

**Forest Service Handbook  
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**Forest Service Handbook 6709.11 – Health and Safety Code Handbook  
Chapter 40 - Equipment and Machinery**

**Amendment:** 6709.11-2018-1

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**Digest:** Following is an explanation of the changes throughout the directive by section.

**6709.11:** Revised Handbook in its entirety.

**12 - 13:** Removes codes, captions, and direction for Motorized Vehicles and Specialized Equipment and recodes direction with revisions to FSM 7130.

**14:** Removes codes, captions, and direction for Aviation and recodes direction with revisions to the 2016 National Aviation Safety Management System Guide.

**15:** Removes codes, captions, and direction for Watercraft Safety and recodes direction with revisions to FSM 7130.

**22:** Removes codes, captions, and direction for Resource Management.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

**22.3:** Removes codes, captions, and direction for Recreation and recodes direction with revisions to FSM 2300.

**22.4:** Removes codes, captions, and direction for Forest Management and recodes directions with revisions to FSM 2000.

**22.5:** Removes codes, captions, and direction for Watershed and Air Management and recodes direction with revisions to FSM 2500.

**22.6:** Removes codes, captions, and direction for Wildlife, Fish, and Sensitive Plant Management and recodes directions with revisions to FSM 2630.

**22.62:** Removes codes, captions, and direction for Diving and recodes directions with revisions to FSH 4209.11.

**22.7:** Removes codes, captions, and direction for Special Uses and recodes directions with revisions to FSM 2700.

**22.8:** Removes codes, captions, and direction for Minerals and Geology and recodes directions with revisions to FSM 2800.

**23:** Removes codes, captions, and direction for State and Private Forestry.

**24:** Removes codes, captions, and direction for Research.

**25.1:** Removes codes, captions, and direction and recodes directions with revisions to Interagency Standards for Fire and Fire Aviation Operations.

**25.2:** Removes codes, captions, and direction on Smokejumping and recodes directions with revisions to Interagency Standards for Fire and Fire Aviation Operations.

**25.3:** Removes codes, captions, and direction on Law Enforcement and recodes directions with revisions to FSH 5309.11.

**26:** Removes codes, captions, and direction on Management Services.

**27:** Removes codes, captions, and direction on Engineering and recodes directions with revisions to FSM 7000 Series Publications.

**36:** Removes codes, captions, and direction for Electrical Standards and recodes direction with revisions to FSM 7600.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**

**Chapter 40 - Equipment and Machinery**

**Amendment:** 6709.11-2018-1

**Effective date:** December 03, 2018

**37:** Removes codes, captions, and direction for Occupational Health and Environmental Controls and recodes directions with revisions to FSM 7400.

**38:** Removes codes, captions, and direction for General Environmental Controls and recodes direction with revisions to FSM 7400.

**44:** Removes codes, captions, and direction for Heavy Equipment and recodes direction with revisions to EM 7130-2.

**45:** Removes codes, captions, and direction for Equipment Development and recodes direction with revisions to FSM 7120.

**70:** Changes chapter caption from “Job Hazard Analysis (Form FS-6700-7) and Personal Protective Equipment” to “Personal Protective Equipment, Glossary, and Index” and revises chapter in its entirety.

## Table of Contents

<b>41 - Hand and Portable Powered Tools .....</b>	<b>6</b>
41.01 - Authority .....	6
41.04 - Responsibility .....	6
41.04a - Supervisors .....	6
41.04b - Employees .....	6
41.1 - Qualifications .....	6
41.11 - Personal Protective Equipment (PPE) .....	7
41.13 - Safety Practices .....	7
41.2 - Chopping Tools .....	8
41.21 - Safety Practices .....	8
41.3 - Cutting Tools .....	9
41.31 - Safety Practices .....	9
41.4 - Storage .....	11
41.41 - Safety Practices .....	11
<b>42 - Other Tools and Equipment .....</b>	<b>12</b>
42.01 - Authority .....	12
42.1 - Safety Practices .....	12
42.2 - Rigging Equipment for Material Handling .....	22
42.21 - Safety Practices .....	22
42.3 - Chains .....	25
42.31 - Safety Practices .....	25
42.4 - Slings .....	25
42.41 - Safety Practices .....	25
<b>43 - Power-Operated Tools .....</b>	<b>26</b>
43.01 - Authority .....	26
43.04 - Responsibility .....	26
43.04a - Supervisor .....	26
43.04b - Employees .....	27
43.1 - Qualifications .....	27
43.11 - Personal Protective Equipment .....	27
43.12 - Safety Practices .....	27
43.2 - Air Receivers .....	28
43.21 - Safety Practices .....	28
43.3 - Pneumatic Power Tools .....	28
43.31 - Safety Practices .....	28
43.4 - Powder/Explosive-Actuated Tools .....	29
43.41 - Safety Practices .....	30
43.5 - Woodworking Equipment .....	30
43.51 - Safety Practices .....	30
43.51a - Portable Saws, Jointers, and Sanders .....	32

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**

**Chapter 40 - Equipment and Machinery**

**Amendment:** 6709.11-2018-1

**Effective date:** December 03, 2018

<b>43.6 - Drills .....</b>	<b>36</b>
<b>43.61 - Safety Practices .....</b>	<b>36</b>
<b>43.7 - Grinders.....</b>	<b>36</b>
<b>43.71 - Safety Practices .....</b>	<b>36</b>

## **41 - Hand and Portable Powered Tools**

### **41.01 - Authority**

The authority for safeguards for personnel protection (relevant to electrical hazards) is in Title 29, Code of Federal Regulations (29 CFR), section 1910.335. The authority for eye and face protection, storage, and use of hand and portable powered tools is in 1910.133 and 1910.138.

### **41.04 - Responsibility**

#### **41.04a - Supervisors**

Supervisors are responsible for the following actions:

1. Ensuring that tools are not modified or used in any manner that increases the risk of injury.
2. Ensuring that tools remain in a safe condition through periodic inspection and repair. This includes tools furnished by employees.
3. Monitoring employee performance periodically to ensure proper methods are followed.

#### **41.04b - Employees**

Employees are responsible for using hand- and portable-powered tools in the prescribed manner. Employees assigned to tool rooms are responsible for inspecting and for repairing or replacing hand- and portable-powered tools as necessary.

### **41.1 - Qualifications**

Supervisors shall ensure that employees are trained in the proper use and care of hand- and portable-powered tools required by the work project or activity. Only employees who have demonstrated the ability to handle a tool safely shall be permitted to work alone with that tool. Basic training may include the following:

1. Appropriate use of tools and personal protective equipment (PPE).
2. Tool operating limitations.
3. Inspections.
4. Adjustments and maintenance (changing bits, blades, handles, and heads).
5. Safety features.

