GEORGIA INSTITUTE OF TECHNOLOGY

ENVIRONMENTAL HEALTH AND SAFETY

GENERAL SAFETY

MAKER SPACE AND STUDENT MACHINE SHOP SAFETY PROGRAM

This program was derived from Steven Sheffield, School of Mechanical Engineering and EHS (Environmental Health & Safety) General Safety Department.

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PURPOSE

The purpose of this document is to provide guidance to Maker Spaces and Student Machine Shops at Georgia Tech to ensure a safe and productive work environment.

SCOPE

These guidelines apply to all Georgia Tech students, staff, faculty, visitors, and occupants who actively work in maker spaces and student machine shops with machining tools and equipment. The maker space and student machine shop safety program has been designed to comply with Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.211-.219, Machinery and Machine Guarding.

This guideline applies to all who work with hands tools, fixed and non-fixed equipment, and/or machinery in a maker space or student machine shop. Typical student shops and/or maker spaces have two or more pieces of fixed machinery and at least one employee or student who uses or oversees the shop. Common maker space and student machine shop equipment include but are not limited to: drill press, lathe, band saw, table saw, mill, grinder, buffer, shear, metal punch, jointer, portable power tools, swing arm saw, radial arm saw, drum sanders, belt sanders, veneer cutters, splicers, welding, and more.

If the area is not considered a "student machine shop" or “maker space,” but a few pieces of machinery are present, they must still comply with the Maker Space and Student Machine Shop Safety Program. Exceptions may apply; contact EHS General Safety Office for guidance as some spaces will require an assessment for classification.

RESPONSIBILITIES

EHS General Safety is responsible for:

- Conducting safety inspections of all maker spaces and student machine shops
- Providing safety guidance and oversight for maker spaces and student machine shops
- Monitoring conformance with this program
- Providing technical support on all aspects of this program
- Ensure proper training is completed before in-house maintenance is completed
- Provide safety awareness training upon request
- Conducting program review semi-annually

Academic Units are responsible for:

- Appointing a Shop Supervisor for each student shop area under the department’s control
- Providing support as needed for the Supervisor to meet the requirements of these procedures
- Ensuring each Maker Space and Student machine shop occupant who works in and around Maker Space and Student machine shop areas receives appropriate training
- Ensuring that the Shop Supervisor, someone with equivalent training or student assistant is in the maker space and student machine shop area during operating hours

Shop Supervisor are responsible for:

- Creating Site-Specific Plan for maker space or student machine shop
- Providing documented shop specific and machine-specific training to all Authorized Users

- Assure proper documented training of people reporting to them and other "Authorized Persons" working in the Maker Space and Student machine shop and assure compliance with this program by all who fall under their responsibility
- Implementing the requirements of these procedures in the Maker Space and Student machine shop area
- Ensuring that the manufacturer's maintenance schedule for each piece of equipment is followed
- Must ensure that all Authorized Users of maker apace and student machine shop equipment have been instructed in safe operating procedures (i.e., hands-on training) and are aware of specific personal protective equipment requirements
- Ensuring that required safety features are installed and maintained for each piece of machinery
- Ensuring that related programs, such as but not limited Lockout/Tagout, PPE, and Hot Work are followed
- Must maintain appropriate documentation of training rosters and content
- Maintain copies of Authorization documents
- Maintain copies of procedures, guides, and other safe-work protocols
- Must conduct and maintain "Maker Space and Student machine shop Self-Inspections" for every Maker Space and Student machine shop
- Operator's Manuals for each piece of machinery shall be available. All machinery shall be used and maintained in accordance with manufacturer's recommendations
- Must ensure that all machinery is in safe and proper working order when in use
- Must conduct monthly shop inspections to identify and correct existing or potential hazards

The **Authorized User** of the maker space and student machine shop is responsible for:

- Completing and understanding machine-specific training prior to operating any machinery
- Conducting tasks in a safe manner, wearing appropriate personal protective equipment, and only using equipment after being formally trained
- Following standard operating procedures for the machinery and equipment including the proper use of safety features
- Complying with the site-specific plan of the space they are occupying
- Reporting injuries to the Shop Supervisor
- Dressing appropriately. The following should **not** be worn in the Maker Space and Student machine shop:
  - Jewelry
  - Loose clothing
  - Unsecured hair
  - Open-toed shoes
  - Long pants

  Consult with the respective Site-Specific plan for additional guidance.
- Wearing the appropriate Personal Protective Equipment
- Reporting problems with machines or equipment to the Shop Supervisor
- Report any emergency immediately to the Shop Supervisor and GTPD (Georgia Tech Police Department)

DEFINITIONS

Authorized User – a student/employee who has received specific machine tool and equipment training by the designated Shop Supervisor or other designated trainer; and is authorized to use the specific machining tools and equipment.

Guard – an enclosure designed to restrain pieces of abrasive wheels, wheel pulley assemblies, other moving parts or working stock, and to protect the user in the event of breakage or accidental contact with the moving part of a machine.

Hand Tool – an instrument used or worked by hand.

Lock-out/Tag-out – the placement of a lock/tag on an energy-isolating device in accordance with established procedures, ensuring that the energy-isolating device cannot be operated until removal of the lock/tag.

Maker Space– a communal public workshop in which users can work on small personal projects.

Shop Supervisor – an employee who oversees the maker space or student machine shop and develops and implements administrative controls to ensure the safety of those using the maker space and student machine shop.

Student machine shop- a workshop in which students use industrial machines to create. Exceptions may apply; contact EHS General Safety Office for guidance as some spaces will require an assessment for classification. The facility may contain at least one of the following pieces of equipment but not limited to: drill press, lathe, band saw, table saw, mill, grinder, buffer, shear, metal punch, jointer, portable power tools, swing arm saw, radial arm saw, planer, slitter, roll-form machine, cold header, multi-slide machines, drum sanders, belt sanders, veneer cutters, splicers, welding, and alligator shears.

