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The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education

for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.

- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.



Are You “Sweeping” Your Grain Bin Safely?

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Carol L. Jones, PhD, PE

Professor and Orville L. and Helen L. Buchanan Chair
Stored Products Engineering

Introduction

The Occupational Safety and Health Administration (OSHA) has been concerned about the safety surrounding sweep augers since 2009. The OSHA Grain Handling Standard 29 CFR 1910.272 was interpreted by OSHA to mean that an employee could not enter a grain bin while the sweep auger was engaged. About four years later, and after much discussion with industry, OSHA backed off its ruling to a certain extent. In a memorandum issued in May 2013, OSHA agreed that workers could be allowed into a bin with the sweep auger engaged if certain conditions were met. These conditions are listed below. The OSHA standards listed in this fact sheet are available at the www.osha.gov website by searching for the number of the standard.

While not all farms are under the jurisdiction of OSHA, the same safety guidelines are good “best practices” to follow to keep workers and family members safe while working around grain bins. If a farm bin has a sweep auger, efforts to meet the conditions below will certainly help to provide a safer working environment and could potentially save a life or a limb from entanglement.

Reducing Danger when Operating Sweep Augers

These 10 steps are required by OSHA and go a long way in keeping workers safe when entering and working around grain bins.

1. Workers must obtain a bin entry permit certifying that the precautions contained in 1910.272(g) have been implemented, unless the employer or the employer’s representative who would issue the permit is present during the entire operation. (An example of a bin entry permit is given at the end of this fact sheet.)
2. The grain entry points and the subfloor auger must be de-energized and locked out/tagged out before anyone enters the bin. Figure 1 demonstrates locking out/tagging out of an energy source.
3. Grates/guards must be in place and SECURED on the subfloor auger sumps before the sweep auger is operated. The grates must be secured against all forces that could act on the guard in such a way that it might be displaced. Figures 2 and 3 show an unguarded sump opening and the same sump opening with a guard imposed on the figure. The unguarded sump opening is a safety hazard

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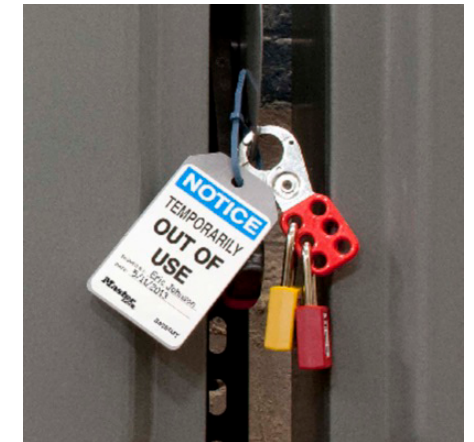


Figure 1. Lock out/tag out of electrical equipment.

because workers could step into the sump. Many limbs have been lost and deaths have occurred in unguarded sump openings with the subfloor auger in operation. Figure 4 shows a guard in place but not properly secured. Figure 5 shows a guard that can be securely attached. The space between the bars on the grates is determined by the distance between the bin floor and the auger flights or paddles (Figure 6)



Figure 2. Unguarded bin sump.

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Figure 3. Guarded bin sump.



Figure 4. Improperly secured grate.

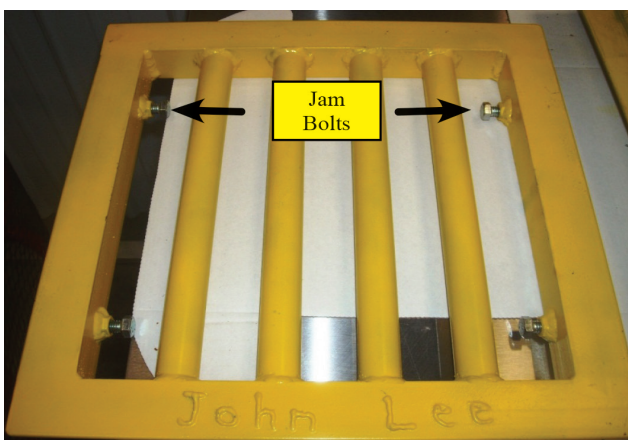


Figure 5. Grate with proper secure mounting modifications.

