HS Risk management form - HS017

For additional information refer to HS329 Risk Management Procedure

Faculty/Division: Faculty of Engineering		School/Unit: School of Mechanical and Manufacturing Engineering		
Document number: G8-RM-01	Initial Issue date 11/07/2024	Current version V1.0	Current Version Issue date 11/07/24	Next review date 12/07/24

Risk management name	**MECH4100 Group 8 Assembly of Stirling Engine**

Form completed by	Rachel Hansen	*Signature: R.H.*	*Date* 11/07/24
Responsible supervisor/authorising officer	Dr. Irene Renaud-Assemat, Senior Lecturer	*Signature:*	*Date*

Identify the activity and the location of the activity:	**Identify who may be at risk from the activity:** This may include fellow workers, visitors, contractors and the public. The types of people may affect the risk controls needed and the location may affect the number of people at risk
Description of activity	**Persons at risk**
A group of 7 MECH4100 students (undergraduate and postgraduate) will complete 3 x 2-hour sessions to manufacture parts for, and finally assemble, a Stirling Engine. The sessions will be run concurrently with the assembly sessions of max. 8 other MECH4100 groups. The 3 sessions will run across a total of 4 weeks, with each week containing a maximum of 1 session.	Group 8 members, UNSW Technical Staff and MECH4100 course conveners, members of surrounding MECH4100 groups
Description of location	**How they were consulted on the risk**

Assembly sessions are completed in Lab 214, Willis Annexe, Floor L2. This is a mechanical workshop.	Group 8 Members: Briefings for the assembly sessions in assignment specification documents, course lectures, and during meetings with UNSW technical staff. All members have read the following Risk management form. UNSW Technical Staff and MECH4100 course conveners: Have been provided with the following Risk management form. Members of surrounding MECH4100 groups: Briefings for the assembly sessions in assignment specification documents, course lectures, and during meetings with UNSW technical staff. Each group has produced, and will have read, their own Risk Management Form for assembly sessions.
List legislation, standards, codes of practice, manufacturer's guidance etc used to determine control measures necessary	
Work Health and Safety Act 2011 Work Health and Safety Regulation 2017	

Identify hazards and control the risks.
1. An activity may be divided into tasks. For each task identify the hazards and associated risks. Also list the possible scenarios which could sooner or later cause harm.
2. Determine controls necessary based on legislation, codes of practice, Australian standards, manufacturer's instructions, safety data sheets etc.
3. List existing risk controls and any additional controls that need to be implemented
4. Rate the risk once all controls are in place using the risk rating matrix (below and in HS329 Risk Management Procedure)

SHADED GREY AREAS
If you need to determine whether it's reasonably practicable to implement a control based on the risk, complete the shaded grey columns

Feel free to resize the boxes to suit your situation/the amount of text you need to use

Task / Scenario	*Hazard*	*Associated harm*	*Existing controls*	*Any additional controls required?*	*Risk Rating*			*Cost of controls (in terms of time, effort, money)*	*Is this reasonably practicable* Y/N
					Consequences	*Likelihood*	*Risk*		
Cutting parts with the hacksaw	• Sharp blade on hacksaw • Sharp edges on cut pieces • Hacksaw or parts may be dropped • Dust particles from cut parts • Friction from cutting may heat the parts	• Skin lacerations from hacksaw blade or sharp edges • Physical injury from falling hacksaw or parts • Eye and lung irritation from dust particles • Burns to the skin from hot parts	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Students are instructed on proper use of the hacksaw and safe manufacturing practices prior to assembly sessions • Lab technicians are present during assembly sessions to ensure safe manufacturing practices, and can provide assistance with hacksaw use • Lab is well ventilated • Workbench must remain organised and un-cluttered	• Respiratory masks can be worn while cutting parts with the hacksaw • Cut parts will be handled with care, and stored securely until assembly	*3*	*D*	*M*		

