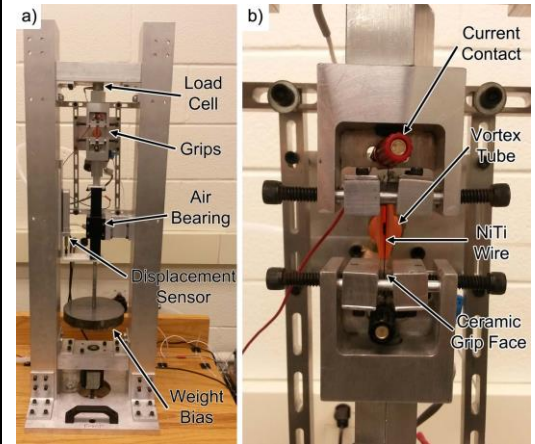


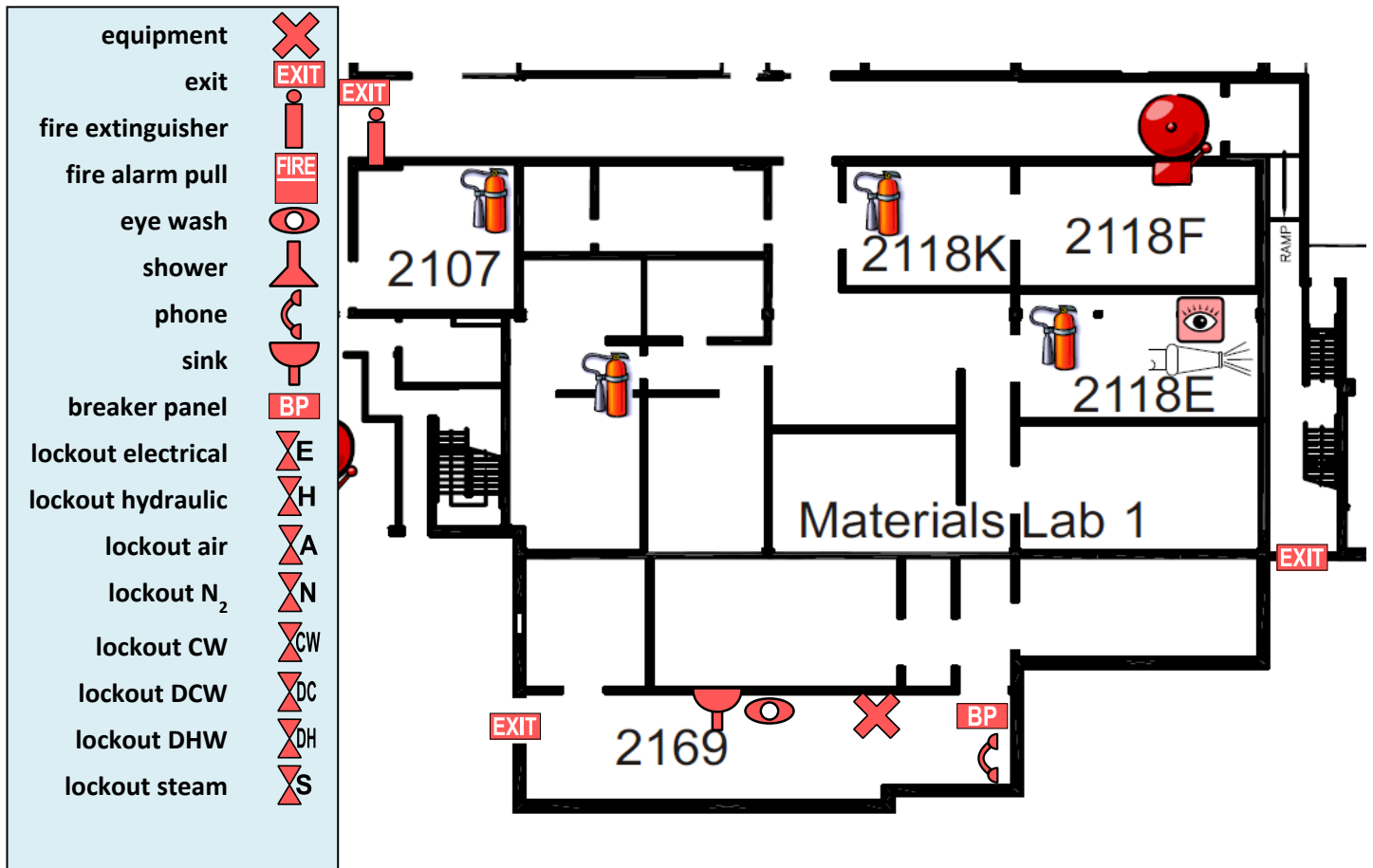
MME Standard Operating Procedure (SOP)