6. Care and cleaning.

#### **41.11 - Personal Protective Equipment (PPE)**

Where PPE is required, a formal certification must be accomplished in accordance with Federal Occupational Safety and Health Administration (OSHA) criteria outlined in 29 CFR 1910.132(d) (2), which identifies the workplace evaluated; the Supervisor or person certifying the evaluation has been performed; the hazard assessment date; and the PPE necessary to protect employees from specific hazards of the work performed. The certification can be documented using a variety of risk assessment (RA) products, such as a job hazard analysis (JHA).

#### **41.13 - Safety Practices**

Because hand- and portable-powered tools seem easy to use, people often expect them to do more than they were designed to do and frequently use the wrong tool for the job. Using wrenches as hammers and hammers in place of striking wrenches when working with particularly stubborn nuts are two typical examples. Observe the following guidelines when selecting and using tools:

1. Where required, Supervisors shall select the proper PPE (see FSH 6709.11, ch. 70) for the tool being utilized and ensure employees are properly trained on PPE use, care, and storage.
2. Review and adhere to manufacturer's recommendations regarding tool use, care, storage, and limitations.
3. Select ergonomically designed tools (weight, size, and type) and consider buying several versions or sizes of the same tool. Use each tool only for the job for which it was designed.
4. Keep blades, cutters, and jaw teeth sharp for better results. Sharp tools improve accuracy, lower fatigue, and lessen accident and injury risk. Inspect hand- and portable-powered tools periodically for chips, cracks, distortion, mushrooming, or wear.
5. Keep all tools clean and in working order. Protect them against corrosion damage. Wipe off accumulated grease and dirt. Lubricate adjustable and moving parts to prevent misalignment and wear.
6. Keep handles tight; secure them with wedges when necessary. Inspect wood handles for checking, cracking, splinters, splitting, and warping. Do not use a tool with a loose or damaged handle.
7. In the presence of flammable materials or explosive dusts and vapors, use non-sparking tools. Do not expose tools to excessive heat or use urethane-coated tools in excessive temperatures.

8. Never throw tools under any circumstances.
9. When a tool is not in use, shield any sharp edges and place the tool in a predetermined location, away from personnel. When transporting tools to and from the job site, ensure that sharp edges are guarded and that all tools are securely stored.
10. Never transport loose tools inside the same compartment with employees unless the vehicle is equipped with a net, protective screen, or secured stationary toolbox.
11. Discard or repair damaged tools promptly. Temporary and makeshift repairs are prohibited. If tools cannot be repaired on site, return them to the tool room for repairs or replacement. Separate and tag tools needing repair from tools that are in good working order.
12. Provide suitable bins and storage racks for all tools.

#### **41.2 - Chopping Tools**

Chopping tools include axes, adzes, brush hooks, hatchets, machetes, and Pulaskis. Employees who utilize these types of chopping tools should review One Moving Part, National Technology and Development Program (NTDP) publication.

##### **41.21 - Safety Practices**

All employees shall follow these basic safety practices for maintenance and use.

1. Employees shall be instructed in proper chopping techniques and tool sharpening.
  - a. When filing a chopping tool, secure the tool in a clamp or vise when available. Stroke the file across the tool's edge. Finish the edge with a hand stone.
  - b. Replace and discard axes, hatchets, and Pulaskis that show excessive signs of wear or have mushroomed edges or rounded corners that are beyond repair. Check tools against standard templates. Inspect for cracked or loose heads and crooked, split, splintered, or warped handles.
2. Carry a chopping tool by grasping around the shoulder of the handle close to the tool head. Hold the tool so that the flat surface of the blade is vertical (parallel to your leg), with the arm hanging naturally at one's side. Use of a sheath is recommended, especially when carrying a tool for long distances. Never carry a chopping tool on your shoulder.
3. Always remove branches, debris, or underbrush that might interfere with chopping. Follow these general rules:
  - a. Do not allow people to stand in the chopping area and alert other workers of the distance chopped materials may fly.



- b. Remove all overhead obstructions in which the tool might become hung up or strike. Always position your body securely while working with a tool.
- c. Be alert when working on hillsides or uneven ground.
- d. Be especially watchful for spring poles if cutting a sapling that is bound down and under tension. Be alert for sudden breakage. If there is not a need to cut it, leave it.
- e. Standing on a log to chop is not recommended. Exceptions exist; exercise caution in such situations.
- f. When chopping limbs from a felled tree, stand on the opposite side of the log from the limb being chopped and swing toward the top of the branch or tree.
- g. When swinging a chopping tool vertically, the finish stroke should be in a plane that is parallel to the ground in most situations.
- h. If the cutting edge picks up a wood chip, stop chopping and remove the chip before continuing.
- i. To prevent glancing, keep the striking angle of the tool head almost perpendicular to the tree trunk.
- j. Use special foot and shin/leg protection if needed.

### **41.3 - Cutting Tools**

Cutting tools include chisels, files, saws, knives, shears, and snips.

#### **41.31 - Safety Practices**

Employees should follow the following basic guidelines for maintenance and use:

1. General Guidelines. Cutting tools must be handled with extra care. Do not store them with other tools where someone could be cut accidentally by inadvertently grabbing a sharp edge. The nuts and bolts on tools, such as shears and snips, require frequent adjustment. Wipe the edges of cutting tools frequently with a lightly oiled rag. Never hit a cutting tool with a striking tool.
2. Handsaws. Keep saw teeth sharp and properly set. Protect saw teeth with a sheath/guard when not in use. Consider the tooth shape and pattern for the material to be cut. Examine materials being cut for knots, nails, and other objects that may damage the saw or cause the saw to buckle. Hold pieces being cut firmly in place.
  - a. Bow Saws. Specific techniques include the following:

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

- (1) When inserting a blade in a bow-saw frame, keep your hands and fingers in the clear when the tension lever snaps into or against the saw frame.
- (2) When removing a bow-saw blade from the frame, ensure that the blade guard is in place.
- (3) Carry a bow saw with the guarded blade to the rear. Ensure the cutting edge faces away from your body even when the guard is in place.
- b. Hacksaws. Specific techniques include the following:
  - (1) Elect the proper blade for the material being cut.
  - (2) Point the blade teeth forward. Always keep the blade taut and the frame properly aligned.
  - (3) Use strong, steady strokes directed away from your body.
  - (4) Do not cut thin, flat pieces from edge to edge; always clamp them securely and cut so that several teeth are cutting at all times.
3. Knives. Specific techniques include the following:
  - a. Keep handles in place and cutting edges sharp and free of nicks.
  - b. When using drawknives, place material at working height; firmly anchor; and hold steady. Do not use a drawknife on material being braced by a worker.
  - c. When possible, use knives that lock open. Keep your fingers away from the knife's edge when closing.
4. Chisels/Punches. Specific techniques include the following:
  - a. Select the proper hammer for striking. When striking a chisel, punch, or wedge, always wear eye protection and use a hammer with a striking face that is approximately 3/8 inch (9-1/2 mm) larger than the face of the tool being struck.
  - b. Select a wood chisel large enough for the job and drive with a wooden or rubber maul of sufficient weight. Use the proper chisel for the material being cut.
  - c. Hold chisels near the top with a steady but relaxed grip. Keep your eyes on chisel's cutting edge.
  - d. Repair or replace chipped, deformed, or mushroomed chisels and discard broken or cracked chisel handles. When sharpening a chisel, maintain its original shape and angle.

- e. Punches must be straight and heavy enough for the work. Keep them accurately ground at all times.
  - f. Start punches with light taps. Hold them securely, especially on rounded surfaces. When knocking out rivets and pins, begin with a starting punch; finish with a pin punch.
5. Files. Specific techniques include the following:
- a. Equip files with properly sized handles and wear cut-resistant (or leather) gloves when using files.
  - b. Tap the file into the handle by striking the handle end on a flat surface. Do not drive the handle onto the file with a hammer.
  - c. Keep the file free of grease, oil, and shavings. Discard dull files or files with hard spots.
  - d. Use the correct type of file for the work. Cut on the forward pass of the file only; do not file backwards. When filing small objects, clamp the material securely in a vise or clamp with sufficient pressure.

#### **41.4 - Storage**

Cabinets, chests, and toolboxes may seem safe, but improper use can lead to serious accidents resulting in injuries. Always ensure that all drawers are closed. Overloaded overhead drawers are unsafe and can cause the unit to suddenly tumble over onto the user.

##### **41.41 - Safety Practices**

Toolbox guidelines include the following:

1. Select a toolbox that is compatible with the intended use. The toolbox design should accommodate the following:
  - a. Allow for storage, removal, and transportation of tools efficiently and without damage.
  - b. Include carrying handles for easy moving.
2. Limit the size of a portable toolbox so that it can be easily handled and secured in position on a vehicle.
3. Keep toolbox lids and edges free of rough, sharp edges, and surfaces.
4. Never walk backward while pulling a toolbox with wheels.

## **42 - Other Tools and Equipment**

### **42.01 - Authority**

The authority for handling materials, portable equipment tools and equipment, and slings is in Title 29, Code of Federal Regulations (29 CFR), sections 1910.176, 1910.184, and 1910.244. The authority for storage, rigging equipment for hoists, jacks, material handling, and wedges is in 29 CFR 1926.250 - 1926.252, 1926.305, and 1926.552 - 1926.554.

### **42.1 - Safety Practices**

Follow these basic guidelines for maintenance and use:

1. Pry bar (42.1, Exhibit 01); digging and tamping bars (42.1, Exhibit 02).
  - a. Secure fulcrums and toeholds. When prying, push with your palms. When applying leverage, keep your face, feet, and other body parts out of line with the bar.
  - b. When breaking, chipping, or prying rock or similar materials, wear protective eyewear and ensure that other people are not within striking distance of flying particles.
  - c. Lay the bar flat and in the clear when not in use.
  - d. Maintain bars by keeping them straight. Sharpen tips to retain the factory bevel.
  - e. Replace bent or twisted bars. Bent or twisted bars can rotate during use and strike the user.
  - f. Store bars so that they do not present a tip-over or falling hazard.
2. Grubbing tools. Such tools include combination tools, grubbing hoes (42.1, Exhibit 03), mattocks, McLeods, picks, Pulaskis (42.1, Exhibit 04), and various types of hoes.
  - a. Keep the blade eye tight-fitting and secured. Repair or replace defective or excessively worn tools immediately.
  - b. When working, ensure secure footing. Maintain a tight grip on the handle and keep legs and feet in the clear when swinging. Avoid directing the tool toward the body. Keep the tool out in front. Use gentle but deliberate swinging or hoeing motions.
  - c. Do not allow people to stand in the chopping, grubbing, or hoeing area. Watch for rocks or objects that will cause the tool to glance, rebound, or create excessive flying material. When swinging a tool vertically, the finish stroke should be in a plane that is parallel with the ground and out in front.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

- d. Where feasible, maintain 10 feet (3 m) minimum between employees while working.
  - e. Remove all overhead obstructions the tool might strike or snag.
3. Wrenches. Generally, the safest wrench is a box or socket type. Adjustable, flare nut, and open-end wrenches are not as strong as the corresponding sizes of box or socket wrenches and are not intended for heavy loads, such as breaking loose frozen fasteners or final tightening. If the wrench is not the correct size for the fastener, it is likely to damage the corners of the fastener or slip or break and cause an injury.
- a. Use tools with insulated handles for electrical work.
  - b. Do not extend the wrench handle with pipe or other “cheater bar” to add leverage.
  - c. Whenever possible, pull rather than push a wrench handle. Pull it toward you at right angles. Adjustable wrenches should be tightly adjusted to the nut and pulled in such a manner that the force is on the side of the fixed jaw.
  - d. Never use a wrench on machinery or material in motion.
  - e. Do not position hands so that they can be jammed against other objects if a wrench slips.
  - f. Replace and discard wrenches when the jaws are sprung.
  - g. Keep jaw corrugations on pipe wrenches sharp and clean.
  - h. Keep handles and adjusting screws on all wrenches in good condition.
4. Hammers. Hammers are one of the most widely used type of hand tool and one of the most often abused. More than two dozen styles of hammers are manufactured in various configurations, sizes, and types for very specific purposes. It is essential for safety and efficiency to select the proper hammer for the specific activity or work project.
- a. Always use a wood or rubber maul of sufficient weight when striking a wood-handle chisel to prevent cracking the handle.
  - b. Hold nails being driven just under the head and not at the base.
  - c. Never use a hammer to strike a nail-puller bar.
  - d. Use a maul tempered harder than the object being struck.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

5. Pliers. Pliers are designed and manufactured to perform specific functions; pliers are not wrenches, and they should not be used to turn nuts or bolts.