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					Consequences	*Likelihood*	*Risk*		
			• Before handling the hacksaw, the area must be clear of traffic • Before cutting, all parts must be clamped securely • Whilst handling the hacksaw, ensure body and fingers are not in the cutting path						
Filing sharp edges	• Sharp edges on pre-filed pieces • Rough surface of the file • File or parts may be dropped • Dust particles from filed parts • Friction from filing may heat the parts	• Skin lacerations from sharp edges • Skin abrasions from the file surface • Physical injury from falling file or parts • Eye and lung irritation from dust particles	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Students are instructed on proper use of the file and safe manufacturing practices prior to assembly sessions • Lab technicians are present during assembly sessions to ensure safe	• Respiratory masks can be worn while filing parts • Filed parts will be handled with care, and stored securely until assembly	*3*	*D*	*M*		

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					Consequences	*Likelihood*	*Risk*		
		• Burns to the skin from hot parts	manufacturing practices, and can provide assistance with filing • Lab is well ventilated • Workbench must remain organised and un-cluttered • Whilst handling the file, ensure hands are not in the filing path						
Drilling and reaming parts	• Drill bit is sharp • Fast moving parts during operation • Loose hair or clothing near the moving parts • Friction from machining may heat the drill bit and parts • Dust particles from the drilled/reamed parts	• Skin lacerations from the drill bit • Hair or loose clothing may become caught in moving parts and cause physical injury • Eye and lung irritation from dust particles	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Loose hair and clothing must be tightly secured • Students are instructed on proper use of the drill press and safe manufacturing practices prior to assembly sessions	• Respiratory masks can be worn while drilling and reaming parts • Drilled parts will be handled with care, and stored securely until assembly	*4*	*E*	*M*		

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					Consequences	*Likelihood*	*Risk*		
	• Flying fragments	• Eye injuries from flying fragments • Burns to the skin from hot drill bit or parts	• Lab technicians are present during assembly sessions to ensure safe manufacturing practices, and can provide assistance with drilling and reaming • Lab is well ventilated • Drill press has a guard to protect users from the drill bit, moving parts and flying fragments • Whilst machining, ensure body parts are behind the guard • An appropriate speed must be chosen for the drilling/reaming job						
Walking around the lab	• Trip hazards around the lab (e.g. bags left on the ground, electrical chords)	• Slip/trip/fall injury	• Ensure bags/other personal items are kept under benches	NA	*1*	*E*	*L*		

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					Consequences	*Likelihood*	*Risk*		
			• When moving/placing electrical chords, ensure they are clearly visible and are not crossing over walking paths • Those inside the lab must ensure that they, and those around them, are aware of their surroundings and use deliberate, careful movements when moving throughout the lab						
Handling the glass cylinders	• Glass may break/shatter, followed by the release of glass fragments	• Skin lacerations from broken glass and flying fragments • Cuts to the eye from flying fragments	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Glass cylinders should be handled with care, and with the minimum force required • Lab technicians are present during assembly sessions	• Glass cylinders will be stored securely and away from edges	*4*	*D*	*M*		

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					Consequences	*Likelihood*	*Risk*		
			to ensure safe manufacturing practices, and can provide assistance with the handling of glass cylinders						
Handling the acrylic parts	• Acrylic may break/shatter, followed by the release of fragments • Sharp edges on parts	• Skin lacerations from sharp edges, broken acrylic and flying fragments • Cuts to the eye from flying fragments	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Acrylic parts should be handled with care, and with the minimum force required • Sharp edges are filed in the manufacturing stage • Lab technicians are present during assembly sessions to ensure safe manufacturing practices, and can provide assistance with the handling of acrylic parts	• Acrylic parts will be stored securely and away from edges	*2*	*E*	*L*		

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					Consequences	*Likelihood*	*Risk*		
Handling the metal parts	• Sharp edges on parts	• Skin lacerations from sharp edges	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Sharp edges are deburred and filed in the manufacturing stage • Lab technicians are present during assembly sessions to ensure safe manufacturing practices, and can provide assistance with the handling of metal parts	• Metal parts will be stored securely and away from edges	*2*	*D*	*L*		
Adhering metal parts with Loctite641	• Contact to skin causes irritation • Contact to eyes causes sight damage • Flammable material	• Irritation to the skin from contact with skin • Irritation to the respiratory system from	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Protective gloves must be worn when handling Loctite641	NA	*3*	*D*	*M*		

