

SUBJECT AREA CONTENT

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Management System: Worker Safety and Health			
Subject Area: Machine Shop Safety			
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Effective Date: Feb 4, 2016 (Rev 2.0) Periodic Review Due: Feb 4, 2019	Subject Matter Expert: Mario Cubillo	Management System Executive: Ed Nowak	Management System Steward: Gail Mattson

Introduction

Machine tools pose multiple hazards. Federal regulations require that machine tools be provided and maintained in a safe condition and operated safely. Employee exposure to inadequately guarded machines is prevalent in many workplaces. Consequently, workers who operate and maintain machinery suffer amputations, lacerations, crushing injuries, abrasions, and hundreds of deaths per year.

This subject area describes the requirements and procedures for ensuring that all [machine tools](#) comply with all applicable safety regulations and are ready for operation. Only qualified and authorized operators may use machines and the use of those machines must be in conformance with this subject area.

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Section

Overview of Content (see section for full process)

[1. General Requirements for Machine Shop Safety](#)

- 1.1 General Requirements
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- 1.3 Operator Requirements
- 1.4 Equipment Requirements
- 1.5 Procurement, Inspection, and Service Requirements

2. Inspections

- 2.1 Pre-use Inspections.
- 2.2 Monthly Machine Shop Inspections.

3. Satellite Machine Shop Operation

- Maintain a qualified list of users.
- Monitor and document equipment use for safe work practices.
- Ensure contractual documents for Temporary Employees and Leased Workers (job shoppers) include appropriate risk transfer language.
- Ensure that agreements for Guests and Users include appropriate risk transfer language.

Definitions

Exhibits

Machine Shop Rules

Forms

[Machine Risk Assessment \(MRA\) Form](#)

[Machine Shop Safe Work Practices Evaluation Forms](#)

[Monthly Machine Shop Inspection Checklist](#)

Training Requirements and Reporting Obligations

This subject area contains training requirements (see the [BNL Training and Qualifications](#) website):

- Machine Shop Supervisor Training (TQ-MACHINESHOPSUPER).

This subject area does not contain reporting obligations.

External/Internal Requirements

Requirement Number	Requirement Title
<u>29 CFR 1910</u>	Labor/Occupational Safety and Health Standards
<u>ANSI Z 87.1; ANSI/ISEA Z 87.1</u>	Occupational and Educational Personal Eye and Face Protection Devices [1968:IBR 29 CFR 1926.102; 1968, 1989 & 2003: IBR 1910.113, 133, 252]
<u>BSA Contract No. DE-SC0012704 - Clause C.4</u>	Statement Of Work
<u>BSA Contract No. DE-SC0012704 - Clause H.27 (ACT)</u>	Non-Federal Agreements for Commercializing Technology (Pilot) (ACT)

BSA Contract No. DE-SC0012704 - Clause I.131 (DEAR 970.5223-1)	INTEGRATION OF ENVIRONMENT, SAFETY, AND HEALTH INTO WORK PLANNING AND EXECUTION (DEC 2000)
NFPA 79	Electrical Standard for Industrial Machinery

References

[BNL Training and Qualifications](#) website

DOE Order 470, Worker Protection

[ESH Guide: Machine Shop Safety, Safety and Health Services](#) website

[Guests and Visitors](#) Subject Area

[Lockout/Tagout \(LOTO\) for Installation, Demolition, or Service and Maintenance](#) Subject Area

NFPA 79-2012, Electrical Standard for Industrial Machinery

[OSHA Machine Guarding eTool](#) website

[Personal Protective Equipment and Respirators](#) Subject Area

[Requirements Management](#) Subject Area

Standards of Performance

Managers, Supervisors and Hosts shall analyze work for hazards, authorize work to proceed, and ensure that work is performed within established controls.

Managers, Supervisors and Hosts shall ensure that the scope of work properly considers all elements of the Laboratory's operational priorities.

All authorized machine shop users shall identify, evaluate, and control hazards in order to ensure that work is conducted safely and in a manner that is compliant, and protects the environment and the public.

All authorized machine shop users shall promptly report accidents, injuries, ES&H deficiencies, emergencies, and off-normal events in accordance with procedures.

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PROCEDURE: GENERAL REQUIREMENTS FOR MACHINE SHOP SAFETY

Management System: Worker Safety and Health		
Subject Area: Machine Shop Safety		
1. General Requirements for Machine Shop Safety		
Effective Date: Feb 4, 2016	Subject Matter Expert: Mario Cubillo	Management System Executive: Ed Nowak

Applicability

This procedure applies to all BNL and non-BNL staff who use [machine tools](#) in a [machine shop](#).

Machine and Machine Shop Accessibility:

Use of machine tools is restricted to qualified and authorized personnel under the control of the [Machine Shop Supervisor](#). This prevents equipment use by untrained/unauthorized persons. Direct supervision by a trained and qualified person is required when untrained persons use equipment for training or experience.

