

Instrumentation Safety

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

THIS RISK ASSESSMENT IS APPROVED BY THE PCBU ON THIS 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:	

SAMPLE

RISK MATRIX									
LIKELIHOOD	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	SCORE	ACTION	HIERARCHY OF CONTROLS	
ALMOST CERTAIN	3 HIGH	3 HIGH	4 ACUTE	4 ACUTE	4 ACUTE			Elimination Remove the hazard.	
LIKELY	2 MODERATE	3 HIGH	3 HIGH	4 ACUTE	4 ACUTE	4A ACUTE	DO NOT PROCEED	Substitution Replace the hazard.	
POSSIBLE	1 LOW	2 MODERATE	3 HIGH	4 ACUTE	4 ACUTE	3H HIGH	Review before work starts.	Isolation Isolate People from the hazard	
UNLIKELY	1 LOW	1 LOW	2 MODERATE	3 HIGH	4 ACUTE	2M MODERATE	Ensure control measures in place.	Engineering Isolate the hazard	
RARE	1 LOW	1 LOW	2 MODERATE	3 HIGH	3 HIGH	1L LOW	Monitor and keep records.	Administrative Change	
								PPE	

Risk Rating & Required Action:	
4A	Stop work. The risk is intolerable. Eliminate the hazard or redesign the activity before proceeding. A Safe Work Method Statement (SWMS) or higher-level authorisation is required.
3H	Review and approve additional controls for the task parts. Senior supervisor sign-off needed.
2M	Ensure all nominated controls are in place and effective. 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	<ul style="list-style-type: none"> Inadequate understanding of WHS Act 2011 and WHS Regulations as they relate to instrumentation activities (transducers, encoders, control systems) Lack of clear allocation of PCBU, officer, and worker duties for instrumentation safety management Absence of documented WHS objectives, KPIs and due diligence processes specific to instrumentation work Failure to integrate instrumentation safety into the organisation's WHS management system and risk register Non-compliance with relevant Australian Standards for electrical, hazardous area and instrumentation installations (e.g. AS/NZS 3000, AS/NZS 60079 series, AS 61508/61511 where applicable) Poor monitoring of changes to legislation, standards and manufacturer requirements affecting transducers and encoders Insufficient contractor management processes for specific instrumentation vendors and calibrators 	4A	<ul style="list-style-type: none"> Establish and maintain a documented WHS management system that explicitly covers instrumentation safety, aligned with WHS Act 2011, WHS Regulations and applicable Australian Standards Define and document roles, responsibilities and accountabilities for officers, line management, engineers, technicians and contractors involved with instrumentation design, installation, calibration and maintenance Implement a legal and standards register for instrumentation and electrical work, with scheduled reviews and a nominated responsible person (e.g. Engineering Manager) to track changes Integrate instrumentation risks into the corporate risk register, including escalation criteria, reporting lines and review frequency Ensure officers exercise due diligence by periodically reviewing instrumentation safety performance, audit outcomes and corrective action close-out Develop and enforce a contractor management procedure specific to instrumentation contractors, including pre-qualification, WHS capability assessment and monitoring of performance Undertake periodic compliance audits of instrumentation installations and practices against WHS legislative requirements and relevant Australian Standards, with findings tracked to completion 	3H
2. Instrumentation Design & Functional Safety Integration	<ul style="list-style-type: none"> Instrumentation systems not designed to fail-safe, leading to unsafe process conditions on loss of signal or power Inadequate consideration of functional safety (e.g. SIL requirements) in selecting and applying transducers and encoders Incorrect instrument range, response time or accuracy for the process, causing undetected excursions beyond safe limits Lack of redundancy or diversity for critical measurements (pressure, level, position, speed) that protect people and plant 	4A	<ul style="list-style-type: none"> Implement a formal engineering design governance process that requires risk-based justification for all instrumentation on safety-critical plant, including design reviews and approvals Apply relevant functional safety standards (e.g. AS IEC 61511 for process industries where applicable) to determine SIL requirements and ensure appropriate selection of transducers, encoders and logic systems Mandate HAZOP and, where appropriate, LOPA or equivalent risk assessments to identify the safety role of instrumentation and specify required performance standards (availability, response time, accuracy, diagnostic coverage) Specify fail-safe design principles in corporate engineering standards, including defined behaviour on loss of signal, power, or communication, with documented safe-state logic Establish engineering standards for redundancy (e.g. 2oo3 voting, dual encoders) on critical measurements that provide protection against overpressure, overspeed, overfill, and uncontrolled motion 	2M

