

# SCHOOL OF ENGINEERING LOCAL LABORATORY RULES

## Materials Laboratory

To be read in conjunction with the School's safety handbooks, policies and guidance: [School Policies, Guidance & Resources | School of Engineering | The University of Aberdeen \(abdn.ac.uk\)](#)

<b>Laboratory Coordinator</b>	Professor A. Akisanya <a href="mailto:a.r.akisanya@abdn.ac.uk">a.r.akisanya@abdn.ac.uk</a>	2989
<b>Technicians</b>	Mr A. Maclean <a href="mailto:alan.maclean@abdn.ac.uk">alan.maclean@abdn.ac.uk</a>	2810
	Mr M. Gourlay <a href="mailto:mark.gourlay@abdn.ac.uk">mark.gourlay@abdn.ac.uk</a>	3769
<b>Local Safety Coordinator</b>	Mr G. Cordiner <a href="mailto:g.cordiner@abdn.ac.uk">g.cordiner@abdn.ac.uk</a>	2788
<b>Technical Resources Officer</b>	Mr G. Cordiner <a href="mailto:g.cordiner@abdn.ac.uk">g.cordiner@abdn.ac.uk</a>	2788

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Areas covered by this document	
Materials Laboratory	Fraser Noble 015

## **1. Training and Risk Assessment**

All persons commencing work in the lab must undergo a formal Laboratory Induction in addition to the Basic Induction they received on arrival at the school. In addition to records of induction training, records must also be kept of any further training provided.

No work should commence in the lab until a risk assessment has been completed in conformance with School procedures as stated in the School Safety Handbook.

## **2. Electricity**

The Estates Section are responsible for the provision and maintenance of a safe electrical supply.

When undertaking maintenance work on electrically powered equipment, the power supply should either be isolated and padlocked off or, in the case of 13Amp plugs, plugs should be removed from their sockets and the plug and cable returned to the equipment.

No electrical equipment should be opened or used without permission of a supervisor and without having the necessary experience.

## **3. Dangerous Moving Parts**

The lab uses equipment with potentially dangerous moving parts. When working with equipment with dangerous moving parts the equipment must be adequately guarded to prevent accidental contact to the experimenter or any other persons having business in the lab. Section 13 provides more information on the use of guards.

When setting up or adjusting electrically powered equipment with dangerous moving parts, the power supply should either be isolated and padlocked off or, in the case of 13Amp plugs, plugs should be removed from their sockets and the plug and cable returned to the equipment.

No equipment should be operated without the express permission of the Lab Coordinator or the Resident Technician and only after training.

## **4. Materials Testing Apparatus**

The lab contains large equipment used in compression, tensile and shear testing of a wide variety of materials. The equipment is generally electrically powered often requiring hydraulic and compressed air supplies. No operation of equipment is permitted without the express permission of the Lab Co-ordinator or Resident Technician and only after obtaining adequate training. The technician will normally oversee testing operations within the lab.

The machines use moving parts, and the operator needs to be aware of the potential to trap fingers in the mechanisms. Appropriate training, supervision, awareness and guarding should eliminate any risks.

Maintenance of the testing equipment is undertaken by the Resident technician and manufacturers. It is the responsibility of the Lab Co-ordinator to ensure this happens.

#### 4.1 Using Guards on Materials Testing Apparatus

Compression and tensile testing of the standard materials (e.g., metals) used in the lab would not normally result in flying fragments. In this case the use of guards as eye protection is not strictly required but safety spectacles are advisable. **Guards may however be necessary to protect from moving parts.**

Less commonly used materials such as concrete, ceramics or plastics have the potential to fragment under load creating a risk of injury from flying fragments. **In this case the use of guards and/or safety spectacles is mandatory.**

The lab contains general purpose guards which are adequate for most activities. These guards commonly consist of a plastic screen held in place with a magnetic base and placed such that they protect the areas in which people are working. They are designed for light work and would not be able to contain a heavy object. In cases where the general-purpose guard is deemed insufficient an alternative guard must be acquired before any tests commence. In planning a project, the time and resources required for the design and manufacture of bespoke guards must be taken into account.

Guards also serve as a barrier from moving parts where there exists a risk of fingers getting caught in mechanisms.

In all cases the risk assessment for any project should consider guards and eye protection. The risk assessment must also consider any risks posed to other laboratory users as a result of any operations.

#### 4.2 Operating the Instron 1185 Universal Test Machine

The machine must not be used without reference to the Lab Coordinator or the Resident Technician and carefully studying the operation manual for the machine.. Always arrange guards around the test area.

Ensure machine and computer are switched on and that the load cell is correctly calibrated.

- Ensure that only Instron approved jigs and fixtures, or fixtures specifically designed for this machine, are used.
- Calculate maximum load required prior to test. Note: the maximum available range is 2-150kN and an appropriate safety factor should be allowed in all calculations
- Parameters such as testing speed, load, dimensions of test piece etc should all be entered using the software prior to testing.
- Vertical limit switches adjusted so fixtures cannot collide.
- Prior to starting test ensure all safety guards are in place and all body parts are clear. All users to be wearing suitable PPE and that they are following the Risk Assessment requirements. Other Lab users to be advised of potential testing hazards.
- To commence test, select start test using software.
- To stop, select stop test using software. If the test piece has not fractured ensure the load is removed before releasing the test piece.
- For emergency stop, depress large red button on Mains Controller.