GENERAL REQUIREMENTS TRAINING

Only authorized users as defined by this program are permitted to operate hand or machine tools.

Training of authorized users shall be performed by the designated Shop Supervisor, or another qualified person determined by the Shop Supervisor, who has thorough knowledge of how machining tools and equipment are operated, the safety hazards associated with those, and specific actions to take in case of an emergency.

Training records for authorized users must be maintained by each maker space and student machine shop. Records must include specific machining tools or other equipment the individual was trained on, date of training, GT ID number, and the signature of the trainee and trainer.

EHS also provides safety training and safety awareness training. The Georgia Tech EHS General Safety Unit can provide Maker Space and Student machine shop Safety Awareness Training in-person by request or online via Genius. Visit ehs.gatech.edu/training for a list of training.

ACCESS TO MAKER SPACE AND STUDENT MACHINE SHOPS

Access to maker spaces and student machine shops and facilities with machining tools shall be limited to persons who have received appropriate trained deemed by the Shop Supervisor of the space.
The "Authorization Form", listed in the *Appendices* can be used to document authorization to attest approval from the Shop Supervisor's that user possess the training and qualifications for safe work in the maker space or student machine shop.

Use of maker spaces, student machine shops and facilities with machining tools and equipment shall be limited to established hours of operation. Using these facilities beyond established hours shall be prohibited unless the Shop Supervisor approves the use in advance. Refer to maker space and machine shop respective Site-Specific plan for detailed information regard access.

INSPECTIONS

EHS General Safety Unit will conduct Maker Space and Student machine shop safety audit at least annually. Any unsafe conditions that are found will be noted in a Maker Space and Student machine shop inspection report sent to the Shop Supervisor.

Shop Supervisor or trained designee will conduct pre-semester and periodic Maker Space and Student machine shop safety inspections. These records must be documented and kept by the space.

Items/areas to be inspected in the maker space and student machine shops include but not limited to:

- Machine guarding
- Tools
- PPE
- Fire safety
- Electrical safety
- Fall protection
- Emergency eyewashes
- Emergency showers and
- Housekeeping

An inspection checklist has been developed and should be used when inspecting your shop. (*Reference: Appendices/ Maker Space and Student machine shop Self-Inspection Form*)

GENERAL MACHINERY AND EQUIPMENT HAZARDS

Maker Space/Student machine shop users must be provided protection from these hazards:

Point of Operation:
Refers to the area on a machine where work is actually performed upon the material being processed 1910.212(a)(3)(i). Some machinery such as guillotine cutters, shears, alligator shears, power presses, milling machines, power saws, jointers, portable power tools, forming rolls and calendars.

Nip or Pinch Point:
Refers to an area other than a point of operation where a belt contacts a pulley, or one or more rotating parts come together where it is possible for a part of the body to be nipped or pinched by the moving parts.

Power Transmission:
Refers to areas where power is transferred from one part to another such as a drive shaft, belt, or chain, belts pulleys, flywheels, rotating parts, etc. must be guarded to prevent entanglement and injury.

- The owner's or operator's manual for each machine must be in the Maker Space and Student machine shop area and available to all users of machinery.
- The area of operation must be free of obstructions. Space must be provided between each machine and other objects, including other machine operating areas to allow safe operation of the machine.
- Older Maker Space and Student machine shop equipment may not have appropriate guarding when compared to newer standards and design requirements. Check with the manufacturer to see if a retrofit kit is available. If a retrofit kit is unavailable, a guard must be purchased. The guard must sufficiently cover the hazard without creating an additional hazard. Contact EHS General Safety Office for assistance.
- Machinery that is no longer used by the department shall be removed from the Maker Space and Student machine shop/lab. Place a lock on the power source and a "Do Not Use/Out of Service" tag on the machine until it is removed to prevent someone from using the machine.

Machine Guarding Guidelines are listed below:

MACHINE GUARDING GUIDELINES

According to the Occupational Safety and Health Administration (OSHA): Moving machine parts have the potential to cause severe workplace injuries, such as crushed fingers or hands, amputations, burns, or blindness. Safeguards are essential for protecting workers from these preventable injuries. Any machine part, function, or process that may cause injury must be safeguarded. When the operation of a machine or accidental contact injure the operator or others in the vicinity, the hazards must be eliminated or controlled.

Types of Guarding:

One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are-barrier guards, two-hand tripping devices, electronic safety devices, etc. 1910.212(a)(1)

General requirements for machine guards:

Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself. 1910.212(a)(2)

Point of operation guarding:

Point of operation is the area on a machine where work is actually performed upon the material being processed.

The point of operation of machines whose operation exposes a user to injury shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle. 1910.212(a)(3)(ii)

Special hand tools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section but can only be used to supplement protection provided. 1910.212(a)(3)(iii)

Anchoring fixed machinery

Machines designed for a fixed location shall be securely anchored to prevent walking or moving. 1910.212(b)

PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

The selection of clothing and personal protective equipment for working in a maker space/ student machine shop is essential for your personal safety. Shop Supervisors must ensure the appropriate PPE is available in the maker space and student machine shop for all users. The following guidelines must be followed while working in a maker space and/or student machine shop:

- Neck ties, scarves, or hoods with strings must not be worn while operating a machine
- Remove jewlery (necklaces, bracelets, watches, rings, etc.) that could get caught in tool or machinery before working with tools or machinery
- No gloves during machinery use
- Closed toes shoes must be worn, no open toed shoes
- Long pants must be worn
- Long hair must be pulled back and secured/covered by a hair net or cap
- Medium to long beards must be covered to avoid getting caught in machine or tool
- Safety glasses must be worn at all times
- Other machine-specific clothing/equipment must be used when recommended by the manufacturer.