4. Walking on the grain where the depth of the grain presents an engulfment hazard is forbidden.
5. Sweep augers, including portable sweep augers, must have guards that protect against contact with moving parts at both the top and back areas of the sweep auger. The only unguarded portion of the sweep auger should be the front point of operation. Figures 7 and 8 show an auger with no acceptable guarding and an auger with an acceptable guard system.

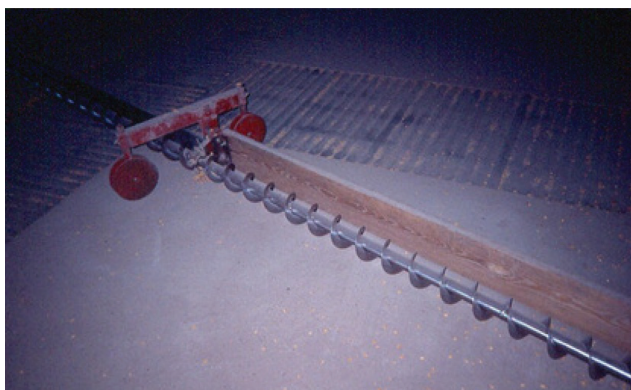


Figure 7. Unguarded sweep auger.



Figure 8. Sweep auger with acceptable guarding.

6. An observer must be positioned outside the storage structure and have contact with the person working in the bin either through sight, radio or voice. This observer must be trained in emergency procedures and rescue, and know who to contact in case of an emergency.
7. When the sweep auger is energized, a worker may enter the bin if grates are secured over the sumps (see step 3) and the worker must use engineering controls within the bin to prevent the worker from coming in contact with the operating sweep auger. These engineering controls may include:
 - a. Sweep auger equipped with an attached guard preventing contact with the worker on the unguarded portion

CONFINED SPACE ENTRY PERMIT

Example (Other examples are available on the Internet)

PERMIT VALID FOR 8 HOURS ONLY. ALL PERMIT COPIES MUST REMAIN AT THE SITE UNTIL JOB IS COMPLETED.					
Date:		Site location /description:			
Purpose of entry:					
Supervisor (s) in charge of crews		Type of Crew		Telephone #	
Communication procedures:					
Rescue procedures (telephone number at bottom):					
BOLD INDICATES MINIMUM REQUIREMENTS TO COMPLETE AND REVIEW PRIOR TO ENTRY Note: For items that do not apply, enter N/A in the blank.					
REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lockout/De-energize/Tagout			Full Body Harness w/"D" Ring		
Line(s) Broken-Capped-Blank			Emergency Escape Retrieval Equipment		
Purge-Flush and Vent			Lifelines		
Ventilation			Fire Extinguishers		
Secure Area (Post and Flag)			Lighting (Explosive proof)		
Breathing Apparatus			Protective Clothing		
Resuscitator - Inhalator			Respirator(s) (Air Purifying)		
Standby Safety Personnel			Burning and Welding Permit		
Continuous Monitoring: <input type="checkbox"/> Yes <input type="checkbox"/> No					
Periodic Monitoring Frequency: _____					
Test(s)			Permissible entry level		
Percent of oxygen			19.5% TO 23.5%		
Lower flammable limit			Under 10%		
Carbon monoxide			+35 PPM		
Aromatic Hydrocarbon			+1 PPM *5 PPM		
Hydrogen Cyanide			(Skin) *4 PPM		
Hydrogen Sulfide			+10 PPM *15 PPM		
Sulfur Dioxide			+2 PPM *5 PPM		
Ammonia			* 35 PPM		
* Short-term exposure limit: Employees can work in the area up to 15 minutes.					
+ 8 hour Time Weighted Average: Employees can work in the area 8 hours (longer with appropriate respiratory protection).					
REMARKS: _____					

safety steps, preparation for sweep-cleaning operations and disciplinary action for employees not willing to follow the requirements set forth in the operating guidelines.