### 4.3 Operating the Instron 8033 Universal Test Machine

The machine must not be used without reference to the Lab Co-ordinator or the Resident Technician and carefully studying the operation manual for the machine. Always arrange guards around the test area.

- Ensure machine and computer are switched on and Load Cell calibration has taken place.
- Calculate maximum load required. The load cell on the machine is rated at 500kN and cannot be exceeded. An appropriate safety factor should also be included in the calculations.
- Select hydraulic grips appropriate to test fixture requirements.
- Caution must be exercised when clamping test fixtures into hydraulic grips.
- Enter test parameters into software.
- Ensure machine crosshead is set with enough clearance to allow the Ram to move to its zero position prior to use. Also ensure it is clamped prior to conducting a test.
- Ensure all necessary guarding is in place and that all users are at a safe distance and are wearing appropriate PPE and that they are following the Risk Assessment requirements. Other Lab users to be advised of potential testing hazards.
- To stop select stop test button on software.
- Ensure any load is removed from test piece prior to releasing it from hydraulic grips. This is done using the Load protect button.
- In an emergency depress **RED** button on machine base or on the console.

### 4.4 Operating the Hounsfield Testing Machine

The machine must not be used without reference to the Lab Co-ordinator or the Resident Technician and carefully studying the operation manual for the machine.

- Ensure machine and computer are switched on.
- Calculate maximum load required. The load cell on the machine is rated at 10kN. An appropriate safety factor should be allowed for in calculations.
- Select appropriate fixtures and grips and mount correctly.
- Adjust vertical limit switches so that fixtures cannot collide.
- Select suitable test program and enter test parameters into software
- Ensure all necessary guarding is in place and that all body parts are clear of testing area. Users to ensure correct PPE is being used and that they are following the Risk Assessment requirements. Other Lab users to be advised of potential testing hazards.
- To stop select stop test on the software.
- In an emergency press the large **RED** button.
- If the test piece has not fractured ensure the load is removed before releasing the test piece.

## **5. Ovens and Furnaces**

The lab contains ovens and furnaces used in the treatment of test samples. These devices can reach high temperatures and cause serious burns. Temperature resistant gloves and sleeves are available for working with the furnaces. No operation of the furnaces is permitted without the express permission of the Lab Coordinator or the Resident Technician and after obtaining adequate training. The technician will normally oversee operations within the lab.

## **6. Compressed Air**

Some machines and equipment require a compressed air supply for normal operation. The Resident Technician will make any connections to machines requiring compressed air. Compressed air may also be used for cleaning parts or inaccessible areas. Never direct compressed air at anyone. It has been known for people to be killed by misuse of compressed air.

## **7. Hydraulic Pump Room**

The hydraulic pump room contains controls for turning on the hydraulic pumps which provide power to the test machines. The Resident Technician controls access to the hydraulic pump room. No other lab user requires access to this room.

## **8. Slips and Trips**

The main walkways should be kept clear of objects and there should be no trailing cables. If it is necessary to have trailing cables, they should be covered with a suitable ramp or rubber cable protector. Oil spills should be cleared immediately.

## **9. Manual Handling**

Whenever possible, mechanical lifting devices should be used to move concrete and equipment in the Lab. Roller trucks, trolleys and the high stacker must be kept in good condition and maintained regularly. Lifting equipment, shackles and slings should be entered on the School's Lifting Register and inspected by the University Insurance inspector at proscribed intervals. In the case of lifting equipment this is annual and for lifting accessories the interval is 6 months. The TRO is responsible for making sure all this happens and that records are kept.

## **10. Chemicals**

A list of chemicals and their safety data sheets must be kept up to date and filed in the appropriate folder. Solvents and acids must be stored in separate cabinets. Chemicals used in both maintenance and experimental work must be addressed in the Risk Assessment.

## **11. Hand Tools**

Hand tools must be maintained in good condition. Safety goggles, footwear and gloves must be used when necessary.

## 12. Pedestal Drill

A list of authorised users is posted next to the drill and only they can operate the pedestal drill. The Resident Technician will maintain this list.

The following points must be adhered to by all users:

- The guard must be in position at all times.
- Eye protection must be worn.
- Beware of loose clothing.
- No jewellery or bandages, and gloves must not be worn.
- Long hair must be tied back.

## 13. Use of Lasers

Class 2 laser extensometers are used in the Lab from time to time on the Hounsfield testing machine and although they are safe for accidental exposure (< 0.25s) the following instructions should still be applied.

Ensure compliance to the Local Safety Rules regarding the use of Lasers in the Lab  
Adhere to instructions in the Risk Assessment concerning Laser use.  
Consult with Lab Co-Ordinator and the Technician were necessary.

Before powering the unit on, make sure that the unit aperture (at the left-hand side) is directed away from the naked eye and towards an area which would block the laser beam (i.e., Wall)

Avoid looking directly into the laser aperture when the unit is operative (always use an object to allow the laser beam to strike if viewing is required).

Avoid allowing the laser beam to strike a highly polished surface (i.e., mirror, polished test-pieces).

Avoid allowing any person to walk through the laser beam scan if the unit cannot be arranged as above.

If the instrument fails and the scanning mirrors stop, immediately turn the instrument off.

Never remove any of the covers of the instrument without contacting the manufacturers or referring to the relevant service manual.

## Review Record

Issue	Who	Date	Reason for Review
2	ES	11/03/2024	General update. Reviewed and approved by the Lab Coordinator.