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	<ul style="list-style-type: none"> Poor segregation of safety-related instrumentation from general control and monitoring systems Inadequate hazard and operability (HAZOP) or LOPA assessments to identify instrumentation demands in safety functions Failure to consider maintainability and testability in system design, resulting in bypassing or defeating protections 		<ul style="list-style-type: none"> Ensure physical and logical segregation of safety-related instrumentation (SIS loops, safety encoders) from non-safety control and monitoring networks Include maintainability and proof-test requirements in design specifications (e.g. test ports, isolating valves, accessible mounting for transducers and encoders) Require independent design verification for high-risk or high-consequence instrumentation systems prior to installation and commissioning 	
3. Technical Specification, Procurement & Vendor Management	<ul style="list-style-type: none"> Procurement of non-compliant or unsuitable transducers and encoders (incorrect rating, IP, temperature, vibration, hazardous area) Use of counterfeit or unverified instrumentation products with unknown performance and reliability Inadequate specification of calibration accuracy, long-term stability and environmental performance in purchase documents Missing certification for hazardous areas, electrical safety and safety integrity (where claimed) from suppliers Lack of alignment between design intent and what is purchased and delivered to site Poor vendor documentation (datasheets, manuals, safety instructions) leading to incorrect installation and calibration Inconsistent spare parts and model variants causing configuration errors and unsafe substitutions 	3H	<ul style="list-style-type: none"> Develop corporate instrumentation specification standards that define minimum technical, environmental and safety requirements for transducers and encoders, including hazardous area, IP rating and process pressure ratings Implement a pre-qualification process for instrumentation vendors, including review of certifications, quality systems (e.g. ISO 9001) and track record in similar applications Require detailed technical datasheets, conformity certificates and, where relevant, Ex and SIL certificates with each instrument purchase, and verify against design requirements prior to acceptance Establish a formal technical review and approval process for instrumentation purchase requisitions by competent engineers or senior technicians Standardise preferred makes and models for critical instrumentation to reduce complexity and minimise configuration or wiring errors Maintain a controlled master instrument list (asset register) with approved model numbers, firmware versions and spare parts references Require vendors to provide manufacturer installation, operation and calibration instructions in English and to Australian normative standards where applicable Implement incoming goods inspection checks, including verification of nameplate data, certification marks, and physical condition prior to issuing to site 	2M
4. Installation Systems & Physical Integration of Transducers	<ul style="list-style-type: none"> Incorrect mechanical installation of transducers (mounting orientation, impulse line routing, vibration, inadequate support) leading to measurement error or failure Inappropriate process connection selection (threaded vs flanged, pressure 	3H	<p>[REDACTED]</p> <p>[REDACTED]</p>	2M

