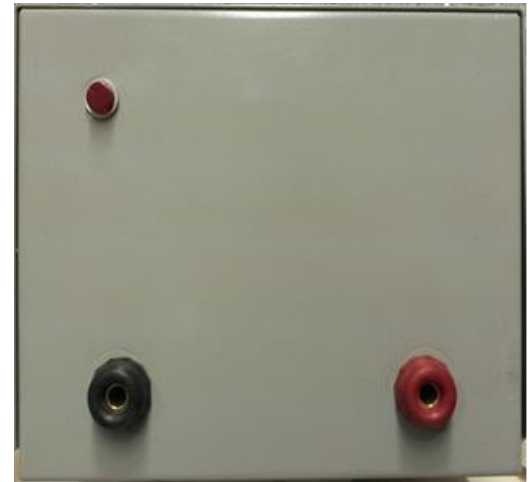


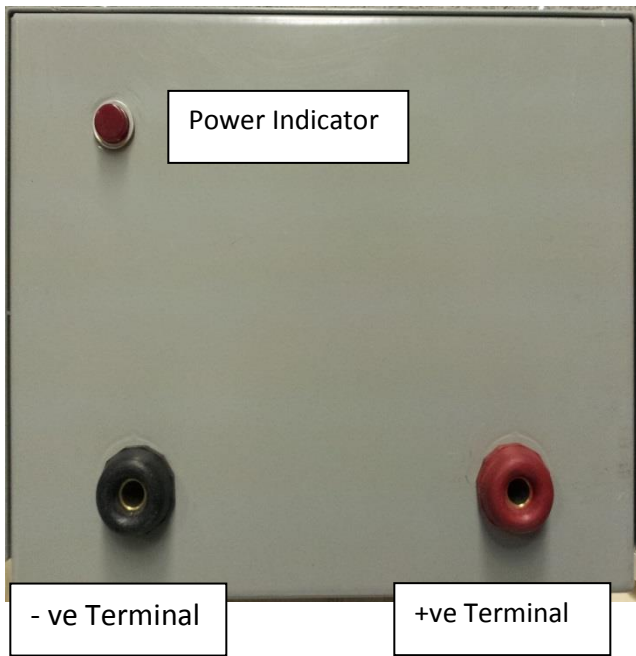
MME Standard Operating Procedure (SOP)

Name	<ul style="list-style-type: none"> Huys ESD Machine #1
Description	<ul style="list-style-type: none"> R&D Fixed parameters ESD Machine
Location	<ul style="list-style-type: none"> E3-2107 "Welding Lab"
SOP Creation Date	<ul style="list-style-type: none"> 2015-3-31
SOP Created By	<ul style="list-style-type: none"> Foss Jiao, Dominic Leung
SOP Revision Date	<ul style="list-style-type: none">
SOP Revised By	<ul style="list-style-type: none">
SOP Location	<ul style="list-style-type: none"> inv.mme.uwaterloo.ca
Manual Location	<ul style="list-style-type: none"> E3-2107 "Welding Lab"
Equipment Owner	<ul style="list-style-type: none"> Professor Norman Zhou (x36095) & Huys Industries
Authorized Trainers	<ul style="list-style-type: none"> Joyce Koo, Foss Jiao, Stephen Peterkin and Dominic Leung
Support Technicians	<ul style="list-style-type: none"> Dominic Leung



Significant Hazards	<ul style="list-style-type: none"> Light <ul style="list-style-type: none"> Weak UV radiation from the electrode sparks Weak UV radiation from red hot metals Burns <ul style="list-style-type: none"> Operating electrode tips reach red hot temperatures Fumes <ul style="list-style-type: none"> Some metals may be rapidly oxidized or vaporized during deposition forming toxic vapors Vibrations <ul style="list-style-type: none"> Vibrations from the applicator would cause bodily fatigue after an extended period of operation Noise <ul style="list-style-type: none"> Extended use of depending on the applicator can cause hearing damage
Administrative Controls	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Equipment design prevents excess large short circuit discharges while the applicator is not rotating / vibrating Equipment discharge and resistance requirements prevents electrocution during operation

