

## RSPHys Risk Assessment: RA\_076110 – Elionix EBL

- This form is used when a documented risk assessment is required in accordance with Appendix A of WHSMS Handbook Chapter 3.1.
- Original risk assessments must be provided in a convenient location accessible by all people affected by the risk assessment.
- Static risk assessments must be forwarded to local WHS Manager for inclusion in the School Static Risk Assessment Register.

Static Risk Assessment No.		Assessment Date	Reviewed by Date	Version	Top Residual Risk
RA_076110		20 Nov 2023	20 Nov 2026	1.0	Low
<b>Name of the activity</b>	Electron Beam Lithography (EBL), Elionix Boden 125 Hazards Assessed: Plant and Equipment, Electrical, Chemical, Ergonomics and Manual Tasks, After Hours				
<b>Description of the activity</b>	EBL (Electron Beam Lithography) tool is used to transfer various patterns on substrates using a beam of electrons and a CAD mask.				
<b>School/ Department</b>	Research School of Physics, EME	<b>Location</b>	Building: 160, Room: P3.51H		
<b>Risk Assessment Team</b> Have you completed ANU WHS Risk Management Training? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <b>IF NO, DO NOT PROCEED</b>	<b>Supervisor</b>	Horst Punzmann	<b>Email</b>	<a href="mailto:horst.punzmann@anu.edu.au">horst.punzmann@anu.edu.au</a>	<b>Ph</b> +612 612 50001
	<b>Name</b>	Gayatri Vaidya	<b>Email</b>	<a href="mailto:gayatri.vaidya@anu.edu.au">gayatri.vaidya@anu.edu.au</a>	<b>Ph</b> +612 612 59638
	<b>Name</b>	Rick Walsh	<b>Email</b>	<a href="mailto:rick.walsh@anu.edu.au">rick.walsh@anu.edu.au</a>	<b>Ph</b> +612 612 50105
	<b>Name</b>		<b>Email</b>		<b>Ph</b>
	<b>Name</b>		<b>Email</b>		<b>Ph</b>
<b>Who is affected by this RA?</b>	<input checked="" type="checkbox"/> All people at the location <input type="checkbox"/> A group of people (list right) <input type="checkbox"/> A single person (list right)	<b>People consulted on this RA.</b> (All persons affected, or their representatives need to be consulted)			
<b>WHS Legal and Other Requirements</b>	Work Health and Safety Act 2011 (Cth) Work Health and Safety Regulations 2011 (Cth) ANU WHSMS Handbook Chapter 3.1: Hazard Management				
<b>Type of RA</b>	<input checked="" type="checkbox"/>	<b>Static RA (long term, &gt; 6 months)</b>	Send a copy to WHS Manager and keep original locally near the activity/location, accessible to all people affected.		
	<input type="checkbox"/>	<b>Dynamic RA (short term &lt; 6 months)</b>	Keep the original locally (electronically or physically) near the activity/location, accessible to all people affected.		

## Risk Assessment Instruction

- List the hazards of the activity in the 'Hazards' column of the RA Form. Include information on when and where the hazard is present during the activity.
- Estimate inherent risk of the hazard (without any controls in place) using the Likelihood against Consequences definitions described in Table 1 and Table 2 and the ANU WHS Risk Matrix (Table 3). List them in 'Inherent Risk' column of the RA Form for each hazard.
- Develop control measures in accordance with the Hierarchy of Control Principle (Table 4) and list them in 'Control' column of the RA Form.
- Estimate the residual risk of the hazard after implementing all controls. Remember that engineering, administrative and PPE controls only reduce the likelihood of an event occurring, not the consequences.
- Identify any controls that are not in place as corrective actions and implement them before undertaking the activity.
- Obtain approval from relevant people as identified.
- Identify if this is a static risk assessment (> 6 months) or dynamic risk assessment (< 6 months).
- Send a copy of the static risk assessments to WHS Managers– Keep on file for 7 years.
- Keep originals of risk assessments in close vicinity of the activity. Dynamic risk assessments can be destroyed 1 year after the activity ceases.
- Review the static risk assessments and associated safe work procedures in accordance with Section 3.1.2.6: Step 4 of Chapter 3.1 requirements.

