HAZARDS OF WELDING

1. Are any of the following hazards of welding present?

- Fires Yes No
- Burns Yes No
- Fumes Yes No
- Electric shock Yes No
- Compressed gases Yes No
- Hazardous substances Yes No
- Heat stress Yes No
- Toxic gases Yes No
- Asphyxiant gases (suffocation) Yes No
- Radiation Yes No
- Heat stress Yes No
- Suffocation Yes No
- Noise and vibration Yes No
- Manual handling Yes No

2. Comment on the general knowledge of health and safety in welding

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3. Comment on the general knowledge of the standard ways to prevent these hazards causing harm

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TRAINING AND CERTIFICATION

4. Are welders certified for the job they are doing and in the basic elements of welding health and safety?

- Certification for job competency (including knowledge of correct use of welding equipment) Yes No
- Certification for health and safety in welding (e.g. unit standard 21907) Yes No
- Is management aware of the range of unit standards for welding? Yes No

5. Do all operators have a copy of the appropriate operating instructions for the equipment they use?

- Yes No Not applicable

6. Are welders trained in the use of:

- Fire extinguishers Yes No
- Hot work permits Yes No Not applicable

PROCESS AND EQUIPMENT SELECTION

7. What types of welding or cutting are carried out?

- Manual metal arc welding (MMAW) Yes No
- Gas tungsten arc welding (TIG) Yes No
- Gas metal arc welding (MIG) Yes No
- Flux cored arc welding (FCAW) Yes No
- Submerged arc welding (SAW) Yes No
- Electroslag welding (ESW) Yes No
- Electrode gas welding (EGW) Yes No
- Arc cutting Yes No
- Plasma arc welding Yes No
- Gas welding, cutting or gouging Yes No
- Other Yes No

(Please describe)

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8. What types of electrode are being used?

- Cellulosic (TiO₂, sand, and magnesium silicate) Yes No
- Rutile (TiO₂, CaCO₃ plus some cellulose) Yes No
- Basic (high content of calcium carbonate or fluoride) Yes No
- Other Yes No

(Please describe)

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9. What diameter electrodes are in use?

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10. What metals are involved in the welding (either as the metal being welded, as a coating on the metal or as part of the welding consumables)?

- Aluminium Yes No
- Bronze Yes No
- Brass Yes No
- Copper Yes No
- Mild steel Yes No
- Stainless steel Yes No
- Galvanised* Yes No
- Ni/Cr* Yes No
- Leaded metals* Yes No
- Cadmium* Yes No
- Beryllium* Yes No
- Manganese* Yes No
- Other Yes No

(Please describe)

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* Fumes generated by these metals are extremely toxic.

11. Are any coatings applied to the material being welded? (All may be toxic or highly toxic.)

- Metallic (zinc, aluminium, copper, nickel, cadmium) Yes No
- Paints (lead, zinc, chromium, phosphate, cadmium) Yes No
- Plastics (possibility that ammonia, hydrochloric acid, carbon dioxide, cyanides etc. will be generated.) Yes No
- Degreasing agents and oils Yes No

12. What gases are being used for welding?

- Argon Yes No
- Helium Yes No
- LPG Yes No
- Acetylene Yes No
- Oxygen Yes No
- Carbon dioxide Yes No

13. What is the duration of the welding activity?

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14. Comments:

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General welding safety

GENERAL HEALTH AND SAFETY

15. Does work stop if there is the smell of gas?

- Yes No Not applicable

16. Are welding cables and hoses kept clear of passageways, ladders and stairways?

- Yes No Not applicable

17. Do booths and screens permit air circulation at the floor level? (At least 50 cm of space is recommended at the bottom of the screens.)

- Yes No Not applicable

18. Are employees working nearby protected from arc flash by screens, booths or shields?

- Yes No Not applicable

19. Are work areas:

- Well lit (300 lux or more) Yes No
- Properly ventilated Yes No
- Well arranged Yes No
- Tidy Yes No

20. Are signs reading: "Danger, No Smoking, Matches, or Open Lights" or the equivalent posted?

- Yes No Not applicable

21. Are hazardous materials properly labelled?

- Yes No Not applicable

22. Are safety data sheets available?

- Yes No Not applicable

23. Is first aid equipment for welders immediately available at all times?

- Yes No Not applicable

SAFE USE OF WELDING GASES

67. Maintenance of gas bottle integrity.

- Are cylinders correctly labelled? Yes No
- Are cylinders stored in a ventilated area? Yes No
- Are cylinders properly secured against falls? Yes No
- Are fuel gas cylinders and oxygen cylinders stored separately? Yes No
- Are gas cylinders kept away from sources of heat and electrical apparatus? Yes No
- Are acetylene cylinders stored upright? Yes No
- Are gas cylinders regularly examined for obvious signs of defects, rusting or leakage? Yes No
- Are empty cylinders appropriately marked, their valves closed and valve protection caps on? Yes No