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	<p>rating mismatch) causing leaks or rupture</p> <ul style="list-style-type: none"> • Poor isolation arrangements (lack of block/bleed valves, test points) resulting in unsafe maintenance and calibration practices • Ingress of moisture, dust or corrosive agents due to inadequate IP rating, incorrect cable glands or poor enclosure sealing • Mechanical damage to sensor bodies, capillaries or impulse lines during installation works • Improper segregation of instrument cabling from power cables causing interference and spurious readings • Inadequate earthing and bonding for instrumentation, increasing risk of electric shock or spurious signals • Uncontrolled field modifications (adapters, tees, non-approved fittings) compromising integrity and pressure rating 		<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	
5. Installation Systems & Physical Integration of Encoders and Position Sensors	<ul style="list-style-type: none"> • Incorrect mounting of encoders on rotating shafts or moving equipment causing mechanical misalignment or shaft damage • Improper coupling selection or installation leading to encoder damage and loss of accurate position or speed feedback • Excessive vibration or shock loading exceeding encoder design limits • Inadequate guarding and physical protection of encoders and wiring from mechanical impact or entanglement hazards • Failure to maintain correct air gap or alignment on non-contact encoders, resulting in intermittent signals • Unmanaged interaction between mechanical isolation procedures and 	3H	<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	2M

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	<ul style="list-style-type: none"> encoder mounting, leading to unexpected motion during installation or removal Lack of standardised encoder installation procedures across different machines and OEM designs 		[REDACTED]	
6. Electrical, Control System Integration & Cybersecurity	<ul style="list-style-type: none"> Incorrect wiring or termination of transducers and encoders causing unreliable signals, short circuits or electric shock Inadequate segregation between low voltage/high voltage and analogue/digital circuits causing noise and measurement errors Weak configuration management of PLC/DCS/SCADA changes related to instrumentation points Unauthorised or uncontrolled software changes to scaling, filtering or logic affecting safety-critical instrumentation Cybersecurity vulnerabilities allowing remote manipulation or disabling of instrumentation signals at points Inadequate power supply quality or redundancy for critical instrumentation (e.g. loss of 24 VDC to transducers and encoders) Failure to correctly implement earthing, shielding and surge protection on instrumentation circuits 	4A	[REDACTED]	2M
7. Calibration Management & Metrology Systems	<ul style="list-style-type: none"> Inadequate calibration intervals for transducers and encoders, leading to undetected drift and unsafe operating conditions Use of uncalibrated or out-of-tolerance test equipment for calibration activities Lack of traceability of calibration data to national or international standards Poor documentation and record-keeping of calibration results and as-found data 	4A	[REDACTED]	2M

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	<ul style="list-style-type: none"> Inconsistent calibration methods between technicians resulting in variable outcomes Failure to assess and manage the impact of failed or out-of-tolerance instruments on process safety and product quality Calibration activities carried out without appropriate isolation, causing exposure to pressure, temperature, chemical or mechanical hazards 		[REDACTED]	
8. Competency, Training & Authorisation of Instrumentation Personnel	<ul style="list-style-type: none"> Instrumentation technicians, electricians and engineers performing tasks without adequate competency or licensing Lack of specific training on installed transducers, encoders and control systems, leading to incorrect installation or calibration Inadequate understanding of process hazards that instrumentation is intended to control or monitor Poor knowledge of isolation, permit and lockout/tagout systems when working on instrumentation connected to hazardous energy sources Insufficient supervision or mentoring of apprentices and new starters working on complex instrumentation Inadequate assessment and recording of competency for contractors performing instrumentation work 	3H	[REDACTED]	2M
9. Change Management, Modifications & Configuration Control	<ul style="list-style-type: none"> Uncontrolled modifications to instrumentation, set-points, scaling, or wiring creating new hazards or defeating safeguards Temporary bypasses or overrides of instrumentation (e.g. safety trips, 	4A	[REDACTED]	2M

