Chain saws powered by gasoline or electric motors are used principally in logging, but they are also used in construction, electrical utilities, land clearing, tree trimming, pulpwood cutting and similar work.* Air and hydraulically operated chain saws also are occasionally used.

1. This data sheet will discuss the hazards encountered while using portable power chain saws and what procedures should be followed to avoid personal injury.

2. Logging terminology varies in different parts of the country. For example, sawing a tree up into log lengths is usually called “bucking.”

   Likewise, the person supervising the work of all fallers and buckers is called the “bull bucker” or “falling and bucking supervisor” (in some sections of the country a “head sawyer,” or a “walking boss” in others).

3. Fallers work in an area where there are no other workmen. Signs are posted in the area, and no one is permitted to enter the area without special clearance from the faller. Fallers make certain that no one is within the danger area, which is twice the height of trees being felled, then proceed to fall trees. A faller does not stop unless there are problems or unless co-workers must be checked.

4. Conditions and logging practices also vary. Level ground with little undergrowth and deadwood is found in some sections, while mountainous country obstructed by fallen trees and undergrowth prevails in such sections as the Northwest Pacific slope. In some areas snow is a major problem. Trees 10-inches thick and less are cut in some operations; in others, trees run to 6 feet and more in diameter.

5. Saws used should be no larger or longer than required for the average size of the timber being cut. Lightweight saws suitable for falling and bucking require less exertion by the operator and are less likely to cause strain.

**Hazards**

6. Operators of chain saws are exposed to hazards similar to those of men doing the same work with hand saws.

---

*The techniques concerning portable chain saws described in this data sheet apply specifically to logging, but they can be used with equal success in other occupations.*
In addition there are some special hazards such as:

- Falling while carrying a saw or when sawing
- Sprains and strains from carrying a heavy saw and working with it
- Being cut by contact with the chain while it is in motion
- Being cut by the chain not in motion, either on or off the saw
- Injuries from starting the gasoline engine
- Inhaling exhaust gases
- Electric shock from electrically operated saws
- Being struck by wood from overhead due to vibration of tree
- Sawdust in the eyes, especially when holding the tail stock or “stinger” end of a saw above the head
- Burns from contact with hot muffler or cylinder head
- Injuries from falling trees and snags or rolling logs due to inability to hear because of gasoline engine noise

7. The operation of a chain saw for falling is a one- or two-person job, depending on the type of saw being used. If a two-person saw is used, the head faller handles the engine end of the saw, because he or she is the more experienced member of the falling crew.

8. If a one-person saw is used, the operator should be an experienced faller and should use the same precautions as when operating a two-person saw—being exceptionally careful not to cut into the “undercut” or “notch” with the outboard end of the cutting rail.

9. One person should never work alone. Two people, each with a saw, should stay within shouting distance of each other.

10. Some firms use three-person crews but the same safety rules apply. The head sawyer—bull bucker or woods boss—is in charge, and he or she is responsible for the safety of the falling crew and any others who might be endangered by the falling operations. He or she should be an experienced faller.

11. When electric saws are used by line crews only qualified linemen should tap into powerlines. (The saw frame should be grounded.)

12. Proper selection of saw operators is as important as for other skilled occupations. Only trained, certified workers should be allowed to use a chain saw. Risk assessment must be carried out before carrying out chain saw operations.

**Handling and transportation**

13. When chain saws are regularly transported by truck, suitable racks should be provided. However, when chain saws are only occasionally carried by truck they should be properly secured to prevent shifting.

14. The larger chain saws are heavy and unwieldy to carry over rough ground, fallen timber and through underbrush. If the workplaces are some distance from the road, the larger saws are usually left in the woods overnight and only the chains are carried to camp for servicing and sharpening. When not in use, precautions should be taken to prevent anyone from falling over the saw by placing it alongside a log.

