

# HIRAC Report

Risk, Health, and Safety

**Title: Wazer Abrasive Waterjet Cutting System**

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## 1. Hazard Management Details – General

This form relates to OHS Procedure – [Hazard Identification, Risk Assessment and Control \(HIRAC\)](#)

School / Work Location: **Ballarat Tech School (Fed College)**

Name of Person(s): Liam Mudge,

Date Conducted: 11/12/2023

Last Reviewed: 05/08/2022

Next Review Due: December 2024

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## Description of Use:

The Ballarat Tech School delivers a range of STEM curriculum projects. Some of these may be hazardous to user's health if safety procedures and lab etiquette are not followed.

This document assesses the risk involved with

- Abrasive Water-jetting (AWJ) utilises an abrasive medium suspended in a pressurised stream of water to abrasively cut through materials.
- The Wazer desktop AWJ system was developed for smaller work pieces. It is a new system on the market and as such sits in a grey area in a standards/guidelines sense. It has an operational pressure is 320bar with a water flow rate of 1.9L/min. While this does not meet the definition of a high-pressure system. Being defined as an operation pressure over 800 bar with a flow rate of more than 10L/min.
- As this is a new application of the technology the standards relating to a high-pressure system have been used to inform some of the risk identification and mitigation sections in this risk assessment.
- The Ballarat Tech School delivers a range of STEM curriculum projects. Some of these may be hazardous to user's health if safety procedures and lab etiquette are not followed.

## Summary of Key Risks:

**(Refer to appropriate subsections)**

- Entanglement
- Impact and cutting
- Electricity
- Slips/trips/falls
- Temperature
- Other (dust)
- Bio-Hazard
- Abrasive injury
- Penetration Injury

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## Risk Assessment Matrix

### Assessing OHS Risks

Risk assessments in matters of Occupational Health and Safety\* are based on 2 key factors:

- The severity of any injury/illness resulting from the hazard(s), and
- The likelihood that the injury/illness will actually occur.

*\*Assessment of risk level based on likely severity and probability of harm*

		LIKELIHOOD			
		Very Unlikely Could happen, but probably never will	Unlikely Could happen, but very rarely	Likely Could happen sometime	Very likely Could happen any time
SEVERITY	Death or permanent disability	MEDIUM	HIGH	EXTREME	EXTREME
	Long-term illness or serious injury	LOW	MEDIUM	HIGH	EXTREME
	Medical attention and short-term incapacity	VERY LOW	LOW	MEDIUM	HIGH
	First aid needed	VERY LOW	VERY LOW	LOW	MEDIUM

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## 2. Documentation

Relevant Legislation/Standards	Y / N	Comments
Is plant required to be registered?	N	
Is a user license required?	N	
<b>Key reference material:</b>		<ul style="list-style-type: none"> <li>AS 4233.1:2013:2020, High Pressure Water Jetting Systems - Safe Operation and Maintenance</li> <li>AS 4233.2:2013:2020, High Pressure Water Jetting Systems – Construction and Performance</li> <li>Safe Work Australia: Guide for managing risks from high pressure water jetting.</li> <li>AS/NZS 3760:2022 In service safety inspection and testing of electrical equipment</li> <li>AS 4024.1100:2019 Safety of Machinery</li> <li>Radvanská, A. (2010). Abrasive waterjet cutting technology risk assessment by means of failure modes and effects analysis method. <i>Tehnički vjesnik</i>, 17(1), 121-128.</li> <li>Safe Work Australia web page re: Noise <a href="https://www.safeworkaustralia.gov.au/noise">https://www.safeworkaustralia.gov.au/noise</a></li> </ul>
<b>Are operator's manuals accessible?</b>		Hard copy with unit, digital copy of reference materials <a href="#">Wazer</a>
<b>Is this a restricted use item?</b>		Only to be operated by appropriately trained/inducted personnel.

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## 3. Hazards

Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<p><b>ENTANGLEMENT</b> Can anyone's hair, clothing, gloves, cleaning brushes, tools, rags or other materials become entangled with moving parts of the tools or materials?</p>	Yes	M	<ul style="list-style-type: none"> <li>Long hair, loose clothing, rags, cleaning brushes and jewellery could become entangled in the moving parts of the equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure hair, loose clothing, rags and jewellery is kept clear of moving parts when in use.</li> <li>Aprons can be used to restrict loose clothing.</li> <li>Hair ties/hair nets can be used to secure long hair.</li> <li>Ensure inappropriate jewellery and accessories (e.g. bracelets) are not worn when operating equipment.</li> </ul>	L

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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<b>IMPACT &amp; CUTTING INJURIES</b> Can anyone be crushed/cut/struck etc. due to	Yes	M			
Exposure to Abrasive Waterjet Steam (AWS)		M	<ul style="list-style-type: none"> <li>Exposure to AWS may cause severe injury abrasive/cutting damage to body parts.</li> <li>Injuries to the torso can involve internal organ damage.</li> </ul>	<ul style="list-style-type: none"> <li>Only appropriately trained/inducted personnel to operate the unit.</li> <li>Operator must be signed off via the BTS Equipment Induction Register.</li> <li>Ensure unit is always supervised by appropriately trained/inducted operator during the machining process.</li> <li>Do NOT intentionally expose operators/bystanders AWS.</li> <li>Do NOT open the unit while the water jet is active.</li> <li>Follow safety procedures as specified in the user manual.</li> <li>Ensure appropriate PPE is worn whilst operating the equipment (e.g. eye protection).</li> </ul>	L

