

	<p style="text-align: center;">UNIVERSITY SAFETY ENVIRONMENTAL MANAGEMENT SYSTEM University Heights Newark, New Jersey 07102</p>	<p style="text-align: center;">September 2018 Version 1</p>
<p style="text-align: center;">New Jersey Institute of Technology Laboratory Standard Operating Procedure (For the Use of 3D Printers on Campus)</p>		

OBJECTIVE

The objective of this policy is to establish health and safety requirements for using 3D printers in NJIT 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.

POLICY

The 3D Printer Policy establishes the minimum requirements necessary to allow for the safe use of 3D printers located in the NJIT buildings. The policy covers all 3D printers including but not limited to those affiliated with the sciences, medicine, fine arts, performing arts, and engineering, libraries and arts and craft studios.

RESPONSIBILITIES

Environmental Health and Safety (EHS)

EHS 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.

- Choose low-emitting printers and feed materials/filament when possible.
- Provide proper personal protective equipment for hazards of the equipment and process. Have a risk assessment to determine what is required.
- Purchase and use the manufacturers' supplied controls, such as an interlocked enclosure. (Enclosures appear to be more effective at controlling emissions than just a machine cover.)

EHS may request the modification of proposed printer location or the addition of improved exhaust ventilation before purchasing approval is granted.

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

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 compliance with the training requirements.

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

Users of 3D printers (Faculty, staff, students)

Individuals (staff and students) 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.

PROCEDURES

The two most commonly used types of 3D printer media are Polylactic Acid (PLA) and Acrylonitrile Butadiene Styrene (ABS). When heated during the print process, both media types produce large concentrations of ultrafine particles (UFP). Exposures to UFP or nanoparticles, particularly at high concentrations, have been associated with adverse health effects. Elevated concentrations of volatile organic compounds (VOC) can also be produced during the printing process.

Generally speaking, ABS represents a greater health and safety risk than PLA media. Where practical, the use of PLA printers is preferred.

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

Ventilation

3D printers using PLA media exclusively may be set-up in any 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 should be reviewed by EHS before proceeding.

- Additional local exhaust ventilation may be required.

3D printers using ABS media, including printers designed and set-up to use both PLA and ABS may only be used in work areas having a dedicated exhaust system or one pass air and at least 6 air changes per hour.

It is recommended that printers using ABS media be used within a fume hood whenever possible.

3D printers using other types of media, including but not limited to thermoplastics, photopolymers, nylon, high impact polystyrene, high density polyethylene, powdered metals, biological media or other uncommon media 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.

General Safety

All printers must be installed according to the manufacturer's requirements and according to NFPA 70, National Electric Code.

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

Safety interlock switches on panels 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.

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. A copy of this document will be kept at EHS office.

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 station will be required in the immediate vicinity of the work.

A spill kit capable of neutralizing the caustic components of the alkaline bath shall also be provided.

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