15. Fallers and buckers should stop the chain of power saws when moving from cut to cut. Chain saw operators should shut off the saw motor when carrying it for a distance greater than tree to tree. (Distance usually means less than 150 feet.) On electric chain saws, the cables should be disconnected at the motor end. When the saw is to be carried, it should be grasped at the top section of the handle with the cutter bar directed to the rear. Use a scabbard or bar guard to cover the chain when carrying or transporting a chain saw.

**Two-person operation**

16. It is especially important that operators have secure footing so they will not slip. In a two-person chain saw operation, the individual on the engine
end should always stand on the high or safer side of the tree. To coordinate the work of chain saw operators properly, a standard set of signals should be established.

17. The chain saw should not be started until the saw is in position and ready to cut. The motor end should be held solidly against the tree before starting the cut to prevent jerking or jumping. The operators should stand as far as possible behind and in line with the engine end of the saw, never beside it. They should have both hands on the handles and should keep them there until the chain stops.

18. When using a two-person type saw for bucking cuts, the transmission should be swiveled so the cutting teeth run toward the motor on the underside of the bar, thus tending to pull the motor end against the tree. The individual at the motor end should keep his or her body in contact with the motor frame at all times while the saw is in operation. If the saw binds and kicks back, he or she will be pushed rather than struck. The engine end of the saw should be started into the tree first. After the saw is well into the cut, the nose end should be swung around to bring the saw evenly into the cut. Then the saw will not sag between the engine and the bar, which could cause pinching of the chain.

19. Cuts from the running chain are the most frequent and serious type of incident resulting from the use of power saws. It is imperative to avoid contact with the chain. Workers should make sure the chain does not travel on the bar when the engine is at idling speed. If it does, the engine is in need of adjustment or the centrifugal clutch operation may be faulty. It also is extremely important that the fallers stand behind the saw, never at the side.

20. Undergrowth should always be cleared from around the tree with an axe before the saw cut is started.

Note: Brush and saplings should not be cut with chain saws, because such growths are likely to whip when they are cut.

21. Properly made undercuts make falling safer. Correctly done, the undercut guides the direction of fall. In chain saw operation the undercut is usually made with a saw rather than with an axe, so it is impractical to make the conventional V-shaped undercut. There are several types of undercuts (Figure 1). Undercuts are made either entirely with a chain saw or with a chain saw and axe. Sometimes a special axe, a “Pulaski,” is used to cut the undercuts.

22. When a large tree is being cut, a stepped undercut should be used to keep it from rolling onto the stump. The step should always be parallel to the undercut (Figure 1). When trees are less than 18 inches in diameter some operators prefer to make a conventional V-shaped undercut, making the horizontal cut with the saw and chopping out the angular cut with an axe (Figure 1). From the standpoint of safety there is little choice between these methods.
23. For proper control of a tree, it is important to remember that the undercut should be at least one-third of the diameter of the tree, and the undercut removed before the back-cut is started, so the tree will fall straight and not slab or kick back. The undercut should be high enough to permit the tree to lean 30 degrees from the vertical before closing. (The back cut should be two-inches above the undercut, and it should be straight.)

24. In western areas, the Humboldt under-cut is used (Figure 1). This technique involves making a horizontal cut into the bole of the tree to one-fourth to one-half of the diameter of the tree. The saw is then slanted upward, and a bottom kerf is made. Finally, the backcut is made above the undercut.

Falling trees

25. Backcuts should always be started slightly above an undercut, about two inches, which will help prevent kickbacks. After the undercut has been sawed, the saw should be stopped, and the undercut wood removed. If the ground is level and unobstructed, the saw should be carried to the opposite side of the tree. If the work is being done on a hill or on very rough ground, it may be safer to swing the nose end of the cutter bar around, pivoting it on the spike or claw mounted on the engine end. A path of retreat should be laid out prior to the start of the back or falling cut.

26. With a one-man saw there is little need for side notching (Figure 1), particularly if the saw bar is long enough to reach more than halfway through the tree. There is some danger when side notching; e.g., the tree will fall with the side notch, as the side notch weakens the holding wood on that side.

