

CAP Fab Lab D-Fab Facilities

3D Printing Policies and Procedures

CAP Fab Lab Website: <http://capfablab.info>

3D Printer Lab Location: AB 005

D-Fab Staff Contact: capfablab@bsu.edu or join **CAP Fab Lab - Q&A** ([link](#)) on Microsoft Teams

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CAP offers 3D printing services to CAP students, faculty and staff at or below the cost of materials consumed per print. These services are subsidized by the CAP Dean's Office in order to provide CAP constituents equitable access to advanced fabrication tools. The following policies and procedures are designed ensure this access.

For the purposes of this document all users of CAP digital fabrication (D-Fab) services are called clients, including faculty, staff and students.

COVID-related changes and additions to policies and procedures are highlighted in red throughout this document.

1. Requests

- a. **Clients who have not 3D printed before are encouraged to book a remote consultation session through the CAP Fab Lab website (<http://capfablab.info>)** to be introduced to available 3D printing technologies and associated requirements and considerations for 3D modeling when preparing geometry for 3D printing.
- b. **Faculty considering 3D printing as a suggested or required element of a class or studio project** are encouraged to contact the Lab Manager or a staff member prior to assigning the project for information about 3D printing constraints (build size, geometry limitations, typical print duration, etc.) and the feasibility of accommodating the 3D print request volume that may result. D-Fab staff members are available to provide introductory sessions for classes and studio sections upon request.
- c. **Clients must submit 3D print requests through the CAP Fab Lab website. D-Fab staff can assist with this process during remote consultation sessions (see 1.a. above).** Each type of 3D printing technology made available to clients has a corresponding online request form on the CAP Fab Lab website. 3D print geometry must be provided at time request is submitted.
- d. **Clients are encouraged to submit requests as far in advance of due dates as possible** and to plan time for post-processing (e.g. removing supports, cleaning up print surfaces, etc).
- e. FDM (plastic filament-based) Print Requests
 - i. Client requests for specific printers and specific print settings will be accommodated where possible, but a print may be moved to a different machine without notice if no change to the requested filament is necessary.
 - ii. Due to software limitations not all print settings can be customized by D-Fab staff. For best results, include notes about the purpose behind requesting a particular setting so that staff can bring knowledge of CAP's specific machines to bear on print setup.
- f. **When making a request clients can choose how they will receive completed prints. See Section 5 for options and details.**

2. Review

- a. D-Fab staff members will review all print requests prior to queuing them for printing. Submitted 3D models may be returned for modifications or rejected if not suitable for 3D printing due to reasons including, but not limited to:
 - i. bad geometry (e.g. open meshes, non-manifold edges—see guidelines on website),
 - ii. improperly scaled geometry (see website for build size constraints),
 - iii. offensive or dangerous content (such as obscene objects, firearms, weapons),
 - iv. during crunch times, non-curricular content (toys, game pieces, action figures, household items, etc.).
- b. D-Fab staff members will advise clients regarding bad geometry and options for fixing it but are not responsible for correcting bad geometry on client's behalf.
- c. **Error-free geometry does not necessarily mean the geometry can be reasonably 3D printed.** D-Fab staff members will advise clients of potential issues and may encourage clients to consider alternative fabrication approaches. In such cases clients are asked to be considerate of other patrons that may be in line and select fabrication approaches more likely to succeed.
- d. **3D printing is a complex fabrication process that is prone to failures based on numerous factors.** D-Fab staff members, to the best of their abilities, will communicate any potential issues to clients before starting a print; however, not all failures can be predicted.
- e. **By requesting a print, clients assume the risk of print failure in terms of both cost and time for any failure due to client error not reasonably detectable by a D-Fab staff member.** See Costs section for additional terms.

3. Queues & Scheduling

- a. We reserve the right to deny non-CAP affiliated client print requests in order to manage our resources effectively in service of CAP-affiliated clients. See also Costs section.
- b. Print requests will be processed in the order received; however, newer requests may be printed before older requests due constraints related to geometry, filament choice and print duration. D-Fab staff will do its best to optimize print queue processing with the following factors in mind:
 - i. Problematic geometry may require client attention before a print can be started.
 - ii. Some geometries are only printable on certain machines due to their size.
 - iii. Certain filaments can only be printed on certain machines.
 - iv. Newer print jobs that are shorter may complete before older print jobs that are longer running.
 - v. Client “needed by” date for one job may be sooner than that of other prints, and running it first will not cause other prints to be delayed beyond associated “needed by” dates.
- c. **D-Fab staff will do their best to accommodate client “needed by” dates but can make no guarantees** due to constraints including print duration, equipment availability, and staff work schedules and hours. If a print cannot be completed by client's “needed by” date, client will be notified as soon as possible.
- d. Completed Binderjet (powder-based) 3D prints require an excavation process (and in some cases other post-processing steps) that can result in damage to prints with fine details, thin

- walls or narrow protrusions. **D-Fab staff will excavate all Binderjet prints on behalf of clients. See Section 5 for additional details.**
- e. During crunch times (defined as the last four weeks of a semester), the following limits will be put in effect to ensure equitable access to 3D printing resources.
 - i. No prints estimated to take longer than 24 hours will be accepted.
 - ii. Clients will be restricted to a single 3D printer (of a given type) at a time as long as there are other client requests in the queue. Total print time for client prints to be started simultaneously on separate machines may not exceed 24 hours.
 - f. Outside of crunch times longer and multi-machine print requests may be accepted if there are machines available and demand is low, but special permission will be required for any of the following cases:
 - i. A single print exceeds 48 hours.
 - ii. All machines of a given 3D printing technology or supporting a given filament diameter will be occupied by a single project for more than 24 hours.