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	<p>encoder feedback) not adequately risk assessed or tracked</p> <ul style="list-style-type: none"> • Inaccurate or outdated drawings and documentation after modifications, leading to incorrect future work • Concurrent modifications by different teams (mechanical, electrical, controls) without coordination, resulting in conflicting changes • Failure to consult affected stakeholders (operations, maintenance, safety) when changing instrumentation configurations • Software and firmware updates to smart instruments or encoders applied without assessment of safety or interoperability impacts 		[REDACTED]	
10. Monitoring, Alarms, Interlocks & Human-Machine Interface	<ul style="list-style-type: none"> • Poorly designed alarms linked to instrumentation (too many, ambiguous, or poorly prioritised) causing alarm fatigue and missed critical events • Inadequate indication of encoder or transducer failure (e.g. signal loss appears as valid value) leading to latent hazards • Lack of clear display of critical measurements and instrument status for operators • Alarm set-points not aligned with process safety limits or operating procedures • Failure of interlocks relying on instrumentation signals because of logic errors or defeat mechanisms • Operators not trained in the meaning and response required for instrument-related alarms and trips 	3H	[REDACTED]	2M
11. Inspection, Preventive Maintenance & Reliability Management	<ul style="list-style-type: none"> • Lack of systematic inspection and preventive maintenance on transducers and encoders leading to undetected degradation or imminent failure • Failure to address recurring instrumentation faults, resulting in 	3H	[REDACTED]	2M

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	<p>normalisation of deviance and workaround behaviours</p> <ul style="list-style-type: none"> • Inadequate spare parts management, leading to use of non-standard or incorrect instruments under time pressure • Environmental deterioration (corrosion, UV, temperature cycling, vibration) not monitored or mitigated for field instruments • Poorly planned maintenance windows causing rushed work and increased likelihood of error in instrumentation tasks • Inadequate analysis of instrumentation failure data, limiting opportunities to improve reliability and safety performance 		[REDACTED]	
12. Hazardous Areas, Pressure, Electrical & Process Interface Risks	<ul style="list-style-type: none"> • Incorrect selection or installation of transducers and encoders in hazardous (Ex) areas leading to ignition of flammable atmospheres • Overpressure or process upsets causing failure of sensing elements and release of hazardous substances • Exposure of technicians to high pressure, temperature, chemicals or moving machinery while accessing instruments • Working on live electrical circuits for instruments and encoders without appropriate controls • Lack of clear zoning, labelling and documentation of hazardous areas containing instrumentation • Inadequate use of barriers, isolators or intrinsic safety measures for field instruments • Failure to revalidate hazardous area compliance after modifications to instrumentation or surrounding plant 	4A	[REDACTED]	2M

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13. Documentation, Records, Labelling & Knowledge Management	<ul style="list-style-type: none"> • Incomplete or inaccurate documentation of instrumentation (loop diagrams, data sheets, calibration records, configuration files) • Inadequate labelling of transducers, encoders and associated valves or junction boxes, leading to misidentification and incorrect work • Loss of corporate knowledge about instrumentation design intent, history and known issues due to turnover or poor record management • Difficulty retrieving critical information during faults or emergencies due to disorganised or inaccessible records • Multiple conflicting data sources (drawings, spreadsheets, CMMS, control system database) causing errors in decision-making 	3H	[REDACTED]	1L
14. Emergency Preparedness, Incident Response & Learning	<ul style="list-style-type: none"> • Unpreparedness for failure of critical transducers and encoders that provide safety-related measurements or shutdown functions • Delayed or inappropriate emergency response due to misinterpretation of faulty instrumentation signals • Failure to investigate and learn from instrumentation-related incidents, near misses and false trips • No contingency plans for operating in degraded modes when instrumentation is partially unavailable • Inadequate communication between operations, maintenance and WHS during instrumentation failures or emergency work 	3H	[REDACTED]	2M

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SAMPLE

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>

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>

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-codes-of-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>

Northern Territory

Work Health and Safety (National Uniform Legislation) Act 2011
 Work Health and Safety (National Uniform Legislation) Regulation 2011
 Legislation NT: <https://worksafe.nt.gov.au/laws-and-compliance/workplace-safety-laws>
 Codes of Practice NT: <https://worksafe.nt.gov.au/laws-and-compliance/codes-of-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>

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>

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

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.