

Topic: 3D Printer Selection and Usage
Effective: May 2016
Review/Revision Date: May 2018
Responsibility: Executive Officer of Human Resources

INTENDED PURPOSE:

To provide guidance on the safe use of 3D printers in the delivery of curriculum.

PREAMBLE:

The use of 3D printers is gaining popularity in Ontario schools, and provides students with a dynamic design opportunity. As 3D printers utilize a relatively young technology known as nanotechnology, this document outlines minimum safety requirements for safe use that must be implemented within all Halton District School Board schools.

PROCEDURES:

Selection:

1. 3D printers must be used to meet curriculum expectations.
2. Certain design features of specific printers are unique and appear to be designed as a control technique, whereas others appear to be a design of convenience. To ensure safety for staff and students, 3D printers must only be purchased from the approved for use list on the Board tender. These models have been approved because they meet the following criteria:
 - a) To protect against physical hazards, select a model of 3D printer that is enclosed or guarded from moving parts, pinch points and the heating plate.
 - b) To control emission hazards, select a model of 3D printer that is fully enclosed, has a good seal and is outfitted with a lock mechanism that prevents opening during use.
 - c) The power supply AND the printer assembly must be Canadian Standards Association (CSA) or Electrical Safety Authority (ESA) certified for Canada. If this criterion is not met, the 3D printer will require an ESA Field Evaluation to be completed.
3. Where a unique or new 3D printer model is on the market but not yet on the Board tender list or where a school is to receive a donated 3D printer, the model should be reviewed in consultation with Program Services and Information Technology. The model being considered must be approved by the Health & Safety Department prior to acquisition or use to ensure it meets the Board's standard with respect to safety. If an older model is currently in use and is not enclosed, contact the Health & Safety Department for assessment and recommendations for safe use.
4. All 3D printers must be purchased through a Purchase Order.

General:

1. A malfunctioning 3D printer poses a fire hazard. Therefore, projects that require an extended run time (beyond the school day) must be printed in a room that complies with Fire Code requirements (fixed-temperature-rate-of-rise heat detector or smoke detector).
2. Follow manufacturer's instruction for the unit.

- Students using 3D printers must receive instruction on the safe use of the specific model of 3D printer they will be using prior to use. Included in these instructions should be general hazards associated with 3D printing.

Feedstock:

- Use 100% Virgin Grade A feedstock that is obtained from Board approved suppliers (refer to the Standard Supply List).
- Only PLA feedstock is to be used in elementary schools.
- Obtain Material Safety Data Sheets (MSDS) or Safety Data Sheets (SDS) for filament feedstock.
- Use of other filament feedstock must be approved by the Health & Safety Department.

Ventilation:

- Printers must be installed away from staff and student desks/work areas.
- Contact the Health & Safety Department to determine registration requirements for emissions with the Ministry of Environment.
- The room where the 3D printer will be located must have general ventilation. Refer to the following chart for specifics.
 - In the absence of general ventilation, a local exhaust system is required. Contact the Health and Safety Department and/or Facilities Department for assistance.

Ventilation Control Matrix for Emissions

Risk Group	3D Printer Parameters for Classroom Use	Minimum Controls Recommended
A	1 3D printer with PLA or ABS filament; AND printer bay enclosure is sealed and does not have gaps around the viewing window or along the perimeter of the housing OR 1 3D printer with PLA filament; AND printer bay enclosure has gaps around window or housing	The room should meet minimum combined outdoor air rate of 15 cfm per person as per ANSI/ASHRAE 62.1-2013. The room should maintain a slightly negative air pressure differential with respect to adjacent rooms/hallways. The HVAC system servicing the room should be reviewed. CAV systems or systems allowing continual air movement are preferred. The printer should be located as far away as practicable from a work station that can be occupied. Follow manufacturer's recommendations for installation, care and maintenance.

Risk Group	3D Printer Parameters for Classroom Use	Minimum Controls Recommended
B	<p>Multiple 3D printers with PLA filament</p> <p>OR</p> <p>Multiple 3D printers with combination of PLA or ABS filaments</p> <p>OR</p> <p>1 3D printer with ABS filament; AND printer bay enclosure has gaps around window or housing</p> <p>OR</p> <p>1 3D printer with PLA filament; AND no enclosure</p>	<p>Exhaust ventilation to remove emissions from the room in the form of a capture hood or local exhaust designed and/or verified for each printer.</p> <p>If air is to be re-circulated into the room, the exhaust system must be equipped with a HEPA filter with MERV 17 rating; and an adsorbent filter such as activated carbon.</p> <p>The room should maintain a slightly negative air pressure differential with respect to adjacent rooms/hallways. The printer(s) should be located as far away as practicable from an occupiable work station.</p> <p>Follow manufacturer's recommendations for installation, care and maintenance.</p>