See Site-Specific plan of respective space for detailed guidance.

MAKER SPACE AND STUDENT MACHINE SHOP SAFE-WORK PRACTICES

EQUIPMENT OPERATION

The operation of all shop equipment requires prior training and approval by the Shop Supervisor. Only persons authorized by the Shop Supervisor and trained in the safe operation of the maker space and student machine shop equipment are permitted to work in a maker space and student machine shop and operate maker space and student machine shop equipment. The “Authorization Form” in *Appendices* can be used to certify this level of qualification. Documentation must be kept of authorization given of users.

COMPRESSED AIR
Compressed air or other gases in excess of 10 pounds per square inch are never used to blow dirt, chips or dust from clothing while it is being worn, or from any surface as part of routine maker space and student machine shop cleaning. Use suction devices or other cleaning methods instead.

DRAIN DISPOSAL
No carcinogenic, hazardous or biohazard waste is to be poured down the drain due to the campus' wastewater discharge permit limitations. A waste is considered hazardous if it is flammable, corrosive, reactive, toxic or contains heavy metals. All hazardous and chemical wastes must be disposed of by EHS Hazardous Material unit.

FORKLIFTS / AERIAL LIFTS
Only drivers / operators who have been trained and attended the "Forklift Safety Training" course offered through EHS General Safety; and who possess a current forklift operator's license issued by the EHS General Safety; and a valid driver's license, are permitted to operate forklifts.

HAND TOOLS
Only people authorized by the Shop Supervisor and trained in the safe use of hand tools are permitted to use this equipment. Defer to Site-Specific Plan of the respective space for procedure regarding their space tool access and usage. Use hand tools and devices only as they were designed/intended to be used.
(Reference: Tool Safety Procedures at https://www.ehs.gatech.edu/general/occupational-safety)

HYDRAULICS
Only persons authorized by the Shop Supervisor/Supervisor and trained in the safe operation and/or development of hydraulic systems are permitted to assemble, qualify, and operate hydraulic equipment connected to any maker space and student machine shop hydraulic system.

OVERHEAD CRANES / HOISTS
Only persons authorized by the Shop Supervisor/Supervisor and trained in crane safety according to the requirements of the program are permitted to operate such equipment.

SCRAP METAL RECYCLING
Contact the Office of Solid Waste Management and Recycling for assistance with scrap metal recycling.

HOUSEKEEPING AND MATERIAL STORAGE
The work and surrounding area in which you are working must be kept neat, clean, and safe at all times.

Floors, machines, and other surfaces must be kept free of dirt and debris. If floor surfaces are wet or slippery or become wet during operations, they should be protected with a non-slip coating or covering.

Wood and metal chips, sawdust, and other debris must be routinely cleaned if collection systems are not in place.

Dispose flammable oily or solvent soaked rags in an empty approved metal container with a tight metal lid.

Storage areas must be free of accumulation of materials that constitute a hazard from fire, explosion, etc. An unobstructed, three-foot aisle must be maintained between machines.

Stock materials must be stored in such a manner as to prevent falling, slipping, or rolling.

Mezzanines used to store materials shall be load rated and clearly marked. Do not overload mezzanines.

Shelving and storage rack systems shall be labelled with their corresponding weight capacity.

ELECTRICAL

Work on electrical equipment must be performed by a qualified person in accordance to OSHA standard 1910.399.

Proper lockout/tagout procedures shall be followed for all servicing and maintenance of machinery and equipment. *(Reference: Georgia Tech Lockout/Tagout Procedure* https://www.ehs.gatech.edu/general/occupational-safety/loto)

Where machinery is hard-wired into the electrical system, an accessible and labelled disconnect shall be provided.

All electrical panels and electrical disconnects shall have at least three feet of clearance space in front of them.

Where machinery is cord-and-plug connected to the power supply, proper grounding shall be maintained.

All electrical cords shall be maintained in good condition.

Extension cords shall be used only on a temporary basis, not as a permanent source of electricity. They shall also be the correct gauge for the application. Exposed energized electrical hazards, such as missing knockouts, covers, damaged cords, etc. shall be corrected immediately.

Reference: Georgia Tech Electrical Safety Guidelines https://www.ehs.gatech.edu/general/occupational-safety/electrical

FIRE SAFETY

FIRE SPRINKLERS

Automatic fire sprinklers must remain clear and unblocked to function properly. Do not store materials within 18” of the sprinkler head or 19" of the ceiling to allow for proper sprinkler function

FIRE EXTINGUISHERS

Be aware of the condition of fire extinguishers. Fire extinguishers should be inspected monthly, and inspection recorded on the back of the tag. The inspection consists of making sure nothing is blocking the fire extinguisher and that the gauge on the extinguisher is in the green.
Report any broken seals, damage, low gauge pressure or improper mounting to the GT Fire Marshal (404-894-2990). If the seal has been broken, assume that the fire extinguisher has been used and must be recharged. (Note: Do not use fire extinguishers unless you are trained and feel confident to do so. Contact EHS Fire Safety department to schedule training: https://ehs.gatech.edu/contact/fire) Report ALL fires by phoning 911.

CHEMICAL SAFETY

CHEMICALS AND GASES

The Environmental Health and Safety Lab and Chemical Safety Manual must be followed regarding Chemicals and gases. Visit https://www.ehs.gatech.edu/chemical/lsm and Dangerous Gases | Environmental Health & Safety (gatech.edu) for more detailed information.

Chemicals must be stored in approved cabinets, as appropriate.

Do not store incompatible chemicals together. Please visit: Segregation and Storage of Chemicals According to Hazard Class | Environmental Health & Safety (gatech.edu) to view the "Chemical Incompatibility Matrix."

