

3D PRINTERS

Consult the *Ontario Occupational Health and Safety Act* and its regulations for additional information on the duties of workplace parties.

Technological advancements have made the availability of three-dimensional printers (3D printers) readily accessible to educational institutions as well as individuals. These devices are largely unregulated at the present time; however that does not limit the health and safety (and design) implications that may be present with the device itself or the materials printed / constructed.

Popular types of 3D printers operate by forcing a plastic filament through a heated nozzle. The object is printed when the plastic filament is heated and melted in layers; thus producing the three-dimensional effect. The two principle types of plastics are acrylonitrile butadiene styrene (ABS) and polylactic acid (PLA). The plastic filament typically must be heated to between 180 to 220 °C in order to melt. ABS has the potential to release volatile organic compounds (VOCs) such as styrene, ethylbenzene, and acrylonitrile during heating. Other hazardous products (such as carbon monoxide and hydrogen cyanide) can be emitted when ABS burns; however 3D printers typically do not operate at the required temperatures to produce these substances.

The following are recommended actions for personnel purchasing 3D printers at uOttawa.

1. Depending on the model of 3D printer selected, there may be additional ventilation requirements to ensure that exposure to particles generated as a result of printing are minimized. Locate the 3D printer in a well-ventilated location. Additional, local ventilation may be required.
2. Choose an appropriate printing medium. Where possible, avoid the use of acrylonitrile butadiene styrene (ABS). Polylactic acid (PLA) is generally preferred due to its safety for use in the food industry.
3. Printed materials shall, under no circumstances, be used to substitute components that are required for the safe operation of equipment or devices. If replacement parts for equipment are required, contact the manufacturer of the equipment to obtain proper components.
4. No person (including workers, students and visitors) shall use a 3D printer to print or construct weapons, either actual or imitation, and must advise the supervisor of the workshop of their project. The lab / shop supervisor is responsible for all projects created using the 3D printer.
5. If printed materials are intended for use with or around food material, select material that is intended for use around food. Consider using a food-safe sealant following completion of your 3D printed object. Of particular note is the intricacy of 3D printed objects; it is possible that small crevasses or micro porous assemblies may not be able to be cleaned effectively, thus permitting bacterial growth.
6. Access to moving parts, including printing devices, must be guarded to prevent unintended injury (including contact with heating elements and hot surfaces).
7. Printing devices have the potential to become warm following use; especially extended use. Ensure that materials are kept away from the printer.
8. Written lab / workshop standard operating procedures for the use of 3D printers are required prior to the commissioning of any related equipment. It is the lab manager / supervisor's responsibility to develop and

maintain these procedures as well as ensuring users are properly trained and oriented in the proper use of the equipment.

9. Maintain all related equipment at its recommended interval.
10. Wear required protective equipment when equipment is in operation (in required cases). Examples of equipment that may be required include protective eyewear and respiratory equipment. Consult the local Health, Safety and Risk Manager (HSRM) or the Office of Risk Management for assistance.

For more information on 3D printers, or to learn more about these devices at uOttawa, please visit the [Faculty of Engineering Richard L'Abbé Maker Space](#) or the [Faculty of Arts, Department of Visual Arts](#).

For information on health and safety related implications, please contact your local [Health, Safety and Risk Manager](#), or the [Office of Risk Management](#).