

# HIRAC Report

Risk, Health and Safety

<b>Title: Virtual/Augmented Reality Risk Management Form</b>	<b>Authorized By: Liam Mudge / Damon Minotti</b>
	<b>Page Number: 1 of 12</b>

## 1. Hazard Management Details – General

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

Virtual/Augmented Reality Risk Assessment	Date Conducted: 14/01/2021 Last Reviewed: 05/02/2023 Next Review Date: August 2023
School / Work Location:	<b>Ballarat Tech School (Fed College)</b>
Name of Person(s) Conducting Review:	Liam Mudge, Albert Ferguson
Name of Person(s) Conducting Activity:	

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# HIRAC Report

Risk, Health and Safety

**Title: Virtual/Augmented Reality Risk Management Form**

**Authorized By: Liam Mudge / Damon Minotti**

**Page Number: 2 of 12**

## 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.

Augmented & Virtual Reality (AR & VR) involves the interaction of and engagement with a digital rendered environment. Completely digital in the case of VR and overlaying digital content on a real-world view with AR. Often done using a Head Mounted Display (HMD) to immerse the user in said digital landscape for a myriad of uses.

Equipment covered by this HIRAC includes:

- Oculus Rift
- Oculus Quest
- HoloLens
- HTC Vive
- Foldable Cardboard

## Summary of Key Risks:

**(refer to appropriate subsections)**

- Entanglement
- Electricity
- Slips/trips/falls
- Human/Biological

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# HIRAC Report

Risk, Health and Safety

Title: Virtual/Augmented Reality Risk Management Form	Authorized By: Liam Mudge / Damon Minotti
	Page Number: 3 of 12

## 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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# HIRAC Report

Risk, Health and Safety

Title: Virtual/Augmented Reality Risk Management Form

Authorized By: Liam Mudge / Damon Minotti

Page Number: 4 of 12

## 2. Documentation

Relevant Legislation/Standards	Y / N	Comments
Key reference material:		<ul style="list-style-type: none"> <li>Bingcheng Wang, P.-L. P. R., Lili Dong. (2017). <i>Effects of Controller and Body Posture On Simulator Sickness and Visual Fatigue in Virtual Reality</i>. Paper presented at the Proceedings of The 2nd Asian Conference on Ergonomics and Design 2017.</li> <li>Park, W. D., Jang, S. W., Kim, Y. H., Kim, G. A., Son, W., &amp; Kim, Y. S. (2017). A study on cyber sickness reduction by oculo-motor exercise performed immediately prior to viewing virtual reality (VR) content on head mounted display (HMD). <i>Journal of Vibroengineering</i>, 14.</li> <li>Sharma, A., Bajpai, P., Singh, S., &amp; Khatter, K. (2017). Virtual Reality: Blessings and Risk Assessment. <i>arXiv preprint arXiv:1708.09540</i>.</li> <li>Spiegel, J. S. (2017). The Ethics of Virtual Reality Technology: Social Hazards and Public Policy Recommendations. <i>Science and engineering ethics</i>, 1-14.</li> <li>Penumudi, S. A., Kuppam, V. A., Kim, J. H., &amp; Hwang, J. (2020). The effects of target location on musculoskeletal load, task performance, and subjective discomfort during virtual reality interactions. <i>Applied Ergonomics</i>, 84, 103010.</li> <li>Al Tawil L, Aldokhayel S, Zeitouni L, Qadoumi T, Hussein S, Ahamed SS. Prevalence of self-reported computer vision syndrome symptoms and its associated factors among university students. <i>European Journal of Ophthalmology</i>. 2020;30(1):189-195. doi:10.1177/112067211881511</li> <li><a href="#">Vive Safety Guide</a></li> <li>AS/NZS 3760 In service safety inspection and testing of electrical equipment</li> <li><a href="#">The Safety of Domestic Virtual Reality Systems</a></li> <li>Federation University Australia – <a href="#">COVIDSafe Plan</a></li> </ul>

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# HIRAC Report

Risk, Health and Safety

<b>Title: Virtual/Augmented Reality Risk Management Form</b>	<b>Authorized By: Liam Mudge / Damon Minotti</b>
	<b>Page Number: 5 of 12</b>

Plant Documentation	Y / N	Comments
<b>Are operator's manuals accessible?</b>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Digital copies held online/on BTS file store. Access to manuals available at each machine.