[Students](#), [Guests](#), and [Visitors](#), who do not meet the definition of a User according to the [Guests and Visitors](#) Subject Area, may not use machine tools in machine shops. Users and job shoppers (temporary employees and leased workers, see [Definitions](#)) may be authorized to use machine tools in machine shops provided they meet and comply with the requirements in the section [Satellite Machine Shop Operation](#).

Required Procedure

General Requirements for Machine Shop Safety contains five subsections:

- [1.1 General Requirements](#)
- [1.2 Department/Division Requirements](#)
- [1.3 Operator Requirements](#)
- [1.4 Equipment Requirements](#)
- [1.5 Procurement, Inspection, and Service Requirements](#)

1.1 General Requirements

This section provides the general requirements for machine shop safety.

Step 1	
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[Students](#), [Guests](#), and [Visitors](#), who do not meet the definition of a [User](#) according to the [Guests and Visitors](#) Subject Area, may not use machine tools in machine shops. Users and job shoppers (temporary employees and leased workers, see [Definitions](#)) may be authorized to use machine tools in machine shops provided they meet and comply with the requirements in the section [Satellite Machine Shop Operation](#).

1.2 Department/Division Requirements

This section provides the requirements for Departments/Divisions that use machine tools.

Step 1

The Department Chair/Division Manager, or designee:

- a. Appoints a [Machine Shop Supervisor](#) for machine shops and notifies the Machine Shop Safety Subject Matter Expert (SME) of the appointment and personnel changes.
- b. Verifies the training and qualifications of Machine Shop Supervisor as a machine shop evaluator (see the [BNL Training and Qualifications](#) website).
- c. Ensures only authorized personnel are trained and signed off to operate machine tools in machine shops.
- d. Ensures all non-employees comply with the requirements of the section [Satellite Machine Shop Operation](#) prior to granting authorization to use machine tools in machine shops.
- e. Ensures machine tools in machine shops comply with the requirements of this subject area.
- f. Ensures operators of machine tools in machine shops comply with the requirements of this subject area.
- g. Ensures all persons entering machine shops comply with the area-based personal protective equipment requirements as required by the [Personal Protective Equipment and Respirators](#) Subject Area. These consist of
 - i. Light Machine Shop - Long pants; fully enclosed shoe; safety glasses with side shields
 - ii. Heavy Machine Shop - Long pants; safety-toe shoe; safety glasses with side shields
- h. Maintains all available owner's or operator's manuals for machine tools and makes these manuals available to operators.
- i. Ensures that a machine operator aid for pre-use inspections is available for each machine. Operator aids must identify existing controls that address predominant hazards of machine use.

Note: Machine operator aid templates for many machine types are available on the [ESH Guide: Machine Shop Safety](#) and may be adapted to be machine specific.
- j. Ensures that the exhibit [Machine Shop Rules](#) is displayed in each area with five or more machine tools. The shop rules address appropriate clothing, hair and dress, safe conduct in the shop, machining of hazardous materials, clean up, and prohibited activities.

Note: It is recommended that the exhibit be posted in any area where machine tools are used regardless of the number of machines.

	<ul style="list-style-type: none"> k. Prepares a maintenance schedule for each machine tool based upon the recommendations of the manufacturer, and ensures this maintenance is performed on a periodic basis. l. Retains records of inspection and maintenance for all machine tools in machine shops for a period of at least two (2) years.
Step 2	<p>The Machine Shop Supervisor:</p> <ul style="list-style-type: none"> a. Reviews machine safe operating guidelines and completes a Machine Shop Safe Work Practices Evaluation Form for each piece of equipment the candidate intends to operate. Note: Machine safe operating guidelines for many machine types are available on the ESH Guide: Machine Shop Safety and may be used for the review. b. Maintains a list of authorized personnel and the equipment they are authorized to operate. c. Inspects machine shop areas monthly in accordance with section 2.2 Monthly Machine Shop Inspections. d. Monitors and documents authorized personnel operation of machine tools in machine shops to ensure continued safe work practices. Note: For shops with infrequent use and where a full-time machine shop supervisor is not available, this requirement can be waived. e. Revokes authorization for personnel that violate Machine Shop Rules or engage in unsafe behavior in BNL Machine Shops. f. Conducts reevaluation of operator competency using a Machine Shop Safe Work Practices Evaluation Form when requested by operator as refresher, operator's supervisor, ESH Coordinator, or Machine Shop Safety SME.

1.3 Operator Requirements

Operators of machine tools are exposed to noise, laceration, bite, struck by, pinch point, and other hazards and must utilize engineering controls including physical guards, observe postings and administrative controls and wear required personal protective equipment to abate and mitigate these hazards. This section provides the requirements for operators of machine tools.

