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

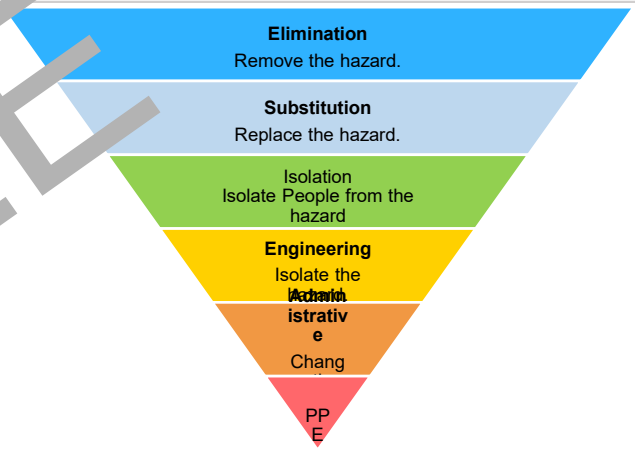
THIS RISK ASSESSMENT IS APPROVED BY THE PCBU OF THE PROJECT		
Under the Work Health and Safety Regulation (WHS Regulation), a person conducting a business or undertaking (PCBU) is required to ensure that a RISK ASSESSMENT is prepared before the proposed work starts.		
Full Name:		
Signature:	Title:	Date:

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, WHS Duties and Regulatory Compliance	• Lack of clear allocation of WHS responsibilities for cryogenic operations under WHS Act 2011 leading to gaps in oversight and decision-making • Failure to identify and comply with relevant Australian Standards, Codes of Practice and manufacturer instructions for cryogenic equipment and substances • Inadequate WHS policy framework specific to cryogenic hazards (extreme cold, asphyxiation, pressure, chemical reactivity) • Insufficient consultation with workers and health and safety representatives on cryogenic-related risks and controls • No systematic review of changes (new cryogens, new vessels, process changes) resulting in unmanaged new or increased risks	High	• Establish and document a WHS governance structure that assigns clear PCBU, officer and worker responsibilities for cryogenic substances in line with WHS Act 2011 and WHS Regulations • Develop a cryogen-specific WHS policy and management standard that references relevant Australian Standards (e.g. AS 1894, AS 3814 where applicable), Safe Work Australia guidance and manufacturer specifications • Implement a formal WHS legal and standards register covering cryogenic substances, storage vessels, pressure equipment, emergency response and hazardous chemicals (where applicable), and review it at least annually • Embed mandatory WHS risk management for cryogenic activities into corporate risk procedures, including identification, risk assessment, control implementation and monitoring requirements • Establish a documented management of change (MoC) procedure for introduction or modification of cryogenic substances, equipment, processes and locations, including pre-implementation risk assessment and consultation • Formalise worker consultation and participation processes (e.g. WHS committee meetings, toolbox talks) that include cryogenic risk topics and track actions through to closure • Ensure officers can demonstrate due diligence by receiving periodic briefings on cryogenic risks, performance indicators and significant incidents or near misses	Medium
2. Hazard Identification and Risk Management System	• Incomplete identification of cryogenic hazards such as extreme cold burns, material embrittlement, oxygen displacement, oxygen enrichment, over-pressurisation and projectiles • Risk assessment done informally or only for tasks, with no system-level review of storage, transfer and integration with other plant and processes • Failure to consider interaction between cryogenic systems and other hazards (electrical, confined spaces, hazardous chemicals, radiation, biological materials) • Risk assessments not kept current when equipment, volumes, or layouts change • Inconsistent application of hierarchy of controls for cryogenic risks, resulting in over-reliance on PPE and administrative controls	High	• Implement a formal WHS risk management procedure that mandates structured hazard identification and risk assessment for all cryogenic systems and management processes, not just operational tasks • Develop and maintain a cryogenic hazard register covering all locations, storage vessels, distribution systems, vent lines, relief devices and interfaces with other plant and activities • Use multi-disciplinary risk assessment teams (operations, engineering, WHS, maintenance, emergency response) for cryogenic system assessments, with periodic review (e.g. annually or after any significant change or incident) • Systematically apply the hierarchy of controls (elimination, substitution, isolation, engineering, administrative, PPE) when evaluating and selecting cryogenic controls and document rationale for any residual risk • Ensure cryogenic risk assessments explicitly consider oxygen displacement/asphyxiation, oxygen enrichment/fire risk, pressure build-up, brittle fracture, icing and obstruction of valves or vents • Integrate cryogenic risks into broader organisational risk registers and corporate risk reporting, with defined risk owners and due dates for treatment actions • Establish a schedule and triggers for formal review of cryogenic risk assessments (e.g. new cryogen type, change in storage capacity, new plant connection, building modifications)	Medium

