

LEGISLATIVE INTERPRETATIONS

Topic: Chain Shot on Mechanical Harvesters	Issued by: Director, Compliance and Regulatory Review
Statute: General Regulation – 91-191	Date Issued: July 2016
Section: Section 219(1), 223(1), 223(2), 242(3) and 242(5)	Date Revised:

Question

How can I minimize the risk of chain shot injuries to mechanized timber harvesting and processing operators and to bystanders?

Response

Chain shot occurs when a harvester head chain breaks. After a break, the free end of the chain whips away from the break, and if the chain is not contained by the saw box or some energy absorbing guard, the broken end will speed up rapidly, carrying with it tremendous dynamic energy. At the peak of the whip, chain parts may break loose and be thrown at high speeds, especially if the free end of the chain strikes the saw box. Chain parts can be thrown in many directions, although the highest risk zone is along the saw's plane. Researchers estimate that a chain shot might occur once in every 50 chain breaks (Hallonborg, 2002).

This interpretation provides the forest industry with practical steps that owners and operators of mechanized harvesters can take to avoid serious injury. The following practices must be adopted to minimize the risk associated with chain shot.

1. Chain Shot Guards and Catchers

Properly designed chain shot guards and catchers greatly reduce the danger of a chain shot from the drive sprocket area. However, there is currently no known way to place similar guards in the bar tip area without significantly disrupting the cutting operation. Because of this, chain shots can be generated and pose the same risk of injury and death as those generated at the drive sprocket area. Equipment should be designed with appropriate guards and catchers such as a:

- Chain shot guard near the drive sprocket
- Chain arrestor / catcher

Chain Shot Guard: A chain shot guard is an energy-absorbing piece of material (such as heavy rubber) mounted behind the drive sprocket. This guard has two functions:

- Absorbs the energy of a broken chain coming in contact with the saw box, and prevents chain parts from breaking off and being ejected.

- Acts as an extension of the saw box, reducing the opportunity for thrown chain or chain parts to escape the saw box.

Chain Catcher: A chain catcher can help contain a thrown chain, and is a complement to guards and shields. The chain catcher is a sturdy rod placed perpendicular to the centre of the drive sprocket. It can be mounted either to the drive shaft, or to the saw box, with a narrow gap for chain installation and removal.

2. Glazing Material for Windows

Appropriate windshield material must be installed and maintained. Glazing material with at least 19 mm polycarbonate is recommended to avoid chain shot penetration of windshields.

(<http://www.cmeig.com.au/documents/CMEIGPositionPaper-ChainShotPhenomenon.pdf>)

Equipment Maintenance

- Review the saw's speed and maximum pressure to ensure they are within manufacturer's specifications. *A suggested best practice is to install tamper indicators to the adjustor controls for the pressure and flow control valves.*
- Ensure the chain speed is controlled within the specifications provided by the manufacturer.
- Inspect chains frequently and replace any damaged, dull, worn or cracked chains. *Industry groups recommend that chains be discarded after the second break.*
- Always use new parts when repairing chains.
- Always sharpen chains to factory specifications.
- Maintain proper bar and chain lubrication.
- Maintain proper chain tension.
- Replace the drive sprocket when it has visible signs of wear.

3. Provide Instruction

Proper instruction will help minimize the exposure of operators and bystanders to the saw's cutting plane. Operators must be instructed to never point the saw blade at the harvester's cab. Chain shot parts can ricochet off objects in their path and come out of the plane of the saw bar. Bystanders should remain out of the saw bar's plane to minimize injuries.

To prevent these types of events:

- Ensure operators and bystanders stay clear of the saw bar's plane when operational.
- Extend the exclusion zone to at least 70 m along the line of sight through the front window.

General Regulation – 91-191

“safeguard” means a guard, shield, guardrail, fence, gate, barrier, safety net, wire mesh or other protective enclosure, handrail or other similar device designed to protect the safety of a person, but does not include protective equipment.

219(1) An employer shall ensure that powered mobile equipment has a cab, screen, shield, grill, deflector, guard or other adequate protection for the operator if the operator may be exposed to the hazard of flying or intruding objects.

223(1) An employer shall ensure that glazing used as part of an enclosure for a cab, canopy or rollover protective structure on powered mobile equipment

(a) meets the requirements of SAE standard J674-NOV90, "Safety Glazing Materials - Motor Vehicles", and (b) is immediately replaced if it presents a hazard to the operator of the equipment.

223(2) Notwithstanding paragraph (1)(a), rigid plastic materials meeting ANSI/SAE standard Z26.1-1996, "American National Standard for Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways – Safety Standard" may be used in all areas on a rollover protective structure, including the front windshield.

242(3) Where there is a possibility of a failure of a machine that may result in an injury to an employee from a flying object, an employer shall install a safeguard strong enough to contain or deflect any flying object.

242(5) Where an employer has determined that an adequate safeguard for a machine cannot be provided, the employer shall ensure that a physical modification of the machine is carried out or a change in work procedure is put into place to protect employees from being exposed to the hazards associated with the lack of an adequate safeguard.