27. Normally, when the backcut approaches the undercut, the saw should be cutting parallel to the backcut. During the early part of the cut it is customary to “corner” (cut on alternate sides). The tree will then hinge on a small section of “holding wood” along the undercut and fall straight. If either end of the fast-cutting saw “leads” and cuts away the holding wood on one side, the tree will tend to fall in the direction of the remaining holding wood.

28. If the tree is a “leaner,” it is important to leave more holding wood away from the “lean” to pull the tree in the direction desired and in timber more than 18 inches on the stump to corner always on the backcut. It also will be necessary to use some type of “dutchman.”

29. “Cornering” involves cutting through the sap wood on both sides to discourage slabling. Even trees without much lean should be cornered, because it ensures safer, cleaner cutting and prevents the tree from pulling part of the stump. The back-cut should be started on the side of the tree and the sap wood should be cut through. The saw should then be quickly worked around in the cut to the other side. A handsaw should be available to finish the cut.

30. If a tree has a heavy lean in the direction it is to be fallen, it should be given an extra large undercut and the sides notched, as shown in Figure 1, to prevent slabling or splitting up from the stump.

31. If the tree has a heavy lean, another method to use with the one-person saw is to bore in with the tip of the saw leaving a piece at the back until last. This method prevents slabling and splitting or “barber” hairs.

32. If the tree settles back after the saw has fully entered the cut, it may bind on the chain at the back and may cause the whole machine to kick violently in the direction of the operator. If a tree has a tendency to bind it must be wedged. Great care should be taken. The saw must be stopped while wedging is being done to prevent the running chain from striking the wedges.

33. Wooden, magnesium or plastic wedges are used effectively in most operations, and will not damage the cutting chain beyond repair if driven too deeply, nor will they throw steel splinters, which might cause eye injuries.
Moving away from a tree

34. Personnel operating power saws often hold the saw and stay near the base of the tree when it falls. This practice should be absolutely prohibited. When the tree starts to fall, the power should be shut off and the saw laid on the ground at the base of the tree.

35. Operators should then move back quickly over a prearranged route at a 45 degree angle opposite the direction of fall, and place themselves behind other trees, if possible, or they should face the tree in order to see the path it takes in falling. They also should stand back at least 25 feet. They will have ample time if they plan their escape in advance.

Springboard and use of pole

36. The fast, easy cutting of power saws makes it possible to cut low stumps. Thus, use of springboards or a forked pole to hold the tail stock end is not usually necessary except on unusually steep ground. Springboards should never be used for chain power saw falling if it is at all possible to do without them. A forked pole to hold the tail stock or “stinger” end is preferable for high reaching. It enables the fallers to stay on the ground and beyond reach of the saw chain. A pole with a ring on the end (Figure 2) is safer than a forked pole, because it not only enables the faller to hold up the tail stock, as he or she can with the forked stick, but it also permits pulling down and guiding the saw as if it were held in his hand.

37. As the use of a pole creates an additional hazard from flying sawdust, fallers using a pole should wear safety goggles. If the man at the motor end must work from a springboard, he should never attempt to adjust it while standing on it and holding the saw. He should always have a springboard long enough to enable him to stand at the end of the saw, never at one side.

Warning to nearby personnel

38. The falling of a tree by using a power saw consumes so little time that ample warning should be given to other personnel before the backcut is started.

If a person is in the danger zone when the cut is started, he or she does not have time to escape to a safe place. Therefore, the fallers should give a loud warning and wait a reasonable time for an answering shout because they cannot hear a shout after starting their cut. The saw motor must be stopped when the warning shout is given. The head faller must establish with certainty that no one is in the danger area of the tree to be felled, and he or she must know at all times the position of any workers who are in or around the danger area.