68. Integrity of equipment connected to gas cylinders

- Is the inspection of the integrity of the equipment fitted to gas cylinders performed routinely? Yes No
- Are cylinders, cylinder valves, couplings, regulators, hoses and apparatus kept free of oily or greasy substances? Yes No
- Is red used to identify the acetylene (and other fuel-gas) hoses, green for oxygen hoses and black for inert gas and air hoses? Yes No
- Are flashback arrestors fitted? Yes No
- Is the use of copper piping with acetylene avoided? Yes No

69. Correct usage of gas equipment

- Do operators know the correct assembly procedures for attaching equipment to gas cylinders? Yes No
- Do operators know the correct procedures and materials (detergent not soap) for leak testing? Yes No
- Do operators know the correct procedures for lighting gas torches? Yes No

Do operators know the signs of a flashback, what to do in response, how to check if damage has occurred to equipment and the actions necessary if it has occurred? Yes No

Are workers instructed to never crack a fuel gas cylinder valve near sources of ignition? Yes No

Before a regulator is removed, is the valve closed and gas released from the regulator? Yes No

Is the use of LPG avoided in holes and trenches (where it can pool at a low level)? Yes No

Do operators know NOT to use oxygen to dust off clothing? Yes No

Do operators know NOT to use oxygen to 'sweeten' the atmosphere? Yes No

70. Comments

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HAZARDOUS SUBSTANCES

71. List any hazardous substances not covered by the above that are being used.

Nitric acid Yes No

Hydrofluoric acid Yes No

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72. What procedures are in place to ensure the safe use of hazardous substances listed in question 71?

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METAL PREPARATION

73. Which, if any, of the following five surface preparation methods are in use?

- Abrasive blasting Yes No
- Mechanical preparation Yes No
- Degreasing chemicals Yes No
- Acid or caustic solutions Yes No
- Contaminated surfaces Yes No

74. What methods are used to control the hazards from question 73?

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WELDING IN CONFINED SPACES

75. Are all welding operations in confined spaces carried out with careful consideration of the following:

- Space ventilation – The exact type should be determined by the processes being carried out Yes No
- Use of gas hoses – Remove gas hoses and torches from confined spaces every time work stops - even for short breaks. Yes No
- Personal respiratory equipment – This will be required under certain circumstances. Yes No
- Safe access – This is required and pre-planned emergency rescue must be assured through the use of suitable emergency equipment. Yes No
- An observer must be stationed outside the space. Yes No
- Atmospheric testing – The atmosphere in a confined space may become depleted in oxygen content. Check with a monitoring device before entry. As welding proceeds, inert gases may displace oxygen – check the atmosphere periodically. Check also for toxic or explosive atmospheres if appropriate. Yes No
- Personnel training – Welders and observers must be properly trained. Yes No

Electrical safety – A range of measures are described in *Health and Safety in Welding - 2004* (TN7), including having an observer outside the space with access to a cut-off switch. Yes No

Reflected arc flash in a confined space – This may affect bare skin (back of the neck). Yes No

Heat stress – Confined spaces may be hot because of solar load (if outside), or may become hot during the process or because of preheating. Take precautions to prevent these conditions affecting the worker. Yes No

Working in a confined space (especially if hot) can affect a welder, given the level of protective equipment required, and it may be necessary to limit the welder's working time.

A permit-to-work system may be used. Yes No

HOT METAL SPARKS

76. Is the housekeeping adequate? Yes No Not applicable

77. Does appropriate flame-resistant personal protective equipment prevent sparks entering clothing and boots? Yes No Not applicable

RADIATION

78. Are the dangers of arc flash through the side of the eye understood? Yes No Not applicable

79. Are all parts of the body covered against ultraviolet and infrared rays and flash burns? Yes No Not applicable

80. Are bystanders and other workers protected against arc flash? Yes No Not applicable

81. Are you aware that, in gas arc welding process, flat hand-shields provide insufficient protection from reflected radiation?

Yes No Not applicable

82. Comments

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General safety issues

WORKING TECHNIQUE

83. Does the operator know to keep his or her head out of the welding plume?

Yes No Not applicable

NOISE AND VIBRATION

Noise

Noise levels can be hazardous during some welding and metal cleaning processes.

The Department of Labour publication *Approved Code of Practice for the Management of Noise in the Workplace* should be followed in identifying noise sources, assessing their significance and applying control measures.

Health and Safety in Welding - 2004 (TN7) refers to Australian noise control practices, and, while much of the information it carries is relevant generally, it should not be referred to for methods of noise assessment.