Safety Data Sheets (SDS) for all chemicals used must be maintained in the maker spaces and student machine shops and managed through EHSA. For EHSA support, contact EHS Lab and Chemical Safety unit.

Compressed gas cylinders must be stored upright and capped. They must be secured properly meaning, with chain or strap between the "waist" and "shoulder of the cylinder at all times, as to prevent tipping. Cylinders "in use" are cylinders which have a regulator attached and are connected to a gas delivery system such as to deliver gas to an instrument which is used no less than monthly. This includes empty cylinders. Cylinders not currently in use must be capped. ("in use" includes cylinders connected to equipment or processes used at least 3 times per week). Empty cylinders must be capped.

Contact the EHS Lab and Chemical Safety department at lab-chemsafety@gatech.edu for guidance.

FLAMMABLE AND COMBUSTIBLE LIQUIDS

The Environmental Health and Safety Lab and Chemical Safety Manual must be followed regarding flammable and combustible liquids. To determine if a material or product is flammable or combustible, read the manufacturers label on the product or review the SDS.

Flammable and combustible materials must be stored in an approved Flammables Storage Cabinet.

Store any cloth rags, paper rags, or material that has been saturated with flammable or combustible liquids, in an approved metal can with a tight-fitting metal lid. These materials should be removed on a daily basis and placed into a 55-gallon metal drum with tight fitting metal lid located in an approved storage location. Contact Georgia Tech EHS Hazardous Materials Unit for disposal of the drum when full.

Contact the Lab and Chemical Safety department at lab-chemsafety@gatech.edu for guidance.

EHSA CHEMICAL INVENTORY

If chemicals are present, stored, and/or used anywhere in the maker space and/or student machine shop, most or all of them should be entered into the Georgia Tech EHS chemical inventory system, EHSA. Georgia Tech adopted EHS Assistant (EHSA by OnSite Systems) as the official GT Chemical Inventory System in July 2017. All shops are required to enter and track their chemical inventories in EHSA.

Georgia Tech's Chemical Inventory System (EHSA) provides mechanisms for:

- Identifying and bar-coding containers of chemicals to include items generated in the workplace.
- Creating labels (called "waste cards") to include bar codes for waste containers.
- Requesting pick-up of waste via the internet.
- Automatic updating of inventories when the material is removed by Hazardous Material personnel.

The Shop Supervisor responsible for the space should have access to EHSA. If the Shop Supervisor does not, email ehsa@gatech.edu for access. The email address may also be used for any questions relating to general chemical usage, storage, disposal, or inventory in the makerspace.
A chemical inventory reconciliation report for all spaces on campus is required to be submitted semi-annually (by January 1st and July 1st) by the University System of Georgia (USG) Board of Regents (BOR).

Items required to be in EHSA are:

- Gas Cylinders
- Solvents
- Chemical samples
- Stock bottles of chemicals
- Chemicals
- Cleaning supplies such as Bleach, Pine-sol, Windex, etc.
- Chemicals in maintenance shops

To assist in using the features of EHSA, the Environmental Health and Safety Lab and Chemical Safety department has developed an EHSA User Handbook. This Handbook provides step-by-step instructions on how to complete several tasks as a PI/Shop Supervisor and additional items that a Chair/Director can access. Visit https://www.ehs.gatech.edu/ehsa-handbook to access the EHSA Handbook and https://www.ehs.gatech.edu/ehsa for more information including training on EHSA. For questions or issues regarding EHSA email ehsa@gatech.edu

Contact the Lab and Chemical Safety department at lab-chemsafety@gatech.edu for guidance.

EMERGENCY SHOWERS

Emergency showers shall be located within a 10 second fast walk of any location where wet bench work is performed.

Access to emergency showers shall be immediate: shower access is not to be blocked by garbage cans, furniture, boxes, etc.
Emergency Showers shall have a 30-inch diameter clear space under the shower head and have a pull chain or lever no more than 42” from the floor

Emergency showers shall not be located near electrical equipment (s/a refrigerators), or within 6 feet of electrical outlets.

Emergency showers shall be checked no less than once per year by Georgia Tech Facilities and shall have a tag on which indicates the date of the last test.

Maker spaces and student machine shops are encouraged to check their showers more frequently, (once per month is recommended) and record the test on the shower tag.

Contact your Building Manager if the safety shower in your maker space and/or student machine shop has not been inspected by Facilities so that your shop can be added to the Facilities Area Maintenance Team Preventative Maintenance Program for safety shower inspections.

EMERGENCY EYEWASH

Access to emergency eyewashes shall be immediate: eyewash access is not to be blocked by glassware, equipment, carboys, etc.

Eyewashes that are located on/near sinks and which drain into the sink, or eyewashes that are independent of sinks but that are plumbed with a drain or are adjacent to a floor drain shall be tested/flushed for no less than one minute every week by the shop staff. This test is to be recorded on a tag on the eyewash or on a record sheet posted prominently nearby.

Eyewashes that are independent of sinks and have no immediate access to drains shall be tested/flushed once per year by Georgia Tech Facilities and the test recorded on the eyewash tag. Maker spaces and student machine shops are encouraged to flush these eyewashes more often and record the test on the tag or on a record sheet posted prominently nearby.

HAZARDOUS WASTE

Federal, state, and local governments impose strict regulations concerning the management, storage, and disposal of hazardous materials. Compliance with these laws, good safety practices, and the necessity to avoid future liabilities dictate that the Institute take a conservative approach in handling this material.

The term “hazardous waste” as used in this program means any substance no longer of use to the possessor whose chemical or biological properties have the potential to endanger personnel, material, or the environment if handled improperly. Hazardous waste includes, but is not limited to, items specifically identified as “hazardous waste” under federal and state statutes.

