Soldering Brazing and Heat Treatment

Business Name:	ABN:	
Business Address:		
Contact Person:	Phone:	Email:

THIS RISK ASSESSMENT IS APPROVED BY THE PCBU OF THE PROJECT

Under the Work Health and Safety Regulation (WHS Regulation), a person conducting a business or undertaking (PCBU) is required to ensure that a RISK ASSESSMENT is prepared before the proposed work starts.

Full Name:		
Signature:	Title:	Date:

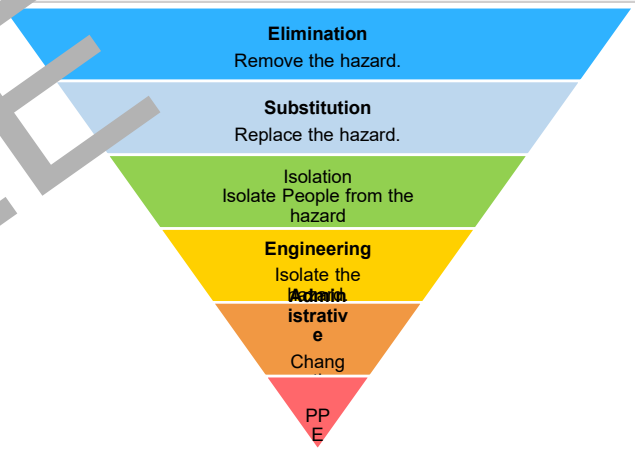
CLIENT OR PRINCIPAL CONTRACTOR DETAILS

Client:	SCOPE OF WORKS
Project Name:	
Project Address:	
Project Manager:	
Contact Phone:	
Date Risk Assessment supplied to Project Manager:	

RISK MATRIX

LIKELIHOOD	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	SCORE	ACTION
ALMOST CERTAIN	3 HIGH	3 HIGH	4 ACUTE	4 ACUTE	4 ACUTE		
LIKELY	2 MODERATE	3 HIGH	3 HIGH	4 ACUTE	4 ACUTE	4A ACUTE	DO NOT PROCEED
POSSIBLE	1 LOW	2 MODERATE	3 HIGH	4 ACUTE	4 ACUTE	3H HIGH	Rev before work
UNLIKELY	1 LOW	1 LOW	2 MODERATE	3 HIGH	4 ACU	2M MO RATE	Ensure control measures in place.
RARE	1 LOW	1 LOW	2 MODERATE	3 HIGH	3 H	1L LOW	Monitor and keep records.

HIERARCHY OF CONTROLS



Risk Rating & Required Action:

4A	Stop work. The risk is intolerable. E inate the hazar redesign the activity before proceeding. A Safe Work Method Statement (SWMS) or hi er-level authorisati is required.
3H	Review and approve additional c rols b ask arts. Senior supervisor sign-off needed.
2M	Ensure all nominated controls are in ace and effe ive. Proceed with caution; monitor conditions.
1L	Proceed, following standard operating procedures Monitor and keep records.

Consequence Scale:

Consequence	People (injury/illness)	Project / Assets	Compliance / Reputation
Catastrophic	Fatality or permanent total disability	project shutdown	Significant regulator intervention; criminal prosecution
Major	Serious injury/illness (hospital > 5 days)	critical delay	Improvement notice; major media coverage
Moderate	Medical-treatment injury; lost-time > 1 day	moderate delay	Minor breach; adverse client comment
Minor	First-aid only, no lost time	negligible delay	Isolated non-conformance
Insignificant	No injury	no schedule impact	Deviation caught and corrected on site

Notes on Hierarchy of Controls:
Remember to apply controls in the preferred order shown by the coloured pyramid:

1. **Eliminate**
2. Substitute
3. Isolate
4. Engineering
5. Administrative
6. PPE

Always document **why** a lower-order control is accepted if elimination or substitution is not reasonably practicable.

aligned with Safe Work Australia's Managing the risk of fatigue at work *(2023) and ISO 45001:2018 clauses 6–8.*