39. This procedure should be made known by special instructions and appropriate posters to all employees who may be in the woods. They also should be warned to keep out of the territory where trees are being felled. Anyone who must go into that vicinity should notify the head faller who should make sure everyone is clear before starting to fall a tree.

40. The bull bucker should be responsible for placing the fallers and buckers so they will not be working dangerously close to one another. The head faller should stop work immediately and report to the bull bucker whenever crews are working too closely together. It is a practice in some areas to allow two saws, on a cutting strip, in large timber. When the backcut is started, only one saw should be operating, and both workers should be at the tree being felled.

Figure 2. The pole for holding the tail stock of a saw for high reaching should be 6 to 8 feet long and about 1-3/4 inches in diameter. The ring should be slightly larger than the tail stock of the saw and made of scrap iron.
41. Many hazards are present in power-saw bucking. The bucker must foresee exactly what is going to happen when a cut is completed. Careful training and supervision should be required. The following precautions should be done prior to power-saw bucking:

- Each cut should be planned prior to starting an engine.
- Proper work areas should be chosen to avoid being struck by logs being cut or by other logs that may become dislodged.
- To avoid throwback stones, bark and other debris should be cleared.
- Legs should be well apart or positioned to one side of the machine; if kickback occurs it will not strike the legs.
- When possible, all under-buckling should be done with the cutter chain in the inverted position.
- Cuts should be completed with a hand saw, if it is safer.
- When cuts cannot be made safely, the condition should be reported to the foreman.
- Logs incompletely cut should never be left lying around.

42. Another factor affecting the safety of the bucker is that the weight of equipment in his or her hands hinders a quick getaway when the cut is completed. He must, therefore, work in a spot where he will not be struck by the log being bucked or by other logs that may be dislodged by it. It is sometimes advisable to block or prop up the log to prevent it from rolling. In some instances it is safer to complete a cut with a hand saw rather than with a power saw.

43. The bull bucker or other person supervising this work has the responsibility for the safety of other personnel. It should be understood that if a situation looks unsafe, the bucker should notify the supervisor and receive instructions as to how the log may be cut safely. If it appears that it cannot be cut safely where it lies, it should be skidded to a more advantageous position, or other necessary steps taken to make the job safer.

44. If a log is lying flat against the ground at the point where it is to be cut, all stones, bark and soil should be sufficiently cleared so the chain will not throw them in the direction of the operator. Should it be necessary to back out of a cut with a two-person saw, operators should make sure the engine end is anchored to the ground while the individual on the idler end of the saw applies the upward pressure. This will prevent kickback of the engine and possible injury to the operator.

45. Wherever possible, the engine operator on the two-person saw should stand with legs well apart while making bucking cuts. If a kickback occurs unexpectedly, the engine will not strike the operator on the legs.

46. If two saws are being used when bucking, they should not be operated one above the other on sloping ground.

47. Buckers may often make themselves a trap (Figure 3). Therefore, a bucker should keep cuts straight and place the undercut to one side of the top cut, depending on which log is going to drop, or raise it from its present position. Lateral movements of a log can likewise catch a bar or chain.

48. Before beginning to cut, a bucker should size up the situation to determine what movement the log will make when cut and should use the weight of the log to his or her advantage.

### One-person saws

49. One-person saw equipment is by far the most popular used for falling, bucking and limbing. Most operators feel its light weight and greater maneuverability will eliminate the strains and falls sometimes resulting from the use of the heavier two-person saw.
However, due to its light weight, there may be a tendency for an operator to swing the saw up from the ground resulting in a back strain or a “glancing blow” incident.

Before starting to saw, the operator should ensure that the chain is not touching anything, because there is no tail stock to keep the free end of the chain bar off the ground.

When a one-person saw is used to fall a tree, great care must be taken not to cut into the undercut with the nose end of the cutting log. This is easy to do because an operator cannot see around the tree. Once the saw has cut into the undercut the operator has lost control of the fall of the tree allowing it to spin off the stump and cause injury to the operator. These precautions should be followed:

- The handbook should be studied for the particular saw being used.
- Lifting should be done by bending the legs to avoid back strain.
- Saws should not be swung to avoid self-inflicted wounds or injury to others.