Step 1	Employees and non-employees authorized to use machine tools must comply with this subject area and their host department procedure for using machine tools in machine shops.
Step 2	<p>All persons entering machine shops will comply with the area-based personal protective equipment requirements as required by the Personal Protective Equipment and Respirators Subject Area. These consist of</p> <ul style="list-style-type: none"> a. Light Machine Shop – Machining and assembly of small parts using small machine tools such as sanders, scroll saws and drill presses. Parts and tools are light and drop/crush hazard is minimal. Requires: Long pants; fully enclosed shoe; safety glasses with side shields;

	<p>b. Heavy Machine Shop – Machining and assembly of large parts with major machine tools such as lathes, milling machines, and band saws. Parts and tools drop or crush hazard has the potential to cause significant injury to feet or legs. Requires: Long pants; safety-toe shoe; safety glasses with side shields.</p>
Step 3	<p>Operators of machine tools in machine shops must comply with the rules as described in the exhibit Machine Shop Rules. No alterations to its format or content can be made without the approval and authorization of the SME. Observations of unsafe acts or unsafe conditions must be immediately reported to the Machine Shop Supervisor.</p>

1.4 Equipment Requirements

This section provides the requirements for machine tools. These requirements are further divided into general requirements for all machine tools, and specific requirements for specific types of machine tools.

Step 1	<p>1. General Equipment Requirements</p> <ul style="list-style-type: none"> • Operating Controls <ul style="list-style-type: none"> i. A mechanical or electrical power control must be provided on each machine to make it possible for the operator to cut off the power from each machine without leaving his position at the operator control station. <ul style="list-style-type: none"> 1. Power controls and operating controls should be located within easy reach of the operator while he is at his regular work location, making it unnecessary for him to reach over the cutter to make adjustments. This does not apply to constant pressure controls used only for setup purposes. • Machine Guarding <ul style="list-style-type: none"> i. One or more methods of machine guarding must be provided to protect the operator and other workers in the area of the machine from hazards such as those created by points-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. Point-of-operation guarding must be so designed and constructed as to prevent the operator from having any part of their body in the danger zone during the operating cycle. All guarding will be in compliance with 29 CFR 1910, Subpart O. ii. Special hand tools for placing and removing material must be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools must not be in lieu of guarding requirement and only provide supplemental protection. iii. The following are some of the machines which usually require point-of-operation guarding: <ul style="list-style-type: none"> Guillotine cutters, shears, alligator shears, power presses, lathes, milling machines, bandsaws, power saws, jointers, table saws, pedestal grinders, chop saws, and belt/disc sanders.
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- iv. All mechanical power transmission apparatus, including belts, pulleys, gears, shafts and moving parts, must be guarded. All horizontal belts pulleys, flywheels, and fan blades and those portions of vertical and inclined belts seven (7) feet or less from the floor (or working level) are required to be enclosed by a guard when worker exposure is possible. Flywheel guards must be placed no less than 15 inches or more than 20 inches from the rim. If wheels are in a pit or within 12 inches of the floor, a toeboard is required. **Note:** If workers are naturally guarded from exposure to hazardous areas by location of the belt/components (such as walls and mechanical structures), no additional guard enclosure is required.
- v. Guards must be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard must be such that it does not offer an accident hazard in itself.
- vi. OSHA does not grant a grandfather clause for old equipment. All equipment must be safeguarded. Equipment must also be installed in conformance to other applicable facility standards.

- **Anchoring fixed machinery**

- i. Machines designed for a fixed location must be securely anchored to prevent walking or moving.

- **Emergency Stops**

- i. Machine tools, other than those operated with constant pressure switches, require an NFPA 79-2012 Category 0 or 1 emergency stop that is easily accessible from the normal operator position(s). The installed emergency stop should be selected so as to not add or increase the hazard of the machine.

- **Anti-restart Devices**

- i. Provision must be made to prevent machine tools from automatically restarting upon restoration of power after a loss of power.

Step 2

Risk Assessment Procedure

- a. Existing equipment that cannot feasibly meet all General Equipment Requirements must be reviewed for hazards and controls using a risk assessment procedure to identify the most appropriate hazard mitigation strategy.
- b. A team of Line Organization personnel including at least one worker representative must evaluate the use of the machine, predictable hazards and available controls. This evaluation must be documented on the [Machine Risk Assessment \(MRA\) Form](#).
- c. The completed Machine Risk Assessment Form must be signed by the Line Organization Chair or equivalent accepting residual risk for the organization that operates the machine tool.
- d. The signed Machine Risk Assessment must be forwarded to the Machine Shop Safety Subject Matter Expert (SME) for concurrence.
- e. All identified alternative controls must be in place and the Machine Risk Assessment with SME concurrence must be posted at the machine location

	<p>prior to operation of equipment that cannot be feasibly brought into compliance with the General Equipment Requirements.</p> <ul style="list-style-type: none"> f. The posted Machine Risk Assessment must remain in place for six months following approval to allow for comments to be submitted to the Machine Shop Safety Subject Matter Expert. g. The Line Organization must retain the Machine Risk Assessment until the machine is permanently removed from service or brought into compliance with the General Equipment Requirements. h. Modifications which impact the safety of the machine or change existing controls must include a review of the Machine Risk Assessment.
Step 3	<p>The Machine Shop Safety SME maintains the official records of inventory and compliance status with the requirements of this subject area. See the ESH Guide: Machine Shop Safety for how to access the data.</p>

1.5 Procurement, Inspection, and Service Requirements

This section provides the requirements for procuring, inspecting, and servicing machine tools.