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
1. WHS Governance, Duties and Consultation	• Lack of clear WHS responsibilities for soldering, brazing and heat treatment activities under WHS Act 2011 • Inadequate consultation with workers and Health and Safety Representatives about hot work and thermal processes • No formal process for reviewing WHS performance for annealing, tempering, galvanising and brazing operations • Failure to integrate WHS obligations into contracts with labour hire, maintenance contractors and specialist heat treatment providers • Insufficient consideration of PCBUs overlapping duties in multi-employer facilities (e.g. shared galvanising lines, maintenance workshops)	4A	• Establish and document a WHS governance structure that allocates clear roles, responsibilities and accountabilities for all hot work (soldering, brazing, annealing, tempering, galvanising, induction heating, preheating and hot glue application) in line with WHS Act 2011 and WHS Regulation • Implement a formal consultation, cooperation and coordination procedure with workers, HSRs, contractors and neighbouring PCBUs specifically addressing hot work and heat treatment risks • Include soldering, brazing and heat treatment risk management as a standing agenda item in WHS committee and leadership meetings, with actions tracked to completion • Integrate WHS requirements for hot work and heat treatment into procurement, contract and service level agreements (e.g. competency, equipment standards, emergency readiness) • Establish an annual management review of WHS performance for thermal processes, including incident trends, audit findings and compliance with relevant Codes of Practice • Ensure PCBUs with overlapping duties (e.g. host employer and galvanising contractor) have documented WHS coordination arrangements and agreed control standards	3H
2. WHS Risk Management Framework for Hot Work and Heat Treatment	• Absence of a formal, documented risk management procedure for hot works and heat treatment activities • Inconsistent identification and assessment of hazards associated with annealing, case hardening, tempering and metal brazing machines • Risk assessments not updated when processes change (e.g. new induction heating equipment, new brazing consumables or hot cutting systems) • Failure to consider reasonably foreseeable abnormal conditions (e.g. power failure during galvanising process, loss of extraction ventilation, gas leaks) • Inadequate involvement of competent technical personnel in risk assessments for complex thermal processes	4A	• Develop and implement a corporate WHS risk management procedure that specifically references hot works and thermal processes, aligned with WHS Regulation Part 3.1 • Require documented, task-based risk assessments for key process categories (e.g. annealing and case hardening, annealing and tempering, brazing and soldering, induction heating, galvanising, hot cutting knives, preheating tasks, hot glue applicator use) prior to commencing or modifying operations • Implement a formal change management process so that any new or modified heat treatment equipment, soldering methods or materials trigger a review of risk assessments and control measures • Mandate multidisciplinary participation in risk assessments (engineering, operations, maintenance, WHS and worker representatives) for complex systems such as metal brazing machines and galvanising lines • Establish a scheduled review cycle (e.g. every 2 years or after any significant incident) for all hot work and heat treatment risk assessments, with documented approval by a competent person	2M
3. Plant and Equipment Design, Selection and Guarding	• Use of non-compliant or poorly designed soldering irons, brazing torches, hot glue applicators and hot cutting knives without appropriate guarding or controls	4A	• Implement a plant selection standard requiring all new soldering, brazing, induction heating, annealing, tempering and galvanising equipment to comply with relevant Australian Standards and include integral guarding, insulation and temperature controls	2M

