Heat Treatment Safety

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:

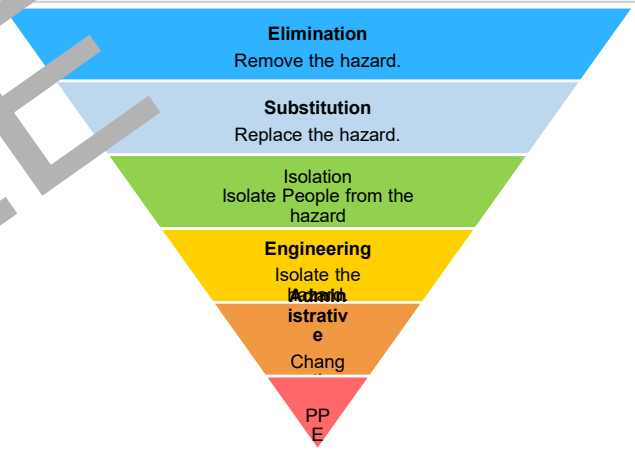
CLIENT OR PRINCIPAL CONTRACTOR DETAILS

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. Governance, Legal Compliance & WHS Duties	• Lack of documented WHS policy specific to heat treatment operations, quenching and hardening furnaces • Failure to identify and comply with WHS Act 2011, WHS Regulations and relevant Australian Standards (e.g. AS/NZS 4024 series, AS 2865, AS 1336/1337, AS 1894 gas-fired equipment, electrical standards) • Inadequate consultation with workers and Health and Safety Representatives regarding heat treatment risks • No formal process to review incidents, near misses and regulatory changes affecting heat treatment safety • Unclear allocation of WHS responsibilities between PCBUs, managers, supervisors and contractors involved with furnaces and quenching systems	4A	• Establish and endorse a site-specific Heat Treatment Safety Policy aligned with the WHS Act 2011 and WHS Regulations, endorsed by senior management • Undertake and maintain a legal register identifying applicable WHS legislation, codes of practice and Australian Standards relevant to furnaces, thermal processes and hazardous chemicals • Define and document WHS roles, responsibilities and accountabilities for officers, managers, supervisors, maintenance personnel and operators in relation to heat treatment operations • Implement formal consultation mechanisms (e.g. safety committees, toolbox meetings, HSR forums) that include standing agenda items for furnace and quenching risks • Introduce a scheduled management review process (e.g. annually) to evaluate heat treatment risk controls, audit findings, incident trends and regulatory updates • Ensure that due diligence training for officers specifically addresses high-temperature and quenching risks, and the need for adequate resources and verification of controls • Require contractual WHS clauses for contractors (e.g. furnace service technicians, gas fitters) outlining obligations, qualifications and compliance with site procedures	3H
2. Plant Design, Selection & Engineering of Furnaces	• Use of furnaces or ovens that are not designed or certified for the specific heat treatment temperature range and atmosphere • Absence or failure of critical interlocks (e.g. door locks, gas shut-off valves, combustion safeguards, emergency stops) • Inadequate guarding around hot surfaces, moving parts, load handling mechanisms and pinch points • Poor furnace insulation or refractory design resulting in radiant heat exposure and risk of burns to workers • Lack of engineered ventilation or extraction for combustion products, fumes and heat build-up around furnaces • Improvised or modified plant (e.g. bypassed guards, non-compliant burners, ad-hoc controls) without engineering assessment	4A	• Specify and procure heat treatment furnaces that comply with relevant Australian and international safety standards, with third-party certification where appropriate • Ensure all new and existing furnaces undergo a documented plant risk assessment and engineering review before commissioning or modification • Provide fixed guarding, heat shields and physical barriers around hot surfaces and moving components, in accordance with AS/NZS 4024 principles • Install and maintain engineered safety systems including automatic burner management, flame failure detection, gas leak detection, door interlocks and fail-safe emergency stops • Integrate temperature limiters, over-temperature alarms and data-logging controls to prevent overheating and enable traceability of furnace performance • Design and maintain effective local exhaust ventilation and general ventilation systems to manage heat, combustion products and fumes from treated parts • Implement a formal management-of-change (MoC) process for any physical or control system changes to furnaces, ensuring engineering sign-off and update of documentation	2M