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3. Procurement, Design and Installation of Cryogenic Plant	• Procurement of cryogenic vessels, piping and equipment that are not compliant with relevant Australian Standards or unsuitable for the specific cryogen and operating conditions • Inadequate consideration of layout, segregation, ventilation and emergency egress during design, increasing exposure to cold burns, asphyxiation or explosion • Insufficient specification of pressure relief, venting and fail-safe features during design and purchase • Use of incompatible construction materials leading to brittle fracture, failure on exposure to cryogenic temperatures or chemical reaction with the cryogen • Lack of engineering review of third-party installations leading to hidden defects or non-conformances	High	• Develop procurement standards for cryogenic plant and systems that mandate compliance with applicable Australian Standards, WHS Regulations and manufacturer requirements, and require provision of design and test documentation • Require engineering design review and approval by a competent person for all cryogenic systems, including hazard analysis (e.g. HAZOP or equivalent) at design stage • Specify minimum design requirements for cryogenic systems such as double-walled insulated vessels, appropriate materials, control and pressure ratings, relief devices, emergency shut-off valves and dedicated vent lines to safe locations outdoors • Incorporate site layout principles into the design process, including segregation distances, physical protection from vehicles, secure access control, clear egress routes and signage in accordance with WHS and building requirements • Require suppliers/installers to provide as-built drawings, certificates of conformity, commissioning records and operation manuals for all cryogenic plant before handover • Implement formal acceptance and commissioning process that includes pre-start verification against design, functional testing of safety systems, leak testing, and WHS review prior to operational use • Ensure all modifications to cryogenic systems follow an engineering change control process with updated drawings, risk assessments and approvals	Medium
4. Storage, Facility Layout and Ventilation Management	• Location of cryogenic storage in poorly ventilated or confined areas leading to oxygen displacement and asphyxiation risk • Inadequate venting or discharge points that release gases into walkways, workstations or building air intakes • Insufficient separation distances between cryogenic storage and ignition sources, public areas, traffic routes or incompatible materials • Poor cylinder and vessel restraint systems increasing risk of toppling, impact damage or projectile events if fittings fail • Inadequate control of access to cryogenic storage zones and plant rooms, allowing untrained or unauthorised persons to enter	High	[redacted]	Medium

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			[redacted]	
5. Engineering Controls, Plant Integrity and Pressure Management	• Failure of pressure relief devices, valves or vent systems causing vessel over-pressurisation and potential rupture • Undetected leaks from piping, fittings or valves leading to ice build-up, oxygen displacement, oxygen enrichment or uncontrolled releases • Icing and condensation on equipment obscuring gauges, blocking moving parts, or causing slips and trips • Use of non-cryogenic rated hoses, fittings or valves leading to embrittlement, cracking or catastrophic failure • Inadequate monitoring and alarm systems for oxygen levels, pressure, temperature or flow in critical cryogenic systems	High	[redacted]	Medium
6. Information, Documentation and Labelling	• Absence or inaccessibility of Safety Data Sheets (SDS) and manufacturer information for cryogenic substances and equipment • Inadequate or unclear labelling of vessels, pipework, valves and storage areas leading to inadvertent mixing, misuse or incorrect isolation • Out-of-date procedures and manuals that do not reflect current cryogenic plant configuration or risks • Workers unaware of specific properties of cryogens (e.g. heavier than air, oxidising, flammable, inert) due to poor information management	Medium	[redacted]	Low

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			[redacted]	
7. Training, Competency and Supervision	• Workers and supervisors lacking competency in cryogenic hazards, system design, and control measures leading to unsafe decisions and practices • No structured training program for new starters, contractors or visitors who may enter cryogenic areas • Inadequate supervision of inexperienced personnel, especially during abnormal conditions, maintenance or emergencies • Failure to verify competency for critic roles (e.g. system controllers, maintenance technicians rgency response personnel)	High	[redacted]	Medium
8. Contractor, Visitor and Third-Party Management	• Contractors performing work on o ear cryogenic systems without ade te understanding of hazards e-specific controls • Visitors entering cryogenic areas without induction, appropriate PPE or accompaniment • Poor coordination between tenant, landlord and service providers on cryogenic plant in shared facilities leading to conflicting procedures or compromised controls • Failure to ensure external emergency services and suppliers understand the cryogenic layout and risks on site	High	[redacted]	Medium

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			[redacted]	
9. Maintenance, Inspection and Asset Management	• Deferred or unplanned maintenance on cryogenic vessels, valves, relief devices and piping leading to undetected deterioration or failure • Inadequate inspection schedules for corrosion, insulation breakdown, structural supports and restraints • Maintenance activities conducted without considering cryogenic hazards (e.g. rapid warming, trapped liquid, residual pressure, oxygen-enriched atmospheres) • Incomplete maintenance records making it difficult to demonstrate compliance or identify recurring faults	High	[redacted]	Medium
10. Emergency Preparedness and Response for Cryogenic Incidents	• Lack of clear, tested emergency procedures for cryogenic leaks, vessel failure, oxygen deficiency, oxygen enrichment or fire involving cryogens • Inadequate provision, placement or maintenance of emergency equipment such as alarms, emergency shut-off controls, spill kits, showers and eye wash facilities • Workers untrained in recognising cryogenic alarms or early signs of oxygen depletion/enrichment and appropriate response actions	High	[redacted]	Medium

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	• Poor coordination with external emergency services leading to delayed or unsafe responses		[redacted]	
11. Health Monitoring, PPE Strategy and Human Factors	• Lack of systematic consideration of health impacts such as cold burns, frostbite, respiratory irritation or hypoxia from cryogenic atmospheres • Over-reliance on PPE as a primary control without a supporting system for selection, fit, maintenance and training • Human factors such as fatigue, time pressure, environmental conditions and complacency reducing adherence to cryogenic procedures • Inadequate consideration of fitness for work or medical conditions that may increase vulnerability to cold or oxygen-related hazards	Medium	[redacted]	Low
12. Monitoring, Incident Management and Continuous Improvement	• Failure to detect emerging cryogenic risks due to limited WHS performance monitoring or lack of specific indicators • Under-reporting of cryogenic incidents, near misses or alarm activations, leading to missed learning opportunities • No systematic process to investigate and address root causes of	Medium	[redacted]	Low

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	cryogenic-related incidents or plant failures • Inadequate management review of cryogenic risk controls and overall performance		[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