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					Consequences	*Likelihood*	*Risk*		
		inhalation of fumes • Damage to eyes from contact with eyes • Burns to the skin if material becomes ignited	• Respiratory mask must be worn when handling Loctite641 • Wash hands immediately after use • Use in isolation from any potential ignition sources • Lab technicians are present during assembly sessions to ensure safe manufacturing practices, and can provide assistance with Loctite641 use						
Disassembling metal parts connected with Loctite641 (If necessary)	• Parts that are connected using Loctite641 must be heated to 250°C to enable disassembly • Blowtorch flame	• Third degree burns to the skin from contact with blowtorch flame and hot metal parts	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Lab technicians and MECH4100 course conveners are present	• A "hot zone" should be implemented, where all hot components are placed and left to cool before further handling	*4*	*D*	*M*		

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					Consequences	*Likelihood*	*Risk*		
			during prototype testing sessions to ensure safety • Heat resistant gloves must be worn when handling the blow torch and any heated parts • Hot parts must be securely stored in isolation, to be left to cool, before being handled • A safe distance must be kept from the flame at all times.						
Assembling and securing all parts into the Stirling engine configuration	• Engine components falling off the workbench • Skin pinches when fastening components	• Physical injury (i.e. bruising) from the impact of falling parts • Skin lacerations from pinches by the fasteners	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Lab technicians are present during assembly sessions to ensure safe manufacturing practices,	NA	*1*	*D*	*L*		

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					Consequences	*Likelihood*	*Risk*		
			and can provide assistance with assembly • Ensure workspace is uncluttered and organised when assembling the engine • Ensure appropriate clearance space is allocated to allow the insertion and fastening of each part into the engine configuration • Ensure appropriate tools are used when fastening components (e.g. Allen-keys)						
Lighting the tealight candle	• Candle flame • Components of the engine may be heated by the candle flame	• Second degree burns to the skin from contact with the candle flame	• Lab technicians and MECH4100 course conveners are present during prototype testing sessions to ensure safety	• A "hot zone" should be implemented, where all hot components are placed and left to	*3*	*D*	*M*		

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					Consequences	*Likelihood*	*Risk*		
		• First degree burns to the skin from contact with hot engine components	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • A safe distance must be kept from the candle flame at all times • Parts that have been directly exposed to a flame will be allowed to cool before handling	cool before further handling					
Potential use of blowtorch to heat the hot cylinder	• Blowtorch flame	• Third degree burns to the skin from contact with the blowtorch flame	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Lab technicians and MECH4100 course conveners are present during prototype testing sessions to ensure safety	• A "hot zone" should be implemented, where all hot components are placed and left to cool before further handling	*4*	*D*	*M*		

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					Consequences	*Likelihood*	*Risk*		
			• A safe distance must be kept from the flame at all times • Parts that have been directly exposed to a flame will be allowed to cool before handling						
Engine operation	• Loose hair or clothing near the moving parts • Engine failure during operation could result in flying objects • Crush risk to fingers or limbs • Candle flame • Components of the engine may be heated by the candle flame	• Hair or loose clothing may become caught in moving parts and cause physical injury • Cuts to the eye from flying fragments • Moving components can catch body parts, leading to harmed	• Sturdy, enclosed shoes must be worn • Safety glasses must be worn • Loose hair and clothing must be tightly secured • An appropriate distance away from all moving components must be maintained • Lab technicians and MECH4100 course conveners are present	NA	*3*	*E*	*M*		

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		fingers or limbs. • Burns to the skin from contact with the candle flame or hot engine components	during prototype testing sessions to ensure safety						

Risk Rating Matrix

RISK RATING METHODOLOGY AND MATRIX

Consider the Consequences	Consider the Likelihood	Calculate the Risk
Consider: What type of harm could occur (minor, serious, death)? Is there anything that will influence the severity (e.g. proximity to hazard, person involved in task etc.). How many people are exposed to the hazard? Could one failure lead to other failures? Could a small event escalate?	Consider: How often is the task done? Has an accident happened before (here or at another workplace)? How long are people exposed? How effective are the control measures? Does the environment effect it (e.g. lighting/temperature/pace)? What are people's behaviours (e.g. stress, panic, deadlines) What people are exposed (e.g. disabled, young workers etc.)?	1.Take the consequences rating and select the correct column 2.Take the likelihood rating and select the correct row 3. Select the risk rating where the two ratings cross on the matrix below. **VH = Very high, H = High, M = Medium, L = Low**
5. Severe: death or permanent disability to one or more persons **4. Major:** hospital admission required **3. Moderate:** medical treatment required **2. Minor:** first aid required **1. Insignificant**: injuries not requiring first aid	**A. Almost certain:** expected to occur in most circumstances **B. Likely:** will probably occur in most circumstances **C. Possible:** might occur occasionally **D. Unlikely:** could happen at some time **E. Rare:** may happen only in exceptional circumstances	