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
	• Metal brazing machines, induction heaters and furnaces lacking engineered safeguards against contact with hot surfaces and moving parts • Galvanising baths and heat treatment furnaces without adequate fixed barriers, access controls or fall protection systems • Inadequate segregation of hot work areas from pedestrian walkways and other processes, increasing the likelihood of bystander burns or collisions • Lack of safety interlocks, emergency stops and fail-safe controls on automated heat treatment and brazing equipment		• Ensure all furnaces, galvanising baths, metal brazing machines and induction heaters are fitted with fixed physical barriers, interlocked access doors and clearly defined exclusion zones to prevent inadvertent contact with hot plant or molten metal • Provide local and remote emergency stop devi[illegible] and safety interlocks for automated heat treatment, brazing and cutting equipment, verified via c[illegible]missioning and periodic testing regimes • Design layouts so that hot work areas and p[illegible]heating [illegible]ations are physically separated from general traffic routes and other incompatible activities [illegible]ers, signage and controlled access systems • Implement a documented pl[illegible]t verification and c[illegible]mission[illegible] process before use, including functional safety testing of guards, interlo[illegible]s, temperature co[illegible]ols [illegible] emergency stops	
4. Thermal, Fire and Explosion Risk Management	• Uncontrolled ignition sources from soldering, brazing, hot cutting and preheating tasks in areas with combustible materials or flammable vapours • Accumulation of flammable residues, fluxes, coatings or clea[illegible] solvents in galvanising and hea[illegible]reatment areas • Inadequate mana[illegible]ement of cylinders, fuel lines [illegible]gen syst[illegible]s associated with brazing and hot work • Poorly designed or maintained [illegible] work permit system leadi[illegible] unauthorised or uncontrolled hot works • Failure to manage fire separation between annealing furnaces, case hardening units, galvanising baths and storage of combustible materials	4A	[redacted]	2M
5. Hazardous Substances, Fumes and Atmospheric Contaminants	• Generation of metal fumes, flux fumes and combustion products from brazing, soldering, galvanising and heat treatment of coated or contaminated metals • Exposure to hazardous substances used in annealing, case hardening and tempering processes (e.g. quench oils,	4A	[redacted]	2M

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
	salts, cyanide-based compounds where applicable) • Inadequate ventilation and extraction for soldering and brazing stations, galvanising baths and induction heating processes • Failure to identify and control hazardous decomposition products when heating plastics, adhesives, coatings and hot glue • Non-compliance with workplace exposure standards due to poor atmospheric monitoring and control		[redacted]	
6. Energy Isolation, Interlocks and Process Control	• Uncontrolled release of thermal energy from furnaces, galvanising baths, induction heaters and metal brazing machines during maintenance or upset conditions • Bypassing or defeating safety interlocks and temperature control systems to maintain production • Inadequate lockout-tagout systems fo electrical, gas, hydraulic ermal energy sources ass ted with heat treatment and braz g equipment • Failure of process ontr instrumentation (e.g. thermocouples, level sensors) leading to overheatin molten metal spills or quench tan boil-over • Lack of defined response procedures for abnormal operating conditions, alarms and trips		[redacted]	2M
7. Maintenance, Inspection and Asset Integrity	• Deferred or ad-hoc maintenance on furnaces, galvanising lines, induction heaters and brazing machines leading to failures and unsafe conditions • Undetected degradation of refractory linings, insulation, support structures and bath linings in galvanising and annealing equipment • Lack of systematic inspection of soldering irons, torches, hot glue	3H	[redacted]	2M

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
	applicators and hot cutting knives for damage and defects • Absence of documented inspection criteria for safety-critical components such as gas hoses, regulators, quench tanks, emergency cooling systems and extraction fans • Reliance on breakdown maintenance with no long-term asset integrity strategy for hot work and heat treatment plant		[redacted]	
8. Facility Layout, Traffic Management and Segregation of Hot Work Areas	• Crowded or poorly designed layouts around galvanising baths, furnaces and brazing machines leading to collision, spillage or contact with hot surfaces • Inadequate segregation between hot work areas and walkways, storage areas or other processes (e.g. flammable liquids, compressed gases, packaging) • Uncontrolled movement of forklifts, cranes and trolleys near hot metal transfer, quench tanks or galvanising operations • Lack of clearly defined [redacted] work zones for preh[redacted] tasks and hot soldering of coppe[redacted] pipes in maintenance area • Insufficient provisio[redacted] safe egress routes from hot work and heat treat[redacted] areas during an emergency	3H	[redacted]	2M
9. Competency, Training and Supervision	• Workers and contractors conducting brazing, soldering, annealing, galvanising or induction heating without verified competency • Inadequate training on specific hazards such as molten metal behaviour, quench reactions, induction heating fields and hot glue burning potential • Insufficient supervisor capability to enforce hot work permits, process limits and housekeeping standards • No formal verification of competency for new technologies such as automated	4A	[redacted]	2M