Before starting a motor, workers should make sure their saws are not touching anything.

Note: When making a backcut, workers should not cut into the undercut. If a saw cuts through into the undercut, the tree will be completely out of control and may spin off the stump.

Grounding electrical equipment

Electrically operated saws should be connected through a switch, fuse and Ground Circuit Fault Interrupter (GFCI) to the power source. Motor control should be through a deadman switch. The power cable should be inspected at frequent intervals and any defects repaired.

Gasoline motors

On gasoline powered saws the exhaust should be directed so it doesn’t blow toward the operators. Operators should be instructed to pull the starting coil away from their bodies. (They should never wrap the rewind starter around their hands.) The motors should be given the necessary care to make them easy to start. This will help protect personnel from strains, sprains and bruised knuckles.

Prevention of fires

Gasoline should be taken out to the job in a substantial capped container painted red and labeled “gasoline.” The container should have a suitable spout for pouring gasoline into the tank, or a funnel should be provided for this purpose. Under no circumstances should the gasoline tank be replenished while the engine is running. Any gasoline spilled on the tank or engine should be carefully wiped off before starting the engine.

Smoking should be prohibited while personnel are filling gasoline tanks. Additional precautions to prevent fires are:

- Smoking should be prohibited while filling gasoline tanks.
• Gasoline containers with a spout or funnel should be used.
• Tanks should be filled only in an area of bare ground.
• Proper gasoline and oil mixtures should be used to minimize carbonization.
• Motors should not be filled where a tank was previously filled.
• Saws should be kept clean of gasoline, oil and sawdust.
• Mufflers should be in good condition.
• Spark plugs and wire connections should be kept tight.
• Fire extinguishers should be nearby at all times.
• Flammable materials should be kept clear and away from point of saw cut.

Note: All possible causes of fire should be reported to the foreman immediately.

Personal protective equipment

57. Personnel operating chain saws and carrying them through the woods must be surefooted. In Pacific Coast forests where the ground is covered with fallen timber, good sharp calked boots should be worn. In other sections hob-nailed shoes are preferable and in the winter, rubber soled shoes. Among the most common incidents are falls, so the wearing of proper footwear to minimize this hazard should be mandatory.

58. Safety-toe footwear is a good investment for members of a cutting crew.

59. Protective helmets always should be worn by fallers and buckers and others working in the woods.

60. Heavy deadwood is often lodged in the branches of trees high over head and out of sight. Inability to hear well, because of exhaust engine noise makes it especially important that safety hats be worn. Many individuals have been killed by falling wood, and many lives have been saved by using safety hats. Their use should be mandatory.

61. Employees should wear eye protection where flying particles present a hazard.

62. A ballistic nylon patch covering part of the leg has reduced incidents to that part of the body. The patches are held in pockets or otherwise attached to the work pants. The patches increase the time for an operator to shut off the saw in the event that a saw chain should come against a leg.

63. First aid kits should be provided at the jobsite. One individual in each work crew should be trained in first aid.

64. In areas where poisonous snakes are known to exist, a snake bite kit should be provided.

65. The employer should be aware of the noise level of a chain saw and associated equipment. It may be necessary to provide noise attenuating devices (earmuffs or plugs).

Sources of information

American National Standards Institute, 1899 L Street, NW, 11th Floor, Washington, DC 20036.
U.S. Department of Labor, Occupational Safety and Health Administration, Washington, D.C. 20010:

Copyright ©2016 National Safety Council. All rights reserved.

Although the information and recommendations contained in this publication have been compiled from sources believed to be reliable, the National Safety Council makes no guarantee as to, and assumes no responsibility for, the correctness, sufficiency or completeness of such information or recommendations. Other or additional safety measures may be required under particular circumstances.