		CONSEQUENCES				
		1	2	3	4	5
LIKELIHOOD	A	M	H	H	VH	VH
	B	M	M	H	H	VH
	C	L	M	H	H	VH
	D	L	L	M	M	H
	E	L	L	M	M	M

Risk level	Required action
Very high	**Act immediately**: The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of risk controls
High	**Act today:** The proposed activity can only proceed, provided that: (i) the risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls and (ii) the risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. and (iii) the document has been reviewed and approved by the Supervisor and (iv) a Safe Working Procedure or Safe Work Method has been prepared and (v) the supervisor must review and document the effectiveness of the implemented risk controls
Medium	**Act this week**: The proposed task or process can proceed, provided that: (i) the risk level has been reduced to as low as reasonably practicable using the hierarchy of controls and (ii) the document has been reviewed and approved by the Supervisor and (iii) a Safe Working Procedure or Safe Work Method has been prepared.
Low	**Act this month:** Managed by local documented routine procedures which must include application of the hierarchy of controls.

List emergency procedures and controls **List emergency controls for how to deal with fires, spills or exposure to hazardous substances and/or emergency shutdown procedures**
• Fire extinguisher available in all UTL Facilities • All team members are aware of evacuation procedures • UTL lab technicians are updated on first-aid training • Emergency services can be easily contactable • All team members have emergency contacts update to date

Implementation			
Additional control measures needed:	**Resources required**	**Responsible person**	**Date of Implementation**
Respiratory masks can be worn when cutting parts with the hacksaw, filing, and drilling/reaming with the drill press	Respiratory mask x 7	Rachel Hansen	12/07/2024
All parts to be machined (i.e. cut, filed or drilled) will be stored securely	Large storage container, labelled 'machining'	Joel Thambi	12/07/2024
Glass cylinders will be stored securely and away from edges	Storage container, labelled 'glass cylinders'	Joel Thambi	12/07/2024
Finished acrylic parts will be stored securely and away from edges	Storage container, labelled 'finished acrylic'	Joel Thambi	12/07/2024
Finished metal parts will be stored securely and away from edges	Storage container, labelled 'finished metal'	Joel Thambi	12/07/2024
A 'hot zone' should be implemented, where all hot components are placed and left to cool before further handling	Roll of masking tape (to designate space on workbench as 'hot zone')	Rachel Hansen	12/07/2024

REVIEW			
Scheduled review date:	12/07/2024	18/07/2024	25/07/2024
Are all control measures in place?	Yes		
Are controls eliminating or minimising the risk?	Yes		
Are there any new problems with the risk?	No		
Review by: (name)	Rachel Hansen		
Review date:	12/07/2024		

Acknowledgement of Understanding
All persons performing these tasks must sign that they have read and understood the risk management (as described in HS329 Risk Management Procedure).

Note: for activities which are low risk or include a large group of people (e.g. open days, BBQ's, student classes etc), only the persons undertaking the key activities need to sign below. For all others involved in such activities, the information can be covered by other methods including for example a safety briefing, induction, and/or safety information sheet (ensure the method of communicating this information is specified here)	
Risk management name and version number:	**I have read and understand this risk management form:**

Name	**Signature**	**Date**
Joshua d'Ettorre	J.D.E.	11/07/2024
Christopher Dykstra	C.D.	11/07/2024
Chisom Ezeaku	C.E.	11/07/2024
Rachel Hansen	R.H.	11/07/2024
Nathan Sivalingam	N.S.	11/07/2024
Joel Thambi	J.T.	11/07/2024
Raymond Wang	R.W.	11/07/2024