- a. Use specifically manufactured pliers to cut hardened wire.
- b. Always cut at right angles.
- c. Do not rock pliers from side to side or bend the wire back and forth against the cutting edges.
- d. Pliers with plastic coated handles are not designed to provide electrical protection.

6. Screwdrivers. Screwdrivers come in many sizes and shapes and are to be used only for driving and withdrawing threaded fasteners. Suggested safety practices include the following:

- a. Keep a proper assortment of screwdrivers on hand.
- b. Select a properly fitted screwdriver; the blade will make a snug fit.
- c. Select a handle design that provides both comfort and proper leverage. Plastic and other handle coatings are for comfort only. They do not provide protection when working around electricity.
- d. Do not use a screwdriver at eye level when directing pressure upward.
- e. Always be prepared to respond should the screwdriver slip.

7. Vises. Vises (42.1, Exhibit 05) come in many sizes and shapes and are manufactured to hold specific types of work. A vise with bolt holes must be bolted, not screwed, to a bench. A vise that is loose at its base or with its jaws clamped too loosely on the work can cause accidents and injury. A vise with overtightened jaws can crush or damage the work. Proper pressure must be applied.

- a. Use arm power only to close the jaws of a vise. Do not use an extension handle or hammer to tighten the jaws.
- b. For a safe, secure hold, do the work as close to the vise jaws as possible.
- c. Support long overhanging work at the far end with a saw horse or similar device.
- d. When possible, clamp work centrally in the jaws instead of the corners. Use special jaw inserts for contoured or soft work pieces.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

8. Jacks. Employees use various types of jacks, such as hydraulic, lever, ratchet, and screw jacks (42.1, Exhibit 06).

- a. Select jacks strong enough to hold the load safely and securely.
- b. See that the manufacturer's rated capacity is legibly marked on all jacks. Never exceed the rated capacity.
- c. Use only jacks that have a positive stop to prevent over travel. The operator must watch the stop indicator, which has to be kept clean in order to determine the limit of travel.
- d. Inspect jacks before using. Tag jacks if they are inoperable and do not use them until repairs are made. Follow this inspection timetable and inspect each jack thoroughly:
  - (1) For constant or intermittent use at one locality: at least once every six months.
  - (2) For jacks sent out of the shop for special work: when sent out and when returned.
  - (3) For a jack subjected to abnormal load or shock: immediately before and immediately after use.
- e. Lubricate jacks at regular intervals according to manufacturer's specifications or at least twice a year. Store them away from moisture.
- f. Supply hydraulic jacks exposed to freezing temperatures with an adequate antifreeze liquid.
- g. Always place the base of the jack on a level, firm foundation. When using cup-provided jacks, if there is a possibility of cup slippage, place a block between the cup and the load. Center the load to prevent tipping.
- h. Chock or block and secure vehicles before raising them.
- i. After the load has been raised, crib, block, or otherwise secure at once.
- j. Shore any load that must remain raised in a position for any length of time.
- k. Never get under a load supported by a jack unless the object is securely blocked on jack stands or on other approved support designed for the load.
- l. Tag any jack that is out of order. Do not use until repaired. Replace jacks not easily repaired.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

9. High-lift Jacks. High-lift jacks (42.1, Exhibit 07), such as the “handyman” jack, if misused or not maintained correctly, are potentially hazardous (refer to the Glossary).

- a. Review the conditions under which specific jacks may be used and ensure that operators are trained to use them properly.
- b. Never stand directly in front of a high-lift jack.

10. Hand Trucks. It is extremely important to select the appropriate hand trucks (42.1, Exhibit 08) for the specific load to be moved or for the work project to be performed. Consider the following:

- a. Load-carrying capacity, strength of frame, leverage, and nose plate for stability.
- b. Handle configuration and type (single, double, continuous, integral, or a combination).
- c. Ergonomic design to allow the load balance point to move easily over the wheels, reducing break-over effort.
- d. Rear casters that support the load’s weight to help keep the load balanced and casters that swivel to reduce the maneuvering effort.
- e. Specially designed heavy-duty appliance hand trucks with auto-rewind ratchet tighteners and retractable molded casters (42.1, Exhibit 08).
- f. Proper hand truck operation is as follows:
  - (1) Before moving forward, make sure the path is smooth and clear. Bumps or obstacles can cause the load to fall.
  - (2) Ensure the load does not block your vision. Keep the load secure and well-balanced.
  - (3) Where feasible, strap the object securely to the frame.
  - (4) Ensure that wheels are secured to the frame and that the frame is straight and in good repair.
  - (5) Keep your feet away from moving hand truck wheels; position your hands and fingers away from pinch points.
  - (6) When possible, push instead of pull.
  - (7) Slow down at blind corners and intersections.



**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

(8) Store hand trucks clear of aisles, exits, general traffic, passageways, and stairways.

11. Hoists. Hoists must meet the applicable requirements for construction, design, installation, testing, inspection, maintenance, and operation, as the manufacturer prescribes.

- a. Select the appropriate hoist for the load by referring to the manufacturer's determined workload capacity as indicated on the hoist. Mark the hoist body or hook with the rated load capacity, recommended speed, and special hazard warnings.
- b. Never let the hoist capacities exceed structure or building capacities. Use overhead support and rigging strong enough to carry maximum loads with a safety factor of two and one-half to one (2 ½ times stronger than the maximum load they are rated to carry).
- c. Inspect chains, hooks, running gear, and straps for cracks and other signs of fatigue to make sure they will not slip or give way under stress.
- d. Ensure that hook openings do not exceed 15 percent of the original hook gap throat (opening) or more than a 10-degree twist from the plane of the unbent hook.
- e. Ensure that hoists are securely anchored.
- f. Guide heavy loads with ropes rather than by hand.
- g. Side-pull the chain hoist only when the superstructure is braced to withstand lateral stress.
- h. Engage the ratchet pawl when lifting or suspending loads. Remove the crank when the load is suspended.
- i. Use only crank handles with a free-floating grip.
- j. Ensure that all hooks meet the manufacturer's recommendations and are not overloaded.

12. Peaveys, cant hooks, and pike poles (42.1, Exhibit 09).

- a. Keep your body balanced when pushing/pulling the pole.
- b. Grip the handle firmly. Do not overstress the handle.
- c. Place guards on points when the tool is not in use or is being transported.

13. Shovels.

- a. Keep shovels sharp and replace them if they show cracks, ragged edges, or splits. Follow sharpening guides carefully. Never sharpen cutting edges all the way to the foot plate.
- b. When shoveling, support your upper body by bracing the forearm closest to your body against your thigh as you pivot the blade sideways.