Step 1	<p>Procuring machine tools and components</p> <ul style="list-style-type: none"> a. Procure new machine tools and components for modifications and repairs other than like-in-kind replacements using the PeopleSoft Web Requisition system and selecting the category "Powered Machine Shop Equipment" from the type "Purchase Matl/Supplies". The BNL-QA-101 Clause titled "Powered Machine Shop Equipment" will automatically be included on all Purchase Orders issued using the PeopleSoft Web Requisition System. b. Coordinate a review of requested equipment or components with the Machine Shop Safety Subject Matter Expert (SME) to ensure that OSHA and BNL requirements are met.
Step 2	<p>Inspecting machine tools in machine shops</p> <ul style="list-style-type: none"> a. Maintenance and servicing activities that expose personnel to hazardous energy or dangerous machine movement must be conducted in accordance with the Lockout/Tagout (LOTO) for Installation, Demolition, or Service and Maintenance Subject Area and applicable departmental procedures. b. When the devices are located out of visual sight from the control panel, such as behind an opaque wall, energy control procedures, Lockout/Tagout (LOTO) must be used whenever employees enter the machine's danger zone with the exception of activities described below with alternative controls in place. c. Minor tool (including blade and abrasive wheel) changes and adjustments, and other minor servicing activities, which take place during normal production operations, if they are routine, repetitive, and integral to the use of the equipment for production (as often can be the case with respect to activities like changing a tool bit

	<p>on a milling machine or a drill bit on a drill press) may be performed using local disconnects or control switches that are:</p> <ul style="list-style-type: none"> d. Placed in an "OFF" position; e. Provide effective employee protection through proper design and application; and f. Are under the exclusive control of the employee performing the task. <p>Note: In all other situations in which employees are performing servicing and maintenance activities and may be exposed to hazardous energy, LOTO must be performed to protect employees from hazardous energy.</p>
Step 3	<p>Inspecting new or repaired machine tools in machine shops</p> <ul style="list-style-type: none"> a. New and relocated machine tools must be inspected by the Line Organization Machine Shop Supervisor prior to being placed in service. The Machine Shop Safety SME must be notified of all installations or relocations of machines prior to placing them into service. b. Completed modifications to machine tools other than like-in-kind replacements or maintenance activities must be inspected by the line organization Machine Shop Supervisor and Machine Shop Safety SME prior to being returned to service.
Step 4	<p>Existing Operator's or Owner's Manuals for machine tools will be made available to the operators and service mechanics. Operators will operate machine tools in accordance with these manuals and best practices.</p>
Step 5	<p>Maintenance procedures, including the schedule for performing that maintenance, must be developed and documented for each machine tool. These procedures must be prepared using the recommendations of the manufacturer and best practices for similar machines. Perform maintenance consistent with these procedures.</p>

References

[BNL Training and Qualifications](#) website

[ESH Guide: Machine Shop Safety, Safety and Health Services](#) website

[Guests and Visitors](#) Subject Area

[Lockout/Tagout \(LOTO\) for Installation, Demolition, or Service and Maintenance](#) Subject Area

NFPA 79-2012, Electrical Standard for Industrial Machinery

[Personal Protective Equipment and Respirators](#) Subject Area

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PROCEDURE: INSPECTIONS

Management System: Worker Safety and Health		
Subject Area: Machine Shop Safety		
2. Inspections		
Effective Date: Feb 4, 2016	Subject Matter Expert: Mario Cubillo	Management System Executive: Ed Nowak

Applicability

This procedure applies to all BNL and non-BNL staff who use machine tools in a machine shop.

Required Procedure

Inspections contains two subsections:

[2.1 Pre-use Inspections](#)

[2.2 Monthly Machine Shop Inspections](#)

2.1 Pre-use Inspections

This section provides the requirements for inspection of machine tools to ensure that equipment can be operated safely.