Organizations shall not arrange for off- or on-site disposal of hazardous material or use the Institute’s EPA ID number without prior coordination with GT EHS. This does not preclude the routine transfer of chemicals between GT maker spaces/student machine shops or the use of the GT EPA ID number on research proposals.

Georgia Tech EHS is charged with ensuring that all hazardous waste generated at Georgia Tech is handled properly. Within specific activities, EHS will provide advice and technical assistance. However, it is the responsibility of each individual to know the possible dangers associated with any material being used or generated and know how the material should be handled and disposed of before the project begins.

Contact the GT EHS HazMat team at hazmat@gatech.edu for assistance and guidance.

ENVIRONMENTAL SAFETY

WASTE MANAGEMENT- DRAIN AND TRASH DISPOSAL OF MATERIALS

The wastewater from shop sinks, floor drains, and other areas within Georgia Tech buildings enters the public sewer system, where it flows to a publicly owned treatment works (POTW) operated by the Atlanta Watershed Authority. There the wastewater receives chemical and biological treatment before being discharged.

To protect water quality and the biological treatment processes, the Atlanta Watershed Authority enforces strict limits on contaminants and pollutants in the water discharged to sewers. Exceeding the stipulated discharge limits could subject Georgia Tech to administrative, or even criminal, penalties. Plumbing systems, even if "chemically resistant," or equipped with "dilution tanks," are capable of handling only incidental quantities of waste; they are NOT designed for use as a primary disposal method.

All members of the Georgia Tech community are responsible for maintaining acceptable quality in our wastewater discharges. Shop personnel must make special efforts to keep certain items out of the sinks and floor drains. Questions about these policies should be directed to EHS. Described below are the substances that may be disposed of through drains.

For shops, studios, kitchens, janitorial areas, ground, athletic operations, maintenance operations, and construction sites, chemicals, and wastewater of little or no hazard in dilute solutions are suitable for disposal down the drain in quantities that would be expected in normal operations (for example, latex paint brush wash-water or a bucket of mop water). Large quantity wastewater discharges from physical plant equipment can be drain disposed if approved by the City of Atlanta (for example, cooling tower discharges and boiler blow-down). The following are examples of drain disposable chemicals and process wastewater for shops, physical plant operations, kitchens, janitorial, grounds, and athletic operations.

- Commercially available custodial and cleaning products such as soaps and detergents if they are used in accordance with the manufacturer instructions.
- Standard Shop articles (e.g., gloves, pads, wipes, rags) contaminated with non-hazardous chemicals may be disposed via the trash. In order to dispose of contaminated Shop debris via the trash, it must:
    1. Meet the following characteristics
        - contain no radioactive materials. Contact the Radiological Safety Office at (404) 894-3605 for the disposal of radioactive materials
        - contain no biological hazards
        - be free of excess or free-flowing powders (see below).
        - refer to Section 4 of these procedures for guidance regarding solvent laden wipe and rags
    2. If possible, be consolidated in a bag or other container to minimize potential releases, and
    3. Be placed in a normal trash receptacle.

WASTE MANAGEMENT- USED OIL, OIL FILTERS, and OIL AND SOLVENT LADEN RAGS

The following procedures have been developed for the management and disposal of used oil, oil filters, and oil and solvent laden rags generated at Georgia Tech.

Used oil means any oil that has been refined from crude oil, or any synthetic oil, that has been used, and as a result of such use is contaminated by physical or chemical impurities. Examples of used oil include motor oil, hydraulic fluid, lubricants, and oil coolants.

Generators of used oil must store used oil in containers that are in good condition (no severe rusting, apparent structural defects or deterioration) and not leaking (no visible leaks). Remove damaged containers from use or repair immediately. Keep containers (including funnels) closed except when adding or removing used oil. Use secondary containment structures or other spill management practices to prevent oil from reaching the environment in the event of a leak or a spill. Used oil containers are potentially subject to the Spill Prevention, Control and Countermeasures rule (40 CFR Part 112). When a container of used oil with a capacity of at least 55 gallons is placed in service, notify EHS so that it can incorporate the container into Georgia Tech's SPCC Plan.

Containers and aboveground tanks used to store used oil must be labeled or marked clearly with the words "Used Oil," and NOT "Waste Oil." Used oil should not be mixed with solvents or other waste. Silicon oil should not be consolidated with other oils. Used oil filters should be placed in a leak proof container for collection by EHS. Generate a waste label and request a pick-up via EHSA (ehsa.gatech.edu). Contact EHS for help in using the EHSA waste module at ehsa@gatech.edu.

Oil and solvent laden rags are potentially subject to hazardous waste regulation, meaning that they need to be collected in a proper container that is kept closed and labeled, and managed under accumulation requirements and sent to a proper disposal facility. Free liquids must be managed accordingly, including in accordance with hazardous waste regulations if applicable. As such, Georgia Tech personnel generating oil and solvent laden rags should implement the following practices:

- Rags intended for disposal must be managed as chemical waste as described in Section 1 since the rags could be a hazardous waste.
- Maintain rags in a closed, labeled container as described in Section 1.
- Use wringing or other type of extraction process to recover excess solvent and achieve "no free liquids" state. Reuse the liquid where possible. Allowing oil or solvents to evaporate to achieve a "no free liquids" state is not permitted.
- Spray a minimum amount of solvent onto rags instead of soaking rags.
- Store rags in a closed, labeled container ("used shop rags" or similar).
- Contaminated rags or commercial wipes regulated as hazardous waste may not be burned.
- Absorbents used to clean up oil spills should be managed as chemical waste. Upon collection, generate a waste label and request a pick-up via EHSA (ehsa.gatech.edu). Contact EHS for help in using the EHSA waste module at ehsa@gatech.edu.

