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OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD

BOARD STAFF'S REVIEW OF PETITION FILE NO. 549

Petitioner: Mr. Jeff Buchanan

Submitted by: Michael Nelmida
Title: Senior Engineer-Standards
Date: December 21, 2015

INTRODUCTION

On August 20, 2015, The Occupational Safety and Health Standards Board (Board) received a petition dated August 20, 2015 from Mr. Jeff Buchanan (Petitioner).

Labor Code Section 142.2 permits interested persons to propose new or revised regulations concerning occupational safety and health and requires the Board to consider such proposals and to render its decision no later than six months following receipt. In accordance with Board policy, the purpose of this evaluation is to provide the Board with relevant information upon which to base a reasonable decision.

The Petitioner requested that the Board amend Title 8 California Code of Regulations (CCR) Section 3424 of the General Industry Safety Orders. The Petitioner puts forward his position that the current standards governing chippers are insufficient to protect employees. The Petitioner compares the existing standard with the Federal guarding requirements within 29 CFR 1910.212 and expresses his concern that the California Standard does not achieve the goals set for the Federal Standard. The Petitioner believes that his device would afford the protections required under the Federal Standard. In subsequent discussions with Board Staff during the evaluation period, the Petitioner requested that the Board consider rulemaking that would mandate employers in the tree trimming industry (Treework, Maintenance and Removal) to install Chipsafe®, a passive detection system, as a means to guard the point of operation of wood chippers.

HISTORY

Board Staff found no prior Petition requests for sensor modifications to brush and slash chippers.

The requirements of Title 8, Sections 3424 and 4299 were written in 1985. Though each standard was adopted separately, based on the Final Statement of Reasons for each, both standards are based on the requirements of ANSI Z133.1 (1982) Section 5.3.

REASON FOR THE PETITION

The Petitioner, within his petition, identifies published statistics related to fatal and non-fatal accidents involving wood chippers. Wood chippers are mechanical devices that utilize a rotating cutting head to grind brush, branches and other material from trees and shrubs into smaller chips. The Treework, Maintenance and Removal industry utilizes wood chippers to consolidate waste material into transportable volumes for offsite disposal.

The Petitioner currently co-owns U.S. Patent No. 8,322,259 B2 entitled *Safety System and Method for Cutting Machine*. The device, Chipsafe®, the Petitioner identifies within his petition is a presence sensing device (the Petitioner refers to as "passive detection system") which halts the operations of the infeed rollers of the wood chipper when the accessories supplied by the manufacturer and worn by the affected employees are detected, by the detection plates located near the point of operation.

The Petitioner explains that the current regulations within Title 8 do not adequately prevent the operator from having any part of his body in the danger zone during the operating cycle. The Petitioner promotes his device, as a means to ensure that employees who may be pulled into the chipper are able to stop the chipper without conscience intervention.

NATIONAL CONSENSUS STANDARD

ANSI Z133.1-2012 is the current consensus standard that addresses chippers in the tree care industry, which mirrors the Title 8 requirements for the guarding of chippers.

FEDERAL STANDARDS

The Federal Regulations include specific guarding requirements for chippers.

1910.269(r)(2) Brush chippers.

1910.269(r)(2)(i) Brush chippers shall be equipped with a locking device in the ignition system.

1910.269(r)(2)(ii) Access panels for maintenance and adjustment of the chipper blades and associated drive train shall be in place and secure during operation of the equipment.

1910.269(r)(2)(iii) Brush chippers not equipped with a mechanical infeed system shall be equipped with an infeed hopper of length sufficient to prevent employees from contacting the blades or knives of the machine during operation.

The Petitioner points to 29 CFR 1910.212 in his petition, as the guarding requirement that he identifies as applicable.

1910.212(a)(3)(ii) which states:

> *The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.*

The "danger zone" for chippers is the infeed portion of the chipper where the material is hogged (at the cutting head) and where the material is fed into the machine (including the area within the hopper).

DIVISION EVALUATION

The Division, in their evaluation dated November 4, 2015, recommended that an advisory committee be convened to explore the safety and economic issues of the passive detection system. The Division identified limitations regarding the operation of the Petitioner's device including detection limitations and potential wear of the accessories worn by employees which would render the detection system null. Board Staff agrees with concerns raised by the Division with respect to the detection limitations and potential failure due to 'wear and tear' of the

essential detection accessories. Moreover, should the employees neglect to don the accessories; the employees would not be detected by the device, and thus not protected. The Division also raised concerns about pursuing a regulation that require employers to install devices that are subject to intellectual property laws such as patents. Board Staff echoes these concerns.