Step 1	<p>Before operating a specific machine for the first time that day, each authorized user must conduct a pre-use inspection and completely review the machine to ensure that safe operation of the equipment can be performed. The operator should utilize the available machine operator aid to identify critical inspection points and settings. Operator aids must identify existing controls that address predominant hazards of machine use.</p> <p>Note: For operator reference, it is adequate to have the laminated/protected operator aid on or near the machine.</p> <p>Note: Machine operator aid templates for many machine types are available on the ESH Guide: Machine Shop Safety and may be adapted to be machine specific.</p>
Step 2	<p>If any deficiencies are noted during the pre-use inspection, the operator must not use the machine. The operator must bring the deficiencies to the attention of the Machine Shop Supervisor, their direct supervisor, or ES&H Coordinator. The machine must be removed from service (see the see the Lockout/Tagout [LOTO] for Installation, Demolition, or Service</p>

[and Maintenance](#) Subject Area) for deficiencies which prevent safe operation of the machine and may not be used until the deficiency is corrected.

2.2 Monthly Machine Shop Inspections

This section provides the requirements for monthly inspection of the machine shop area to ensure that new hazards have not been introduced, controls are satisfactory for known hazards and that equipment is in good repair and safe condition.

Step 1	<p>The Machine Shop Supervisor completes the Monthly Machine Shop Inspection Checklist, whether or not the shop is being used, unless there is a preventive maintenance program in place. This checklist may be conducted in conjunction with the Tier I inspection. Copies of the checklists will be retained by the Department Chair/Division Manager or designee for a period of two years.</p> <p>Note: Isolated machine tools may be grouped for inspection purposes if locations are indicated on the inspection form.</p>
Step 2	<p>All deficiencies identified during the monthly machine shop inspection must be brought to the attention of the ES&H Coordinator and Machine Shop Subject Matter Expert for correction. The machine must be removed from service (see the Lockout/Tagout [LOTO] for Installation, Demolition, or Service and Maintenance Subject Area) for deficiencies which prevent safe operation of the machine and may not be used until the deficiency is corrected.</p>

References

[ESH Guide: Machine Shop Safety, Safety and Health Services](#) website

[Lockout/Tagout \(LOTO\) for Installation, Demolition, or Service and Maintenance](#) Subject Area

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PROCEDURE: SATELLITE MACHINE SHOP OPERATION

Management System: Worker Safety and Health		
Subject Area: Machine Shop Safety		
3. Satellite Machine Shop Operation		
Effective Date: Feb 4, 2016	Subject Matter Expert: Mario Cubillo	Management System Executive: Ed Nowak

Applicability

This procedure applies to all BNL and non-BNL staff who use machine tools in a satellite machine shop not assigned to Central Fabrication Services. Students and visitors may not use machine tools at BNL unless an internal waiver is granted in accordance with the [Requirements Management](#) Subject Area.

[Students](#), [Guests](#), and [Visitors](#), who do not meet the definition of a [User](#) according to the [Guests and Visitors](#) Subject Area, may not use machine tools in machine shops. Users and job shoppers (temporary employees and leased workers, see [Definitions](#)) may be authorized to use machine tools in machine shops provided they meet and comply with the requirements of this section.

Required Procedure

This section provides the procedures to authorize personnel to operate machine shop equipment.

Step 1	The Department Chair/Division Manager or designee appoints a Machine Shop Supervisor .
Step 2	The Machine Shop Supervisor completes a Machine Shop Safe Work Practices Evaluation Form for each piece of equipment the prospective user intends to operate.
Step 3	The Machine Shop Supervisor maintains a list of users and the equipment they are qualified to operate.
Step 4	The Machine Shop Supervisor periodically monitors users' equipment operation to ensure continued safe work practices.
Step 5	Procurement & Property Management (PPM) will include the necessary "Supplemental Terms and Conditions for Work by Contractors On-Site at Brookhaven National Laboratory" to the contracts it awards for Temporary Employees and Leased Workers (job shoppers) and ensure that proper certificates of insurance are obtained.

References

[Guests and Visitors](#) Subject Area,

[Requirements Management](#) Subject Area

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EXHIBIT: MACHINE SHOP RULES

Management System: [Worker Safety and Health](#)

Subject Area: [Machine Shop Safety](#)

Machine Shop Rules

Effective Date: Feb 04, 2016

The exhibit [Machine Shop Rules](#) is provided as a Word file.

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FORM: MACHINE RISK ASSESSMENT (MRA) FORM

Management System: [Worker Safety and Health](#)

Subject Area: [Machine Shop Safety](#)

Machine Risk Assessment (MRA) Form

Effective Date: Feb 04, 2016

The [Machine Risk Assessment \(MRA\) Form](#) is provided as Word file.