14. Wheelbarrows.

- a. Select the appropriate wheelbarrow for the job, with a strong, straight frame and strong wheels that are well secured to the frame.
- b. Keep your back straight and use your legs when lifting the handles of a loaded wheelbarrow. Never overload a wheelbarrow; keep the load evenly balanced, with weight well forward to avoid lifting strain. Push, do not pull, wheelbarrows.
- c. Watch for obstacles that will stop or tip a wheelbarrow. Do not run with a wheelbarrow. Check the route before moving the wheelbarrow.

(1) Allow enough clearance to avoid injuring fingers and hands.

(2) Exercise caution when ascending or descending ramps, especially when frosted, snow-covered, or wet.

15. Wedges.

- a. Select the correct wedge(s) for the job. The proper type, size, length, and combination are essential for efficiency and safety.
- b. Check wedges daily or before each job and do not use cracked or flawed wedges.
- c. Carry wedges in an appropriate belt or other container, not in clothing pockets.
- d. Always drive wedges by striking them squarely on the head and driving them carefully into the cut to prevent them from flying out of the cut or kerf.
- e. Recondition heads and the tapered ends of wedges to the manufacturer's original shape and angle. Wear eye protection and a dust mask when grinding to recondition wedges.

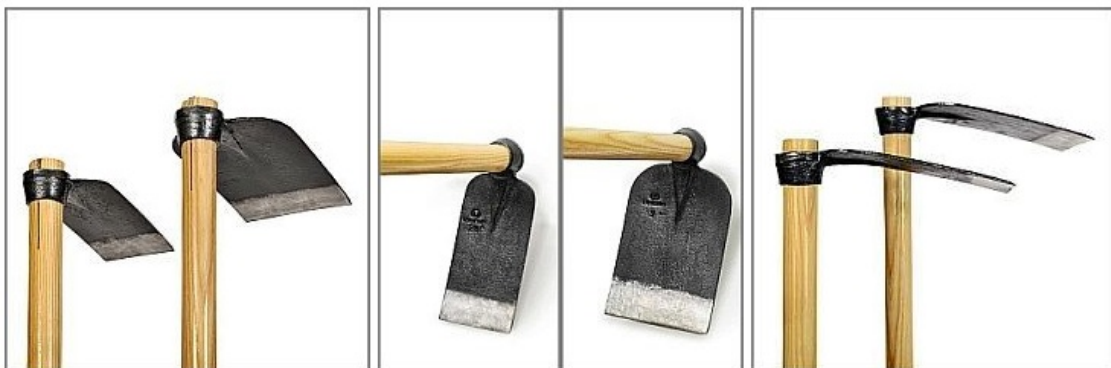
**42.1 – Exhibit 01 – Pry Bar**



**42.1 – Exhibit 02 – Digging and Tamping Bar**



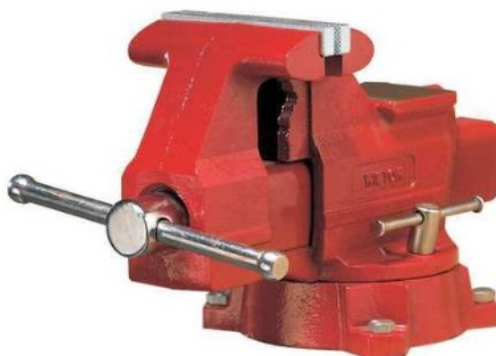
**42.1 – Exhibit 03 – Grubbing Hoes**



**42.1 – Exhibit 04 – Pulaski**



**42.1 – Exhibit 05 – Vise**



**42.1 – Exhibit 06 – Hydraulic Jacks**



**42.1 – Exhibit 07 – High Lift Jacks**



**42.1 – Exhibit 08 – Hand Trucks**



**42.1 – Exhibit 09 – Peavey and Cant Hook**



## 42.2 - Rigging Equipment for Material Handling

This section covers the use of fiber, synthetic, and wire ropes for lifting and structural support.

### 42.21 - Safety Practices

#### 1. General Guidelines.

- a. Inspect ropes and related equipment before each shift. Tag all equipment with safe working load ratings. Replace cracked blocks, hubs, flanges or sheaves, spokes, and winches. Discard hooks, rings, shackles, and slings that are bent, spread, or otherwise damaged. Continue to monitor ropes during use for broken strands, cuts, and frayed or worn spots. Immediately remove from service any defective rigging equipment.
- b. Ensure that only a qualified splicer makes splices. Never use knots in lieu of splices. Ensure only qualified persons tie knots for tie-downs and loads. Match the type of knot to the purpose.
- c. Carefully match the rope and the job:
  - (1) Use manila ropes preferably on rigging and other jobs where tight bends and sharp corners occur.
  - (2) Never use dynamic ropes where stretching causes problems.
  - (3) Use wire ropes for hoisting where slings and hardware are provided; for permanent guy wires and structured tension members; and for running or working ropes under heavy loads. (Use chains when hooks, ratchets, and other holding devices are used.)
  - (4) Never exceed the rigging equipment's recommended safe working load. Refer to 29 CFR 1910.184 and 29 CFR 1926.251 for specific rated capacities of rigging equipment.
  - (5) Always remove rigging equipment in the immediate work area when not in use so as to remove any potential hazard to workers.

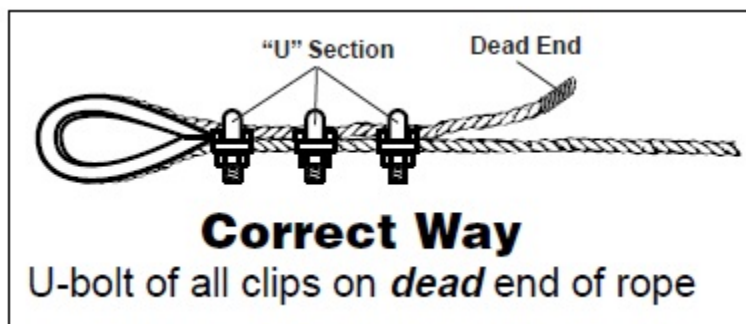
#### 2. Natural Rope and Synthetic Fiber.