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
	metal brazing machines or induction heating systems • Lack of refresher training leading to drift from safe operating practices and controls		[redacted]	
10. Procedures, Work Instructions and Standardisation	• Absence of documented procedures for key heat treatment and hot work processes such as annealing and case hardening, annealing and tempering, brazing, galvanising and preheating tasks • Workers relying on informal custom and practice when operating hot glue applicators, hot cutting knives or soldering copper pipes • Procedures not reflecting current plant configuration, controls or legislative requirements • Complex or inaccessible documentation leading to work-around and non-compliance • Inconsistent application of heat treatment and brazing p[redacted]ters, increasing risk of pr[redacted]ss instability and equipment damag[redacted]	3H	[redacted]	2M
11. Contractor and Visitor Management for Hot Work Areas	• Contractors perform[redacted]ot works, maintenance or installation on galvanising, annealing, induction [redacted]ating and brazing systems with[redacted]gnment to site WHS standards • Inadequate induction and supervision of contractors undertaking soldering, hot cutting or preheating tasks in plant areas • Visitors and non-essential personnel entering high-risk hot work or galvanising zones without awareness of hazards and controls • Poor coordination between contractor safe systems of work and host PCBU procedures and permits	3H	[redacted]	2M

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
	• Lack of verification that contractor plant and equipment used for hot work meets safety requirements			
12. Emergency Preparedness and Response for Thermal Incidents	• Inadequate emergency planning for burns, fires, explosions, molten metal spills and quench tank incidents • Lack of readily accessible and appropriate first aid resources for thermal burns and fume inhalation • Insufficient training of wardens and first aiders in responding to hot work and galvanising incidents • Emergency drills not reflecting realistic scenarios involving heat treatment and brazing equipment failures • Poor communication systems to alert and evacuate workers from hot work and heat treatment areas	4A	[redacted]	2M
13. Manual Handling, Ergonomics and Work Organisation	• Poorly designed manual handling tas[redacted] related to loading and unloading of par[redacted] for annealing, case hardening, tempering, brazing and [redacted]ising processes • Repetitive and a[redacted]ward postur[redacted]when using soldering iro[redacted] hot applicators and small brazing tools a[redacted] benches or in confined plant spaces • Time pressure and proc[redacted]argets encouraging unsafe handling of hot components or bypassing cooling steps • Insufficient planning of staffing levels and shift arrangements for heavy or awkward work associated with hot work setups • Inadequate provision of mechanical aids for handling heavy jigs, fixtures or workpieces near hot plant	3H	[redacted]	2M
14. Fatigue, Scheduling and Environmental Conditions	• Extended shifts and night work in heat treatment and galvanising operations contributing to fatigue-related errors and incidents	3H	[redacted]	2M

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
	• High ambient temperatures around furnaces, galvanising baths and induction heaters exacerbating heat stress and reducing concentration • Inadequate rest breaks and hydration arrangements for workers in hot environments performing soldering, brazing or preheating tasks • Roster patterns not considering cumulative fatigue for key roles such as furnace operators and galvanising line controllers • Lack of monitoring for signs of heat stress and fatigue among workers in thermal process areas		[redacted]	
15. Personal Protective Equipment (PPE) Management System	• Reliance on PPE as the primary control rather than as part of a broader hierarchy of controls for hot work and heat treatment • Inconsistent specification, issue and maintenance of PPE for different processes (e.g. galvanising, soldering, brazing, hot glue use, hot cutting) • Lack of systems to ensure PPE suitability for therm , chemical, mechanical and el trical haz present in heat trea galvanising operations • Poor storage, cleaning and replacement arrangemen ing to degraded PPE performance • Workers not trained or supervised in correct PPE selection, use and limitations	3H	[redacted]	1L
16. Incident Reporting, Investigation and Continuous Improvement	• Under-reporting of near misses and minor incidents involving hot work and heat treatment, limiting learning opportunities • Superficial or delayed investigations that fail to identify systemic causes such as inadequate procedures, training gaps or design deficiencies	3H	[redacted]	1L

JOB STEP	POTENTIAL HAZARDS	IR	CONTROL MEASURES	RR
SPECIFIC WORK STEPS	HAZARDS THAT MAY ARISE	INITIAL RISK	SPECIFIC MEASURES TO BE PUT IN PLACE TO ELIMINATE OR CONTROL THE RISKS	RESIDUAL RISK
	• Lack of trend analysis for incidents related to soldering, brazing, galvanising and induction heating operations • Failure to implement and verify corrective and preventive actions across all relevant areas and shifts • Limited sharing of lessons learned between different departments or sites that perform similar thermal processes		[redacted]	

EMERGENCY RESPONSE – CALL 000 FOR EMERGENCIES

Ensure to have an Emergency Management Plan in place as well as adequate numbers of trained first aid staff with easy access to fully stocked first aid kits, rescue equipment, material safety data sheets, adequate access to emergency communication equipment and fire-fighting equipment suitable for all classes of fire and ignition sources.

