



## Investigation Guideline

**Product: Chain Saws**

**Appendix # : 2**

**Date amended: May 4, 2005**

### **I. Introduction**

#### **A. Background Information**

The Directorate for Epidemiology estimated that about 25,560 injuries were treated in U.S. hospital emergency rooms associated with chain saws for the calendar year 2002. The number of deaths involving chain saws reported to the Commission varies from 12 to 23 deaths per year between the calendar years 1995 and 2001.

The major hazard pattern identified with chain saw was kickback – which was estimated at 20 percent of injuries and almost half of the deaths. Rotational kickback is defined as a sudden upward or rearward movement of the chain saw. It most often occurs when the saw chain moving around the nose of the guide bar accidentally touches another object such as log, branch, or twig. Contact like this can throw the chain saw violently back toward the operator. Kickback can also occur when the moving chain on the top of the guide bar is pinched in the cut or binds in the wood; this is known as pinch kickback. Although the major single hazard pattern identified with chain saw was kickback, about three fourths of the injuries are non-kickback injuries including numerous scenarios resulting in the saw striking the victim. Identified non-kickback hazard patterns include: chain saw skating or bouncing, loss of saw control, follow-through after cut, loss balance (operator), unaware of bystander location, and falling tree or tree branch. In addition, miscellaneous injuries occur when the victim inadvertently contacts the moving chain or coasting chain during position changes, or even when the victim contacts the non-operating chain during repairs or other handling. More investigations are needed to monitor these hazard patterns in order to reduce the frequency of injuries through additional standards or information campaigns.

From 1979 to 1985, the primary focus of the Commission was on rotational kickback hazards. The CPSC staff participated with the chain saw industry in developing amendments to the American National Standards Institute (ANSI) voluntary standard for gasoline powered chain saws, B175.1 –1985, to reduce the likelihood that rotational kickback would result in serious injury and death. Since 1985, the focus has been on non-kickback hazards, particularly those involving skating/bouncing and one-handed operations. In 1986, voluntary standard for electric chain saws was published. In the same year, the commission confirmed virtually 100 percent conformance of new saws to kickback standard.<sup>1</sup>

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<sup>1</sup> Letter from CPSC Chairman Terrence Scanlon to Mr. Donald Purcell, President, Portable Power Equipment Manufacturers Association, November 23, 1987.

The current standard for gasoline chain saws is ANSI B175.1-2000. Its full title is “American National Standard for Power Tools – Gasoline – Powered Chain Saws – Safety Requirements.” It was last revised on October 27, 2000. In June 2002 this standard was changed from the ANSI committee process to the ANSI canvass process. CPSC is on the canvas list for this standard. As a result, CPSC will be asked to provide comments on any potential changes to the standard as a part of the ANSI approval process. The next ANSI required revision to the standard is to be in 2005<sup>2</sup>.

The current standard for electric chain saws is UL 1662-1998. It was last revised on April 8, 1998. CPSC has not participated in this standard. The standard has “Kickback” provision that was adopted from ANSI B175.1. The next required revision to the standard is to be in 2003<sup>3</sup>.

## **B. Product Descriptions**

Gasoline and electric chain saws can be used for many purposes – cutting firewood, clearing land, or trimming trees. Chain saws are powerful and efficient tools, but they can be very dangerous and, therefore, must be used with great care. Most chain saws are comprised of the following parts:

### 1. Saw Chain

- Describe any missing or broken parts.
- Determine looseness or tightness of chain. Note if there is visible sagging of chain at bottom of guide bar.
- Determine if chain is self-sharpening type.
- Determine if chain is sharp or dull. Try to discover amount of cutting time since chain last sharpened.
- Determine the age of chain. Is it original or replacement? Who installed chain on saw? Try to obtain estimate of usage hours.
- Determine whether it is a low kickback chain that is capable of reducing chain saw kick back.
- Describe any other chain problems known to owner or operator.

### 2. Guide Bar

- Was it a reduced-kickback guide bar (which has been demonstrated to reduce kickback significantly)?
- Guide bar brand name.
- Guide bar shape - symmetrical, asymmetrical, or bow.
- Guide bar tip (difference is presence of teeth on nose of guide bar): solid (without teeth) or sprocket (with teeth).

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<sup>2</sup> Murphy, John R., ESME, Directorate for Engineering Sciences, CPSC – September 30, 2003.