### 3. Hazard Identification

Hazards Inspected	Risk Assessment		Description of Risk	Control Measures
	Initial	Residual		

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# HIRAC Report

Risk, Health and Safety

<b>Title: Virtual/Augmented Reality Risk Management Form</b>	<b>Authorized By: Liam Mudge / Damon Minotti</b>
	<b>Page Number: 6 of 12</b>

<p><b>ENTANGLEMENT</b> Can anyone's hair, clothing, person, become entangled with moving parts or cable (data and power) of the equipment?</p>	<p>Y <input checked="" type="checkbox"/> N <input type="checkbox"/></p>	<p>Medium</p>	<p>Low</p>	<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 or could knock over other equipment.</li> <li>• Operator may become tangled in cables.</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>• 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> <li>• Spotter used to assist ensuring operator does not become tangled.</li> <li>• Safety introduction conducted at beginning of session.</li> </ul>
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# HIRAC Report

Risk, Health and Safety

<b>Title: Virtual/Augmented Reality Risk Management Form</b>	<b>Authorized By: Liam Mudge / Damon Minotti</b>
	<b>Page Number: 7 of 12</b>

<b>IMPACT</b> Can anyone be injured by equipment becoming dislodged or slipping out of users grasp?	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Low	Very Low	<ul style="list-style-type: none"> <li>Controllers and other equipment may become dislodge or thrown during use.</li> </ul>	<ul style="list-style-type: none"> <li>Consult manufactures instructions.</li> <li>Use securing straps to prevent controllers being thrown/slipping.</li> <li>Use of "Chaparone" system</li> <li>Safety introduction conducted at beginning of session.</li> </ul>

Hazards Inspected	Risk Assessment		Description of Risk	Control Measures
	Initial	Residual		
<b>SLIPS/TRIPS/FALLS</b> Can anyone using the equipment, or in the vicinity of the equipment, slip, trip or fall due to:			<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> <li>Inappropriate placement of objects (e.g. spare materials,</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> <li>Spotters used to ensure</li> </ul>
<ul style="list-style-type: none"> <li>Uneven, slippery or steep work surfaces?</li> </ul>	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>			
<ul style="list-style-type: none"> <li>Poor housekeeping, e.g. spillage in the vicinity?</li> </ul>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Medium    Low		

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# HIRAC Report

Risk, Health and Safety

<b>Title: Virtual/Augmented Reality Risk Management Form</b>	<b>Authorized By: Liam Mudge / Damon Minotti</b>
	<b>Page Number: 8 of 12</b>

Hazards Inspected		Risk Assessment		Description of Risk	Control Measures
<ul style="list-style-type: none"> <li>Obstacles being placed in the vicinity of the equipment?</li> </ul>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Medium	Low	bags etc) in the immediate vicinity of the users may result in trip hazard. <ul style="list-style-type: none"> <li>Interactions with virtual and real-world obstacles may result in the user losing balance or colliding with obstacles. Such as chairs, tables, and other furniture.</li> </ul>	user does not collide with obstacles. <ul style="list-style-type: none"> <li>Set up of virtual "Chaparone" system prior to use. To identify obstacles in the room.</li> <li>Safety introduction conducted at beginning of session.</li> </ul>
<b>Ergonomic</b>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Very Low	Very Low	Given higher amount of shoulder flexion angle, neck flexion moment, muscle activities of the neck and shoulder, excessive vertical target locations (15° above and 30° below eye height) should be avoided to reduce musculoskeletal loading and discomfort during VR interactions	<ul style="list-style-type: none"> <li>Identifying the potential for repetitive strain to activity in virtual environment prior to entering VR.</li> <li>Encourage participants to stop, rest and/or stretch if uncomfortable.</li> <li>Limit the amount of time on VR to reduce exposure to repetitive movement.</li> </ul>