- a. Never overload rope.
- b. Uncoil new natural fiber rope from the inside of the spool. Uncoil new synthetic rope by rolling the rope off the spool as it spins on an axle or spindle.
- c. Never drag rope over rough or sharp surfaces.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

- d. Keep acids and acid fumes away from ropes.
  - e. Thoroughly dry rope after use. Coil and pile or suspend rope so air can circulate through the coils. Never pile frozen or wet rope against heat sources. When wet, natural fiber ropes lose strength, and wet synthetic ropes are slippery and may not hold knots well.
  - f. Store synthetic ropes away from sunlight, oil, and any other petroleum products that may cause deterioration.
  - g. Replace all ropes per the manufactures guidelines even when they have been maintained in good condition.
3. Wire Rope. Consult the unit engineer and/or tables for wire rope strength; requirements for proper use of wire rope are in 29 CFR 1910.184 and 29 CFR 1926.251. Serious accidents have resulted from improper handling of wire ropes and installation of wire rope clamps.
- a. Wear leather gloves while handling wire ropes.
  - b. Apply a safety factor of not less than five and never let the working load of a wire rope exceed one-fifth of its breaking strength.
  - c. Do not let wire rope kink. A common cause of wire rope failure is kinking.
  - d. Never allow wire rope to overwrap unevenly on drums.
  - e. Always use the proper size clamps. Inspect clamp nuts daily when rope is in use and tighten them often. Retighten newly installed nuts or slips after one hour of use.
  - f. When used for eye splices, apply the U-bolt so that the U section is in contact with the dead end of the wire rope (ex. 01).
  - g. Remove wire rope from service when the total number of visible broken wires exceeds ten percent of the total number of wires or if the rope shows other signs of corrosion, defect, or excessive wear.
  - h. Maintain the safety of wire rope by lubricating it regularly to protect against corrosion and excessive wear. Be sure the lubricant penetrates to inner wires.

42.21 – Exhibit 01 – Proper Installation of Wire Rope Clamp





## **42.3 - Chains**

### **42.31 - Safety Practices**

1. Consult an Engineer when selecting chains.
2. Inspect chains for corrosion, pits, and small cracks and for deformed, gouged, stretched, or weak links. If a chain is defective, repair or replace it. Dispose of unserviceable chain.
3. Do not splice broken chain with bolts or clamps.
4. Do not use shop hooks and links or makeshift fasteners formed from bolts, rods, or other such attachments.
5. Ensure that hooks; oblong links; pear-shaped links; rings; welded or mechanical coupling links; or other attachments, when used with alloy steel chains, have a rated capacity at least equal to that of the chain.
6. Do not subject chains to impact loads or jerking.
7. When hooking chain, ensure that the hook is completely over the link, so the chain cannot slip and the hook will not bend. The hook must be as far from the load as possible, so the pull is on the back of the hook. Ensure that a straight pull is made. The hook opening must be away from the object being pulled or lifted.
8. After hitching or hooking chains to a load, stand far enough away to avoid being hit by a broken chain, the load, or flying parts or pieces.

## **42.4 - Slings**

### **42.41 - Safety Practices**

1. Each day before use, a competent person shall inspect the sling and all fastenings and attachments for damage or defects. Perform additional inspections during sling use where service conditions warrant. Immediately remove from service any damaged or defective slings.
2. Follow manufacturer's recommendations to determine safe working loads of the various sizes and types of chains, hooks, ropes, slings, and other such rigging equipment. Tag safe working load ratings on all rigging equipment.
3. Do not shorten slings with bolts, knots, or other makeshift devices.
4. Do not allow sling legs to be kinked.

5. Do not exceed safe working load ratings.
6. Pad or otherwise protect a sling from the sharp edges of a load.
7. Always ensure that suspended loads are clear of all obstructions.
8. Ensure that all workers are clear of loads about to be lifted and of suspended loads.
9. Never place hands or fingers between the sling and its load while the sling is being tightened around the load.
10. Do not permit shock loading.
11. Do not pull a sling out from under a load when the load is resting on the sling.

### **43 - Power-Operated Tools**

Generally, power tool accidents are caused by improper handling and poor maintenance. Most accidents can be avoided with proper training.

#### **43.01 - Authority**

The authority for general requirements on machines, abrasive wheel machinery, mechanical power-transmission apparatus, and guarding of portable powered tools is in Title 29, Code of Federal Regulations (29 CFR), sections 1910.212-1920.213, 1910.215, 1910.219, and 1910.242-1910.243. The authority for general tool and equipment requirements is in 29 CFR 1926.300 1926.304, 1926.306, and 1926.702.

#### **43.04 - Responsibility**

##### **43.04a - Supervisor**

Supervisors are responsible for the following actions:

1. Ensure that tools are not modified or allowed to be used in any manner that increases the risk of injury.
2. Ensure that tools are maintained in a safe condition through periodic inspection and repair, including tools furnished by employees.
3. Monitor employee performance periodically to ensure that proper methods and workplace practices are followed.

#### **43.04b - Employees**

Employees are responsible for operating power tools in a safe, prescribed manner, including using all protective equipment provided by the tool manufacturer. Employees are responsible for wearing all required and provided PPE.

#### **43.1 - Qualifications**

Employees shall not work alone with a tool until they have thoroughly demonstrated their ability to handle it safely. Training must be documented.

#### **43.11 - Personal Protective Equipment**

Employees using power-operated tools who are exposed to the hazard of abrasive, falling, flying, moving, rotating, or sharp objects or are exposed to harmful chemical dusts, fumes, gases, mists, or vapors shall be provided with PPE necessary to protect them from the specific hazard(s).

#### **43.12 - Safety Practices**

The following apply to all types of power tools:

1. Proper handling.
  - a. Use cord connected power-operated hand- and portable-powered tools in accordance with the manufacturer's operating, safety, and maintenance instructions.
  - b. When possible, select ergonomically designed tools that may lower fatigue and lessen accident or injury risk.
  - c. Replace or repair worn or damaged cords, equipment, and tools immediately. Temporary and make-shift repairs are prohibited.
  - d. Tag all tools in need of repair with a "do not use" tag and provide suitable storage bins for tools needing repair or maintenance.
  - e. Check power cords frequently for abrasions, cracks, cuts, and broken insulation.
  - f. Keep power cords clean and free of kinks. Never carry a portable power tool by the cord.
  - g. Provide electric tools with a grounding connection or provide double-insulated tools.
  - h. Always unplug the power cord from the outlet before changing parts or making adjustments and after the project is finished.

- i. Place power tools in designated storage areas when not in use.
2. Proper maintenance.
  - a. Do not alter, bypass, or nullify manufacturer's guards and safety equipment on power tools unless the manufacturer identifies specific uses.
  - b. Adjust, inspect, and maintain all guards and safety equipment based on the manufacturer's recommendations or otherwise at regular intervals.
  - c. Keep the work area clean, dry, and well lit. Good housekeeping is essential to good workmanship.
  - d. Do not wear clothing or jewelry that could become entangled in power tools.