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	• Inadequate temperature control, monitoring and data logging leading to overheating or thermal runaway			
3. Quenching System Design & Controls	• Inadequate design of quench tanks leading to violent boiling, splashing, overflow or vapour cloud formation • Use of incompatible or degraded quench media (e.g. oil, polymer, water) increasing fire, explosion or cracking risk • Lack of agitation control and temperature control in quench baths causing instability and inconsistent cooling • Inadequate guarding or containment around quench tanks and transfer areas exposing workers to hot fluids or vapours • No engineered separation between hot surfaces and combustible quench oils, increasing fire propagation risk • Uncontrolled introduction of wet parts or moisture into hot oil quench tanks causing boil-over or froth	4A	• Engineer quench tanks with appropriate capacity, freeboard, baffles, agitation systems and covers to control fluid movement and minimise splashing and overflow • Specify and document approved quench media for each process, including supplier data, operating temperature range and fire characteristics • Install temperature and level monitoring with alarms and automatic cut-outs for quench systems to prevent overheating and low-level exposure of heaters • Provide fixed guarding, drip trays, splash shields and non-slip surfaces around quench tanks and transfer paths • Physically separate quench tanks from furnace combustion sources and provide fire-resistant barriers where separation distances cannot be achieved Implement engineered moisture control, such as pre-drying stages, and procedural controls that prohibit introduction of wet or contaminated parts into oil quench tanks Introduce regular sampling and analysis program for quench media condition, with defined criteria for replacement or treatment	2M
4. Hazardous Energy Isolation & Lockout Systems	• Uncontrolled release of thermal, gas, electrical or mechanical energy during maintenance, cleaning or breakdown response • Lack of formal isolation and lockout/tagout (LOTO) procedures for furnaces, burners, fans, conveyors and quench systems • Multiple contractors or departments working on the same equipment without coordinated isolation control • Failure to isolate stored energy sources such as pressurised gas lines, hydraulic systems or heated media • Unclear or illegible labelling of isolation points and control panels	4A	[redacted]	2M

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5. Combustible Materials, Fire & Explosion Risk Management	• Accumulation of combustible quench oil mist, vapours or residues around furnaces and quench tanks • Gas leaks or poor combustion control in gas-fired furnaces leading to explosion or flashback risk • Ignition of combustible materials (packaging, rags, insulation, timber pallets) stored too close to hot surfaces or quench tanks • Inadequate fire detection, suppression and emergency shutdown systems for heat treatment areas • Lack of hazardous area classification and inappropriate electrical equipment in areas with flammable vapours	4A	[redacted]	2M
6. Thermal Environment, Ventilation & Heat Stress Management	• Excessive ambient heat load from furnaces and hot parts causing heat stress, dehydration an[redacted] • Inadequate gene[redacted] and local ventilation resultin[redacted] heat bui[redacted]nd poor air quality aro[redacted]tations • Lack of formal heat stress management plan for summer conditions or high-throug[redacted]perations • Insufficient rest breaks, hydration practices and acclimatisation arrangements for workers • Poor monitoring of indoor environmental conditions (temperature, humidity, radiant heat)	3H	[redacted]	2M
7. Hazardous Substances, Fumes & Exposure Controls	• Exposure to metal fumes, combustion products, quench oil mists and decomposition products during heat treatment and quenching	3H	[redacted]	2M