<sup>3</sup> *ibid*

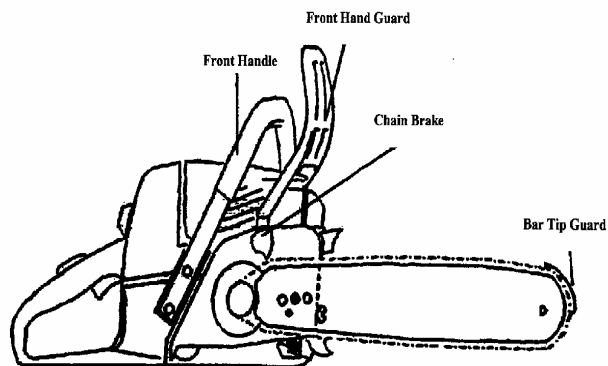
- Guide bar length (from the tip of the nose to front handle), in inches.

### 3. Hand Guard

A hand guard, when present, will be found between the front handle of the saw and the guide bar and is intended to prevent the hand from contacting the chain. They often may be attached to, or part of, the chain brake mechanism. Hand guards may be solid or have open areas and may be rigid or somewhat flexible. One common hand guard is the non-wrap around which extends only over the area in front of the upper portion of the front handle (Figure 1). Another is the wrap around which parallels both the upper and left side of the front handles (Figures 2-3 in different angles). Determine the following with respect to the hand guard:

- Did the chain saw have a hand guard when it was purchased or acquired? Was it on the saw at the time of accident? If not, determined why not.
- Described hand guard on the saw at the time of accident if it was physically attached to the saw.
- Described hand guard condition at time of incident (i.e., broken, bent, or in good condition).
- Determine if hand guard bent or deflected during the incident?
- Determine and describe any permanent damage that may have occurred to hand guard during incident and how it might have happened.

**Figure 1**



4. Chain Brake (A device used to stop the saw chain, Figure 1). Determine the following:

- Was chain brake attached to the saw at the time of purchased?
- Was it operating at the time of the incident?
- Was it adjusted/serviced just before the incident? Give time since last adjustment.
- Were there problems associated with chain brake?

5. Nose Tip Guard/Bar-Tip Guard

A shield that prevents contact with the chain at the tip of guide bar and which may be removable and replaceable (Figure 1). Determine the following:

- Was it factory attached to the saw when purchased or obtained?
- Was it attached at the time of incident?

**Figure 2**



**Figure 3**



### **C. Specific Items of Interest**

Incidents involving chain saws require information on product, brand, model, cubic inch displacement (CID), amperage (Amps), as well as details about the chain, guide bar, and safety devices such as hand guard, nose tip guard, and chain brake (see illustrations). Include all gasoline and electrical powered chain saws.

### **C. Headquarters Contacts**

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## **II. Instructions for Collecting Specific Information**

### **A. Synopsis**

Please provide a summary of the sequence of events that occurred prior to and during the incident that includes the following important information:

- Position of the saw.
- Position of the operator.
- Position of the victim (if not operator).
- Position of object being cut.

- Whether the saw was inside the cut or just being directed to the wood (or kickback object).
- Direction of injuries (vertical or horizontal).
- Object causing kickback.

## **B. Description of Incident Environment**

Describe the location and environment of the incident, working areas, and object being cut. Also describe operator's intended actions, e.g., limbing, bucking, felling, or clearing prior to the incident and the following:



LIMBING



BUCKING



FELLING



CLEARING

- Any adverse weather conditions, temperature, wind speed, and direction, rain, snow, etc.
- Lighting conditions at the time of the incident.
- Where operator/victim was standing (condition, shape, and material), e.g., on pile of logs (one foot diameter or stacked three feet high).
- Ground surface conditions, e.g., wet/dry, or slippery.

### C. Description of Interaction between Injured Person(s) and Product

- Stipulate the type of material being cut, length/diameter, hard wood, softwood, condition of wood – frozen, wet, knotty, green, or rotted.
- Specify whether operator held saw with one or both hands.
- Specify position of hands and feet.
- Describe grip on front handle, firm/relaxed, elbow locked/bent.
- If **one-handed** operation, describe how saw was held and activity of hand not holding saw.
- Indicate whether trigger was released at the time of accident.
- Indicate whether chain was moving (running, coasting, stopped) at the time of the incident (note **chain brake activation**).
- Describe orientation of saw to wood being cut: cutting edge (upper or lower blade), angle of entry, position of the operator (or victim) relative to saw and wood.
- Indicate if guide bar was parallel, perpendicular, or some other angle to the ground.
- Describe object that causing kickback; whether object being cut or other (specify).
- Describe where object contacted chain or guide bar: tip (mid, upper, lower), bar top, bar bottom, other (specify).