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# HIRAC Report

Risk, Health and Safety

<b>Title: Virtual/Augmented Reality Risk Management Form</b>	<b>Authorized By: Liam Mudge / Damon Minotti</b>
	<b>Page Number: 9 of 12</b>

Hazards Inspected		Risk Assessment		Description of Risk	Control Measures
		Initial	Residual		
<b>ELECTRICITY</b> Can anyone be injured or burnt due to:	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Low	Very Low		Equipment is typically low voltage/battery powered.
• Access to electricity?	Y <input type="checkbox"/> N <input checked="" type="checkbox"/>				
• Damaged or poorly maintained electrical leads, cables or switches?	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Low	Very Low	• Damaged or frayed electrical cables pose an electrical hazard.	<ul style="list-style-type: none"> <li>• Operator to check for damaged electrical cords prior to use.</li> <li>• Ensure equipment is regularly serviced, tested and tagged (if not hardwired) and appropriate isolation procedures (e.g. lock out tags) are in place.</li> </ul>

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# HIRAC Report

Risk, Health and Safety

Title: <b>Virtual/Augmented Reality Risk Management Form</b>	Authorized By: <b>Liam Mudge / Damon Minotti</b>
	Page Number: <b>10 of 12</b>

Hazards Inspected		Risk Assessment		Description of Risk	Control Measures
<ul style="list-style-type: none"> <li>Water near electrical equipment?</li> </ul>	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Low	Very Low	<ul style="list-style-type: none"> <li>Cleaning fluids/spills</li> </ul>	<ul style="list-style-type: none"> <li>Ensure only the minimum amount of cleaning fluids used to successfully achieve outcomes.</li> <li>Restrict drinks around electrical equipment.</li> <li>Isolate power and mop up any spills as soon as practicable.</li> </ul>

Hazards Inspected		Risk Assessment		Description of Risk	Control Measures
		Initial	Residual		
<b>Biological or Human</b> Is a hazard likely due to biological or human activity	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>				

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# HIRAC Report

Risk, Health and Safety

Title: Virtual/Augmented Reality Risk Management Form	Authorized By: Liam Mudge / Damon Minotti
	Page Number: 11 of 12

Hazards Inspected		Risk Assessment		Description of Risk	Control Measures
Cyber Sickness	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Low	Very Low	<ul style="list-style-type: none"> <li>Commonly referred to as 'Cyber Sickness' users can suffer eye strain, nausea and disorientation. During and after engaging with a VR environment through a HMD.</li> <li>Cyber Sickness may result in users becoming nauseated, potentially resulting in vomiting.</li> </ul>	<ul style="list-style-type: none"> <li>Limit time users occupy VR environment to avoid cyber sickness.</li> <li>Begin activity from a sitting position if necessary. Then progress to standing.</li> <li>Users to engage in appropriate Oculo-motor exercises prior to using VR for extended periods of time,</li> <li>Users able to remove the HMD if they begin to feel symptoms of cyber sickness.</li> <li>Ensure adequate cleaning facilities available should users become ill (thereby avoiding slip/trip hazard.)</li> <li>Safety introduction conducted at beginning of session.</li> <li>Use of 20-20-20 rule to reduce eye strain.</li> <li>In the event of Cyber Sickness occurring remove user from VR environment for at least 15 minutes.</li> </ul>

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# HIRAC Report

Risk, Health and Safety

Title: Virtual/Augmented Reality Risk Management Form	Authorized By: Liam Mudge / Damon Minotti
	Page Number: 12 of 12

Hazards Inspected		Risk Assessment		Description of Risk	Control Measures
Sharing of bodily fluids/Infection	Y <input checked="" type="checkbox"/> N <input type="checkbox"/>	Medium	Low	<ul style="list-style-type: none"> <li>Sharing of the HMD by multiple users has the potential to pass on contact of body fluids such as sweat and potential pathogens.</li> </ul>	<ul style="list-style-type: none"> <li>Use of Hygiene covers and alcohols cleaning products to ensure safe/sterile equipment for all users.</li> <li>Supply of medical grade sick bags incase users become ill.</li> </ul>

## 4. Risk Assessment Signoff

Authorised By: Damon Minotti	Signature: 	Date: 05/02/2023
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