

MAI Project Safety Statement

Project Title	
Lab	Injury Biomechanics Laboratory (TBSI room B3.31)
Student	
PI	
Date	

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Emergency contacts

Name	Position	Contact Email	Phone
Ciaran Simms	PI for Injury Biomechanics Lab	csimms@tcd.ie	01 896 3768
Simon Carroll	Safety Officer, TCBE	scarrol6@tcd.ie	01 896 8503
Gordon O'Brien	Safety Officer, Dept. of Mech, Manuf and Biomedical Eng.	Gordon.O'Brien@tcd.ie	01 896 2396

Overview

This document outlines the activities and procedures that will be performed in the Injury Biomechanics Laboratory (TBSI room B3.31), including any associated risks and hazards. An up-to-date copy of this document will be kept in a folder next to the entrance of Room B3.31.

Since there are several potentially dangerous activities that are regularly performed in this laboratory, any individual who intends to carry out any activities in this room must:

- a) Familiarize themselves with the contents of this document. This includes having an understanding of the activities that are carried out by other users of this laboratory and the associated risks.
- b) Sign the 'Registered users form' (next section) in this document
- c) Update this document when new procedures not already described herein are planned or significant modifications are required for existing procedures. This will involve revising the associated Risk Assessment documents and notifying all other registered users (by email) of all significant changes that may have an impact on the health and safety of other lab users.

Activity 1: Hydraulic Impact Ram

Overview of Activity 1

The hydraulic impact Ram delivers a controlled impact. Applications are varied, but the impact Ram has been used for:

- scaled roadside barrier testing
- wheelchair head restraint testing
- low speed vehicle bumper testing.

SOP of Activity 1

The operator(s) ensures the Impact Room (B3.31) is vacated, then sets up the test and leaves the room, locks it and place a warning sign on the door and goes to the control room (B3.32). When the control console is used and the lock yokes are disengaged, a flashing warning light connected on the outside of the impact room door automatically engages, as well as a warning sound. The operator observes through the viewing glass whether the ram is safe to fire. When safe, the RAM is fired. The lock yokes are reengaged and the warning sign and sound stop. The operator observes through the viewing glass whether the room is safe to enter, remove the warning sign on the door, unlocks the impact room door, enters and makes a final inspection that the room is safe for others to enter. Testing is over.

Operating procedure:

1. Load high pressure hose should be disconnected from the ram so as not allow a load to be filled into the ram which may endanger people in the lab.
2. Computer used for monitoring test, recording data or capturing video should be setup with triggers and make sure that triggers are working properly for test.
3. Setup the test that you wish to record and make sure everything is in place.
4. Attach load pressure hose to ram. (Ram and sled should be in retracted position).
5. Leave test room and lock door ensuring nobody is inside while testing.
6. Ensure door to control room is open during testing.
7. Turn on control panel (ensure all vent valves on control panel are closed).
8. Open valves on cylinders if not already open.
9. Ensure lock yokes engaged.
10. Fill set pressure to desired value. (max value for set pressure can be adjusted using regulator inside control panel)
11. Ensure set isolation light is on before filling load pressure and trigger pressure by pressing green load button.
12. Fill load pressure to desired value. (a max ratio of 5:1 between load and set pressure should be used)
13. Fill trigger pressure to desired of around 300Psi (fill very slowly as pressure increases very quickly).
14. Retract lock yokes by pressing button.
15. Trigger ram by holding button down for 10 seconds.
16. Press green load button to vent load pressure after firing this also retracts the thrust column. (Leave the room while venting as this is very loud)
17. Ensure thrust column is fully retracted so lock yokes will engage when button is pressed (switch is not being pressed by column so may need to be done manually)
18. Ensure load pressure is fully gone, enter room and remove load pressure hose.

Risk assessment of Activity 1- Use MMBE Risk Assessment Template

Potential Hazard	Who is at risk?	Existing Control Measures	Risk Rating	Preventative Measures	Responsibilities
Asphyxiation	All persons in lab	Oxygen level sensors. Notices stating the gas being used and contact details displayed.	Medium	Check on regulator and pipe seals in open area before installation. Regularly check oxygen depletion monitors are working	PI
Dynamic force of the sudden release of pressure from a cylinder	All persons in lab	Safety cabinet to help contain sudden release of pressure	Medium	The cylinders will be secured into the cabinet to ensure they do not move and also transported by trained personnel	PI
Explosion risk to fire fighting personnel due to structural failure in a fire	Fire fighters and other personnel in the lab	Safety cabinet has a fire rating of 30 mins for an increase of 50 kelvin at bottle neck	Medium	Copies of the compressed gas permit form will be exhibited on the outer doors to the lab and a copy in reception.	PI
Damage to walls in room B3.31 due to impacted test objects striking walls	Material rather than personal damage	Individual impact tests will be designed to provide catching mechanisms for all larger objects where this risk exists.	Very Low	safe design of testing campaigns	PI
Injury to operator due to being struck by test objects	Testing operator	Testing operator follow strict protocol in which impact ram can only be fired when operator is in adjoining control room protected by toughened glass	Very low	Auditing of test protocol on a regular basis	PI
Injury to impact ram operator due to failure of compressed gas containers	Testing operator	Compressed gas cylinders are stored in ISO rated gas safety cabinet. High-pressure gas hoses are reinforced and secured	Very Low	Checking of gas lines and gas bottles on a regular basis	Operator

