

3D Printing Safety

Texas A&M University – Texarkana (TAMUT) has a wide variety of 3D printers on campus. In some 3D printing processes, thermoplastics are heated, nozzle extruded and then deposited onto a surface to build the object. Since most 3D printers do not have exhaust ventilation or filtration accessories, placement of the printer and selection of printing materials must both be carefully considered. There are both chemical and physical hazards associated with 3D printers, which are determined by the type of printer, chemicals used for print materials, and parts for the finishing process.

These hazards include:

- The generation of ultrafine/nano-sized particles
- Chemical vapors depending on the media being used
- Generation of heat and contact hot surfaces
- Mechanical hazards from moving parts
- High voltage
- Ultraviolet light
- Use of tools to remove and finish parts

Types of 3D Printers

There are many types of 3D printers depending on the printing process and media material used. The two most popular printer types are Fused Deposition Modeling (FDM) and Stereolithography (SLA).

Types of 3D Printing Material

There are many different varieties of printing materials available to use with 3D printers, each has its own inherent hazard. The two most commonly used materials are Polylactic Acid (PLA) and Acrylonitrile Butadiene Styrene (ABS). In general, PLA is much safer to use than ABS.

Each 3D printer has been designed to use certain types of materials. These materials have inherent hazards and may become more hazardous when they are subjected to the 3D printing process or are inadvertently ignited.

3D Printer Safety Guidelines

The following is a list of safety precautions that need to be considered when using a 3D printer:

- All 3D printers must be placed in a well-ventilated area and/or directly ventilate the printer.
- Whenever possible, purchase 3D printer models that are enclosed. (Full enclosure appears more effective at controlling UFP emissions than a cover)
- Any 3D printer that is larger than a desk top model please contact RS to conduct a risk assessment.
- Always use the manufacturer's supplied controls and follow manufacturer's instructions for set up and operation.
- When 3D printers are running, users should not congregate around the printing operation to minimize the inhalation of particulates being created.
- Maintain a distance from the printer to minimize breathing in emitted particles and choose a low-emitting printer and filament when possible;
- Whenever possible, 3D printers that utilize resins and/or corrosives should be placed in areas designed as labs.
- If the printer nozzle jams, turn off the printer and allow it to ventilate before removing the cover;
- Wash hands thoroughly after working with 3D printers.
- There shall be no eating, drinking, applying cosmetics, chewing gum, or handling contact lenses in rooms that contain 3D printing operations.
- All work surfaces must be cleaned by a wet method. Sweeping and other dry methods can create airborne particles.
- All 3D metal printing operations must be assessed on a case-by-case basis by Environmental Health and Safety.

Use of Corrosive Baths for Finishing Parts Made on 3D Printers

- Corrosive baths shall only be used in a designated lab space only.
- Wear Personal Protective Equipment (PPE) including: lab coat or apron, chemical resistant gloves, and safety goggles when handling the chemical, placing an item in, or removing it from the bath.
- Ensure there is an eyewash in the vicinity of the bath, in case of a splash.
- Use tongs when placing an item in, or removing it from, the bath.
- Ensure tank is properly labeled with the chemical name and associated hazards.
- Ensure there is proper ventilation in the area where the bath is located.
- Do not pour any chemical down the drain. All used chemicals must be disposed of as hazardous waste.
- Anyone that works with the corrosive bath must take Hazardous Waste training.
- Caustic Soda is corrosive and can cause chemical burns, scarring and blindness.
- Mixing it with water generates heat that could ignite other materials.
- Sodium hydroxide should always be added to water and not vice versa.