BOARD STAFF EVALUATION

The device at the center of the Petitioner's petition is currently integrated as a companion safety device on some chippers. A demonstration of the passive detection system was observed by Board Staff. The detection system utilizes rare earth magnets sewn into accessories worn by the employee and a pair of detection plates mounted within the hopper. The detection plates (also referred to as antennae) detect the magnetic field from the magnet as the accessory passes over the plates. The principle behind the detection method only requires one plate and one magnet, however two plates are used to increase the detection of the magnets. Control circuitry halts the mechanical infeed system when the detection plates sense the magnetic field. The detection system will not detect (nor protect) an operator who does not wear the supplied accessories.

Figure 1. from Morbark website

Figure 2. from Morbark website.

Board Staff reviewed the requirements under the General Industry Safety Orders (GISO).

Brush and Slash Chippers guarding requirements are specified within Section 4299 and nearly identical requirements are codified within Section 3424. Section 3424 however, applies specifically to Tree Work, Maintenance and Removal.

Section 3424(c) requires:

> *(c) Brush Chippers.*
>
> *(1) Each rotary drum tree or brush chipper or disk-type tree or brush chipper not equipped with a mechanical infeed system shall be equipped with an infeed hopper not less than 85 inches, measured from the blades or knives to ground level over the centerline of the hopper, and shall have sufficient height on its side members so as to prevent personnel from contacting the blades or knives of the machine during normal operations.*
>
> *(2) Each rotary drum tree or brush chipper or disk-type tree or brush chipper not equipped with a mechanical infeed system shall have a flexible anti-kickback device installed in the infeed hopper for the purpose of protecting the operator and other persons in the machine area from the hazards of flying chips and debris.*

Chippers without mechanical infeed systems are required to have both an infeed hopper and an anti-kickback device (as stated above). The infeed hopper protects employees by increasing the distance from where the employee stands during normal operation and the cutting head. The anti-kickback prevents material that the operator feeds into the chipper from rebounding back at the operator or anyone at or near the entry point. Cutting heads typically rotate at high speeds, under high torque and momentum. The cutting heads, when in motion, cannot be stopped quickly.

However, under Section 3424(c)(6):

> *(6) Each disk-type tree or brush chipper equipped with a mechanical infeed system shall have a quick stop and reversing device on the infeed. The activating lever for the quick stop and reversing device shall be located across the top, along each side of, and as close to the feed end of the infeed hopper as practicable and within easy reach of the operator.*

Chippers with a mechanical infeed system feed brush and tree branches to the cutting head at a predetermined rate. The mechanical infeed system operates independent of the cutting head. The quick stop and reversing device controls the feed rollers and not the cutting head. A quick stop and reversing device protects employees, however the device is not required on all chippers with a mechanical infeed system.

The passive detection system relies on the independent control of the cutting head from the mechanical infeed system to protect employees from the cutting head. A button, a switch, or

other control can halt the flow of material into the chipper in less time than is required to stop the cutting head. Various manufacturers utilize methods such as stop bars (See Figure 3) along the base of the hopper or the quick-stop and reversing device (required only on disk-type chippers with a mechanical infeed) to prevent employee contact with the cutting head (See Figure 4).

Figure 3 From Federal OSHA website

Figure 4 From Federal OSHA website

The protection is accomplished by stopping the mechanical infeed system while the cutting head (behind the infeed system) remains in motion. The halted infeed mechanism prevents employee contact with the rotating cutting head by acting as a barrier to the cutting heads.

Table 1 illustrates the applicability of the requirements of Section 3424. The guarding requirements contained within Section 3424 apply to tree and brush chippers in the tree trimming industry while Section 4299 (which has almost identical requirements) applies to all other industries covered by the General Industry Safety Orders.

Table 1 Applicability of Tree or Brush Chipper Guarding Requirements within Title 8, Section 3424

	Rotary Drum without Mechanical Infeed	Rotary Drum with Mechanical Infeed	Disk-type without Mechanical Infeed	Disk-type with Mechanical Infeed
3424(c)(1) Infeed Hopper	Required	Not Required	Required	Not Required
3424(c)(2) Anti-kickback Device	Required	Not Required	Required	Not Required
3424(c)(6) Quick Stop and Reversing Device	Not Required	Not Required	Not Required	Required

Sections 3424 and 4299 do not require an infeed hopper, anti-kickback or quick stop and reversing device be installed on rotary drum chippers with a mechanical infeed.

Where no specific point-of-operation guarding requirements have been promulgated by the Standards Board, (such as the case with rotary drum chippers with a mechanical infeed) Title 8, Section 4184 applies.

Section 4184(b) states:

> *(b) All machines or parts of machines, used in any industry or type of work not specifically covered in Group 8, which present similar hazards as the machines covered under these point of operation orders, shall be guarded at their point of operation as required by the regulations contained in Group 8.*

Employers that utilize rotary drum chippers with a mechanical infeed may choose to comply with Section 4299 or <u>any</u> guarding method within the 'point of operation' standards (Group 8) as their prescribed means to protect employees from the hazards of their chipper, if they choose guarding methodologies of machines with hazards that are similar.