Activity 2: Small Scale Drop Testing

Overview of Activity 2

The drop testing rig is used to deliver drop masses of 1-5kg from a height of up to 1.3m. It consists of a steel tube with stabilising feet and the drop mass is delivered through the tube.

SOP of Activity 2

Operating procedure:

1. Setup computer used for monitoring test, recording data and make sure it is working properly for test.
2. Set up measurement tools, cameras and accelerometer and calibrate before testing.
3. Setup the test that you wish to record and make sure everything is in place.
4. Ensure the steel tube is level to the ground and properly stabilised.
5. Place padding around the impacted object.
6. Place accelerometer on top of the weight to be dropped.
7. Activate measurement tools.
8. Ensure the operator is on higher ground during the drop test and that all other present keep an appropriate distance from the test setup.
9. Perform the test: drop the weight through the tube.
10. Deactivate the measurement tools and save data.

Risk assessment of Activity 2- Use 5x5 Risk Matrix for Risk Assessments

Potential Hazard	Who is at risk?	Existing Control Measures	Risk Rating	Preventative Measures	Responsibilities
Injury to operator due to being struck by dropped weight	Test operator	Adhere to protocol: the operator is on higher ground when performing the drop test to avoid dropping the weight on their feet.	Medium	Auditing of test protocol on a regular basis.	Operator
Damage to the floor of room B3.31 due to dropped weight striking the floor	Material rather than personal damage	Individual drop test will be designed to prevent the weight hitting the floor and padding surrounds the impacted object.	Very low	Safe test design	Operator
Damage to accelerometer due to weight dropped on top of it.	Material rather than personal damage	Adhere to protocol: attach the accelerometer securely on top of a cylindrical weight that can only move through the tube. Padding surrounding the impacted object	Low	Safe test design, auditing of test protocol on a regular basis.	Operator

Activity 3: Tissue Testing

Overview of Activity 3

Mechanical testing of fresh and aged animal tissues for biomechanics research. Focus is on muscle and connective tissues.

SOP of Activity 3

there are a variety of different soft tissue tests: drop testing, abdominal pressure model et cetera each with different test configurations. However the common operating procedures are:

1. Protective gloves to be worn at all times
2. Sharp tools only used by trained personnel
3. Sharps disposed of in sharps bin
4. All surfaces cleaned down with appropriate disinfectants after use
5. Tissues must be labelled and stored in appropriate fridges and freezers.

Risk assessment of Activity 3- Use 5x5 Risk Matrix for Risk Assessments

Potential Hazard	Who is at risk?	Existing Control Measures	Risk Rating	Preventative Measures	Responsibilities
Sharps; Including Specimen preparation tools (scalpels, blades, scissors) Drop Test rig edges	All members involved with the test	New personnel to be trained on sharp equipment handling, how to change blades	Medium	<ol style="list-style-type: none"> 1) Only trained personnel allowed to use sharp tools in the lab. 2) No sharp tools left lying around. 3) Protective gloves worn at all times. 4) Only people working on the experiments are allowed inside the lab 5) Sharps placed into a sharps bin. 	PI
Potential for the biological material in question to harbour pathogens	All members involved with the test	All animal tissue brought into the lab shall be regarded as potentially infectious and appropriate protective action taken	Medium	<ol style="list-style-type: none"> 1) Specific written disinfection protocols in place for areas in which biological material is being handled. Protocols must identify a suitable disinfectant(s) to be used and detail the procedures to be followed when disinfecting contaminated surfaces 2) Good personal hygiene practice 3) Wear correct personal protective equipment 4) All wounds shall be covered using a waterproof dressing at all times. 5) The safe disposal of all contaminated waste biological tissue 6) Training and providing information to all new lab workers in handling potentially infectious material 	The Chief Technical Officer/PI
Biological Contamination from using the phone, light switch or computer	All members involved with the test	Anything that comes into contact with a gloved hand shall be considered contaminated	High	No gloved hand allowed to operate the light switch, computer or phone	PI
Injury from improper use of the drop test rig	All members involved with the test	Proper training on the rig usage	Low	No untrained person allowed to use the rig	PI