

# 3D Printer Policy

## Description

## OBJECTIVE

The objective of this policy is to establish health and safety requirements for using 3D printers in University of Florida facilities. The policy is presented in recognition of the continued expansion of 3D printer use by faculty, staff and students. Studies have indicated that 3D printers are capable of generating potentially harmful concentrations of ultrafine particles (UFP) and chemical vapors during the print process and through processes used following printing to treat the finished product.

## AUTHORITY

By authority delegated from the University President, the Vice-President for Business Affairs is responsible for the safety of all University facilities. Under this authority, policies are developed to provide a safe teaching, research, service, housing and recreational environment.

[su\_spoiler style="fancy" icon="chevron" title=" Reference "] Governor's Executive Order Number 00-292; Occupational Safety and Health Act Sec 5 (General Duty Clause)

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## POLICY

The 3D Printer Policy establishes the minimum requirements necessary to allow for the safe use of 3D printers located in the University of Florida buildings. The policy covers all 3D printers, both department/program owned, and personal units used in campus buildings, including but not limited to those affiliated with the sciences, medicine, fine arts, performing arts, engineering, libraries and arts and craft studios.

## RESPONSIBILITIES

[su\_spoiler style="fancy" icon="chevron" title=" Environmental Health and Safety (EH&S) "] EH&S will be responsible for the review and approval of all 3D printer purchases.

Purchasing review will consider the type of printer, the type of print media to be used and the proposed location of the printer set-up before approval is granted.

EH&S may request the modification of a proposed printer location or the addition of improved exhaust ventilation before purchasing approval is granted.

EH&S has final authority over all safety issues and may immediately halt any operations or procedures it considers unsafe at any time at its discretion.

EH&S is available to perform air monitoring and hazard assessments upon request.

[/su\_spoiler] [su\_spoiler style="fancy" icon="chevron" title=" Principal Investigators (PI) and Managers with 3D printer oversight "] The PI and 3D printer managers are responsible for enforcing the provisions of this policy including providing a set-up location meeting the ventilation requirements and for compliance with the training requirements.

Print supervisors are responsible for providing required personal protective equipment (PPE) and enforcing its correct use.

[/su\_spoiler] [su\_spoiler style="fancy" icon="chevron" title=" Users of 3D printers (Faculty, staff, students) "] Individuals shall receive training in the correct and safe operation of the 3D printer including Hazard Communication (HAZCOM) training relevant to the media and other chemical products used in the printing process.

Required personal protective equipment shall be used.

No eating or drinking is allowed in areas where 3D printers are present.

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## PROCEDURES

3D printing at the University Florida includes the use of almost all currently available additive manufacturing technologies.

All 3D printing variations have the potential to produce health and safety hazards depending on the type of feedstock used and on the other processes involved in printing.

Whenever possible, printers certified to the ANSI/CAN/UL 2904 Standard, which tests and certifies printers for low emission rates, should be purchased.

Fused filament fabrication (FFF) represents one of the more popular types of 3D printing used at UF. This process typically uses a thermoplastic filament though other types of media can be used depending on the printer. Thermoplastic media generates ultrafine particulate (UFP), nanoparticles and volatile organic compounds (VOC) at varying concentrations regardless of which filament media is used. Recent studies have also found that formaldehyde can be produced by all types of filament media.

The amount of contaminant produced depends on the type of media used, the extruder nozzle temperature and on any additives present in the media.

Another popular type of 3D printing conducted on campus is stereolithography (SLA) which uses resins to produce the desired product. Chemicals in these resins can be irritants and sensitizers.

The following sections will serve to address the health and safety issues associated with 3D printers.

[su\_spoiler style="fancy" icon="chevron" title=" Print Media Types "] Filament media can be found in numerous forms. The more commonly used filaments include polylactic acid (PLA), acrylonitrile butadiene styrene (ABS) and nylon. While all filament media types can be hazardous, PLA is generally considered the least hazardous of the group and should be used whenever possible.

Special ventilation considerations may be necessary when using other types of filament media or 3D

printing processes.

Locations with 3D printers using combustible media such as powdered metals or carbon nanotubes must be reviewed and in compliance with fire safety and other health and safety requirements before the printer begins operation.

[/su\_spoiler] [su\_spoiler style="fancy" icon="chevron" title=" Ventilation "] 3D printers using PLA media exclusively may be set-up in a workspace having at least 4 air changes per hour.

The number of PLA printers in one location should be limited by the size of the space. One printer per standard office and no more than two printers for a standard classroom or workroom is allowable. Requests for the placement of multiple PLA printers in any space must be reviewed by EH&S before proceeding.

3D printers using ABS media or nylon may only be used in work areas having local exhaust ventilation or one pass air and at least six air changes per hour.

Printers should be fully enclosed and equipped with local exhaust ventilation or used within a fume hood whenever possible.

3D printers using other types of media, including but not limited to thermoplastics, photopolymers, high impact polystyrene, high density polyethylene, thermoplastic polyurethane (TPU), metal filament, biological media or other uncommon medias shall be reviewed by EH&S on a case by case basis with specific precautions required based on the hazards unique to the printing process.

[/su\_spoiler] [su\_spoiler style="fancy" icon="chevron" title=" General Safety"] All printers must be installed according to the manufacturer's requirements and according to NFPA 72 National Electric Code (current code requirements can be found at [Building Codes Enforcement](#) .)

Modifications to units that would void an existing certification (i.e. UL) are not allowed.

Safety Data Sheets (SDS) must be provided for all print feedstock and for any other chemical product used in the printing process. SDS must be readily accessible for review in the event of an emergency.

Printer extruder nozzles should be operated at the lowest temperature capable of producing the desired result.

Printer progress should be monitored remotely via camera or observation windows to minimize exposure concerns.

Keep 3D printers away from heavily trafficked areas.

Even if local exhaust ventilation is provided, there should be a waiting period in place to allow cool down and contaminant dissipation before opening the printer to access the finished product.

Safety interlock switches must be enabled and working properly during printer operation.

Operators must be protected from hot surfaces associated with the printers.

If UV light is used in the curing process, personal protective equipment and/or shielding must be utilized to protect personnel.

[/su\_spoiler] [su\_spoiler style="fancy" icon="chevron" title=" Training Requirements "] All users working directly with a 3D printer and associated media are required to have hazard communication (HAZCOM)

training covering any hazardous materials used in the process.

Completion of the training must be documented in writing with the records maintained by the manager of the printing operation.

**Personal Protective Equipment (PPE) Requirements**] Follow all PPE recommendations found in the Safety Data Sheet (SDS) for the specific printer media used.

Eye protection is required during any activity where airborne projectiles may be present (i.e. cutting off rough edges of a printed item).

For print processes using an alkaline bath to dissolve support material, an emergency eyewash will be required in the immediate vicinity of the work.

A handwash facility must also be available, particularly in areas where the media or processes used represent dermal hazards (i.e. resin printers).

A spill kit capable of neutralizing the caustic components of the alkaline bath shall also be provided.  
**Prohibitions**] The use of a 3D printer to fabricate any item in whole or in part that is designed to be used as a weapon is prohibited.

A partial list of prohibited items includes:

- Firearms
- Knives
- Striking instruments
- Martial arts weapons
- Bow and arrow combinations
- Explosive devices

**Additional Information**]

The National Institute of Occupational Safety and Health (NIOSH) has additional health and safety information for 3D printers at the following links:

[3D Printing with Filaments: Health and Safety Questions to Ask \(cdc.gov\)](#)

[3D Printing with Metal Powders: Health and Safety Questions to Ask \(cdc.gov\)](#)

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