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3D Printer Safety

- **What is 3D printing?**
  - Also known as additive manufacturing, 3D printing is a method of making items from digital drawings.
  - There are different types of 3D printing methods and materials.
    - Fused Deposition Modeling (FDM) [Most common]
    - Stereolithography (SLA)
    - Digital Light Processing (DLP)
    - Materials can include plastics, metal, ceramic, carbon fiber, and even biological cells in a powder, filament, or liquid form.
  - Important note: 3D printing is a developing technology with hazards still being studied.

● **Potential Hazards**	● **Potential Controls**
○ Ultrafine/Nano-sized particles ○ Volatile Organic Compounds ○ Chemical vapors ○ Electrical shock ○ Ultraviolet radiation ○ Lasers ○ Flammable and/or reactive powders ○ Fire ○ Burns ■ Heat ■ Chemical (if corrosive bath used) ○ Pinch points ○ Biological hazards ○ Sharp edges	○ Engineering ■ Ventilation, Area and Local ■ Thermal Runaway Protection ■ HEPA filtration systems ■ Enclosures ■ Fire protection systems ○ Administrative ■ Standard Operating Procedures ■ Location control ■ Training ○ PPE ■ Nitrile gloves ■ Respirators ■ Safety Glasses

- **Best Practices**
  - Before getting a 3D printer
    - Determine best location using manufacturer and UH Facilities requirements.
    - Check printer certifications (i.e. ANSI/CAN/UL 2904)
    - Order high quality feedstock materials (i.e. manufacturer approved).
    - Source 3D printers from reputable manufacturers.

  - Before using a 3D printer
    - Read and understand the manual.
    - Install according to manufacturer instructions and specifications.
    - Assess the hazards of your particular 3D printer.
    - Read SDS of feedstock materials.

  - While using a 3D printer
    - Once a printing job has been started, do not fix things while the printer is moving.
    - Ensure first layers are adhered properly.
    - Do not leave the printer unattended, keep checking on its progress.
    - Keep ventilation/filtration systems active during printing.

  - After using a 3D printer
    - Ensure 3D printer power is off.
    - Clean up unused materials in and around the printer.
    - Wash hands after handling materials.
    - Dispose of materials properly.

  - Post-processing
    - Label rinse tanks with the chemical name and associated hazards.
    - Ensure there is proper ventilation in the area where the bath is located.
    - Ensure there is an eyewash or shower available, if corrosive materials are used.
    - Do not pour any chemical down the drain. All used chemicals must be disposed of as hazardous waste.
- **Questions**
  - If you have any questions or would like a review of your 3D printing processes please contact EHSO at (808)956-8660 or labsafe@hawaii.edu

- **Resources**
  - NIOSH Additive Manufacturing/3D Printing
  - NIOSH 3D Printing with Filaments: Health and Safety Questions to Ask
  - NIOSH 3D Printing with Metal Powders: Health and Safety Questions to Ask
  - 3D Printers & IAQ: Learning Modules
  - Chemical Insights.org 3d Printer Guidance Documents
  - ANSI/CAN/UL Standard Method for Testing and Assessing Particle and Chemical Emissions from 3D Printers
  - RiT 3-D Printer Safety