# MME Standard Operating Procedure (SOP)

<table>
<thead>
<tr>
<th>Name</th>
<th>Huys ESD Machine #1</th>
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</thead>
<tbody>
<tr>
<td>Description</td>
<td>R&amp;D Fixed parameters ESD Machine</td>
</tr>
<tr>
<td>Location</td>
<td>E3-2107 “Welding Lab”</td>
</tr>
<tr>
<td>SOP Creation Date</td>
<td>2015-3-31</td>
</tr>
<tr>
<td>SOP Created By</td>
<td>Foss Jiao, Dominic Leung</td>
</tr>
<tr>
<td>SOP Revision Date</td>
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<tr>
<td>SOP Revised By</td>
<td></td>
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<tr>
<td>SOP Location</td>
<td>inv.mme.uwaterloo.ca</td>
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<tr>
<td>Manual Location</td>
<td>E3-2107 “Welding Lab”</td>
</tr>
<tr>
<td>Equipment Owner</td>
<td>Professor Norman Zhou (x36095) &amp; Huys Industries</td>
</tr>
<tr>
<td>Authorized Trainers</td>
<td>Joyce Koo, Foss Jiao, Stephen Peterkin and Dominic Leung</td>
</tr>
<tr>
<td>Support Technicians</td>
<td>Dominic Leung</td>
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</tbody>
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## Significant Hazards
- **Light**
  - Weak UV radiation from the electrode sparks
  - Weak UV radiation from red hot metals
- **Burns**
  - Operating electrode tips reach red hot temperatures
- **Fumes**
  - Some metals may be rapidly oxidized or vaporized during deposition forming toxic vapors
- **Vibrations**
  - Vibrations from the applicator would cause bodily fatigue after an extended period of operation
- **Noise**
  - Extended use of depending on the applicator can cause hearing damage

## Administrative Controls
- Scheduling of ESD depositions shall be scheduled amongst the authorized personnel
- Only authorized personnel shall operate, maintain or service the ESD Machine
- Reduce extended depositions to prevent fatigue, eye damage and hearing damage
- Always run the lab ventilation fan when depositing

## Engineering Controls
- Equipment design prevents excess large short circuit discharges while the applicator is not rotating / vibrating
- Equipment discharge and resistance requirements prevents electrocution during operation
**PPE Required**

Typical operating procedures and papers on ESD stress that there are little to no required PPE requirements

- Eye protection is required during ESD
  - Clear safety glasses are the minimum to spectate the ESD equipment
  - Operators should use tinted safety glasses or brazing goggles during extended ESD use, as the bright sparks and weak UV radiation may strain eyes
  - Shades beyond 5 may impair vision during deposition and are not recommended
- Gloves are to be worn to protect from sparks during deposition as well as prevent burns from handling hot substrates and electrodes post deposition
- Long sleeves or lab coats are required to protect wrists and arms from sparks and burns resulting from deposition and contact with hot substrates / electrodes
- Hearing protection can be used if loud applicators are being utilized for extended periods of time

**Relevant Standards and Codes**

- none

**Relevant MSDS**

- All MSDSs can be found at [msds.mme.uwaterloo.ca](http://msds.mme.uwaterloo.ca)
- Argon Compressed gas
- LECO diamond spray

**Accident Procedure**

- All accidents are to be reposted to the supervisor as soon as possible
  - Treat minor incidents with First Aid kits or contact UW Health services 599-888-4096 x84096
  - Contact Dr. Joyce Koo or Professor Norman Zhou
  - Complete incident report
- In the event of serious injury / illness Call 911
  - Also contact campus police services 519-888-4911 or x22222
  - Complete incident report

**Emergency Shutdown Procedure**

- Injury
  - Turn off the Huys ESD Machine using the power ON / OFF switch of the power bar
  - Follow accident procedure
  - Complete incident report
- Fire
  - Turn off the Huys ESD machine if safe to do so
    - Disconnect the power to the machine if safe to do so and necessary
    - Turn off the exhaust fan to the lab if safe to do so
    - Exit the area and assemble outside as stated in the Building Emergency Plan
    - Access fire extinguisher if the fire is small enough
    - Fire extinguisher located on the wall in the corridor outside the lab
    - Activate wall mounted fire alarms
    - Report any information about the fire to the UW Police and Fire Department
Huys ESD Machine #1

- ve Terminal
+ve Terminal

Huys Applicator

ESD Electrode

Power Indicator

Spindle Speed Control

FWD/Off/REV Switch

Operation ON/OFF

Applicator Speed Control
Pre-start Checklist

- Ensure that the lab ventilation fan is on
- Ensure that the door to the lab is closed to protect passers by
- Ensure that the deposition area is clear of flammable media and clutter
- Check the operating condition of the equipment
  - Check the machine power, applicator and grounding cables for fraying and damage
- Do appropriate PPE as listed in the operating procedure
  - Ensure that the operator will not contact the fixtures, ground, substrate or electrode while operating with bare skin
- Ensure that a power bar is securely connected to the wall outlet 15A 120V 60hz
- Ensure that the power switch of the applicator speed control is set to OFF
- Ensure the power switch of the power bar is set to OFF before the ESD machine, the spindle speed control & applicator speed control units are connected to the power bar
- Ensure the spindle unit securely sits on a bench, and is free and safe to rotate
- Ensure that the applicator speed control unit is securely mounted to a wall
- Ensure that a ground cable is securely connecting the –ve terminal of the ESD machine and the terminal of the spindle unit
- Ensure that the ESD power cable from the applicator is securely connected to the +ve terminal of the ESD machine
- Ensure that the cooling fan is operating when the power is ON
### Start-up Procedure
- Attach the applicator and ground clamp before turning on the machine
- Ensure that the power bar is securely connected to the wall outlet 15A 120V 60hz
- Ensure that the ESD machine, spindle speed control unit and the applicator speed control unit power cables are securely connected to the power bar
- Attach an electrode cap, to be ESD coated, to the spindle unit
- Secure an ESD electrode into the applicator (may require the use of a hex key to the holder)

### Operating Procedure
- Turn on the power bar (Ensure that the applicator speed control switch is set to OFF)
- Ensure that the electrode cap on the spindle is rotating in a symmetrical manner. Redo the sitting if necessary.
- Set the spindle speed control to desired value and ensure that the spindle is spinning freely
- Set the power switch of the applicator speed control device to the desired rotational direction, FWD or REV. The applicator should start vibration immediately.
- Begin deposition

### Shutdown Procedure
- Turn off the FWD/OFF/REV switch of the applicator speed control unit
- Carefully place the applicator where the electrode will not damage any of the equipment or fixtures (as it remains hot after deposition)
- Turn off the ON/OFF switch of the power bar

### Maintenance and Repair
- Contact Dominic Leung or other trained staffs for serious problem and electrical issues