Summary

With planning, training and coordination, the risks that are inherent in working inside grain bins can be reduced. Equipping with safety features and having management policies in place certainly help workers stay safe. Grain bin sweeps are an important part of the unloading process of grain bins. Guidelines for safe working conditions are in place and must be followed. When the 10 steps listed above are followed, incidents involving injury and death are greatly reduced, and

in most cases, eliminated. When these methods become habit in a facility, the safety culture of the facility is greatly reinforced.

References and other information sources:

Grain and Feed Association of Illinois *Safety, Health and Environmental Services Update newsletter*, Vol. 25, No. 7, October 2, 2013.
 Grain Journal. 2017. *Sweep Auger Safety*. September/October Issue, pps. 38 – 48.
 National Grain and Feed Association. 2013. *Guidance for Sweep Auger Operations in Grain Bins*.
 Occupational Safety and Health Administration 29CFR1910. 272 Grain Handling Standard.

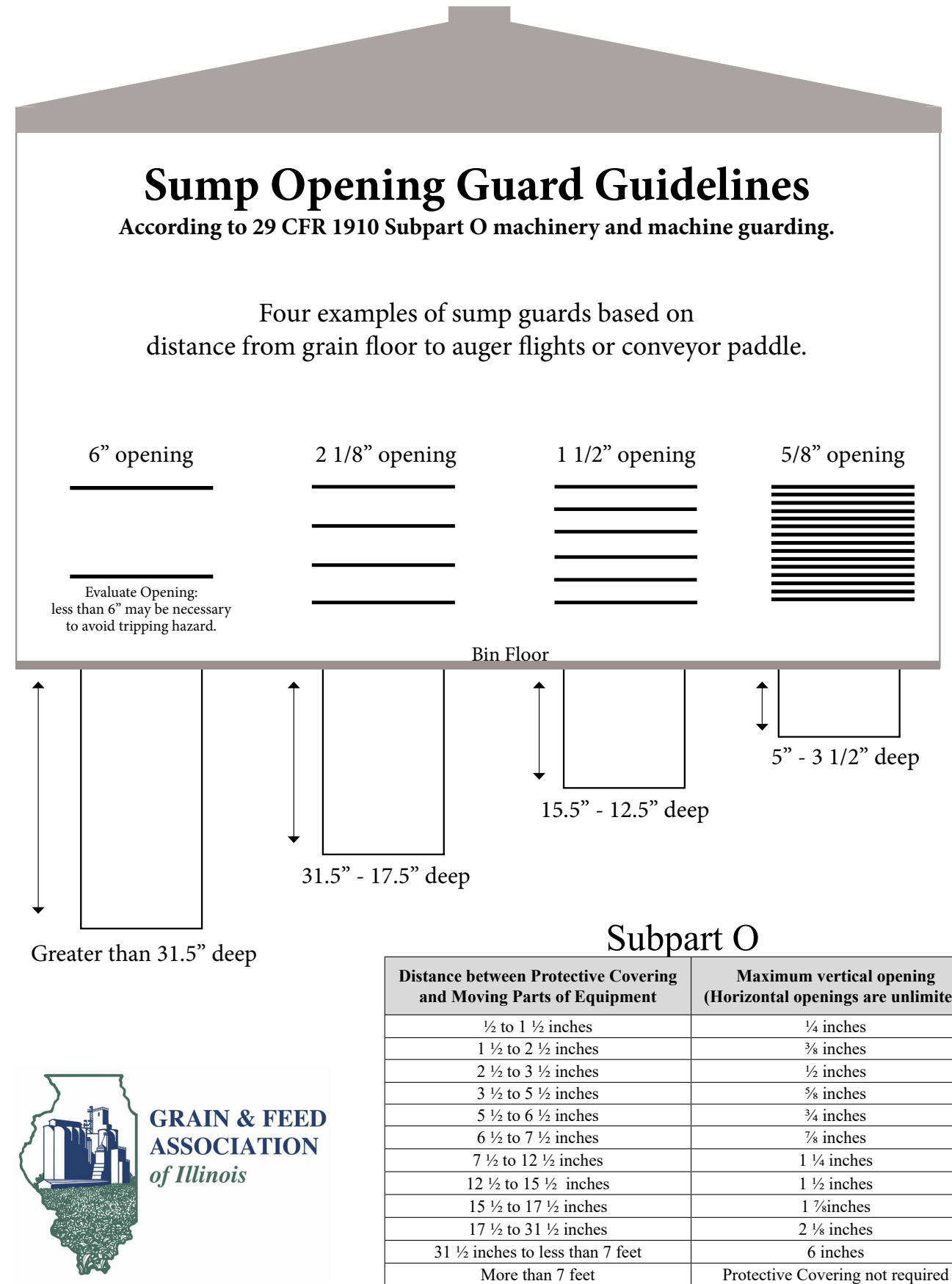


Figure 6. Sump opening guard design requirements.

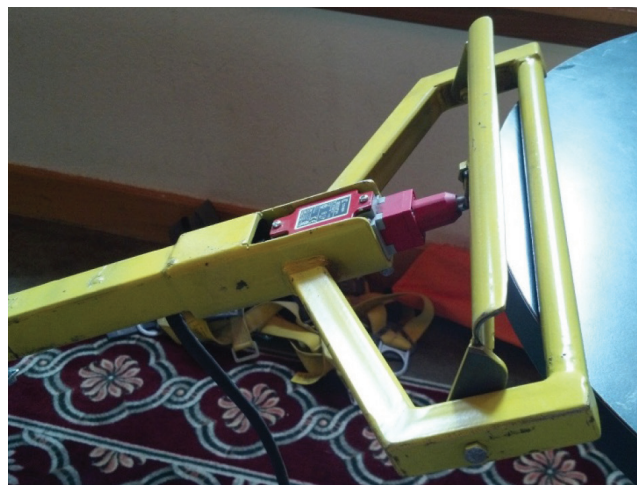


Figure 9. Sweep auger “dead man” handle that energizes the sweep auger only when the worker grips the handle.



Figure 10. “Dead man” control handle for sweep auger.

of the auger (29CFR1910 Subpart O, machinery and machine guarding).

- b. Sweep auger equipped with a dead man switch or similar device that allows operation only when the operator is in contact with the device (Figures 9 and 10). The worker must be positioned at least seven feet from the energized auger at all times.
 - c. Workers in the bin other than the person operating the sweep auger must also be protected in such a manner that they are kept out of the danger zone of the auger. This may be achieved by catwalks or guardrails. All devices should meet 29CFR1910 Subpart O (Figures 11 and 12).
8. The auger has a positive speed control mechanism or bin stop (Figure 13) device that prevents uncontrolled rotation around the bin. These bin stops are for direct drive sweep augers. Hydraulically driven sweep augers are positive speed control augers.
 9. Workers may not use their hands, legs or similar methods to directly manipulate (dislodge) the sweep auger while it is energized (Figures 14 and 15).
 10. The sweep auger must be de-energized and unplugged during maintenance and adjustments. The person doing the maintenance must maintain control of the lock out/tag out equipment or the plug (see Figure 1).



Figure 11. Sweep auger worker protection fencing.



Figure 12. Worker protection caging and sweep auger controls.