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	• Use of cleaning agents, salts, polymers or additives that may release hazardous vapours when heated • Lack of air monitoring or health surveillance where hazardous substances are used or generated • Inadequate storage, labelling and segregation of chemicals used in quenching or furnace maintenance • Failure to consider combined exposures from multiple substances and high ambient heat		[redacted]	
8. Training, Competency & Supervision for Heat Treatment	• Inadequate competency of operators and supervisors to manage furnace operation and quenching systems safely • Reliance on informal or undocumented on-the-job training leading to inconsistent practices • Lack of training on emergency shutdown, fire response and abnorma condition management • Insufficient supervision of new starters labour hire workers or ntractors in heat treatment area • Failure to verify competenc g equipment changes, s modifications or new technology implementation		[redacted]	2M
9. Work Procedures, Permits & Operational Controls	• Absence of clear, accessible operating procedures for heat treatment cycles, furnace start-up/shutdown and quenching sequences • Uncontrolled deviations from process parameters (time, temperature, quench media temperature, agitation) increasing risk of equipment damage or incidents • No documented procedures for handling abnormal situations (e.g. power failure, stuck loads, quench tank overheating, media contamination)	3H	[redacted]	2M

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	• Failure to coordinate work through permits for high-risk tasks (e.g. confined space, hot work, intrusive maintenance) • Over-reliance on operator memory rather than standardised work instructions and checklists		[redacted]	
10. Maintenance, Inspection & Condition Monitoring	• Breakdown or failure of critical safety systems (interlocks, gas valves, burners, temperature controllers) due to inadequate maintenance • Deterioration of refractories, insulation, structural supports or quench tank integrity leading to collapse, leakage or unexpected heat release • Blocked ventilation ducts, flues or extraction systems increasing heat and fume exposure • No systematic inspection of quench tanks for corrosion, cracking or build-up of sludge and contaminants • Reactive rather than preventative maintenance culture resulting in unplanned outages and [illegible]ed risk conditions	4A	[redacted]	2M
11. Materials Handling, Ergonomics & Traffic Management	• Unsafe manual h[illegible]dling of h[illegible]r awkward loads into [illegible]f furnac[illegible] and quench tanks leading to musculoskeletal injury • Inadequate design of lo[illegible]xtures, baskets and tongs resulting in dropped or unstable hot loads • Poor layout and traffic management for forklifts, cranes and pedestrians around furnaces and quench tanks • Lack of designated cooling and staging areas for hot parts, creating congestion and ad-hoc storage • Insufficient lighting and line-of-sight around loading doors, rails and quench stations	3H	[redacted]	2M

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12. Emergency Preparedness, Response & First Aid	• Delayed or ineffective response to fires, explosions, quench tank incidents or serious burns • Lack of coordinated evacuation procedures specific to heat treatment areas with gas supplies and hot equipment • Insufficient first aid capability for burn injuries, smoke inhalation and heat stress • Inadequate drills or training resulting in confusion during emergency events • Poor communication systems for raising the alarm, especially during night shift or reduced staffing	4A	[redacted]	2M
13. Contractor, Visitor & Third-Party Management	• Contractors performing installation, maintenance or calibration on furnaces and quench systems without adequate understanding of site-sp[redacted]isks • Visitors or non-ro[redacted]e workers entering heat treatment are[redacted] without ap[redacted]riate induction or contro[redacted] • Poor coordination between multiple PCBUs during projects or shutdow[redacted] leading to gaps in risk ma[redacted]nt • Lack of verification of contractor qualifications, licences and insurances relevant to gas, electrical and pressure systems	3H	[redacted]	2M
14. Monitoring, Reporting, Auditing & Continuous Improvement	• Failure to detect emerging risks or declining control effectiveness in furnace and quenching operations • Under-reporting of near misses, minor incidents and unsafe conditions in the heat treatment area	3H	[redacted]	1L

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	• Lack of structured WHS performance indicators for heat treatment safety • No systematic audit or inspection program focusing on high-temperature and quenching risks • Limited worker involvement in identifying improvements to heat treatment systems and procedures		[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