Risk Assessment							
Hazards Also list where and when can the hazards present?	Inherent Risk			Control Measures When designing controls, follow the Hierarchy of Controls Principle, assigning the most effective controls before less effective controls (see Table 4). <i>List the control category and the controls for each hazard below. For any controls that are not in place, fill in the Actions table on the next page.</i>	Residual Risk		
	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
<b>Plant and Equipment</b> <ul style="list-style-type: none"> <li>Entanglement and trapping parts</li> <li>Elevated Work Platform used during maintenance (by authorised vendor service engineers only)</li> <li>Cables running between main unit and Various electronic racks and vice versa.</li> </ul>	Unlikely	Major	High	<b>Isolation</b> <ul style="list-style-type: none"> <li>All surface lying cables are routed below the floor.</li> </ul> <b>Engineering</b> <ul style="list-style-type: none"> <li>Emergency Stops available on the tool as well as in lab</li> <li>Stools/ benches available to access elevated areas</li> <li>First Aid Equipment on site</li> <li>Access limited to authorized and trained staff through Cardex/Salto</li> </ul> <b>Administration</b> <ul style="list-style-type: none"> <li>Tier 3 Induction (160_L3_P3.51_2.50_CR_SF Induction)</li> <li>Tier 2 Training: ANU Risk Management Training (WHS003, Pulse)</li> <li>Instruction Manual (IM_160_L3_P3.51H_EBL1)</li> <li>Tier 3 Training EBL1 operator training</li> </ul>	Rare	Moderate	Low

Risk Assessment							
Hazards Also list where and when can the hazards present?	Inherent Risk			Control Measures When designing controls, follow the Hierarchy of Controls Principle, assigning the most effective controls before less effective controls (see Table 4). <i>List the control category and the controls for each hazard below. For any controls that are not in place, fill in the Actions table on the next page.</i>	Residual Risk		
	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
<u>Electrical</u> ➤ Electrical Shock (both minor and major) ➤ Electrocutation	Possible	Catastrophic	High	<b>Isolation</b> <ul style="list-style-type: none"> <li>Power supply and transformer located at level 2, plant room</li> <li>Power supply cables routed under floor</li> </ul> <b>Engineering</b> <ul style="list-style-type: none"> <li>RCDs installed on circuits</li> <li>Emergency Stop/ EPO (Emergency Power Off) installed on the tool</li> <li>Emergency Stop/ EPO (Emergency Power Off) installed in the room</li> </ul> <b>Administration</b> <ul style="list-style-type: none"> <li>Tier 3 Induction (160_L3_P3.51_2.50_CR_SF Induction)</li> <li>Test and tag of all electrical plugged into electrical sockets.</li> </ul>	Rare	Moderate	Low

Risk Assessment							
Hazards Also list where and when can the hazards present?	Inherent Risk			Control Measures When designing controls, follow the Hierarchy of Controls Principle, assigning the most effective controls before less effective controls (see Table 4). <i>List the control category and the controls for each hazard below. For any controls that are not in place, fill in the Actions table on the next page.</i>	Residual Risk		
	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
<b>Chemical</b> <ul style="list-style-type: none"> <li>➤ Flammable Liquids used for cleaning (Isopropanol)</li> <li>➤ Gas lines piped into the room and equipment (Nitorgen)</li> </ul>	Possible	Catastrophic	Extreme	<b>Substitution</b> <ul style="list-style-type: none"> <li>• Nitrogen supplied through ½ inch line (max flow rate limited by wall mounted pressure regulator)</li> </ul> <b>Engineering</b> <ul style="list-style-type: none"> <li>• maximum volume of 500 ml squeeze bottle placed in the room</li> <li>• Oxygen monitors installed in room, linked to building emergency notification systems.</li> <li>• Building ventilation system with alarm in case ventilation fails, link to building emergency notification systems</li> <li>• Safety Showers / Eye Wash stations available in the area</li> </ul> <b>Administration</b> <ul style="list-style-type: none"> <li>• Tier 3 Induction (160_L3_P3.51_2.50_CR_SF Induction)</li> <li>• Tier 2 training: Flammable Substances (WHSO16, Pulse)</li> <li>• Instruction Manual (IM_160_L3_P3.51H_EBL1)</li> <li>• Refilling of flammable liquids to be conducted in wet-benches outside EBL room</li> <li>• Containers labelled to GHS requirements</li> <li>• Chemical Register</li> </ul> <b>PPE</b> <ul style="list-style-type: none"> <li>• Safety goggles/glasses used during sample cleaning</li> </ul>	Rare	Minor	Low
<b>Ergonomics and Manual Tasks</b> <ul style="list-style-type: none"> <li>➤ Repetitive movements</li> <li>➤ Long duration of the same posture (e.g., sitting)</li> </ul>	Possible	Moderate	High	<b>Engineering</b> <ul style="list-style-type: none"> <li>• Ergonomically designed chairs available</li> </ul> <b>Administration</b> <ul style="list-style-type: none"> <li>• Tier 2 Training, Setting up your workstation (WHSO20, Pulse)</li> <li>• Rest breaks every 20 mins</li> </ul>	Rare	Moderate	Low