Zero-Entry Sweep Augers

Clearly, the safest place to be when unloading or working around a grain bin is outside the bin. If workers do not need to enter the bin to dislodge out-of-condition grain clumps and bridges, entrapment and engulfment do not occur. There are two factors that help to keep workers out of bins: keeping grain in good condition, so clumping and bridging do not occur and using zero-entry sweep augers. In the past decade, bin sweep manufacturers have made great advances in sweep design. Zero-entry sweep augers are controlled from outside of the bin and are robust enough to handle out-of-condition grain without help from workers entering the bin.

When purchasing a zero-entry sweep auger, consideration for the types of grain and how often the bin is swept is important. Different types of grain and higher moisture content grain require greater horsepower and larger clearances. Emptying bins completely to the floor more frequently makes it easier for bin sweeps to move the remaining product to the

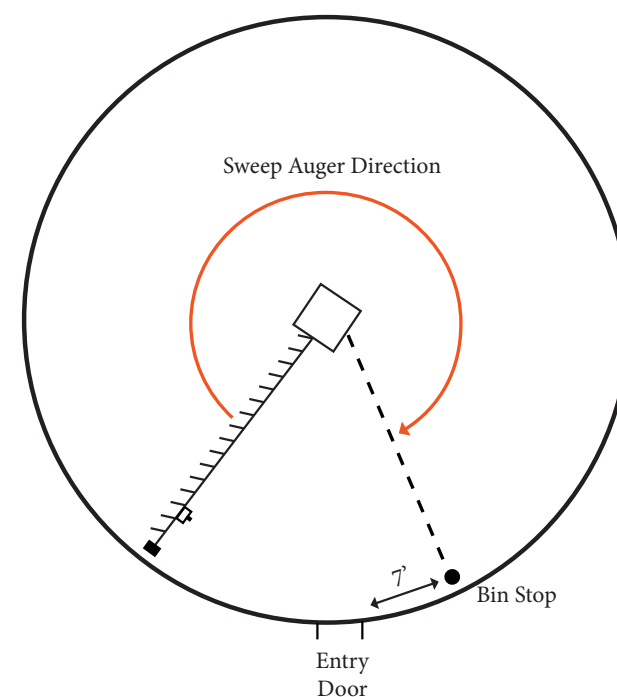


Figure 13. Bin stop for limiting sweep auger travel.



Figure 14. Unsafe handling of a sweep auger with foot.



Figure 15. Moving grain around the sweep auger with a foot is an unsafe practice.

sump openings. Upgrading an existing sweep auger to “zero-entry” is something to consider in some situations. Be sure to work with a reputable dealer of zero-entry bin sweeps when making the decision to retrofit existing equipment or purchase new equipment. If a current sweep auger requires a cord to be run into the bin for power, the sweep is not a good candidate for zero-entry retrofitting. A person must enter the bin to plug the cord into the sweep or retrieve the cord to plug in to power outside of the bin, thus “zero-entry” is not possible.

Grain facility managers report great benefits from installing and using zero-entry sweep augers. These benefits include:

- Reduced time to sweep out bins. Therefore, bins get swept out more often and out-of-condition grain does not develop when old grain is left repeatedly in the bottom of bins.
- Temporary help may be used with reduced training requirements because workers do not have to enter the bin.
- Bins can be used for multiple commodities because of the ease and completeness of bin clean out.
- Added efficiency in unloading a bin. The sweep can work 24/7 while workers may not be available for continuous work assignments. This reduces an otherwise two- or three-day task to a task that takes just a few hours.
- Significant reduction in risk because workers do not enter the bin until it is completely empty.

Sweep Auger Policies

Commercial grain facilities and facilities that must meet OSHA standards should have a sweep auger use and maintenance policy. The National Grain and Feed Association has produced an excellent resource that gives an example of just such a policy. This information may be accessed at: <https://www.ngfa.org/wp-content/uploads/Guidance-for-Sweep-Augger-Operations-in-Grain-Bins-FINAL-1-28-14.pdf>. The policy is based on the 10 steps reported in this fact sheet. It also provides definitions of terms used in the OSHA policy as well as in the 10 steps. Training is addressed along with