FDM Training SOP

Last edited: Furst (08/26/20)

Instructor:

Date:

Attendees:

	Name	Group or Company	Signature
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Overview:

- This training provides an introduction to using and operating the FDM 3D printers including:
  - File Types
  - Software
    - Cura
    - GrabCad Print
  - Printer Use
  - Post processing
  - Printer Maintenance
    - Changing Print Heads
    - Changing Fulfillment Type
    - Cleaning
- The two FDM printers (Ultimaker and F270) are both set up to print with with ABS by default, Other materials are available upon request.
- Work by extruding thermoplastic filament onto build platform-Build the part layer by layer.
- Remember to enter job information into the 3D print job log!

Safety

- The print heads can be very hot - do not touch them with bare hands unless positive they are cool.
- As with any automated machinery make sure that your body is clear of the moving parts to avoid injury.
- The support removal tank for the F270 is filled with heated caustic chemicals that dissolve the support material. An apron, Gloves, and a face shield must be warn when inserting and removing parts or basket from tank.

Job Setup

1. **At the Computer:**:
    1. Load your STL file into the print software on the computer adjacent to the printer (Cura for Ultimaker, GrabCad Print for F270).
    2. Set Print Parameters:
        1. Position the part on the build tray in a way that is conducive to 3D printing (flat side down)
        2. Select appropriate layer or slice height (the more slices the higher the print resolution but the longer it takes to print)
    3. For Ultimaker:
        1. Select “generate support” if necessary
        2. Check appropriate filament and bed temperatures (should be set if using standard filament load out)
        3. Send job to Ultimaker using USB drive
    4. For F270:
        1. The F270 the printer will print a raft before printing the model. Make sure first layer is set to support material or removal will be incredibly difficult.
        2. Send job to F270 over Ethernet
    5. Record the material used and print time in the online log along with the other job information requested. The print log should be on the desktop or https://docs.google.com/forms/d/e/1FAIpQLScS3URUxoHOR62PdQeeSTAYg_suV061UsoFafrgoN0qn6DWYg/viewform.
2. **At the printer:**
    1. Ultimaker:
        1. Make sure print bed is clean
    2. F270:
        1. Make sure that there is enough room on an CLEAN build tray for your part, and that the build tray is secured in the printer with the locking arm horizontal. Build trays may be used until the entire build area has been printed on, but printed areas should ideally not be reused.
    3. Start the job at the printer

Part Removal and Cleaning

Ultimaker

- Remove part from print bed using a spatula or razor being careful not to cut yourself or scratch the build plate. Make sure no body part is in line with the tool should it slip or the part break free unexpectedly.
- If support was used, submerge print in warm water for several hours to dissolve PVA filament. (prints can warp if submerged in water for over 24 hours)

F270

- Remove the build tray and flex it to break the bond between the material and the tray.
- Separate your part from the build tray with a spatula and scrape off any debris so they tray can be reused.
- Put on the appropriate PPE: don gloves, a face shield, and a lab coat.
- Carefully, slowly, and without splashing cleaning solution, open the support removal tank lid

and remove and open the tank.
- Place large parts directly in the tank, small parts may be put in the SS box and placed into the main basket.
- Carefully, slowly, and without splashing lower the basket back into the tank and close the lid.
- Set timer for 8 hours using the “set” button.
- Select the temperature to be 70 degrees C and push the power button to warm the tank.
- After cleaning time has elapsed, follow the instructions above for opening and removing parts.
- Rinse part in warm water.

Rates

F270:

Material	$/Spool	cu in/Spool	$/cu in	$/cc
PLA	79	60	1.31	.08
ABS	164	60	2.73	.17
Sup	228	60	3.79	.23

F270 hourly charge: $1/hr to pay for head replacement

Ultimaker: ABS: .12/gram

F270 Quick Review

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Safety Concerns

- Both print heads and bed are heated during operation. Do not attempt to clean, remove, or adjust without allowing for adequate cool down time.
- Keep hands clear of printer during operation. Pause print before clearing or adjusting part.

Safe Operating Procedures Review

1. On the F270 printers computer, launch GrabCad Print
2. Select File → New Project → Add Models → Import desired models
3. Move models around on virtual build tray so that models on a used build tray do not overlap any previously printed spots
4. the purge block and printed model should be placed close together to minimize print time
5. Select “Print Settings” from the menu on the right hand side
6. From menu, select desired slice height, and verify that the first layer material is set to support.
7. Open and place build tray into F270, making sure that the tray is locked in place by pulling up

on the front locking arm until arm is PARALLEL to build tray.
8. Select print, and send the job to the F270 3D printer
9. on the F270 touch screen, select your job, and then select print.

Post Processing

- If support was constructed from dissoluble filament clean using the F270 Support Removal Apparatus which is filled with heated caustic chemicals. GLOVES, LAB COAT, AND FACE SHIELD MUST BE WORN
- Build tray should be scraped clean and free of any support or build material then placed in the USED F270 tray drawer if printable space is left. Any material protruding from the build tray will damage print heads during the next print.

Maintenance Schedule (see user maintenance page 80):

- Clean oven chamber weekly
- Clean platen weekly
- Inspect, wipe, and clean tip wipe assemblies monthly
- Clean exterior of printer as needed
- Clean touchscreen as needed

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