

## DARTMOUTH COLLEGE STUDENT MACHINE SHOP SAFETY POLICY

### **Purpose:**

The purpose of this policy is to establish a minimum set of safety standards pertaining to the operation of machine shops used by undergraduate and graduate students at Dartmouth College.

For the purpose of this policy, a “Student Machine Shop” is defined as a laboratory or other teaching space that is used by students for the completion of research, class projects, special projects or “hobby” projects where industrial machinery may be used to cut, mill, drill or otherwise alter material.

The definition of Student Machine Shop does not include shops where students may operate machinery to maintain equipment as employees such as tuning skis, sharpening skates, maintaining the Appalachian Trail, etc.

This policy applies to all Student Machine Shops located on Dartmouth College properties and Dartmouth College operated Student Machine Shops at satellite locations.

Following are undergraduate-accessible Student Machine Shops on the Dartmouth College Campus subject to this policy:

BFVAC Sculpture Studio	Thayer Machine Shop	HOP Woodshop
BFVAC Welding Shop	Thayer Couch Lab	HOP Jewelry Shop
BFVAC Architecture Lab	Wilder Machine Shop	HOP Ceramic Shop
HOP Theatre Shop	HOP Music Shop	

The following Graduate Laboratories constitute Student Machine Shops subject to this policy:

Thayer: Ice Research Lab	Thayer: Van Citter Lab	Borwell: L3 (Thayer & Med School)
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### **Student Machine Shop Working Group**

The Student Machine Shop Working Group (referred to in this policy as the “Working Group”) is established and will consist of faculty and staff who have responsibilities for the operation of Student Machine Shops at Dartmouth College. Any staff or faculty with oversight or operational responsibility for Student Machine Shops are welcome to participate in the Working Group.

# DARTMOUTH

Environmental Health & Safety

The Director of the Office of Environmental Health and Safety (“EHS”) will appoint a representative from EHS to provide subject matter guidance regarding concepts and techniques of machine safeguarding. The EHS representative will also serve as the Working Group’s facilitator responsible for scheduling meetings, developing the agenda items, developing training material and overseeing action items developed by the Working Group. The Working Group will establish a machine hazard rating system for each machine or machine type operated in a Student Machine Shop.

The Working Group is responsible for establishing College-wide guidance for the operation of Student Machine Shops. Specifically, the Working Group will establish minimum guidelines for supervision, training and access for Student Machine Shops based upon the hazard rating established for specific machinery.

## **Hazard Rating System:**

The objective for the hazard rating system is to establish criteria for rating tools and machinery based upon the hazards inherent to their use. The Working Group will assign a Hazard Category to each machine on an individual basis based on the general guidelines for hazard determination of machinery to be used by the Working Group noted below.

Hazard Category 1: Hand Tools. Exceptions may include tools like wood carving knives.

Hazard Category 2: 18 Volt or less battery powered hand tools used for any purpose, other than circular saws). Corded powered tools used to fasten or sand material. Other portable powered tools should be evaluated on an individual basis and may be considered for a higher hazard category.

Hazard Category 3: Selected portable powered tools and small bench top tools used to cut or remove material via drilling, milling or turning.

Hazard Category 4: Large industrial type machinery with intrinsic or automatic safety features. Examples include a fully enclosed machine with interlocks that prevent operation if the guards are not in place. A sawstop table saw would also be considered in this hazard category.

Hazard Category 5: Large industrial machinery without intrinsic or automatic safety features. This would include all machinery with self-adjusting or manually adjusted guards.

The Working Group will review each machine included in a Student Machine Shop and its use to assign a Hazard Category using the above guidelines for rating criteria. The above are guidelines used by the Working Group but the Working Group will assign the Hazard Category for each machine on an individual basis as there are often other considerations, including those based on

# DARTMOUTH

Environmental Health & Safety

specific machinery hazard assessments, that may require a higher or lower hazard rating. For example, a machine that is equipped with fully interlocked guards and cannot operate unless all hazard areas of the machine are fully guarded by a fully enclosed guarding system may allow the classification of such a machine by the Working Group as a Hazard Category 1.

The Working Group will maintain an inventory of equipment using the attached worksheet and an excel spreadsheet.

The Hazard Category assigned to a particular machine will determine the training, supervision and access control requirements for machine operation.

