

3D printing (Additive manufacturing)

What is 3D printing?

3D printers create objects by stacking many fine layers of plastic, rubber, mineral, or metal. They are used in factories, hospitals, labs, schools, and homes to create almost anything – from car parts to body parts (prostheses).

3D printing is also known as additive manufacturing.

Additive manufacturing contrasts with subtractive manufacturing processes like turning, drilling, or milling where objects are made by removal of materials and formative manufacturing processes like forging, casting, and injection molding in which objects are fabricated by application of pressure to materials.

What are the potential hazards?

3D printing is a new technology and there are gaps in understanding the health and safety risks. The risks vary based on the printer's energy (high temperature, ultraviolet light, lasers, or even electron beams) and the raw materials used, resulting in a variety of potential hazards including:

- Ultrafine/nano particles
- Volatile Organic Compounds (VOCs) including styrene and formaldehyde
- Lasers/Ultraviolet light (UV)
- Skin or inhalation exposures to harmful materials or allergens
- Surfaces that are hot or contaminated with harmful materials
- High voltage
- Mechanical hazards from moving parts
- Corrosive baths
- Combustible dust



What are the safety guidelines?

- Develop standard operating procedures (SOPs) and train personnel
- Limit equipment access to trained or authorized personnel
- Use enclosures, ventilation, and HEPA filtration
- Use materials with lower emissions
- Reduce time spent near the printer while it is running
- Wear personal protective equipment (PPE), such as safety glasses, gloves, or lab coats
- Keep printer surface and parts clean to reduce skin exposures
- Consider fire/explosion safety (PPE as well as suppression and other controls)
- Grounding and bonding of equipment

Consult these NIOSH resources for specific details regarding recommendations for work practices, engineering controls, administrative controls, and PPE:

(1) [3D Printing with Filaments](#), (2) [3D Printing with Metal Powders](#), (3) [3D Printing Safety](#) .