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FORM: MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORMS

Management System: [Worker Safety and Health](#)

Subject Area: [Machine Shop Safety](#)

Machine Shop Safe Work Practices Evaluation Forms

Effective Date: Feb 04, 2016

Machine Shop Safe Work Practices Evaluation Forms are provided as the following Word files:

[Band Saw](#)

[Belt/Disc Sander](#)

[Circular Saw \(Table Saw\)](#)

[Cut-off Saw \(Chop Saw\)](#)

[Drill Press](#)

[Lathe](#)

[Milling Machine](#)

[Pedestal Grinder](#)

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**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____	Machine: Band Saw
Machine Shop Supervisor's Name: _____	
Employee Name: _____	Life Number: _____

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State BNL Policy for use of eye protection in machine shops.			
2. Identify main disconnect for tool, and explain requirements for access to it.			
3. Identify all controls and describe their functions.			
4. Identify all machine guards and describe their functions.			
5. Identify who may select and change saw blades; and why this is restricted.			
6. Ensure that push sticks or sacrificial blocks are available, and explain their purpose.			
7. Describe how to properly support oversized work pieces.			
8. Demonstrate safe work practice while performing saw cuts.			
8.1. All loose clothing, jewelry, and long hair are secured as necessary.			
8.2 Work piece is secured to the work surface prior to starting.			
8.3. Blade guard set to proper height for the material to be cut.			
8.4 Saw blade, speed and feed rate appropriate for the material.			
8.5 All guards are in place and securely attached.			
8.6 Clean machine and area upon completion, without using bare hands or compressed air on metal chips.			

The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____	Machine: Belt/Disc Sander
Machine Shop Supervisor's Name: _____	
Employee Name: _____	Life Number: _____

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State BNL policy for use of eye protection in machine shops.			
2. Identify main disconnect for tool, and explain the requirement for access to it.			
3. Identify all controls and describe their functions.			
4. Identify all machine guards and describe their functions.			
5. State the proper clearance between the belt/disc and the tool rest.			
6. Explain the process when defects are found.			
7. Describe proper method of holding small parts that need to be ground.			
8. Explain potential hazard of working with wood and metal on the same machine.			
9. Demonstrate safe work practices while sanding a piece of metal. Successful completion includes the following:			
9.1 All loose clothing, jewelry, and long hair are secured as necessary.			
9.2 Belt/disc is not torn or damaged.			
9.3 All guards are in place and securely attached.			
9.2 Hold piece against toolrest while sanding.			
9.3 All rotational motion has stopped prior to cleaning machine and that force is not used to stop the belt/disc.			

The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____	Machine: Circular Saw (Table Saw)
Machine Shop Supervisor's Name: _____	_____
Employee Name: _____	Life Number: _____

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State BNL Policy for use of eye protection in machine shops.			
2. Identify main disconnect for tool and explain requirements for access to saw.			
3. Identify all machine controls and explain their functions.			
4. Identify all machine guards and describe their functions.			
5. Explain the differences between rip and cross cutting.			
6. Identify who may select and change saw blades; and why this is restricted.			
7. Explain the purpose of push sticks, sacrificial blocks and feather boards, and why they are important.			
8. Describe how to properly support oversized work pieces.			
9. Explain hazards involved when tilting the arbor or table and those associated with dado-cuts			
10. Demonstrate safe work practice while performing saw cuts. Successful completion includes the following:			
10.1 All loose clothing, jewelry, and long hair are secured as necessary.			
10.2 Set saw blade to proper cutting height, setting blade just high enough for gullets to clear work piece.			
10.3 All guards/anti-kickback devices in place. Hands and fingers not in line with blade. Uses fence, miter gauge and clamping attachments.			
10.4 Ensure that push sticks or sacrificial blocks are used during cutting operation; and hands and fingers are not in line with moving blade.			
10.5 Use dust collecting systems to reduce airborne dust particles.			
10.6 Blade stopped completely before removing scrap pieces or cleaning machine.			
10.7 Clean machine and area upon completion, using vacuum cleaner or brushes to remove sawdust. Check to ensure that sparks have not ignited sawdust or left smoldering particles.			

10.8 Dispose of all debris properly.			
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The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____ Machine: **Cut-off Saw (Chop Saw)**

Machine Shop Supervisor's Name: _____

Employee Name: _____ Life Number: _____

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State the BNL policy for use of eye protection in machine shops.			
2. Identify the main disconnect for tool and explain the requirement for access to it.			
3. Identify all controls and describe their functions.			
4. Identify all machine guards and describe their functions.			
5. Identify who may change saw blades and why this is restricted.			
6. Describe the proper method of supporting an oversized piece and explain why it is necessary.			
7. Demonstrate safe work practices while performing saw operations. Successful completion includes the following:			
7.1 All loose clothing, jewelry, and long hair are secured as necessary.			
7.2 Saw is level and secure before operation.			
7.3 Work piece secured in vise/clamped. Work piece properly supported on both ends.			
7.4 All guards are in place. Hands and fingers are not in line with the blade.			
7.5 Blade and speed selection proper for material.			
7.6 Pivot base is locked at desired angle before starting the cut.			
7.7 Blade stopped completely before removing pieces or cleaning machine.			
7.8. Clean machine and area upon completion, without using bare hands or compressed air on metal chips.			