Risk Assessment							
Hazards Also list where and when can the hazards present?	Inherent Risk			Control Measures When designing controls, follow the Hierarchy of Controls Principle, assigning the most effective controls before less effective controls (see Table 4). <i>List the control category and the controls for each hazard below. For any controls that are not in place, fill in the Actions table on the next page.</i>	Residual Risk		
	Likelihood	Consequence	Risk rating		Likelihood	Consequence	Risk rating
<b>After hours working</b> ➤ Lack of capacity to respond to emergencies	Likely	Major	Extreme	<b>Elimination</b> <ul style="list-style-type: none"> <li>At this point in time, NO after-hours work is allowed.</li> </ul> <b>Administration</b> <ul style="list-style-type: none"> <li>However, if after-hours work was to be allowed in exceptional circumstances in the future, a work procedure (including afterhours emergency response) will have to be developed.</li> <li>Approval from Supervisor and WHS Office</li> <li>No usage of chemicals in case of after-hours tool operation</li> <li>Minimum required buddy-policy, e.g.:               <ul style="list-style-type: none"> <li>Minimum 2 people to be present for after-hours work, or</li> <li>Check in system with another person to be established.</li> </ul> </li> </ul>	Rare	Moderate	Low

Actions			
<b>The activity must not be commenced until all controls are in place.</b> List below which controls are currently not in place, who will implement them and by when. Add additional rows as needed.			
List of Controls not in place	Who is to implement them?	Timeframe	Date Completed
Develop the instruction manual 'IM_160_L3_P3.51H_EBL1_Vx.docx'	Gayatri	1 month	05.04.2024

If the level of residual risk is assessed as high or extreme,

1. Stop the activity immediately; AND
2. Tag out the plant/equipment; and/or
3. Secure any chemical; and
4. Implement, or seek advice from WHS Officer or Subject Matter Experts to implement, additional controls to reduce the residual risk further to medium [Supervisor signature required];
5. If the above is not possible, seek approval from relevant authority (High – School/Division Director/College Dean; Extreme – COO). NOTE: Approval will only be granted in exceptional circumstances after consultation with Associate Director, WEG and/or a Subject Matter Expert. See Chapter 3.1 for details.

Approval required					
Worker conducted RA			Student conducted RA		
Residual Risk Level	Authority required	Signature and date	Residual Risk Level	Authority required	Signature and date
Low	Author of RA	Gayatri Vaidya 05/04/2024	Low	Supervisor	
Medium	Supervisor		Medium	Supervisor	
High	School Director		High	School Director	
Extreme	COO		Extreme	COO	

**Table 1. Likelihood Table**

Ranking	Description	Probability or frequency of event happening
Almost certain	The hazard is expected to lead to an event in most circumstances at the University	A daily to monthly occurrence
Likely	The hazard could lead to an event in most circumstances at the University	Between monthly to yearly occurrence
Possible	The hazard has led to an event at some time at the University	Occurs once between 1 to 5 years
Unlikely	The hazard could lead to an event at some time	Occurs once between 5 to 20 years
Rare	The hazard may lead to an event in exceptional circumstances	Occurs once between 20+ years