### **43.2 - Air Receivers**

Air receivers are used in many different kinds of activities, including chipping, drilling, hoisting, inflating, painting, and abrasive blast cleaning.

#### **43.21 - Safety Practices**

1. Locate air receivers so handholds, maintenance drains, and safety inspections are easily accessible and so that the pressure indicator gauge is readily visible.
2. Ensure that the drain valve is opened and drained frequently to prevent the accumulation of liquid in the receiver.
3. Test all safety valves (pressure relief) at regular intervals to ensure that they are in good operating condition. Maintain a record of tank draining and safety valve tests at the air receiver.
4. Observe explosion and fire precautions related to air receiver operation.

### **43.3 - Pneumatic Power Tools**

Generally, follow the same precautions for the use and care of pneumatic tools as for electric and gasoline engine-driven equipment.

#### **43.31 - Safety Practices**

1. General Guidelines. Observe fire and explosion precautions related to pneumatic tool operation.
  - a. Ensure that hose and hose connections are designed for the pressure and service needed. Use the air hose only for the purposes for which it was designed.

- b. Inspect air supply lines, connections, and hoses regularly and maintain them in optimum condition.
  - c. Protect air supply lines, connections, and hoses from vehicle, hand-truck traffic, and other physical damage.
  - d. All hoses that exceed one-half inch (12 ¾ mm) inside diameter must have a safety device at the source of the supply or the branch.
  - e. Do not use hoses for hoisting or lowering pneumatic tools.
  - f. Secure hose connection to pneumatic power tools by a positive means to prevent accidental disconnection.
  - g. Ensure that safety clips or retainers are securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
  - h. If an air hose becomes crimped, entangled, or snagged, do not jerk or pull excessively to free it.
  - i. Do not use compressed air for cleaning purposes except where the pressure is reduced to less than 30 psi (214kPa) and then only with a chip guard and appropriate PPE.
  - j. Ensure that others are not in the line of airflow and never aim an air hose at anyone.
  - k. Do not use compressed air for cleaning off clothing or parts of the body.
2. Air Hammers. Air hammer operators shall observe the following:
- a. Be especially careful when laying down an air hammer so that the trigger cannot be pulled accidentally.
  - b. Loosen a tool that is stuck by rocking it back and forth instead of trying to pull it out.
  - c. Never leave an air hammer standing when not in use.

#### **43.4 - Powder/Explosive-Actuated Tools**

A variety of tools using powder/explosive charges to propel fasteners, pins, or studs for the purpose of affixing an object to another surface are available and widely used.

#### **43.41 - Safety Practices**

All powder/explosive-actuated tools must be treated with respect.

1. Inspect the tool each day before use. Follow the manufacturer's recommended procedures for testing the tool. Only employees who have been trained in a particular tool's operation shall be allowed to operate a powder-actuated tool.
2. Ensure that all tools are used with the correct attachment, guard, or shield recommended by the manufacturer.
3. Do not load a tool unless it is being prepared for immediate use. Never point an empty or loaded tool at any person.
4. Never leave a loaded tool unattended.
5. Do not use tools in an explosive or flammable atmosphere.
6. Use only fasteners specifically manufactured for the tool. Do not drive fasteners into very hard or brittle materials, such as cast iron, face brick, glazed or hollow tile, line rock, or surface-hardened steel.
7. Avoid driving into materials that are easily penetrated unless the material is backed by a substance that prevents the fastener or pin from passing completely through.
8. Provide suitable and secure storage for cartridges and munitions.

#### **43.5 - Woodworking Equipment**

Power-driven woodworking equipment includes band saws, circular saws, portable saws, and radial arm saws; jointers; sanders; and others. This equipment may provide for more efficient, productive work; however, it requires individual operator training, skill, and caution.

#### **43.51 - Safety Practices**

When operating such equipment, the following applies:

1. Ensure that the work area is kept free of debris that creates tripping or fire hazards.
2. Inspect all power-driven woodworking machines and associated equipment at regular intervals to ensure that they are in safe operating condition.
3. Remove from service any woodworking machine, tool, or machine equipment not in proper working order. Tag "do not use;" replace or repair.
4. Prohibit temporary or makeshift repairs.

5. Remove immediately from service badly set, cracked, dull, improperly filed, or tensioned saws.
6. Ensure that guards are in place on belts, gears, pulleys, shafts, and moving parts.
7. Secure and anchor woodworking machines designed for a fixed location to prevent moving or walking.
8. Ground all power-driven woodworking machines.
9. Equip each machine with a mechanical or electrical power control so that the operator can cut off the power without leaving the work position.
10. Provide all fixed power-driven woodworking tools with a disconnect switch that can be locked or tagged in the off position.
11. Provide automatic shut-offs to prevent the machine from restarting when power is restored after failures.
12. Lock out the power source when leaving at night.
13. Immediately clean saws that have gum adhering to the sides.
14. Keep all knives and cutting heads sharp, properly adjusted, and firmly secured.
15. Adjust bearings to eliminate play and keep them well lubricated.
16. Only trained persons shall sharpen and tension saw blades or cutting heads.
17. Ensure arbors of all circular saws are kept free from play.
18. Maintain good housekeeping and cleanliness around woodworking machinery. It is particularly important to clean switch enclosures, bearings, and motors to reduce fire and explosion hazards.
19. Provide push blocks or push sticks at the worksite in several sizes and types suitable for the work to be done.
20. Make adjustments and accessory changes only when machinery is turned off and unplugged.
21. When operating machinery, do not wear loose fitting clothing or jewelry that could become caught in the machinery.
22. Take breaks when you are tired. When using equipment, do not take your eyes off your work or talk to anyone.

### **43.51a - Portable Saws, Jointers, and Sanders**

#### **1. General Safety Practices.**

- a. Ensure that saws are equipped with a fixed guard over the upper half of the blade and a movable guard covering the lower half of the blade. Leave both of these guards in place. Blocking or bypassing safety guards is prohibited.
- b. Secure small pieces being cut with bench clamps or by some other means.
- c. Check saw blades regularly and keep them in good condition. Use the blade recommended for the material being cut and never use a dull blade or cutting edge.
- d. Never jam or crowd a saw into the work. Cut green or wet material slowly and with extra caution.
- e. Require approved respiratory and eye protection for operators cutting concrete, stone, or tile.