## **Supervision:**

There are three levels of supervision (as set out below) to be considered by the Working Group. Note that working alone in Student Machine Shops with equipment in Hazard Category 2-5 is not allowed. Working alone with Hazard Category 1 machinery should be discouraged by Student Machine Shop supervisors.

- **Buddy System:** A “Buddy” is an individual who is able to respond in an emergency situation. The purpose of a “Buddy” is to have a person who can respond to an emergency by calling emergency response personnel. (Calling 911)

Buddies can be two people working in the Student Machine Shop, as long as, both are authorized to work in the Student Machine Shop and have completed the required training.

A Buddy is expected to be within sight and hearing of the person performing work in a Student Machine Shop. A Buddy should be in the same room or space as the person performing the work and not in an adjacent open lobby space.

- **Monitor:** A Monitor is a Dartmouth College employee or appointee, who has received extensive training on the piece of machinery being used under the direction of a Professional Staff member and has demonstrated the knowledge skill and ability to perform basic machine operations, identify hazards or potential hazards and can effectively correct the hazards when encountered.
- **Professional Staff:** Professional Staff members hold positions providing oversight and instruction to students in the operation of machinery in the Student Machine Shops. Professional Staff may include professors, instructors and principal investigators who use the equipment to teach or perform research. A list of individuals designated as Professional Staff should be maintained by each individual Student Machine Shop.

The following table provides guidance for determining the supervision level required depending upon the hazard rating of the machine. The Working Group has the authority to require a higher

level of supervision or to allow a lesser level of supervision depending upon the characteristics of an individual machine and its use.

Hazard Category 1: Comply with the recommended practices regarding working alone in laboratories.

Hazard Category 2: Buddy System.

Hazard Category 3: Monitor must be present within “Line of Sight” of the student working in the shop.

Hazard category 4: Monitor with Professional Staff oversight (“oversight” is defined requiring that the Professional Staff member be in the general vicinity of the machine while students are operating the machine).

Hazard Category 5: Professional Staff required. Monitors should be directly involved with the student machine operation; however, Professional Staff must be within sight of the machine being operated.

### **Training:**

Each Student Machine Shop shall develop a shop-specific safety training outline based upon the nature, size, equipment and use of the shop. The shop-specific outline will be submitted to the Working Group for review and approval.

The requirements for a shop-specific training program allow each Student Machine Shop to design a program to meet the specific needs of the shop and remain consistent with the mission of the shop and the overall hazards in the shop.

Following are guidelines for a shop-specific student training program:

- General shop safety: (Web Course developed by EHS)
- An orientation to the specific Student Machine Shop: general overview of shop operations, equipment, hazards and safety requirements, etc.
- Hands-on instruction for the machine being operated under the supervision of a Monitor or Professional Staff member. Basic requirements for competence are safety related items that include:
  - Removing all jewelry, hair tied up and pulled back, no loose sleeves (preferable short sleeves), all other loose clothing or items removed.
  - Ability to select and don proper personal protective equipment
  - Ability to adjust machine guard as applicable
  - Ability to position themselves in such a manner to minimize risk to injury when operating the machine: For example, standing to the side when using a table saw,

not crossing hands over the point of operation when using a chop saw, ensuring that adjacent areas are clear of other individuals, etc.

- Each Student Machine Shop shall maintain records of student training.

The Student Machine Shop Professional Staff will make individual determinations as to the levels of autonomy a student may have when operating a machine so long as supervision complies with the minimum requirements of this policy.

### **Access Control:**

Each Student Machine Shop is required to develop a comprehensive access control plan to ensure that only authorized students can utilize the machinery following the supervision guidelines of this policy.

While it is recommended that shops with machinery with a rating of Hazard Category 3 or higher not operate after 11 pm or before 7 am, the actual hours of operation will be determined by the shop manager if the proper supervision for the equipment being used is available.

***In Student Machine Shops where Hazard Category 1 or Hazard Category 2 equipment can be used 24 hours per day 7 days per week, an automated method for disabling Hazard Category 3, Hazard Category 4 and Hazard Category 5 machines shall be installed and made functional.***

Each Student Machine Shop will develop a written access control policy and submit the shop-specific policy to the Working Group for review and approval.