The Petitioner opines that the two current standards regarding the feed table and control bar (presumably Section 3424(c)(1) and 3424(c)(6)) do not prevent the operator from having any part of his body in the danger zone during the operating cycle in the same manner prescribed under 29 CFR 1910.212. Moreover, the Petitioner highlights that the Chipsafe device accomplishes the goal of guarding point of operation.

For an employer to utilize Chipsafe® as their only prescribed means to protect employees, the Chipsafe® device must comply with requirements for presence sensing devices, under Title 8, Section 4208.

Section 4208(c) which states in part:

> *(c) A presence sensing point of operation device shall protect the operator as provided in subsection (a) (1) of this section, and shall be interlocked into the control circuit to prevent or stop slide motion if any part of the operator's hand or other part of his/her body is within the sensing field of the device during the downstroke of the press slide.*
>
> *(1) The device shall not be used on machines using full revolution clutches.*
>
> *(2) The device shall not be used as a tripping means to initiate slide motion, except when used in conformance with section 4208.1.*
>
> *(3) The device shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent the initiation of a successive stroke until the failure is corrected. The failure shall be indicated by the system.*

NOTE: Muting (bypassing of the protective function) of such device, during the upstroke of the press slide is permitted for the purpose of parts ejection, circuit checking, feeding and when material in contact with the dies being formed on a press brake passes through the sensing field.

(4) The safety distance (Ds) from the sensing field to the point of operation shall be greater than the distance determined by the following formula:

Ds = 63 inches/seconds X Ts

where:

Ds = minimum safety distance (inches); 63 inches/second = hand speed constant: and

Ts = stopping time of the press measured at approximately 90o position of crankshaft rotation (seconds).

(5) Guards shall be used to protect all areas of entry to the point of operation not protected by the presence sensing device.

Section 4208 mainly applies to power operated press operation. Section 4208 criteria has been expanded to other machinery as a means to determine whether point of operation devices (not to be confused with point of operation guards) can adequately prevent an operator from reaching the point of operations while the machinery 'cycles'. Section 4208 requires the location of the sensing field be located a specific distance from the point of operation. That distance is based on the stopping time measured at approximately 90 degrees position of crankshaft rotation.

The safety distance equation within Section 4208 is intended to serve as a criterion to evaluate devices such as two-hand controls, light curtains, and pressure mats detection systems for which the safety distance is fixed, and discernible to the operator.

The distance from the sensing field to the point of operation is not clearly discernible to the operator on the Petitioner's device and similar field detection systems (Radio Frequency Sensors and Capacitive Proximity Sensors). The detection distance of field detection systems can only be determined through repeated testing by bringing the magnet to the sensors to define an approximate detection range. The strength of the detection field can vary based on the sensitivity settings.

In 2003, a device was proposed to NIOSH for evaluation. The device utilized capacitive proximity sensors (CPS) for use with commercial wood chippers. The project began with radio frequency based sensors before substituting CPS. The CPS operates similarly to the Petitioner's device in that the detection method relies on disrupting a field generated by the detection plate. With the petitioner's device, the magnet 'disrupts' the detection field. With the CPS the electrostatic field is disrupted when a part of the operator's body passes through the detection field. The distance from the detection field to the point of operation on CPS and other field

detection devices such as the Petitioner's device can only be determinate by empirical methods (repeated physical testing).

Federal OSHA in a Memorandum dated September 21, 1987:

> *Because of the uncertainties involved with the ability of radiofrequency detectors to measure intrusion accurately due to ground changes, field interference and other physical and environmental conditions,* ***CPS devices should not be used as the primary or only safeguard to protect workers who are frequently exposed to a serious hazard.*** *When used for applications involving infrequent human intervention such as perimeter guarding, CPS devices may provide adequate protection. Changes in sensing distance may not be critical if there is no need for an operator to normally reach into the danger zone. A combination of a CPS device and an automatic feeding device or other safe guarding method provides better protection.*

The Division observed just such detection uncertainties when attending a field demonstration of the Petitioner's device. Given the uncertainty that field based detection systems presents, Board Staff sees a parallel between the Petitioner's device and those detection systems Federal OSHA and NIOSH warned of in 1979 and again in 1987.

Of particular concern, Board Staff believes it is inadvisable to require the use of the Petitioner's device without it having been subjected to some type of national consensus testing/reliability criteria. Unapproved devices could be functionally unreliable in the field and if relied upon could result in serious employee injury or death. Board Staff also emphasizes that nothing in Title 8 prohibits employers from using the Petitioner's device in addition to the safe work practices within Title 8.

RECOMMENDATIONS

Board Staff recommends that the Petitioner's request be DENIED, which is to say it is recommended that at this time the Board not initiate rulemaking toward requiring use of the Petitioner's proposed passive detection system on chippers.

However, apart from denial of the Petition 549 proposal, Board Staff does see value in Staff giving further attention to potential deficiencies in existing Sections 3424 and 4299, particularly guarding requirements for drum type chippers with a mechanical infeed.