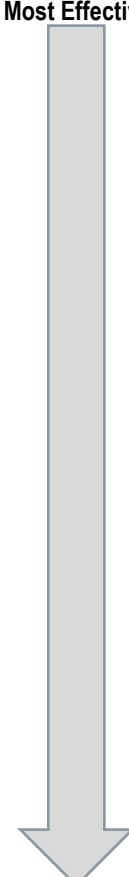
**Table 2. Consequences Table**

Ranking	Injury, Illness or Disease	Plant, Equipment, and materials	Environment
Catastrophic	Fatality / fatalities or permanent disability. Permanently unable to work	Destroyed or cannot be reused	Long term permanent effect to ecosystems. Significant intervention required to remediate
Major	Requiring extensive medical treatment such as hospitalisation as in patient and possibly a Notifiable Incident LTI >1 week	Damage requiring repairs/rebuild and possible recertification prior to reuse, lost use for one or more days	Notification to environmental agency, ecosystem will need time to recover, intervention required to remediate
Moderate	Minor medical treatment injury, such as treated by a health professional, hospital outpatient, no potential to be a Notifiable Incident LTI < 1 week and can return to normal duties	Damage requiring a repair/service by a trade/technician within the day	Contamination event that does not impact on ecosystem. Short impact does not need intervention
Minor	Injury needing significant first aid treatment and can return to work within shift	Equipment able to be reset or gotten back into operation by the operator	Minor contained contamination ceasing when the short event is over, can remediate (e.g., spill kit)
Insignificant	Report only, no injury OR minor first aid (e.g., Band-Aid); short-term discomfort	Report only, no damage	Report only, no contamination

**Table 3. ANU WHS Risk Matrix**

	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium (10)	High (14)	Extreme (21)	Extreme (22)	Extreme (25)
Likely	Medium (7)	High (13)	High (16)	Extreme (20)	Extreme (24)
Possible	Low (4)	Medium (9)	High (15)	High (18)	Extreme (23)
Unlikely	Low (2)	Medium (6)	Medium (8)	High (17)	High (19)
Rare	Low (1)	Low (3)	Low (5)	Medium (11)	Medium (12)

**Table 4. Hierarchy of Controls**

Level	Examples	Effectiveness
Elimination	<ul style="list-style-type: none"> <li>Remove the hazards completely</li> <li>Cease the activity</li> <li>Dispose of unwanted hazardous chemicals or plant etc</li> </ul>	<p style="text-align: center;">Most Effective</p>  <p style="text-align: center;">Least Effective</p>
Substitution	<ul style="list-style-type: none"> <li>Use less hazardous chemicals</li> <li>Use safer plant equipment</li> <li>Use handset instead of telephone</li> <li>Move smaller weight loads instead of large weight</li> </ul>	
Isolation	<ul style="list-style-type: none"> <li>Physical separation from the hazard by distance or complete shielding</li> <li>Install guard rails around edges and holes to floors</li> <li>Move workers to a new room away from hazardous noise</li> </ul>	
Engineering Control	<ul style="list-style-type: none"> <li>Use ventilation system</li> <li>Use fume cupboard when working with hazardous chemicals</li> <li>Install guarding around rotating and crushing parts</li> <li>Use trolley or hoist to lift heavy loads</li> <li>Use duress alarm system while doing home interview or offsite field work</li> </ul>	
Administrative Control	<ul style="list-style-type: none"> <li>Use Safe Work Procedures [<b>See section 3.1.3.1</b>] or instructions</li> <li>Induction and WHS information</li> <li>Training [<b>See Handbook Chapter 3.2</b>]</li> <li>Contingency Planning and Testing [<b>See section 3.1.3.2</b>]</li> <li>Permit to Work system [<b>See section 3.1.3.3</b>]</li> <li>Signage</li> </ul>	
Personal Protective Equipment (PPE)	<ul style="list-style-type: none"> <li>Lab coat</li> <li>Safety glasses/face shield</li> <li>Gloves/cryogenic gloves</li> <li>Respirators/Masks</li> <li>Personal hearing protectors</li> </ul>	

**Table 5. Risk Assessment and SWP review timeframe**

Use this Table to determine review timeframe and frequency for the risk assessment and any safe work procedures.

Residual Risk	Review Frequency		What to do during the review.
Extreme	6 months	And/or <ul style="list-style-type: none"> <li>After an incident where deficiencies in identifying or controlling hazards have been observed</li> <li>When changes to the activity need to occur</li> <li>When significant changes (e.g., renovation) to the workplace occurs</li> <li>When HSRs request a review</li> </ul>	<b>Stop work.</b> Review the control measures and introduce additional control measures to reduce the residual risk to <b>Medium</b> as a maximum.
High	1 Year		
Medium	2 Years		Review the control measures.
Low	3 Years		