All individuals whose duties include the identification, handling, and management of used oil shall participate in an awareness training program prior to their initial involvement of such activities and annually thereafter. The training program will include topics such as:

- Identification of used oil
- Proper used oil container management
- Used oil pick-up and disposal procedures
- Used oil waste reduction.

Contact the Hazardous Materials department at hazmat@gatech.edu or the Environmental Programs department at environmentalprograms@gatech.edu for guidance.

LASER SAFETY

Maker spaces and student machine shops at Georgia Tech often include laser cutters/engravers and 3D printers, along with other laser-based devices. These devices have high power lasers embedded in them that can easily cause damage to the eyes and skin. That said, these devices are typically designed by the manufacturer to be free of laser hazards during normal operation due to the device enclosures, warning labels, safety interlocks, and proper exhaust ventilation. Because of this, the Georgia Tech Laser Safety Program does not require users of these normally operating systems to complete a specific laser safety training. It is required, however, for operators to be given hands-on training so that they are familiar with proper normal operation, the safety features in place on the devices, and to not use the device if any of the safety features seem to be malfunctioning. Below is an excerpt from the Georgia Tech Laser Safety Policy Manual regarding these embedded laser systems for guidance *(full policy located at: https://ehs.gatech.edu/sites/default/files/gt_laser_safety_policy_4.pdf)*

An embedded laser is a laser designated Class 1, 2, or 3a (3R) for normal operation, but contains a Class 3B or Class 4 laser embedded in the system. Georgia Tech has many of these lasers, which include, but are not limited to, laser engravers, cutters, stereo lithography systems, and 3D printers actually contain an embedded Class 3B or 4 lasers.

These embedded systems must have a designated Laser Supervisor (LS). The LS must have completed the Georgia Tech laser safety training, registered via Form LS-1, and registered the laser with the LSO via Form LR-1. Aside from the LS, individuals that operate the embedded systems under normal operating conditions are not required to complete laser safety training or register as Laser Users.

On-the-job training (OJT) shall be provided to all individuals engaging in normal operation of embedded lasers. This training should be documented by the Laser Supervisor.

During activities outside of normal operation, such as maintenance, repair, or other servicing, exposure to laser radiation above the Maximum Permissible Exposure (MPE) is possible. As such, laser hazard control measures that are not required for normal operation will be required during these activities. Any individual conducting activities outside of normal operation must complete the Georgia Tech laser safety training and register as a Laser User.

Other control measures may include, but are not necessarily limited to:

- Written Laser Standard Operating Procedure (SOP)
- Entryway warning signs
- Temporary use of laser barriers
- Use of laser protective eyewear

Contact the LSO at laser@ehs.gatech.edu for guidance prior to maintenance, repair, or other servicing activities.

SITE-SPECIFIC PLAN

In addition to the Maker Space and Student Machine Shop Safety Program the maker spaces and student machine shop's Supervisor must have a Site-Specific Plan for their space. The Site-Specific Plan is a document that will detail information on how the space will operate using the Maker Space and Student Machine Shop Program as guidance. The Site-Specific Plan must detail but not limited to: access to the space, specific training requirements before access to tools and machinery in the space, safeguards for tools and machinery used at that specific site, the space's hours of operation, the respective guidelines and safe work practices that must be followed while operating in the space etc.

The site-specific plan must be reviewed and approved by EHS. An audit of the plan will be conducted when changes are made.

If assistance is needed, please contact the EHS General Safety Office.

RECORD KEEPING

- Copies of any training roster, training content and any signed documents, must be maintained and kept by the maker space and/or student machine shop.

REFERENCES

- Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.211-.219, Machinery and Machine Guarding
- Georgia Tech Lockout/Tagout Procedure
  http://ehs.gatech.edu/general/Lock%20out%20Tag%20out%20Procedure.pdf
- Georgia Tech Electrical Safety Guidelines
  http://ehs.gatech.edu/general/Electrical%20Safety%20Guidelines.pdf
- Hot Work Permit / Program
  http://www.ehs.gatech.edu/fire/hot_work.php
- Georgia Tech Ladder Safety Procedure
  http://www.ehs.gatech.edu/general/Ladder%20Safety%20Procedure.pdf
- Georgia Tech Hand Tool and Power Tools Guidelines
  http://www.ehs.gatech.edu/general/Hand%20Tools%20and%20Power%20Tools.pdf
- Georgia Tech Ergonomic Guidelines
  http://www.ehs.gatech.edu/general/ERGONOMIC%20GUIDE.pdf
- Georgia Tech Machine Guarding
  http://www.ehs.gatech.edu/general/machine_guarding_guidelines.pdf
- Georgia Tech Personal Protective Equipment Guidelines
  http://www.ehs.gatech.edu/general/Personal%20Protective%20Equipment%20Procedure.pdf
- Georgia Tech Fire Watch Procedure
  http://www.ehs.gatech.edu/fire/fire_watch_procedures.pdf

APPENDICES

EMERGENCY INFORMATION

Emergency Numbers

The following list contains important emergency telephone numbers and related information.

Type of Emergency:	Who to Call:	Phone Number and/or website:
General (Includes fire, police, emergency medical treatment, and off hour chemical spills)	**GTPD and EHS Emergency Phone**	**GTPD: 911** from an on-campus phone Or **404-894-1491** from a cell phone **EHS Emergency Phone**: **404-216-5237**
Emergency Repairs and Maintenance	**Facilities Management** **24- hour Trouble Call**	Area 1: **404-385-1000** Area 2: **404-385-2000** Area 3: **404-385-3000** Area 4: **404-385-4000** Area 5: **404-385-5000**
GA Tech Pest Control	**Facilities-Utilities & Energy**	http://facilities.gatech.edu/pest-or-animal-control
Other Numbers		
Insurance and Risk Management		**404-894-3483**

In case of an emergency, call the Call the Georgia Tech Police Department at 404-894-2500 immediately if you are experiencing a life-threatening emergency or need a fire truck or ambulance.

