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3D Printer Safety Guidelines

Objective

The objective of this guideline is to establish health and safety requirements for using 3D printers in Florida International University facilities. The guideline is presented in recognition of the continued expansion of 3D printer use by faculty, staff, and students. Studies have indicated that 3D printers can generate harmful concentrations of ultrafine particles (UFP), chemical vapors, and potentially hazardous waste, requiring guidelines and standards to be set.

Scope

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

Responsibilities

EH&S shall 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 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.

The owner, space occupant or area supervisor is responsible for enforcing the provisions of this guideline including compliance with the training requirements. Print supervisors are responsible for providing required personal protective equipment (PPE) and enforcing its correct use. 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.

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.

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 and ventilation capabilities and/or engineering controls available. 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 shall be reviewed by EH&S before proceeding and an air contaminant test after installation during regular operations might 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 six air changes per hour. It is recommended that printers using ABS media be used within a fume hood whenever possible.

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- 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 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. A dedicated exhaust system will likely be necessary.
- For dedicated exhaust systems, work with Facilities Management and the Building's assigned Project Manager to install or modify an existing one. Modifications or additions have an impact on the HVAC system balance and must be reviewed and approved by Facilities.
- If filtrations attachments are used, a maintenance schedule and/or a filter changeout schedule shall be developed.

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.
- All machine guarding controls, such as, guards, safety interlock switches must be enabled and working properly during printer operation
- Do not modify or bypass a safety control original to the machine.
- 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 as well as fire safety training. Completion of the training must be documented and maintained by the manager of the printing operation.

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 is 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.

For any questions pertaining to this guideline, please contact Environmental Health & Safety at ehs@fiu.edu.