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Hazards Inspected	Initial Risk	Description of Risk	Control Measures	Residual Risk
Material falling off the workspace?	M	<ul style="list-style-type: none"> <li>Work piece is wet may slip when being removed from plant after operation. Workpiece may have sharp edges after abrasive treatment.</li> </ul>	<ul style="list-style-type: none"> <li>Use of nonslip waterproof work gloves as required when handling work piece.</li> <li>Ensure workpiece is securely fastened to cutting bed before machining.</li> </ul>	L
Uncontrolled/unexpected movement of tools /workspace?	M	<ul style="list-style-type: none"> <li>Missing or faulty interlock guard switch can expose operator/bystander to pressurised abrasive water stream.</li> <li>Work piece may become dislodged/ejected during machining.</li> <li>Workpiece may become jammed/dislodged if appropriate design features (tabs etc) are not included in the workpiece design.</li> <li>Incomplete cutting of the work piece may result in an excess abrasive material being ejected from the work surface, potentially damaging the unit's panels exposing operator/bystander to abrasive water stream.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure unit is always supervised by appropriately trained/inducted operator during the machining process.</li> <li>Ensure door interlock is in working order before beginning machining process.</li> <li>Ensure workpiece is properly affixed to the cutting bed before beginning machining operation.</li> <li>Ensure best practices for cutting path design are followed.</li> <li>Operator to ensure effective cutting process.</li> <li>Never use damaged equipment or kinked lines.</li> </ul>	L

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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
The tools tipping or rolling over?		M	<ul style="list-style-type: none"> <li>Internal operation of the unit may result in tipping.</li> </ul>	<ul style="list-style-type: none"> <li>Unit has been secured to rear wall as per user manual instructions.</li> </ul>	L
Parts of the tool disintegrating or collapsing?		M	<ul style="list-style-type: none"> <li>Prolonged splashback of AWS may result in degradation of internal unit components.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure unit is always supervised by appropriately trained/inducted operator during the machining process.</li> <li>Always follow operational instructions as per the user manual to maintain correct cutting method.</li> <li>NEVER use damaged equipment or kinked lines.</li> </ul>	L
Contact with moving parts during testing, inspection, operation, maintenance, cleaning, or repair?		M	<ul style="list-style-type: none"> <li>Exposure to AWS, sharp edges of work piece, spent abrasive material. Exposure to pressurised components</li> </ul>	<ul style="list-style-type: none"> <li>Ensure operator follows instructions for operation, maintenance etc as per the User Manual.</li> <li>Ensure unit is de-energised and de-pressurised before conducting maintenance tasks.</li> <li>Use of safe working/exclusion zone 3m in all directions from the unit.</li> </ul>	L



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Hazards Inspected	Initial Risk	Description of Risk	Control Measures	Residual Risk
Contact with sharp or flying objects? (e.g. work pieces being ejected)	M	<ul style="list-style-type: none"> <li>• Workpiece may become jammed/dislodged if appropriate design features (tabs etc) are not included in the workpiece design.</li> <li>• Inappropriate work piece materials may cause damage to machine resulting in hazard.</li> <li>• Incomplete cutting of the work piece may result in an excess abrasive material being ejected from the work surface, potentially damaging the unit's panels exposing operator/bystander to abrasive water stream.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure operator follows instructions for operation, maintenance etc as per the User Manual.</li> <li>• Use of safe working/exclusion zone 3m in all directions from the unit</li> <li>• Ensure unit is always supervised by appropriately trained/inducted operator during the machining process.</li> <li>• Always follow operational instructions as per the user manual to maintain correct cutting method. Ensure door interlock is in working order before beginning machining process.</li> <li>• Ensure workpiece is properly affixed to the cutting bed before beginning machining operation.</li> </ul>	L

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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
Inappropriate parts and accessories being used?		M	<ul style="list-style-type: none"> <li>• Failure of safety mechanisms.</li> <li>• Damage to unit components resulting in uncontrolled operation of the unit.</li> <li>• Damage to filtration system.</li> </ul>	<ul style="list-style-type: none"> <li>• Always follow operational instructions as per the user manual to maintain correct cutting method.</li> <li>• Complete all safety prechecks and documentation before operating the unit.</li> <li>• Only use material and equipment identified by the manufacture as safe for operation.</li> <li>• Consult user manual, standard operating procedures and relevant MSDS forms and use only as directed.</li> </ul>	L

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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<b>ELECTRICITY</b> Can anyone be injured or burnt due to:	Yes	M			
Damaged or poorly maintained electrical leads, cables, or switches?		M	<ul style="list-style-type: none"> <li>Damaged or frayed electrical cables pose an electrical hazard.</li> </ul>	<ul style="list-style-type: none"> <li>Complete all safety prechecks and review documentation before operating the unit.</li> <li>Complete unit maintenance and inspection in accordance with manufacturers specifications.</li> <li>NEVER use damaged equipment or cabling, contact manufacturer for replacement parts if required.</li> </ul>	L