### D. Description of Victim Contact

State whether the victim was the operator, helper, or bystander. Including victim's age, sex, and severity of injury. Obtain the following information:

- Exact body part injured (i.e., palm, or back of hand) and length of laceration (number of sutures).
- Days of hospitalization, work loss, temporary or permanent disability
- Handedness of operator.
- Experience with chain saw and length of experience.
- Operator's condition at the time of injury e.g., tired or distracted.
- Operator's age and sex, if not victim.
- Duration of saw use that day.
- How long the operator had been using chain saw with the chain turning (prior to injury).
- Any medication victim took and whether victim had any competence reducing physical or medical handicaps.
- Alcohol consumption.
- A complete description of clothing and safety equipment in use (e.g., sure-grip gloves, safety shoes, safety goggles, hard hat, hearing protectors).



### **III. Photographs/ Diagrams of Incident Scene**

Accident involving chain saw kickback require at least **two profile photographs** from which we intend to determine the angle or arc the saw rotated or traveled during the incident.

- (1) **WITHOUT POWER TO THE SAW**, have the operator duplicate the position of the saw and his body at the moment before the incident (also position victim if not operator).
- (2) **WITHOUT POWER TO THE SAW**, have the operator stand in the position as he was struck. The saw should be in the striking position. In theory only the saw, operator's hands, arms, and torso have moved from the first to the second pictures. The feet probably have not moved (also position victim if not operator).
- (3) **WITHOUT POWER TO THE SAW**, take one picture (**front view, full figure**) which will show the position of the right and left hands on the saw and position of the saw relative to the body as the operator was standing at the time of the incident.
- (4) **WITHOUT POWER TO THE SAW**, take one picture of the **operator's hands** on saw handles as they were at the time of the incident.
- (5) **WITHOUT POWER TO THE SAW**, take (**close-up**) pictures of chain saw, chain, guide bar (brand, shape, length, and guide bar tip), and hand guard/chain brake.

### **IV. Obtaining samples and documents related to the investigation**

Obtain operator instruction manual, if available. Obtain copy of labeling, or transcribe label. In case of fatality, obtain medical examiner reports and police/sheriff or fire marshal reports if possible.

**(DATA RECORD SHEET ATTACHED)**

**DATA RECORD SHEET**  
**Investigation Guideline**

**PRODUCT: Chain Saws**

TASK NUMBER \_\_\_\_\_ INCIDENT DATE \_\_\_\_\_

1. Is the chain saw that was used at the time of the incident **gas** or **electric**?
  
2. Had the chain saw been **changed** or **modified** in any way? How was the saw changed or modified?
  
3. At the time of the incident was the operator using a **low kickback** chain (stops before the saw reaches the 45<sup>0</sup> angle)?
  
4. Has the operator/owner ever **replaced** the chain? How often does he/she replace the chain?
  
5. What is the **brand name** of the chain that the operator used with the saw at the time of the incident?
  
6. Did the operator/owner of the saw receive **safety instructions** with the replacement chain?

7. Does the chain saw have a **self-sharpening** feature?

8. In the last year, how many times, if ever, has the operator/owner **sharpened** or **filed** the chain him/herself?

9. What kind of **guide bar** was on the chain saw at the time of the incident, was it symmetrical, non-symmetrical, or bow?

10. What was the **length**, in inches of the guide bar? (length is measured from the housing of the engine to the tip of the bar).

11. Has the operator/owner ever **replaced** the guide bar? How many times in the last year?

12. Did the saw that was used at the time of the incident have a **chain brake** as a safety feature?

13. Did the chain brake **come with** the saw or was it purchased separately?

14. Does the operator use the chain brake to **stop the chain** in addition to it's being a safety feature?

15. At the time of the incident, had the chain brake **been activated**?

16. Was the chain brake **operating properly**?

17. Did the saw used at the time of the incident have a **nose-tip guard** (“noz guard”) as a safety feature?

18. Was the nose-tip guard **attached to the bar** of the saw when purchased, borrowed, or rented?

19. Does the operator/owner always **leave** the tip on or **take it off**?

20. When does the operator/owner **remove** the nose tip guard?

21. About what **percent** of the time does the operator/owner use the nose-tip guard?

22. Did the saw have a **front hand guard** as a safety feature when purchased?

23. What **type** of front hand guard is attached to the saw at the time of the incident?

24. Does the saw have on it a label with letters “**UL**” and the statement that the chain saw meets the **ANSI B 175.1-2000, the American National Standard for powered chainsaws**?

25. In the **operator's opinion**, what caused the incident?

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