
Mechanical and Aerospace Engineering Machine Shop Guidelines and Procedures

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Revision History

Revision	Effective Date	Sections Affected	Notes
REV-NC	13 September 2013	N/A	Original
REV-1	31 March 2014	Added priority list and section on last date to accept new work. Edited other sections	Major revision
REV-2	15 September 2016	Updated Section 3.0 Added shop request form and sample drawing format.	Major revision
REV-3	18 September 2017	Removed shop request form and streamlined process.	Major Revision

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1.0 SECTION RESERVED FOR FUTURE USE

2.0 Shop Guidelines

2.1 Shop Safety

Carleton University's 'Laboratory Health and Safety' rules apply in the MAE machine shop. A copy of this document can be found at <http://www.carleton.ca/ehs/programs/laboratory-health-and-safety/>. A short summary of additional general shop rules are listed below.

1. **IF IN DOUBT, ASK!**
2. You must check in with Alex Proctor or his designate prior to starting any work.
3. You must make yourself familiar with the location of emergency exits, fire extinguishers and emergency shut-off switches around the area in which you are planning to work.
4. You must work safely, obey safety rules and use all safety equipment associated with your task.
5. No open toed shoes, loose clothing, long hair or jewelry (including rings, bracelets, or campus card neck straps).
6. You may only work on the machine and on the operation on which you have been checked in. You must have permission before moving to another machine or operation.
7. Always clean up, return tools, return personal protective equipment and ensure all guards are in place.
8. Report broken tools or equipment to Alex Proctor or his designate.
9. Obey all instructions from machine shop staff.
10. Failure to obey these regulations or work safety will result in a permanent ban from the machine shop.

It is recommended that team manufacturing personnel invest in their own personal protective equipment, such as safety boots and safety glasses.

2.2 Shop Work Scheduling Priority

Work in the MAE shop will be prioritized as follows:

- 1) Urgent or safety related facility and lab repairs and maintenance
- 2) Scheduled undergraduate course machining labs (e.g. MAAE 3901, CAD/CAM)
- 3) Pre-arranged and lead engineer approved manufacturing tasks from 4th year projects – with manufacturing drawings
- 4) Other pre-arranged course-related manufacturing (e.g. MAAE 3901) – with manufacturing drawings
- 5) Pre-arranged graduate research project work – approved by graduate supervisor and with manufacturing drawings

- 6) Other pre-arranged undergraduate extracurricular project work – with manufacturing drawings
- 7) Unscheduled walk-in 4th year project work (to be done by the student or staff after review - time permitting)
- 8) Other unscheduled walk-in graduate and undergraduate work (to be done by the student or staff after review - time permitting)

2.3 Fall and Winter Term Cut-Off Dates

A cut-off date after which no new work will be accepted will be established for the Fall and Winter terms. This is required due to the cyclic nature of 4th year project work with peak workloads near the end of the Fall and Winter terms (e.g. late November and early March). The cut-off dates are the **third Friday in November** and the **first Friday in March** for each Fall and Winter term respectively. For the weeks immediately following these dates and until any 4th year project work backlog is cleared, no new pre-arranged or walk-in work will be accepted. Minor modifications or re-work to already completed or in-progress project work may be completed on a first come, first served basis, time permitting.

2.4 Location and Availability

The Carleton University MAE machine shop is located on the first floor in the Mackenzie Engineering Building's first block. Normal operating hours are from 8:00 to 16:00 Monday to Friday, however due to different circumstances the shop may not always be open to students during this time. The Shop is normally closed from 12:00-13:00 for lunch. The Shop is closed for all University holidays and may only be partially open during Fall and Winter Reading Weeks.

An up to date copy of the MAE machine shop schedule is available in the shop and online at <https://carleton.ca/mae/shop-information-for-4th-year-projects/>. Please make note of key entries such as the drawing review hours, 3901 lab hours, and pre-arranged shop closure dates.

2.5 Tool Rental

Most hand tools and some powered tools are available for students to borrow to be used on school related projects at no cost. Tools must be signed out using the desktop computer near the entrance to the machine shop. Please consult with one of the shop personnel to determine whether and for how long a certain tool may be borrowed. Return all tools promptly when the planned task has been completed. Use tools for their intended purpose only.

2.6 Walk-in Work

Walk-in work will be limited to **simple** part modification, fabrication, or joining tasks requiring minimal tooling and little set-up time. The drawing sign-off procedure is not required for this type of work, though drawings or sketches may still be required in some cases. No walk-in work will be admitted during the 3901 lab hours and no new walk-in work will be admitted after 15:00.

3.0 Machining Approval Process

3.1 Design Phase

In this phase, students are working within the project to design components that satisfy their project requirements. At this time, students have the option to consult the machine shop TA to inquire about general manufacturability based on the shop capabilities, and receive feedback to help simplify or improve a given design. The drawings do not have to be complete at this stage; however, the quality of feedback is higher for drawings that are more complete.

3.2 Making the Drawing

Once the part or assemblies have been completed, the students must create proper engineering drawings in the template designated for a given project. The title block style is at the discretion of each project, however, it **must** have the following information:

- part name or assembly name
- part number or assembly number
- part list (on assembly drawing only)
- project name
- drawn by (printed name)
- reviewed by (printed name)
- approved by (printed name and spot for a signature)
- revision index (could be either a letter, number, etc.,)
- material
- quantity
- general tolerances
- units (mm or inches)

It is the responsibility of the assigned student “shop representative” within each project to ensure that the entire team is using the template correctly, and that all the information is present on the title block (aside from the “Reviewed by” and “Approved by” sections.

Students may also meet with the machine shop TA to review proper drawing techniques, dimensioning, and tolerancing at this point.

