

MME Standard Operating Procedure (SOP)

Name	Etching Nickel-Titanium with Hydrofluoric and Nitric Acid
Description	<ul style="list-style-type: none"> 7.5 %vol. HF and 20% vol. HNO₃ balance water
Location	<ul style="list-style-type: none"> E3-2118E or E3-2169
SOP Creation Date	<ul style="list-style-type: none"> 2015-03-19
SOP Created By	<ul style="list-style-type: none"> Andrew Michael
SOP Revision Date	<ul style="list-style-type: none"> 2015-03-19
SOP Revised By	<ul style="list-style-type: none"> Andrew Michael
SOP Location	<ul style="list-style-type: none"> E3-2103B and E3-2169
Manual Location	
Equipment Owner	<ul style="list-style-type: none"> Mechanical and Mechatronics Engineering Department
Authorized Trainers	<ul style="list-style-type: none"> Andrew Michael and Boyd Panton
Support Technicians	
Significant Hazards	<ul style="list-style-type: none"> Severe contact with skin or eye(s) can result in death. Less severe contact results in tissue damage and chemical burns Extremely destructive to mucous membrane and upper respiratory tract if inhaled May be fatal if swallowed
Administrative Controls	<ul style="list-style-type: none"> The worker must complete the following Online trainings: <ul style="list-style-type: none"> Employee Safety Orientation General Lab Safety The worker must read and understand the hydrofluoric acid's MSDS. The worker must read additional material on acceptable practices for working with hydrofluoric acid The worker must be aware of the first aid measures in case of an accident The worker must be aware of the location of the closest eye wash station and safety sower The worker must know how to summon help The solution concentration must be limited to 1.5 Vol.%. Hydrofluoric acid or lower. A quantity larger than 500 mL should never be prepared. The waste generated from etching must be stored in a properly labelled waste container The worker must carry 2.5% calcium gluconate cream with him/her for several days after working with hydrofluoric acid. Hydrofluoric acid solution with concentration less than 7% can contact skin without causing pain. Symptoms of hydrofluoric acid can appear several hours after initial contact.

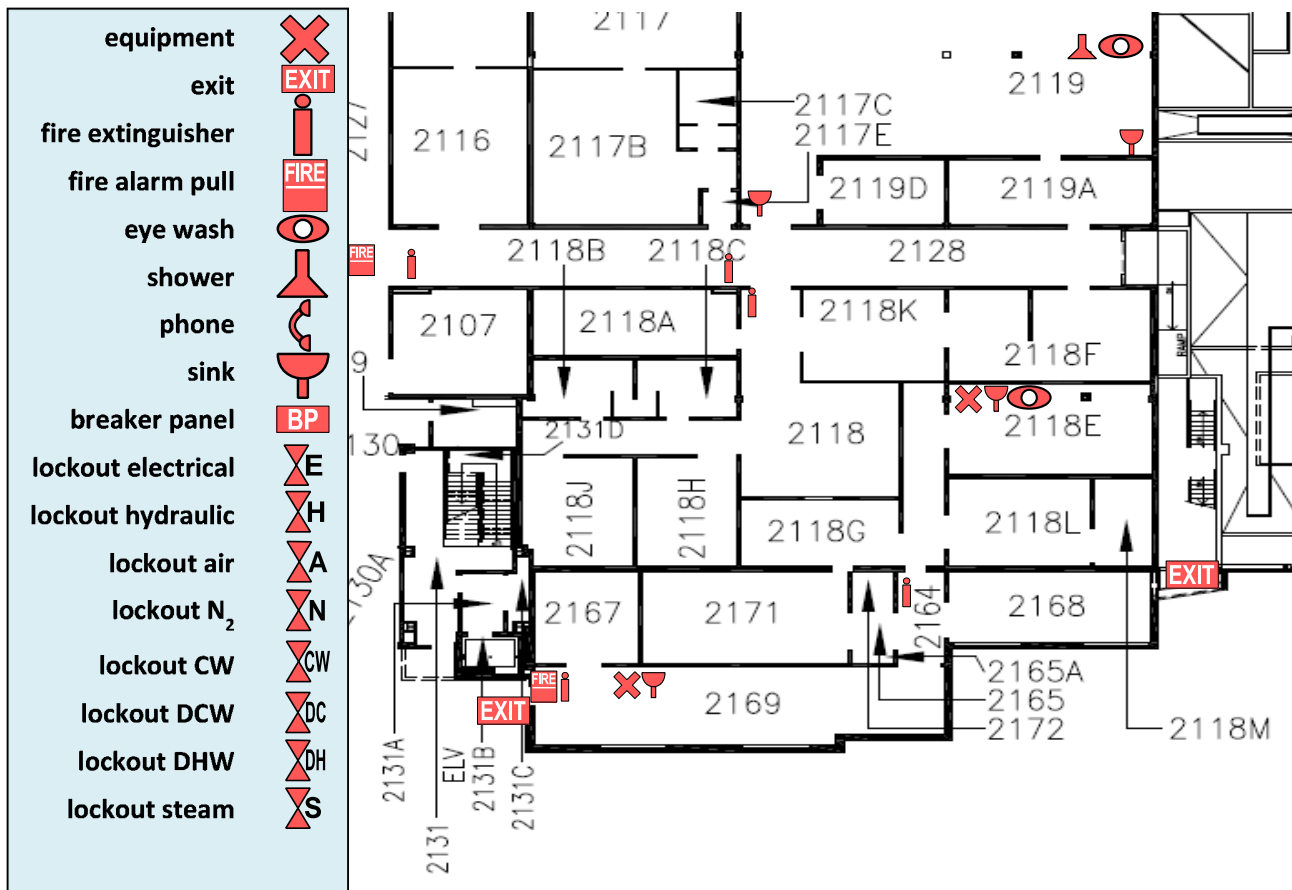


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Engineering Controls	
PPE Required	<ul style="list-style-type: none"> • Fume Hood • Splash goggles • Lab coat • Lab smock • Lab apron • 2.5% Calcium Gluconate Cream should be in one of lab apron's pockets • Butyl Gloves • Two layers of nitrile glove on each hand <ul style="list-style-type: none"> ○ Before use, check the gloves for leak by blowing air in them and hearing for leaks.
Relevant Standards and Codes	<ul style="list-style-type: none"> • None
Relevant MSDS	<ul style="list-style-type: none"> • Hydrofluoric Acid • Nitric Acid <p>MSDS can be found at: https://sharepoint.uwaterloo.ca/sites/MME/MSDS/MSDS%20Data%20Sheets/Forms/AllItems.aspx</p>
Accident Procedure	<ul style="list-style-type: none"> • Any hydrofluoric acid contact with skin or eye(s) should be reported to medical authority as soon as possible. Call 911 or proceed immediately to the UW Hospital Emergency Department. <ul style="list-style-type: none"> ○ In case of eye contact, flush eye(s) for 15-20 minutes. ○ In case of skin contact, remove contaminated articles. Flush the affected area with water for 5 minutes and then apply calcium gluconate. Wear gloves and massage the gel into the burn site. Apply the gel frequently and massage continuously until medical attention is received. • Cases of inhalation or ingestion should also be reported. Health Services → first aid services available → 519-888-4096, X. 84096 <ul style="list-style-type: none"> ○ In case of ingestion, do not induce vomiting. Rinse mouth thoroughly with water. ○ In case of inhalation, move to fresh air. • In case of spill, if safe to do so, neutralize the affected area with calcium carbonate. Flush the area with plenty of water
Emergency Shutdown Procedure	

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Pre-start Checklist

- Turn on fume hood and wait for the fan to turn on.
- Confirm that the fume hood is working by using a tissue paper
- Wear two pair of nitrile gloves, lab coat, splash goggles
- Wear Butyl gloves
- Have shallow dish for etching parts
- Have waste container ready use

Start-up Procedure

- Prepare the etching solution in the fume hood. Always poor acid into water, not water into acid.
- Turn on tap water

Operating Procedure

- Place parts to be etched in shallow etching dish
- Carefully poor etching solution into shallow dish
- Etch parts for desired amount of time



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- Carefully pour etching solution into waste container
- Rinse parts with water and verify etching was successful
- If etching was insufficient repeat steps

Clean-up

- Rinse all materials with plenty of water
- Put the unused etchant and waste container in their designated areas
- Remove PPE

Lockout

Maintenance and Repair