For links to information about a campus-wide emergency, or to sign up for emergency alerts, go to Georgia Tech's main emergency page.

For emergency response for common incidents, visit https://www.ehs.gatech.edu/emergency

POST INJURY/ILLNESS INSTRUCTIONS

Faculty, Staff, & Employed Students:
Injuries must be reported to the Shop Supervisor.

- If no medical attention is required, do not call DOAS 24-hour injury report line.
- If medical attention is required, the Supervisor must call DOAS 24-hour injury report line at (877) 656-7475.

Please Note:
- Agency Unit Location # - Georgia Tech: #7202
- You **may** have to provide the injured employee Social Security Number (SSN)

Georgia Tech Students that are not employed:
The injury must be reported to the Shop Supervisor. In case of an injury, non-employed GA Tech students should visit Stamps Health Services.

Students requiring assistance after attention is sought for the injury/illness may contact the Georgia Tech student Affairs Office/Dean of Students:
- During regular work hours call: 404-894-6367 (choose Option 9)
- After Hours/Weekends call GT Police: 404-894-2500 and ask them to page the Dean on Duty

Supervisor must report injury to EHS:
After the injury is reported to DOAS (if applicable) and/or Student Affairs (if applicable), the supervisor must report the injury to EHS.
- The supervisor must investigate the injury.
- The supervisor must fill out the "Supervisor Accident Investigation" Webform on the EHS website.
- Link to the Webform: https://ehs.gatech.edu/content/supervisors-accident-investigation

For assistance contact: generalsafety@ehs.gatech.edu

AUTHORIZATION FORM

Student Name/GT ID#: _____ Date: _____
(Print)

Shop Supervisor _____ Date: _____

TO BE COMPLETED BY THE SHOP SUPERVISOR OF THE "AUTHORIZED USER":
Re: This document confirms the required qualification of the above-named user to perform:
(Check all that apply)

□ **Operations and work in the following Shops:**

_____
_____

□ **Operate and work with the shop equipment listed:**

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

□ **Other Processes (describe):**

_____
_____

The qualification to work in the Maker Space and Student machine shop will be revoked if the user is not performing safely as trained. Below are signature(s) of responsible person(s) verifying training, experience and/or providing instruction.

TO BE COMPLETED BY THE SHOP SUPERVISOR / SUPERVISOR:
This designation of "Authorized User Form" is based on evidence of safe performance of all duties related to Maker Space and Student machine shop Safety and verification by the "Shop Supervisor / Supervisor" through:
(Check all that apply)

□ **Training:** Training received.
□ **Experience:** Demonstrated skill in safe operation of Shop equipment.
□ **Instruction** This person has received instruction from me or another Maker Space and Student machine shop employee who is qualified/authorized and has observed this person's work while performing Maker Space and Student machine shop operations and confirms that the person has the knowledge to perform Maker Space and Student machine shop work safely.

The authorized user agrees and understands that they are authorized to use only the equipment trained on that is noted above.

Shop Supervisor/Supervisor: _____ Date: _____

Authorized Person's Signature: _____Date: _____

MAKER SPACE/ STUDENT MACHINE SHOP USER'S AGREEMENT

Professional Conduct is required

- Training is required to use equipment in the maker space/student machine shop.
- Respect for others and school resources are required at all times.
- Horseplay is never appropriate in the maker space/student machine shop spaces.
- Be aware of others around your work, and the work being performed around you, at all times.
- Use the correct tool for the job and never abuse the tool. Use the training you have received.
- Avoid holding your work pieces with your hands when using cutting tools. Clamp your work piece in a vise and use two hands to hold the tool whenever possible. Refer to respective space training.
- Know your physical limits. Do not operate power tools when you are too tired to be alert.
- Always report any injury, broken tool, housekeeping issue, or potential hazard.

Dress for the work being performed

- Personal protection equipment (safety glasses, ear plugs, breathing masks, etc.) are to be worn anywhere signs are posted in the workspace, or whenever appropriate based on good training for that tool. For example, safety glasses are to be worn anytime powered, sharp, or impact tools are being used in your vicinity.
- Never approach rotating or any large power tools with loose clothing, long untied hair, lanyards, headphone cords around your neck, or large jewelry that could pull you toward the machine.
- Shoes worn in the fabrication spaces must cover the tops of your feet.

Never Work Alone with Powered Tools (EHS Recommended)

- You must have at least one work partner within at least voice distance of you whenever powered cutting tools are in operation. Visual distance is required for certain equipment as posted.
- You must not be separated by a closed door from this partner. Most certainly not a locked door.
- Your work partner must be trained (and able) to turn off the tool in the event of an emergency.
- Partner must be able to call the campus police (404) 894-2500 in any emergency.
- It is the user's responsibility to confirm the above any time powered tools are in operation.

You Must Help Keep the maker space/student machine shops Safe as You Use Them

- You must clean your work area of any debris that you have created, or others have created before you. The next person using the space must find it to be clean, organized, and safe.
- You must help keep the floor space in the maker space/student machine shops dry and free of tripping or slipping hazards such as saw dust, oil, electrical cords, or raw materials.
- Whenever you use a tool, you are responsible for returning it to its proper storage location, regardless of where you found it. If you are unsure, please ask the lab personnel.
- Exits, corridors, and passageways must be kept clear of furniture or project prototypes for safe passage during an emergency.
- Never modify any tool, and especially, never remove safety devices from tools.
- If you see someone working in an unsafe manner, you must gently correct them as a colleague.
- Have Fun, keep learning, and teach others what you have learned!

The student agrees to the user's agreement and also understands that they are authorized to use only the equipment in which they have received training on.