3.3 Review and Approval

Upon the completion of the drawing, the document must be reviewed to ensure that it is as complete and accurate as possible. This can be done by a peer, the assigned project TA, the machine shop TA, or a lead engineer. If an error is found, the drawing must be corrected.

Following this, Project Engineers will approve the design/drawings to verify that the part is necessary to manufacture, and that the proper engineering design process was performed to produce the drawing. If any errors are identified at this stage, the drawings/design must be corrected accordingly before approval.

3.4 Preliminary Machinist Review

With the drawings approved by a lead engineer, the students are required to email Alex Proctor at alex.proctor@carleton.ca with a clear subject line indicating the course code, the project name, and indicate the purpose of the email; in this case “Part Review Meeting” or “Preliminary Review” (or similar) will suffice.

This email must contain have the final drawings, and the CAD models (preferably as a .step file format), and the student’s availability for a meeting with the machine shop technicians. From here, students will coordinate a suitable time to meet.

Students must bring a printed copy of their drawings that have been **signed** by the approving lead engineer. At the meeting, the machine shop technicians and the students will discuss and clarify part details, synthesize a machining strategy, and lead times. If a critical error is identified at this stage, the students will not be admitted to the machine shop, and will go back to the design phase. If approved, the machine shop technicians will book time slots with the students to begin manufacture, and the material will be ordered.

3.5 Manufacturing Process

The chosen manufacturing persons are not required to have any prior machining experience; they will be trained to operate required machinery as necessary (this will require extra time and is subject to machinist availability).

The machine shop technicians will continue manufacturing the parts without the students being present to prevent accumulation of unfinished work. Students are encouraged to visit the shop from time to time to assist and/or observe the manufacturing process.

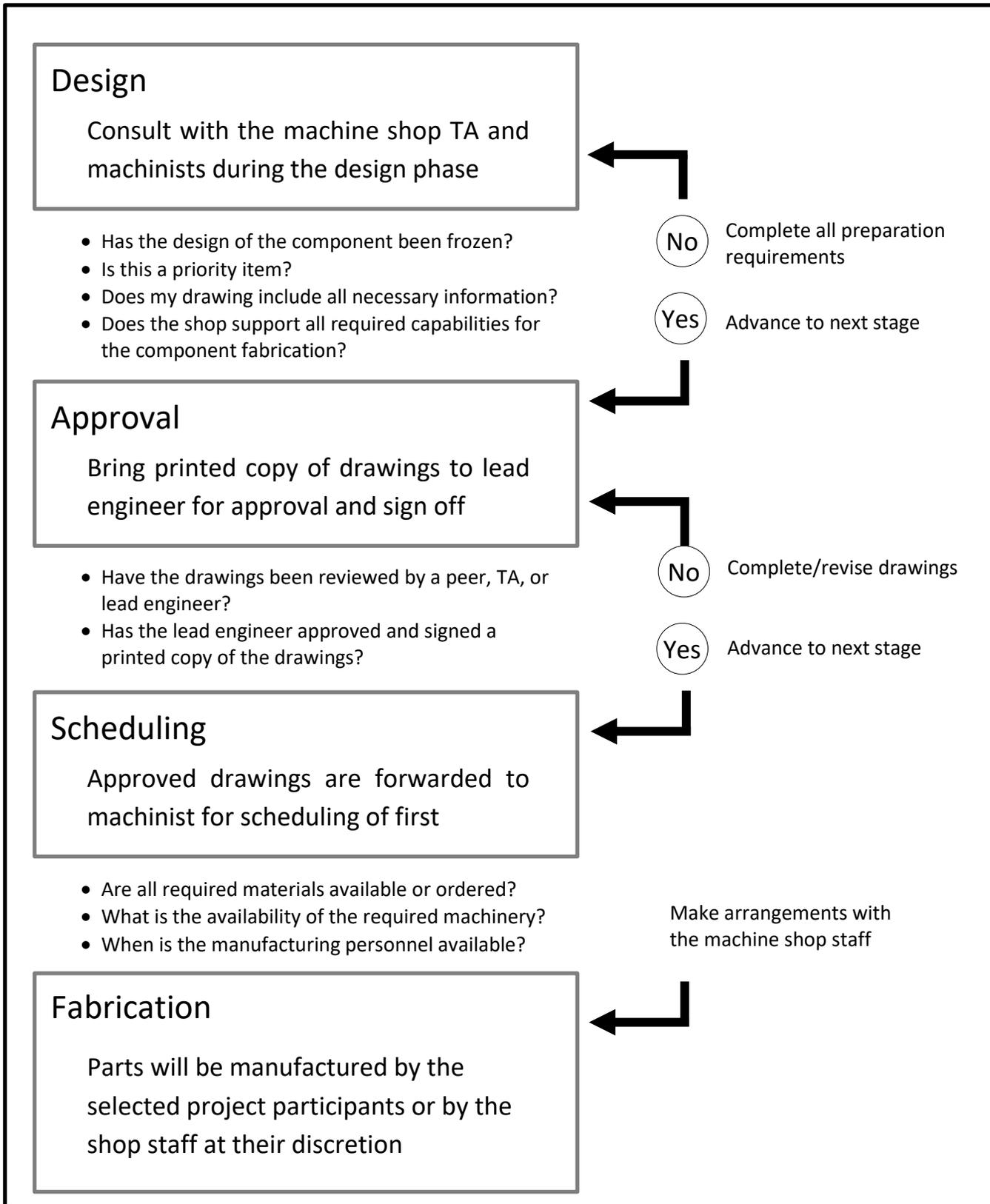


Figure 1: Machine shop approval process