LEGISLATIVE REFERENCES

RELEVANT LEGISLATION AND CODES OF PRACTICE. DELETE THE LEGISLATIVE REFERENCES FOR ANY STATE THAT ARE NOT APPLICABLE

Queensland & Australian Capital Territory
Work Health and Safety Act 2011
Work Health and Safety Regulations 2011
Legislation QLD: https://www.worksafe.qld.gov.au/laws-and-compliance/work-health-and-safety-laws
Codes of Practice QLD: https://www.worksafe.qld.gov.au/laws-and-compliance/codes-of-practice
Legislation ACT: https://www.worksafe.act.gov.au/laws-and-compliance/acts-and-regulations
Codes of Practice ACT: https://www.worksafe.act.gov.au/laws-and-compliance/codes-of-practice

New South Wales
Work Health and Safety Act 2011
Work Health and Safety Regulations 2025
Legislation NSW: https://www.safework.nsw.gov.au/legal-obligations/legislation
Codes of Practice NSW: https://www.safework.nsw.gov.au/resource-library/list-of-codes-of-practice

Northern Territory
Work Health and Safety (National Uniform Legislation) Act 2011
Work Health and Safety (National Uniform Legislation) Regulations 2011
Legislation NT: https://worksafe.nt.gov.au/laws-and-compliance/workplace-safety-laws
Codes of Practice NT: https://worksafe.nt.gov.au/forms-and-resources/codes-of-practice

South Australia
Work Health and Safety Act 2012 (SA)
Work Health and Safety Regulations 2012 (SA)
Legislation for SA: https://www.safework.sa.gov.au/resources/legislation
Codes of Practice for SA: https://www.safework.sa.gov.au/workplaces/codes-of-practice#COPs

Tasmania
Work Health and Safety Act 2012
Work Health and Safety (Transitional and Consequential Provisions) Act 2012
Work Health and Safety Regulations 2012
Work Health and Safety (Transitional) Regulations 2012
Legislation for TAS: https://worksafe.tas.gov.au/topics/laws-and-compliance/acts-and-regulations
Codes of Practice for TAS: https://worksafe.tas.gov.au/topics/laws-and-compliance/codes-of-practice

Details of permits, licenses or access required by regulatory bodies (add or delete as required):

- Permits from local council
- Authorisation to commence work
- Any required documents.

Victoria
Occupational Health and Safety Act 2004
Occupational Health and Safety Regulations 2017
Legislation VIC: https://www.worksafe.vic.gov.au/occupational-health-and-safety-act-and-regulations
Codes of Practice VIC: https://www.worksafe.vic.gov.au/compliance-codes-and-codes-practice

Western Australia
Work Health and Safety Act 2020
Work Health and Safety Regulations 2022
Legislation Western Australia: https://www.commerce.wa.gov.au/worksafe/legislation
Codes of Practice WA: https://www.commerce.wa.gov.au/worksafe/codes-practice

Safe Work Australia Links
Law and Regulation (All States): https://www.safeworkaustralia.gov.au/law-and-regulation
Model Codes of Practice: https://www.safeworkaustralia.gov.au/resources-publications/model-codes-of-practice

Model Codes of Practice

- Managing noise and preventing hearing loss at work
- Confined spaces
- Labelling of workplace hazardous chemicals
- Managing risks of hazardous chemicals in the workplace
- Welding processes
- First aid in the workplace
- Managing the risk of falls at workplaces
- Hazardous manual tasks
- Managing the risk of falls in housing construction
- Managing electrical risks in the workplace
- Demolition work
- Excavation work
- Work health and safety consultation, cooperation and coordination
- Managing the work environment and facilities
- How to manage work health and safety risks
- Managing risks of plant in the workplace
- Construction work