#### **2. Circular Table Saws.**

- a. Ensure that guards include the following:
  - (1) Hood covering the saw at least to the depth of the teeth and giving a clear view of the line of cut.
  - (2) Spreader and anti-kickback device that are part of the guard.
  - (3) Safe under-table protection.
- b. Use a saw only for the work for which it is designed.
- c. Use the correct type of cutting blade for the material to be cut.
- d. For each day of use, check to ensure that saw teeth are set and sharp and that the arbor nut is tight.
- e. Never use the ripping fence as a guide for crosscutting material.
- f. Kickback is one of the greatest hazards in running a table saw. To avoid it, observe the following:
  - (1) Use the splitter guard.
  - (2) Never use a dull blade.
  - (3) Do not cut freehand or attempt to rip badly warped wood.



**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

- (4) Do not drop wood on an unguarded saw.
- (5) Always stand slightly to one side, not in line with the saw.
- (6) Do not reach over the saw to push stock that has been sawed (43.51a, Exhibit 01).
- g. Ensure that circular table saws have magnetic switches.

3. Radial Arm Saws.

- a. Keep the machine in proper alignment and adjustment to prevent excessive vibration.
- b. Use the appropriate load and speed for the saw. If the motor slows while cutting, it may mean that it is overloaded or that the material is being fed too fast.
- c. Provide and use upper and lower blade guards.
- d. Ensure that anti-kickback fingers or dogs contact material when ripping and that the guard just clears the work.
- e. Make sure that saw rotation is conspicuously marked on the hood. In addition, affix a sign to the rear of the guard that reads: “Danger - Do Not Rip or Plough from This End.” It is imperative that work be fed into radial arm saws from the proper direction.
- f. Ensure that radial arm saws have the following features:
  - (1) Are equipped with an adjustable stop to prevent the saw blade from traveling beyond the front of the table.
  - (2) Are installed so the front end of the unit is slightly higher than the rear. This allows the cutting head to return to the starting position when the operator releases it.
  - (3) Has the direction of rip posted on the saw.
  - (4) Is equipped with a floating lower blade guard.
  - (5) Is equipped with magnetic switches.

4. Band Saws.

- a. Ensure that band saws have the following:
  - (1) Wheels that are fully encased or guarded.
  - (2) Effective brakes to stop the wheels in case of blade breakage.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

- (3) A self-adjusting guard for that portion of the blade between the sliding guide and the upper saw wheel guard.
- (4) A tension control device.
- (5) Guard-powered feed rolls.
- (6) Magnetic switches.
- b. With power disconnected, turn the upper wheel manually before starting to ensure that the saw band travels smoothly on both upper and lower wheels and through the band guide.
- c. Use a saw band as wide as the work permits.
- 5. Jointers.
  - a. Ensure that each hand-fed jointer has an automatic guard that covers all of the cutting head on the working side of the fence or gauge and a guard on the exposed portion of cutting head in back of the gauge or fence.
  - b. Ensure that jointers with a vertical head either have an exhaust hood or have guards so arranged as to completely enclose the revolving head.
  - c. Ensure that jointers have magnetic switches.
  - d. Use push blocks or sticks to push stock over cutting heads.
- 6. Sanders.
  - a. Provide belt sanders with guards at each nip point where the sanding belt runs onto a pulley.
  - b. Use particulate (dust) masks or respirators for intermittent or occasional dust.
  - c. Where sander use is frequent, ensure that dust is exhausted and collected; otherwise, dust may create an explosion hazard. These measures are in addition to dust collection systems installed directly on sanders. Avoid open flame and sparks.
  - d. Arrange the power cord so that the abrasive belt cannot damage it.
  - e. Keep both hands on the sander for good control.
  - f. Clean dust and chips from the motor and vent holes regularly.
  - g. Follow the manufacturer's recommended maintenance and service schedule.

**43.51a – Exhibit 01 – Spreader and Anti-Kickback Device**



## **43.6 - Drills**

Drills are available in a variety of configurations, power ratings, and sizes, and they may be corded or cordless. These drills also offer features such as high torque, reversible, and variable-speed, and there are special drills for drilling and hammering.

### **43.61 - Safety Practices**

Follow these basic guidelines:

1. Select the correct bit for the material to be drilled.
2. Where necessary, provide a prick punch or pilot hole for the drill point. Some bits, such as zirconium, may not require center punching.
3. Before drilling, ensure that the material to be drilled is secured to prevent movement or rotation.
4. If the bit may penetrate through the material to be drilled, take necessary steps to protect against damage or injury.
5. Do not straddle a drill or position your body to apply pressure that may exceed the drill's capability or capacity.
6. Always securely anchor drill presses to prevent them from moving or walking.
7. Locate the power control so that it allows the operator to cut off the power without leaving the work position.
8. Equip drill presses with guards to protect the operator from contacting hazards created by rotating parts and nip points.
9. Use the appropriate drill speed for the material being drilled.

## **43.7 - Grinders**

Bench grinders are used for shaping, sharpening, and smoothing metal, plastic, stone, or wood. For additional safety requirements, refer to 29 CFR 1910.212, 1910.215, 1910.303, and 1926.300.

### **43.71 - Safety Practices**

Basic safety practices for grinder use include the following:

1. Inspect all abrasive wheels closely before mounting to ensure that they are free from cracks or defects. Follow up with regular inspections.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 40 - Equipment and Machinery**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

2. Always match the abrasive wheel rotation per minute (rpm) rating with the rpm rating of the grinding machine.
3. When using hand-held grinding machines, always use work rests to support the work.
4. Always keep work rests on the floor and bench-mounted grinders adjusted closely to the wheel with a maximum opening of 1/8 inch (3-1/4 mm). This prevents the work from being jammed between the wheel and the rest, and possibly causing breakage (ex. 01).
5. Always securely clamp the rest after each adjustment.
6. Adjust the tongue guard (when equipped) so that it is 1/4 inch (6-1/2 mm) from wheel.
7. Never make adjustments with the wheel in motion.
8. Keep all machine guards in place and functional. Wear eye and/or face protection.
9. Securely attach bench and floor model grinders and buffers to the floor or work bench before use.
10. Keep abrasive wheels free from oil and properly dressed.
11. Do not leave a running machine unattended.
12. Always stand to one side of the machine while starting the motor until the operating speed is reached to prevent injury if a defective wheel should break and fly apart.
13. Use light pressure when starting to grind. Too much pressure may cause a cold wheel to fail.
14. Always conduct a visual inspection to detect defects before installing parts on a grinder.

43.71 – Exhibit 01 – Work Rest Adjustment