4. Costs

- a. CAP 3D Printer Lab clients pay only for materials used for 3D printing. **Charges for 3D prints are based on material consumption estimates** generated by printer-specific software, with the exception of Binderjet prints which are priced by model volume using a CAP-developed pricing formula.
 - i. Self-service cost estimation tools are available on the CAP Fab Lab website (<http://capfablab.info>) for Binderjet and SLA (resin) print types as part of the corresponding print request forms.
 - ii. FDM (plastic) print costs are calculated per gram of the filament type to be used for a print. Filament quantity required for a given print depends on many factors related to model geometry and print setup—**client should request a remote consultation session through the CAP Fab Lab website** or contact staff via email or Microsoft Teams to obtain estimates. See website for filament pricing.
- b. **Clients are responsible for the costs associated with prints completed at their request whether or not the completed print is claimed/retrieved.**
- c. If a client asks for a print to be canceled after it has already been started, clients will be charged for the material already consumed when the print is stopped (calculated based on percentage completion). It may not be possible to cancel a Binderjet print already underway if other models are part of the same build. In such cases client will be responsible for the entire cost of their print.
- d. **Clients will be responsible for the costs associated with a failed print** (see section 2, d. and e.) unless the failure is directly related to an issue with the associated machine(s) or any CAP-provided materials or if a staff member has clearly been negligent in setting up a print. If a client believes a D-Fab staff member has been negligent, the Lab Manager should be contacted for resolution.
- e. **Charges for student 3D prints will be billed to students' bursar accounts at the end of each semester.** A client's current balance can be provided by the Lab Manager upon request. Faculty members must provide a department or project-related BSU account number to be billed or may pay by check made out to Ball State University.
- f. A 25% surcharge will be added to the print cost for clients not affiliated with CAP.

5. Expectations

- a. Clients will be notified when a print is started (along with estimated completion time) and when completed.
- b. **Completed prints can be:**
 - i. **Picked up at a standard pickup time (preferred).** This is the default option when requesting a print. Client must come to the 3D Printer Lab (AB 005) during one of the standard pickup times (listed on website) following notification of completion to retrieve their completed print(s).
 - ii. **Picked up at an individually arranged time.** To arrange an individual pickup time (outside of standard times) client must respond to the notification they receive when their print is started to request an individual pickup time.
- c. Prints may be canceled at the client's request or due to a print failure. If a print is canceled due to print failure and the failure is not model geometry-related, the print will be restarted unless the print will not complete before client requested "needed by" date. Otherwise client will be notified before any further action is taken.
- d. **If a client's print is completed and remains unclaimed for one week it may be discarded** (and client will still be charged for print—see Costs section above). Week begins after "needed by" date, if provided; otherwise after date of completion.
- e. CAP will not be responsible for any materials, personal tools, projects or other belongings clients leave in the lab.
- f. **Binderjet prints will be excavated and post-processed by D-Fab Staff Members. They will be extremely careful, but they cannot be responsible for breakage where clients have been advised of the risk. Clients will be made aware of any concerns prior to printing.**

6. Safety

- a. **Clients will not be permitted to enter the 3D Printer Lab except during print pickup. In order to allow for social distancing, a maximum of two clients and two staff may be in the lab at one time.**
- b. **D-Fab staff members will wear face masks and gloves when starting and handling client prints. Surfaces in the labs will be sanitized on a regular basis.**
- c. D-Fab staff members and trained faculty are the only people authorized to interact directly with the 3D printers or associated equipment in the lab.
- d. Isopropyl alcohol is used to post-process resin-based 3D prints and to clean 3D printers. No open flame is permitted in the lab.
- e. Post-processing FDM (plastic filament-based) 3D prints
 - i. Any post-processing is the client's responsibility and is at their own risk. Clients are advised to wear eye protection. Small pieces may fly off and get in eyes.
 - ii. **FDM prints should not be sanitized using alcohol as this can "melt" the plastic.**
- f. Post-processing Binderjet (powder-based) 3D prints
 - i. **Any post-processing of prints will be performed by D-Fab staff members.**
 - ii. **Binderjet prints should not be sanitized using liquid cleaners unless prints are post-processed with wax or ColorBond. Even if post-processed, minimize application of any cleaners to avoid damage to print. Clients apply cleaners at their own risk.**
- g. Post-processing Formlabs (resin-based) 3D prints

- i. Any post-processing is the client's responsibility and is at their own risk. Clients are advised to wear eye protection. Small pieces may fly off and get in eyes.