Name	<ul style="list-style-type: none"> Thermomechanical fatigue tester
Description	<ul style="list-style-type: none"> Shape memory alloy fatigue tester
Location	<ul style="list-style-type: none"> Building: Engineering 3, Room: 2169
SOP Creation Date	<ul style="list-style-type: none"> 2016-04-21
SOP Created By	<ul style="list-style-type: none"> Boyd Panton
SOP Revision Date	<ul style="list-style-type: none"> N/A
SOP Revised By	<ul style="list-style-type: none"> N/A
SOP Location	<ul style="list-style-type: none"> https://uwaterloo.ca/centre-advanced-materials-joining/safety-first/standard-operating-procedures
Manual Location	<ul style="list-style-type: none"> N/A
Equipment Owner	<ul style="list-style-type: none"> Prof. Y. Norman Zhou
Authorized Trainers	<ul style="list-style-type: none"> Boyd Panton Greg Seviora
Support Technicians	<ul style="list-style-type: none"> No Technician assigned



Significant Hazards	<ul style="list-style-type: none"> Crush hazards / pinch point <ul style="list-style-type: none"> In between grips Weights Electrical (power supplies, heating shape memory alloy) Noise (vortex tube)
Administrative Controls	<ul style="list-style-type: none"> Authorized personnel: Boyd Panton (x. 36963), Greg Seviora. Only authorized personnel shall operate, maintain or service the equipment. Service personnel shall comply with control procedures.
Engineering Controls	<ul style="list-style-type: none"> The laser and workspace are housed in protective cells. <ul style="list-style-type: none"> There are interlocks on the doors into the work cell The viewports into the work cell are impenetrable to the laser energy The laser is monitored and fired from a remote location (outside of the work cell) Service access panels are interlocked and require a tool for removal. Emergency stop/panic button A key-controlled master switch is provided.
PPE Required	<ul style="list-style-type: none"> No Personal Protective Equipment is required to operate the equipment <ul style="list-style-type: none"> The engineering controls ensure that the operator is never in direct contact with the hazards
Relevant Standards and Codes	<ul style="list-style-type: none"> N/A
Relevant MSDS	<ul style="list-style-type: none"> N/A

<p>Accident Procedure</p>	<ul style="list-style-type: none"> • All accidents/exposures are to be reported to your supervisor as soon as possible. • Compressed argon leakage from cylinder → Call UW Police 519-888-4911 or X. 22222. • For treatment of all other injuries, proceed to: <ul style="list-style-type: none"> ○ Department first aid kit in E3 – 2108H ○ Health Services for first aid services (519-888-4096, X. 84096) ○ UW Police assists if the above services are not available (519-888-4911, X. 22222) • See Safety Posters in this lab
<p>Emergency Shutdown Procedure</p>	<ul style="list-style-type: none"> • Personnel Injury: <ul style="list-style-type: none"> ○ Turn off the laser system with the "Emergency Button" or power switch. ○ Call 911 and inform the dispatcher to advise medical personnel that the accident involved lasers. ○ Contact Health Services – first aid services available → 519-888-4096 or Ext. 84096. ○ UW Police – assists if the above services are not available → 519-888-4911 or Ext. 22222. ○ Complete incident report. • Fire: <ul style="list-style-type: none"> ○ Turn off the laser system with the "Emergency Button" or power switch. ○ Evacuate area as stated in your Building Emergency Plan. ○ Active wall mounted fire alarm pull station located at exits. ○ Call 911 for medical assistance (Ambulance). If using a cell/mobile call UW Police at 519-888-4911. ○ Report any information about fire to UW Police and Fire Department.



Pre-start Checklist

Before starting the equipment:

- Inspect backup power supply, computer, power supply, tester, weights
- Ensure space around tester workspace is clean
- Details operating procedures
- Emergency contact information (UW Police, Health Services, Safety Officer)

Start-up Procedure: Power Up

- Turn on the backup power supply and wait for system to complete self-diagnosis.
- Open compressed air valve for air bearing.
- Turn on DAQ computer.
- Run labview control program.

Start-up Procedure: Specimen mounting

- Ensure proper load is attached to the tester.
 - Use the labview control program to measure the weight
 - Double check the measured weight with the known weight of the lead weights
- Put the gauge length block on top of the bottom grip
- Use the motor to move the weight to the gauge length for testing
- Check the grip faces for defects
 - If significant defects, replace grips

- Place test specimen wire in top current contact and tighten
- Tighten top grip partially, while ensuring the wire is straight with the bottom grip
- Place wire in bottom current contact and tighten
- Tighten bottom grip partially
- Ensure specimen straight then complete tightening of top and bottom grips
- Place plastic cover in front of tester
- Cover tester with sound dampening

Operating Procedure

- Turn on the power supply for heating the wire.
 - Ensure constant current control on
- Input data in labview program:
 - Strain
 - Current
 - Filename and location
- Run program
- Once specimen fails
 - Save file, close and reopen the labview program
 - Turn off power supply
 - Remove specimen, label, save for fracture analysis/DSC
 - Run the next specimen

Shutdown Procedure

- Press 'Stop' in the labview program, then close the labview program
- Shutdown the computer and then turn off
- Turn off the backup power supply
- Turn off the power supply
- Close the compressed air valve for the air bearing

Clean-up

The clean-up procedures are as follows:

- Clean-up the working table after each test.

Maintenance and Repair

Major maintenance or issues must be investigated and performed by the authorized trainers. If tasks are beyond the competence of the trainers then the technicians at the University of Waterloo.

The following procedure must be followed during maintenance and repair:

- Maintain regular log book/schedule for maintenance/repair.