The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____	Machine: Drill Press
Machine Shop Supervisor's Name: _____	
Employee Name: _____	Life Number: _____

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State BNL policy for use of eye protection in machine shops.			
2. Identify main disconnect for tool and explain the requirement for access to it.			
3. Identify all controls and describe their functions.			
4. Identify all machine guards and describe their functions.			
5. Explain the process when defects are found.			
6. Explain the potential hazards of working with soft metals and securing a piece by hand.			
7. Demonstrate safe work practices while drilling a hole in a piece of metal. Successful completion includes the following:			
7.1 All loose clothing, jewelry, and long hair are secured as necessary.			
7.2 Work piece is secured to the work surface prior to starting.			
7.3 The drill bit is secure in the chuck and the chuck key is removed prior to starting.			
7.4 Bits are sharp and appropriate for the material. Drill speed is appropriate for the material.			
7.5 All guards are in place and securely attached.			
7.6 Pull the handle toward self (do not lean into machine) and ensure that excessive downward force is not exerted on drill bit.			
7.7 Ensure that all rotational motion has stopped prior to touching the work piece or chuck.			
7.8 Clean machine and area upon completion, without using bare hands or compressed air on metal chips.			

The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____	Machine: Lathe
Machine Shop Supervisor's Name: _____	
Employee Name: _____ Life Number: _____	

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State BNL policy for use of eye protection in machine shops.			
2. Identify main disconnect for tool and explain the requirement for access to it.			
3. Identify all machine controls and explain their functions.			
4. Identify all machine guards and describe their functions.			
5. Explain the process when defects are found.			
6. Describe the proper methods for supporting oversized pieces and explain why.			
7. Demonstrate safe work practices while machining a piece in the lathe. Successful completion includes the following:			
7.1 All loose clothing, jewelry, and long hair are secured as necessary.			
7.2 Work piece is secure in the chuck and that the chuck key is removed.			
7.3 Speed of rotation, tool, and tool position is appropriate for the material and its size.			
7.4 All guards are in place.			
7.5 Hands are kept clear of the point-of-operation and the chips being removed from the piece.			
7.6 Ensure that all rotational motion has stopped prior to touching or measuring piece.			
7.7. Clean machine and area upon completion, without using bare hands or compressed air on metal chips.			

The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____	Machine: Milling Machine
Machine Shop Supervisor's Name: _____	
Employee Name: _____	Life Number: _____

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State BNL policy for use of eye protection in machine shops.			
2. Identify main disconnect for tool and explain the requirement for access to it.			
3. Identify all controls and describe their functions.			
4. Identify all machine guards and describe their functions.			
5. Explain the process when defects are found.			
6. Demonstrate safe work practices while performing milling operations. Successful completion includes the following:			
6.1 All loose clothing, jewelry, and long hair are secured as necessary.			
6.2 Work piece is secured to the moving surface, and the cutting tool is secured in the chuck. Tool for drawbar is removed.			
6.3 Speed of rotation, tool, and feed rate is appropriate for the material and its size.			
6.4 All guards are in place and securely attached.			
6.5 All moving parts have stopped prior to touching or measuring the piece.			
6.6 Clean milling machine upon completion of cut, without using bare hands or compressed air to remove chips.			

The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

**BROOKHAVEN NATIONAL LABORATORY
MACHINE SHOP SAFE WORK PRACTICES EVALUATION FORM**

Dept./Div: _____	Machine: Pedestal Grinder
Machine Shop Supervisor's Name: _____	
Employee Name: _____	Life Number: _____

Competencies	Date Completed	Evaluated By (Initials)	Comments
1. State BNL policy for use of eye protection in machine shops.			
2. Identify main disconnect for tool and explain the requirement for access to it.			
3. Identify all controls and describe their functions.			
4. Identify all machine guards and describe their functions.			
5. Explain the possible hazard involved with grinding non-ferrous metals.			
6. Identify who is authorized to change grinding wheels and why this is restricted.			
7. State the proper clearance between the wheel and the tool rest, and the wheel and the tongue guard.			
8. Inspect grinding wheel for chips and cracks prior to starting motor.			
9. Explain the process when defects are found.			
10. Describe proper method of holding small parts that need to be ground.			
11. Demonstrate safe work practices while grinding a piece of metal. Successful completion includes the following:			
11.1 All loose clothing, jewelry, and long hair are secured as necessary.			
11.2 Stands out of line with wheel at turn on.			
11.3 Holds piece against toolrest while grinding.			
11.4 Sides of the wheel are not used for grinding unless specifically designed for that purpose.			
11.5 All rotational motion has stopped prior to cleaning machine and force is not used to stop the wheel.			

The Machine Shop Supervisor certifies that the employee demonstrated safe performance of the items listed above.