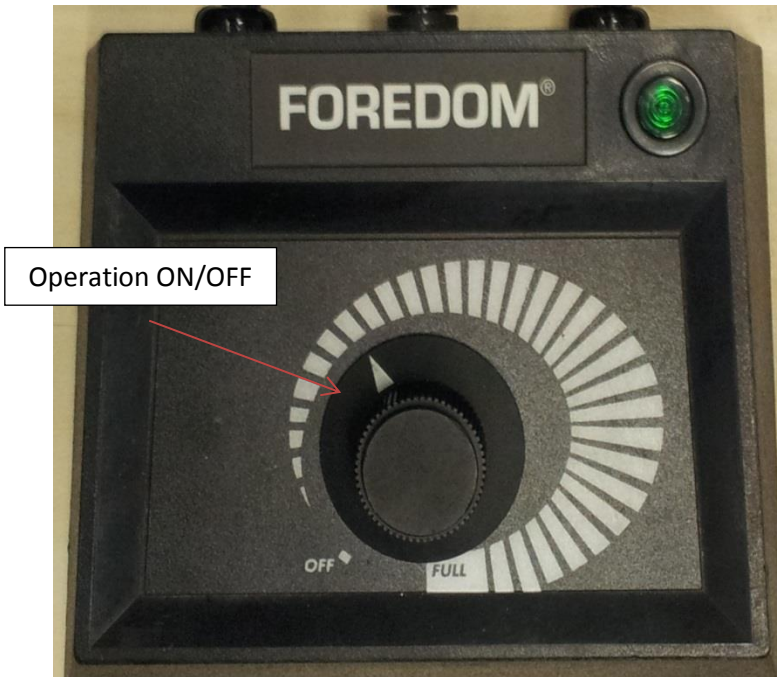
PPE Required	<p>Typical operating procedures and papers on ESD stress that there are little to no required PPE requirements</p> <ul style="list-style-type: none"> • Eye protection is required during ESD <ul style="list-style-type: none"> ○ Clear safety glasses are the minimum to spectate the ESD equipment ○ 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	<ul style="list-style-type: none"> • none
Relevant MSDS	<p>All MSDSs can be found at msds.mme.uwaterloo.ca</p> <ul style="list-style-type: none"> • Argon Compressed gas • LECO diamond spray
Accident Procedure	<ul style="list-style-type: none"> • All accidents are to be reposted to the supervisor as soon as possible <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ Also contact campus police services 519-888-4911 or x22222 ○ Complete incident report
Emergency Shutdown Procedure	<ul style="list-style-type: none"> • Injury <ul style="list-style-type: none"> ○ Turn off the Huys ESD Machine using the power ON / OFF switch of the power bar ○ Follow accident procedure ○ Complete incident report • Fire <ul style="list-style-type: none"> ○ Turn off the Huys ESD machine if safe to do so <ul style="list-style-type: none"> ▪ 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



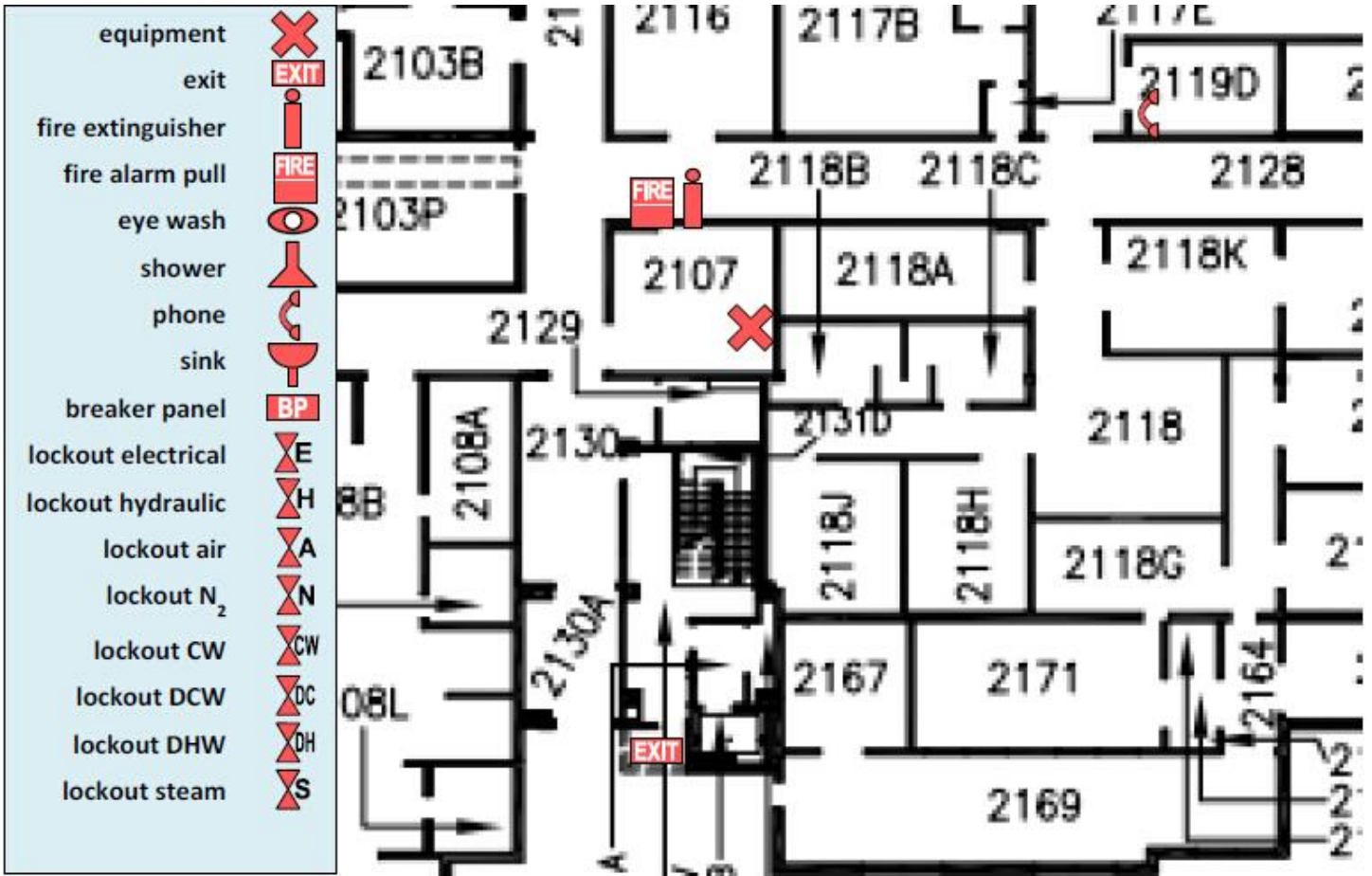
Huys Applicator



Spindle Speed Control



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