Sign and date: _____

MAKER SPACE AND STUDENT MACHINE SHOP SELF-INSPECTION FORM

Shop Name:		**Dept. Head:**
Building Name:		**Supervisor:**
Department:		**RTK Coord:**
Room No:		**Laser Supervisor:**
Building Manger:	**Inspection Date:**	**Inspector:**

Power Platforms, Manlifts, Vehicle-Mounted Platforms	**Yes**	**No**	**N/A**
1. Employees standing on floor of the basket, not on any other devices for work position.	☐	☐	☐
2. Building anchors visible, stabilizer tie at platform suspension ropes at each vertical interval.	☐	☐	☐
3. Man lift and driving mechanisms protected from weather at all times.	☐	☐	☐

Fall Protection	**Yes**	**No**	**N/A**
1. Locking type with a self-closing, self-locking keeper remains closed.	☐	☐	☐
2. Personal fall arrest system used by workers on surfaces more than 4 feet.	☐	☐	☐
3. Body harnesses inspected before use each day.	☐	☐	☐
4. Rails used with at least 42” high mid-rails and toe boards.	☐	☐	☐
5. Portable ladders in good condition. Ladder rungs and steps uniformly spaced.	☐	☐	☐
6. Extension ladders have stabilizers and leg levelers.	☐	☐	☐

Lockout/Tagout	**Yes**	**No**	**N/A**
1. Employees following procedures of a written lockout/tagout plan.	☐	☐	☐

Machine Guarding	**Yes**	**No**	**N/A**
1. The point of operation of machinery that may cause injury is guarded.	☐	☐	☐
2. Each machine free from sensible vibration when idled at full speed.	☐	☐	☐
3. All trip and emergency switches require manual setting.	☐	☐	☐
4. Grinder wheel in good condition.	☐	☐	☐
5. Work rests adjusted closely to the wheel with a maximum opening of 1/8 inch.	☐	☐	☐
6. Machine components covered to reduce release of mechanical energy.	☐	☐	☐
7. Expanded metal, sheet, or wire mesh securely fastened to frame.	☐	☐	☐

Electrical Safety	**Yes**	**No**	**N/A**
1. Are there > 3 ft. of working space in front of switchboards or motor control center’s?	☐	☐	☐
2. Electrode and circuit conductors attached to grounding electrode.	☐	☐	☐
3. Branch circuits originate in a power outlet or panel board.	☐	☐	☐
4. Single mean to disconnect ungrounded main power supply conductors.	☐	☐	☐
5. Equipment provided protection from combustible and flammable hazards.	☐	☐	☐
6. Conductors emerging from the ground in enclosed raceways.	☐	☐	☐
7. GFCIs used on electrical equipment where there is moisture or wetness.	☐	☐	☐
8. Extension cords are used for temporary work only.	☐	☐	☐

9. All junction boxes are covered (no exposed wiring).	☐	☐	☐
10. All wall outlets are covered.	☐	☐	☐
11. All light switches are covered.	☐	☐	☐
12. Any light that is at risk of being struck is properly covered.	☐	☐	☐
13. Power strips are not overloaded.	☐	☐	☐

Fire	**Yes**	**No**	**N/A**
1. Fire extinguishers are accessible with less than 75 feet of travel to any extinguisher.	☐	☐	☐
2. Fire extinguishers are inspected annually and tagged (current inspection).	☐	☐	☐
3. Flammable aerosols and liquids are stored properly (flammables cabinet).	☐	☐	☐
4. There is sufficient clearance (18") between the top of storage and sprinkler heads For ESFR heads, clearance is 36".	☐	☐	☐

Tool Safety	**Yes**	**No**	**N/A**
1. All hand and power tools equipped with guards where applicable.	☐	☐	☐
2. Tools free from structural defects and in good condition.	☐	☐	☐
3. Safety clips attached to prevent attachments from being expelled.	☐	☐	☐
4. When pressure released, pressure switch or control shuts off power.	☐	☐	☐

Compressed Gas Cylinders	**Yes**	**No**	**N/A**
1. Portable tanks and cargo tanks have pressure relief devices.	☐	☐	☐
2. Legibly marked with the name of the gas.	☐	☐	☐
3. Secured individually in upright position.	☐	☐	☐

Personal Protective Equipment (PPE)	**Yes**	**No**	**N/A**
1. PPE appropriate for hazards. Employees are certified on proper use, care, and storage of PPE.	☐	☐	☐
2. Eye and face protection available.	☐	☐	☐
3. Provide adequate protection against hazards for which they are designed.	☐	☐	☐
4. Protective helmet when working in areas where there is potential for falling objects.	☐	☐	☐
5. Protective footwear when working in areas where there is danger of foot injuries.	☐	☐	☐
6. Hand protection against skin abrasions, punctures, chemical burns, and temperature extremes.	☐	☐	☐

Hazardous Materials	**Yes**	**No**	**N/A**
1. All containers properly labelled.	☐	☐	☐
2. Safety Data Sheets (SDS) kept up to date and available to employees.	☐	☐	☐
3. Hazardous materials are stored properly.	☐	☐	☐
4. Are chemicals added to EHSA (campus inventory database)?	☐	☐	☐

Walking/Working Surfaces	**Yes**	**No**	**N/A**
1. Areas clean and orderly. Aisles and passageways clear and in good repair.	☐	☐	☐
2. Barriers around opening – drop of 4'. Rail, toe board around exposed side of opening.	☐	☐	☐

3. Clearance between machines – movement of one operator does not interfere with others.	☐	☐	☐
4. Working spaces, walkways, and similar locations clear of cords.	☐	☐	☐

General Safety and Health Provisions	**Yes**	**No**	**N/A**
1. Employees aware of procedures for reporting injuries.	☐	☐	☐
2. Suitable facility for washing, flushing eyes, or body shower.	☐	☐	☐

Additional Items: