

### Standard Operating Procedure Worksheet

Researcher(s): Department of Mathematics	Building: Monteith
Principal Investigator/Lab Manager: Kevin Marinelli	Lab Number(s): 307
Date: 2/19/2019	Lab Phone #(s):

Description of Experiment/Procedure/Process: 3D printing

#### SECTION 1. CHECK THE TRAINING TO BE COMPLETED PRIOR TO CONDUCTING THE PROCEDURE

TRAINING DOCUMENTATION	YES	NO
EHS HazCom training (In person or online via HuskyCT) <a href="http://ehsapps.uconn.edu/training/schedule/AllTrainingSchedule.php">http://ehsapps.uconn.edu/training/schedule/AllTrainingSchedule.php</a>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

#### SECTION 2. ATTACH OR INSERT A COPY OF THE PROCEDURE OR PROCESS (add more lines as necessary)

Process Steps	Safety Control
1. See attached documentation for Ultimaker Printer	
2. Access to the 3D printer is restricted to the PI and lab manager ONLY	
3. Attached copies of SOP for 3D printing details and SOP for cleaning 3D prints	
4.	
5.	
6.	
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10.	
11.	
12.	

#### SECTION 3. LIST THE CHEMICALS REAGENTS, SOLVENTS, CHEMICAL PRODUCTS, HAZARDS, VOLUMES AND CONCENTRATIONS OF EACH CHEMICAL IN THE PROCEDURE (Add more lines as necessary)

Chemical(s)	Hazard(s)	Concentration	Maximum Amount
PETg Filament	ultrafine particulates  Hazardous decomposition byproducts: Thermal decomposition can yield intense heat, dense smoke, phenols, hydrogen cyanide, carbon dioxide, and carbon monoxide.		
PLA filament	ultrafine particulates  Hazardous decomposition byproducts: May		

	decompose upon heating to produce corrosive and/or toxic fumes.		
<b>HIPS filament</b>	ultrafine particulates  Hazardous decomposition byproducts: Thermal decomposition can yield intense heat, dense smoke, phenols, hydrogen cyanide, carbon dioxide, and carbon monoxide.		
<b>Scrubs wipes</b>	<b>None (Not intended as a cleaner for 3D prints)</b>		
<b>Chemical Products</b>	<b>Hazard(s)</b>	<b>Safety Control(s)</b>	

### SECTION 4. CHECK AND DESCRIBE ADDITIONAL HAZARDS INVOLVED IN PROCEDURE

Hazard Type	Description of Hazard(s) and Control(s)
<input type="checkbox"/> Impact	
<input checked="" type="checkbox"/> Cuts/Penetration	Equipment has potential sharp edged, pinch points, etc. Postprocessing uses a box cutter to remove support materials.
<input type="checkbox"/> Pressure	
<input type="checkbox"/> Biological Agents	
<input checked="" type="checkbox"/> Thermal (Hot/Cold)	Hot print head block on 3D printer and heated print bed
<input type="checkbox"/> Electrical	
<input checked="" type="checkbox"/> Harmful Dust/Mists/Fumes/Vapors	Fumes from 3D printer filament
<input type="checkbox"/> Light (Optical) Radiation	
<input type="checkbox"/> Ionizing Radiation	
<input type="checkbox"/> Noise	
<input type="checkbox"/> Other	

### SECTION 5. SELECT THE ENGINEERING CONTROLS USED TO CONTROL THE HAZARDS

<input type="checkbox"/> Chemical Fume Hood	<input checked="" type="checkbox"/> Local exhaust (e.g., "snorkels" or "elephant trunks")
<input type="checkbox"/> Biological Safety Cabinet	<input type="checkbox"/> Blast Shield
<input type="checkbox"/> Glove Box	<input type="checkbox"/> Other _____

### SECTION 6. SELECT THE WORK PRACTICES USED TO CONTROL THE HAZARDS

Work Practices	Yes	No
Principal Investigator/Lab Supervisor approves <a href="#">working alone</a> during procedure	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Read and understand the Safety Data Sheet (SDS) for each chemical being used	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Substituted or reduced the quantities of hazardous chemicals being used if possible	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Performed a dry run of the procedures as outlined in SOP documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Identified locations and understand how to properly use emergency equipment	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Read and follow departmental training guide for 3D printing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Read and follow HazCom documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### SECTION 7. SELECT PERSONAL PROTECTIVE EQUIPMENT TO BE WORN DURING THE PROCEDURE

Body Part	Personal Protective Equipment	
<input type="checkbox"/> Eye and Face Protection	<input type="checkbox"/> Safety Glasses <input type="checkbox"/> Safety Goggles	<input type="checkbox"/> Face shield <input type="checkbox"/> Other _____
<input type="checkbox"/> Head Protection	<input type="checkbox"/> Hard Hat	<input type="checkbox"/> Other _N/A_____
<input checked="" type="checkbox"/> Hand Protection (For cleaning 3D prints)	<input type="checkbox"/> Butyl Rubber <input type="checkbox"/> Natural Rubber <input type="checkbox"/> Neoprene <input checked="" type="checkbox"/> Nitrile <input type="checkbox"/> Polyvinyl alcohol (PVA)	<input type="checkbox"/> Polyvinyl chloride (PVC) <input type="checkbox"/> Fluoroelastomer (Viton) <input type="checkbox"/> Norfoil <input type="checkbox"/> Thermally-insulated gloves <input checked="" type="checkbox"/> Other: Cut resistant gloves
<input type="checkbox"/> Body Protection	<input type="checkbox"/> Lab coat <input type="checkbox"/> Flame-resistant lab coat <input type="checkbox"/> Long pants	<input type="checkbox"/> Plastic or rubber apron <input type="checkbox"/> Other __N/A_____
<input type="checkbox"/> Foot Protection	<input type="checkbox"/> Closed-toed footwear <input type="checkbox"/> Steel-toed shoes <input type="checkbox"/> Other _____	
<input type="checkbox"/> Respiratory Protection	<input type="checkbox"/> Powered Air-Purifying Respirator <input type="checkbox"/> Full Face-piece Negative Pressure <input type="checkbox"/> Half-mask negative pressure	<input type="checkbox"/> Dust Mask <input type="checkbox"/> Not Applicable <input type="checkbox"/> Other _N/A_____
<input type="checkbox"/> Hearing Protection	<input type="checkbox"/> Ear plugs <input type="checkbox"/> Ear muffs <input type="checkbox"/> Other _____ N/A _____	
<input type="checkbox"/> Other		

### SECTION 8. FOLLOW PROCEDURE FOR EMERGENCIES AS LISTED BELOW:

1. Relocate to a safe location. Close door(s) to lab.
2. Call **911**.
3. If safe, post a "NO ENTRY" sign(s) or other warning information on the door(s)
4. Evacuate the building through the nearest exit. Do not run. Do not use elevators.
5. Do not re-enter area until instructed to do so by UCFD or other emergency personnel
6. Report accident to Principal Investigator/Supervisor

### SECTION 9. REVIEW AND UNDERSTAND FIRST AID PROCEDURES LISTED BELOW:

First Aid- Eyes	<ol style="list-style-type: none"> <li>1. Move to the eyewash, forcibly hold eyelids open and begin flushing both eyes.</li> <li>2. Remove contact lenses and eyewear while flushing (if applicable).</li> <li>3. Dial <b>911</b> or have someone else dial <b>911</b>.</li> <li>4. Keep flushing eyes under the eyewash until emergency personnel arrives.</li> <li>5. Report incident to supervisor and EHS.</li> </ol>
First Aid- Skin	<ol style="list-style-type: none"> <li>1. Move to safety shower, pull shower handle, and flush affected area with water.</li> <li>2. Remove contaminated clothing while flushing (if applicable).</li> <li>3. Dial <b>911</b> or have someone else dial <b>911</b>.</li> <li>4. Keep rinsing affected area until emergency personnel arrives.</li> <li>5. Report incident to supervisor and EHS.</li> </ol>
First Aid- Inhalation	<ol style="list-style-type: none"> <li>1. Move to fresh air.</li> <li>2. Dial <b>911</b> or have someone else dial <b>911</b>.</li> <li>3. Report incident to supervisor and EHS.</li> </ol>
First Aid- Other	<i>Describe additional first aid procedures based on hazards (e.g. use of calcium gluconate gels for hydrofluoric acid).</i>

### SECTION 10. SELECT WASTES GENERATED AND DESCRIBE MANAGEMENT PROCEDURES

Type of Waste	Waste Characteristics	Waste Management
<input type="checkbox"/> Chemical	<input type="checkbox"/> Corrosive <input type="checkbox"/> Ignitable <input type="checkbox"/> Reactive <input type="checkbox"/> Toxic	<i>Describe how hazardous chemical wastes will be managed (e.g. Label with words "Hazardous Waste", Use full chemical names on labels, Keep waste containers closed, Storage with compatible wastes, etc.)</i>
<input type="checkbox"/> Biological	<input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input type="checkbox"/> Sharps <input type="checkbox"/> Animal Research	<i>Describe how biological wastes will be managed (e.g. sharps disposed of in approved sharps containers, solid wastes collected in biohazard box-bag units, etc.).</i>
<input type="checkbox"/> Radioactive	<input type="checkbox"/> Short half-life <input type="checkbox"/> Long half-life	<i>Describe how radiological wastes will be managed (e.g. short half-life waste segregated by radionuclide, radioactive waste stored in containers provided by the Radiation Safety Office, etc.).</i>
<input type="checkbox"/> Other		

### SECTION 11. DECONTAMINATION PROCEDURES

<input type="checkbox"/> Equipment	<i>Describe how equipment will be decontaminated after use (e.g. use manufacturer instructions, specifications, etc.).</i>
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<input type="checkbox"/> <b>Glassware</b>	<i>Describe how glassware (i.e. beakers/flasks/test tubes, etc.) will be decontaminated after use.</i>
<input type="checkbox"/> <b>Work Area</b>	<i>Describe how the work area (e.g. lab benches, fume hoods, etc.) will be decontaminated after use.</i>
<input type="checkbox"/> <b>Personal Hygiene</b>	<i>Describe how the researchers will decontaminate after procedure.</i>

### SECTION 12A. RESEARCHER APPROVAL

I have reviewed and will follow the standard operating procedure (SOP) for the procedure/process listed above. I understand that further approval from the PI/Lab Manager is required if any of the following events occur:

- A change in amount (*Add quantity and/or volume*) or substitution of the chemicals in the procedure is planned
- A change in the agreed-upon experimental set-up is planned
- Signs of a failure in safety design or equipment are observed
- Signs or symptoms of a chemical exposure are observed
- Unexpected and/or potentially dangerous experimental results occur (e.g., fire, uncontrolled buildup of heat and/or pressure, etc.)

Print Name	Signature	Date

### Section 12B. PRINCIPAL INVESTIGATOR APPROVAL

*I approve the contents of the lab-specific standard operating procedure listed above:*

**SIGNATURE:**

**DATE:**

**A HARD OR ELECTRONIC COPY OF EACH PROCEDURE MUST BE STORED IN THE LAB.**