Machine Shop Supervisor's Name(s): _____ Date _____

Machine Shop Supervisor Signature: _____

Employee Signature indicates his or her completion of the above evaluation.

Employee Signature: _____ Date _____

FORM: MONTHLY MACHINE SHOP INSPECTION CHECKLIST

Management System: [Worker Safety and Health](#)

Subject Area: [Machine Shop Safety](#)

Monthly Machine Shop Inspection Checklist

Effective Date: Feb 04, 2016

The [Monthly Machine Shop Inspection Checklist](#) is provided as a Word file.

The only official copy of this file is the one on-line in SBMS.

Before using a printed copy, verify that it is the most current version by checking the *effective date*.

[Questions/Comments](#)

[Disclaimer](#)

https://sbms.bnl.gov/SBMSearch/subjarea/223/223_Exh3.cfm

Monthly Machine Shop Inspection Checklist

Shop Location & Org: _____

Shop Supervisor: _____

Inspector: _____ **Date:** _____

Inspection Item	Yes	No	N/A
Are all machines and tools free of defects that make them unsafe such as cracked handles, oil leaks, or chaffed electrical connections?			
Are effective guards and shields in place on all points-of-operation, ingoing nip points, rotating parts, flying chips and spark areas?			
Are point-of-operation guards being used? Are guards firmly secured?			
Are power transmission gears, sprockets, pulleys, belts, chain drives, or flywheels under 7' from the floor guarded? Are all exposed set-screws, keyways, or collars on rotating parts guarded?			
Is all fixed machinery installed to prevent unintentional movement or tipping?			
Are all machines equipped with anti restarts and emergency stops?			
Are the electrical controls for each piece of equipment properly labeled and unobstructed? Are On/Off and E-Stop accessible from the operator's position?			
Are machine operator aids for pre-use inspections legible and available?			
Is the list of authorized users with allowed equipment operation posted?			
Are the shop rules posted and up to date?			
Is the Hazard Placard for the machine shop current? Correct classification?			
Are emergency telephone numbers clearly posted?			
Is an operator's manual or other written safe operating procedures available for each power tool, piece of equipment and machine?			
Are covered metal containers used for oily and paint-soaked rags? Emptied?			
Are work areas and equipment clean and orderly?			
Are floors and work surfaces near machines dry and/or slip resistant?			
Are all eyewash and emergency shower stations free of obstructions that would prevent quick access by someone temporarily blinded?			
Are stock & materials, including scrap and debris, placed and supported to prevent falling and striking workers?			

Comments: _____

DEFINITIONS

Definition: Machine Shop Safety

Term	Definition
anti-restart device	A switch or circuit control device that prevents unintentional restart of equipment after a loss of power.
barrier guard	A physical device that prevents entry of the operator's hands or fingers into the point of operation.
bite	The nip point between any two in-running rolls.
designee	Individual that is designated in writing by the Department Chair/Division Manager or their supervisor.
emergency stop	An easily recognizable means of stopping equipment using a single human action that is available in all modes of operation.
job shopper	A temporary employee provided to BNL by a temporary staffing agency, or a leased worker provided to BNL by a professional employee organization (PEO).
machine guarding	Means of protecting machine operators from hazards which include barrier guards, two hand trip devices, electronic safety devices, etc.
machine shop	A room or building where work with fixed power tools (machine tools) is performed.
machine shop supervisor	An individual assigned by the Department Chair/Division Manager or designee who is responsible for the operation of the machine shop and ensuring that individuals who operate machines are trained and authorized.
machine tools	Common designation for fixed power tools. Machine tools include, but are not limited to the following: band saws, bench/disc sanders, cut-off saws, drill presses, lathes, milling machines, pedestal grinders, and bench grinders.
operating controls	The means by which the machine operator initiates and adjusts the speed and direction of the tooling or the work.
pinch point	Any point other than the point of operation at which it is possible for a part of the body to be caught between moving and stationary parts of a

	press or auxiliary equipment; or between the material and moving part or parts of the press or auxiliary equipment.
point of operation	That point at which cutting, shaping, boring, or forming is accomplished upon the stock.
power tools	Tools actuated by an additional power source and mechanism other than manual labor. The most common type use electric motors but other power sources include compressed fluids or combustion engines. They are classified as either fixed (stationary) or portable. Fixed power tools are commonly referred to as machine tools. This subject area deals with fixed power tools only.
power transmission	The belts, chains, gears, sprockets, pulleys, or flywheels that are a means to transmit energy to the machine tools. Power transmission for machinery outside the scope of this subject area must comply with OSHA's regulations.
satellite machine shop	A machine shop not associated with Central Fabrication Services.
user	See the Definitions section in the Guests and Visitors Subject Area.

The only official copy of this file is the one on-line in SBMS.

Before using a printed copy, verify that it is the most current version by checking the *effective date*.