Audiometry will be required where employees are exposed to hazardous levels of noise.

Describe any required follow-up action on noise.

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Vibration

The prolonged use of powered hand tools may expose welders to harmful levels of vibration, resulting in decreased blood circulation in the fingers.

The effect of vibration is exacerbated when working in the cold.

Exposure to vibration can be reduced by good tool design and selection, regular tool maintenance and the wearing of gloves.

85. Describe any follow-up action on vibration issues suggested by this checklist.

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MANUAL HANDLING

86. Are any of the following behaviours involved in the task?

Twisted, stooped, awkward asymmetrical postures Yes No

Fixed, sustained, rigid or prolonged postures Yes No

Unvaried, repetitive movements Yes No

Sudden, uncontrolled or jerky movements Yes No

Handling or reaching away from the body Yes No

Using high or sustained force Yes No

Handling heavy or awkward loads Yes No

Whole-body vibration or hand-arm vibration Yes No

Handling that goes on for too long without a break Yes No

87. Describe any follow-up action on manual handling issues suggested by this checklist.

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HAND TOOL FITNESS AND SAFETY

- 88.** Hand tools used in metal preparation and weld treatment can pose several types of hazard. Do any of the following issues need attention?
 - Electrically-powered tools (grinders) pose a risk of shock. Check electrical safety regularly and use RCD devices. Yes No
 - Electrical or heat insulation on the tool handle requires repair. Yes No
 - Tools used for deslagging, grinding and chipping pose hazards to the eyes. Eye protection is worn to address this hazard. Yes No
 - Poorly maintained hand tools are used which may result in injuries from vibration. Yes No
 - The physical design of hand tools is not based on ergonomic principles and poses the risk of a musculoskeletal disorder. Yes No
 - Air-powered tools can discharge cold air over the hands. Yes No
 - Using tools with wet or sweaty hands may compromise electrical safety or cause the hands to slip. Yes No
 - The tool weight, the trigger design, the grip, the handle diameter and the tool shape compromise ease of use. Yes No

REQUIREMENTS OF THE HEALTH AND SAFETY IN EMPLOYMENT ACT 1992

- 89.** Information, training and supervision
 - Have employees been given information about the hazards they face? Yes No
 - Have employees been given training on how to do the work the right way and on controlling hazards? Yes No
 - Are employees supervised until they can carry out the work safely? Yes No
- 90.** Protective equipment
 - Are employees provided with adequate protective equipment? Yes No

- 91.** Monitoring
 - Is environmental monitoring carried out? Yes No
 - Is personal health monitoring carried out? Yes No

- 92.** Employee involvement
 - Are employees involved in health and safety matters? Yes No

93. Comments

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WELDING FUME CONTROL
– SUMMARY WORKSHEET

94. This worksheet can be used to obtain an idea of the level of protection required for the different welding processes.

A. Select a process weighting factor

Process	Weighting
Submerged arc welding (remote operation)	0
Laser cutting and welding	
Micro plasma	
Gas cutting (remote operations)	
Submerged arc welding (manual)	2
Submerged arc welding (multi arcs)	
Brazing (manual operation)	4
Gas tungsten arc welding (TIG) (manual operation)	
Gas welding and cutting (manual)	
Silver soldering (manual)	
Resistance spot welding (manual)	
Plasma cutting (under water table)	
Plasma arc welding	
Gas metal arc welding (MIG) (remote operation)	
Resistance seam welding (remote operation)	
Electroslag welding	
MIG (hand-held)	7
Manual metal arc welding (MMAW)	
Resistance seam welding (manual operations)	
Thermit welding	
Electrogas welding	
Arc cutting	9
Plasma arc gouging	
Air arc gouging	
Flux cored arc welding (manual and remote operation)	
Plasma arc cutting	15

B. Select a fume constituent weighting

Fume group	Weighting
A Iron, aluminium, tin, titanium – less than 5% of group B or C or less than 0.05% of group D.	0
B Copper, magnesium, manganese, molybdenum, silver, tungsten, zinc. Flux fumes such as fluorides, rosin, phosphor acid, zinc chloride and boric acid.	10
C Barium, chromium, cobalt, lead, nickel, ozone, vanadium, phosgene, organic fume.	20
D Beryllium, cadmium.	55

C. Select a work location weighting

Work location	Weighting
Outdoor workspace	0
Open workspace	12
Limited workspace	16
Confined workspace	24

D. Add the three weightings you obtain at A, B and C to determine the control actions needed as below:

Sum of weighting factors	Controls
≤ 9	Natural ventilation
> 9 to 21	Mechanical ventilation
> 21 to 54	Local exhaust ventilation
> 54	Local exhaust ventilation and respiratory protection