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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
Water near electrical equipment?		M	<ul style="list-style-type: none"> <li>Liquids may cause damage or electrical short if contact made with power supplies.</li> <li>Operator/bystander may be exposed to electricity through spills/leaks.</li> </ul>	<ul style="list-style-type: none"> <li>Water supply and plumbing in accordance with the User Manual.</li> <li>Complete all safety prechecks and review documentation before operating the unit.</li> <li>Complete unit maintenance and inspection in accordance with manufacturers specifications.</li> <li>Shut down the unit, unplug from power, wipe up any leak and leave the unit to dry overnight. Assess damage or operational issues before using.</li> <li>Ensure spill alarms are located on the floor near the unit.</li> </ul>	L

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Damaged or poorly maintained electrical leads, cables or switches?		M	<ul style="list-style-type: none"> <li>May result in inadvertent electrification of surfaces, persons or equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect electrical cables prior to operation.</li> <li>Do NOT use electrical equipment if they appear damaged.</li> <li>Routine electrical safety inspections.</li> </ul>	L

Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<b>ERGONOMICS</b>	Yes				
Can anyone be injured due to:					
Does the activity impact on the surrounding workplace and create potential hazards? (Consider safe access and egress from plant, workflow and design of the workplace)		M	<ul style="list-style-type: none"> <li>Personnel accessing to equipment located inside exclusion zone around unit may be exposed to unit related hazards.</li> </ul>	<ul style="list-style-type: none"> <li>Use of clear exclusion zone and signage when unit in operation.</li> </ul>	L

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Hazards Inspected	Initial Risk	Description of Risk	Control Measures	Residual Risk
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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<p><b>NOISE</b> Can anyone using the tool, or in the vicinity of the plant, suffer injury due to exposure to noise?</p>	Yes	M	<ul style="list-style-type: none"> <li>Noise Emission 74+/- 3dB</li> <li>Noise Pressure Level 87+/-3dB</li> <li>Noise levels pose a potential risk to hearing over an extended period of time.</li> </ul>	<ul style="list-style-type: none"> <li>PPE to be worn while unit is operated for extended periods of time.</li> </ul>	L
<p><b>CONDITION</b> Is a hazard likely due to the age and condition of the plant?  Can anyone be injured as a result of the plant not being serviced appropriately and/or maintained in line with manufacturer's recommendations?</p>	Yes	M	<ul style="list-style-type: none"> <li>Improper servicing may result in faulty safety mechanisms and/or guards exposing operators/bystanders to AWS.</li> </ul>	<ul style="list-style-type: none"> <li>Always ensure unit is maintained in accordance with manufacturers specifications and maintenance schedule.</li> </ul>	L

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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<b>SLIPS / TRIPS / FALLS</b> Can anyone using the tool, or in the vicinity of the plant, slip, trip or fall due to:	Yes				
Poor housekeeping, e.g. spillage in the vicinity?		M	<ul style="list-style-type: none"> <li>Poor housekeeping practices allowing the build-up of waste materials or failure to immediately clean up spills could result in a slip hazard.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure appropriate cleaning and housekeeping practices are maintained to minimise the risk of a slip, trip or fall.</li> </ul>	L
Obstacles being placed in the vicinity of the tool?		M	<ul style="list-style-type: none"> <li>Inappropriate placement of objects (e.g. spare materials, bags etc) in the immediate vicinity of the plant equipment may result in a trip hazard</li> </ul>	<ul style="list-style-type: none"> <li>Ensure appropriate cleaning and housekeeping practices are maintained to minimise the risk of a slip, trip or fall.</li> </ul>	L

Hazards Inspected	Initial Risk	Description of Risk	Control Measures	Residual Risk
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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<b>FIRE &amp; EXPLOSION</b> Can anyone be injured by fire?	Yes				
Can anyone be injured by explosion of gases, vapours, liquids, dusts, or other substances?		M	<ul style="list-style-type: none"> <li>Using unit to cut through pressure vessels or components containing volatile substances</li> </ul>	<ul style="list-style-type: none"> <li>Do NOT use the Wazer unit to cut pressurised vessels.</li> <li>Consult MSDS of material before machining materials</li> </ul>	L

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Hazards Inspected		Initial Risk	Description of Risk	Control Measures	Residual Risk
<b>TEMPERATURE / MOISTURE</b> Can anyone come into contact with objects at high or low temperatures?	Yes				
Can anyone be injured or suffer ill-health due to exposure to moisture?		M	<ul style="list-style-type: none"> <li>Wazer reservoir holds water in the tank in order to suspend cutting aggregate. This water may become contaminated/induce mould growth within the tank.</li> </ul>	<ul style="list-style-type: none"> <li>Routine cleaning and purging of the reservoir tank as specified in manufacturer's instructions.</li> </ul>	L

## 4. Risk Assessment Signoff

Authorised By: Albert Ferguson

Signature: A-Ferguson

Date: 16/01/2024