

Standards of Practice

Sweep Auger/Conveying Equipment

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I. PURPOSE

It is the standard of practice of this organization to permit only trained and authorized personnel to operate sweep augers or other conveying equipment inside of a grain bin, silo, or tank. This standard of practice is applicable to both daily operators and those who occasionally work inside grain storage structures. The requirements in this standard operating procedure are designed to provide employees working inside grain bin, silo, or tank with operating sweep augers with effective means of protection against the hazards presented by sweep augers to comply with applicable OSHA requirements, guidance and case law, and to satisfy the principles set forth in **Exhibit A**. This standard operating procedure does not apply if employees are not required to work inside a grain bin. Any other exception must be expressly approved in advance by the area management representative for the facility, and must comply with the principles set forth in **Exhibit A**.

II. SCOPE

This procedure covers the standard operating procedures for safe operation of sweep augers or other conveying equipment inside of a grain bin, silo, or tank that KSU College of Agriculture (COA) can control and over which it can be expected to have an influence. These activities include, but are not limited to standard operating procedures, training, inspections, and the safe operation of the equipment.

III. DEFINITIONS

Center Sump: The sump located in the center of the grain structure through which the sweep auger moves grain into the discharge equipment.

Dead Man or Safety Switch: A safety switch for equipment that allows operation only while depressed or engaged by the operator.

Deenergized: When energy sources are removed (e.g., an electric motor that is turned off and cannot start because the electric source has been unplugged or the disconnect or breaker is in the "off" position).

Dig Out: Process of removing grain from on top of and around the sweep auger so the auger can operate. This process may also include repositioning the sweep auger.

Discharge Equipment: An auger or conveyor under the grain structure floor that removes grain from the center sump and intermediate sumps to other equipment outside the grain structure.

Energized: When an energy source is present allowing equipment to operate.

Intermediate Sump: The sumps located between the grain structure wall and the center sump through which grain enters the discharge equipment.

Kill Switch: A safety device that immediately stops operation of equipment when activated by the operator.

Locked and Tagged Out: The placement of a lock and tag device or other mechanism on an energy isolating device, which physically prevents the unexpected energization, transmission, or release of energy of machines or equipment. COA Lockout and Tagout standard operating procedure.

Observer: An employee stationed outside a grain structure at all times while employees are inside who remains within reach of a stop or deenergizing device for the sweep auger, and who observes the sweep-cleaning operations.

Operating (also includes Operational and Operated): When an energy source is operating equipment (e.g., a sweep auger is operating and turning).

Protective Covering: A material such as snow fence that is attached to the back of standard railing, guards, or other barriers to prevent contact with the moving parts of equipment, guarding requirements Table O-10. See **Exhibit B**.

Standard Railing: Railing that has a vertical height of approximately forty-two (42) inches from the grain structure floor and an intermediate rail halfway between the top rail and the grain structure floor. The railing shall be capable of withstanding a load of at least two hundred (200) pounds applied to the top rail downwards or towards the sweep auger.

Sweep Auger: An apparatus within a circular grain structure that moves grain across the floor towards the center sump.

Sweep Auger Operator: The employee operating the sweep auger with a remote controlled device, switch, or other electronic control enabling the employee to cause the sweep auger to start and stop.

Sump Guard: A substantial cover, grate, standard railing or barrier that is secured in place over both the Center Sump and all Intermediate Sump in a grain structure to guard the opening so employees do not accidentally step into these openings which can result in serious injury. Openings in sump guards must comply with Table O-10. See **Exhibit B**.

IV. CONSEQUENCES OF DEVIATION

This procedure serves as an essential element in identifying and managing risk to staff associated with working sweep augers or other conveying equipment. Ignoring this procedure could result in serious injuries, fatalities, or property damage.

V. RESPONSIBILITIES

The Unit Manager/Supervisor is responsible to initiate all aspects of the Sweep Auger Standard of Practice. Employees are required to be trained and implement all safe work practices associated with the sweep auger standard of practice to include immediate notification of the manager/supervisor if a hazard is encountered that cannot be controlled.

VI. PROCEDURES

PREPARATION FOR SWEEP-CLEANING OPERATIONS

Employees shall complete the followings steps before beginning any sweep-cleaning operations (these steps are applicable to all alternative sweep auger protection measures):

STEP NO. 1: Empty as much grain as possible from the bin, silo, or tank by:

- Gravity through the center and intermediate sumps.
- When grain stops flowing by gravity, turn on all bin, silo, or tank aeration fans and continue to remove grain until the flow of grain stops. This technique is often successful in removing substantially more grain from the bin, silo or tank.

STEP NO. 2: Examine equipment related to the sweep-cleaning operation to ensure it is in safe working order.

STEP NO. 3: Follow Bin, Silo, and Tank Entry SOP.

STEP NO. 4: Ensure the area has adequate lighting.

STEP NO. 5: Post an Observer outside the grain structure at the entry point. The Observer:

- Can be the same employee who is required to remain present during the sweep-cleaning operation as long as the employee is also qualified to be an Observer.
- Must be in constant communication with employees inside the bin, silo, or tank.
- Must not have any other tasks that interfere with the primary task of monitoring safety during the entry and communicating with employees.
- Cannot leave their post for any reason until all employees have exited the grain structure.
- Must be trained in rescue procedures including notification procedures to summon help, first aid and CPR.

Note: In a larger bin, silo, or tank a second observer (Observer 2) inside the grain

structure may be used to assist with communication between the first observer and employees inside the grain bin, silo, or tank. Observer 2 shall not conduct other tasks while acting in this capacity. When it is demonstrated to be a feasible option, a video camera inside the grain bin, silo, or tank may be used by the observer to maintain communication with employees inside the bin, silo, or tank.

STEP NO. 6: Enter the grain bin, silo, or tank once all associated equipment has been locked/tagged out, the grain does not present an engulfment hazard, the atmosphere has been tested and found to be safe and all other safety precautions have been taken and verified by management, and all sumps are guarded. All sump guards must be secured in place to prevent them from moving or becoming dislodged. If using a sump guard with slotted openings, the openings must comply with the guard opening requirements found in Table O-10 of the OSHA standard. See **Exhibit B**.

STEP NO. 7: Dig out the sweep auger or otherwise prepare the grain bin, silo, or tank for sweep-cleaning operations. During dig out, the sweep auger shall be locked and tagged out, and sump guards shall be secured over all sumps or otherwise guarded. Discharge equipment below the grain bin, silo, or tank may be operated during dig out when the sumps are protected by sump guards.

NOTE: Discharge equipment does not include the sweep auger.

STEP NO. 8 Depending on the protective measure being used, ensure the sweep auger:

- Has a guard installed on the sweep that protects against contact with moving parts.
- Is properly connected to the safety handle or guard rails, personnel enclosures or other safeguarding measures are properly installed and operational.

STEP NO. 9: Place or activate the sweep auger stop inside the grain bin, silo, or tank to prevent the sweep auger from completing a full circle around the bin, silo, or tank. The sweep auger stop shall be secured no closer than seven (7) feet from the bin, silo, or tank entry point in the direction opposite the sweep auger's direction of travel.

SWEEP AUGER PROTECTION MEASURES

After preparation for sweep-cleaning operations is completed, employees can remain inside the bin, silo, or tank during the sweep-cleaning operations as long as one or more of the following additional sweep auger protection measures are used:

- **Safety Handle:** A handle of at least seven (7) feet in length attached to the back of the sweep auger that is equipped with a dead man switch or safety switch. The switch being used must be designed so that it cannot be easily

defeated or bypassed by using tape or zip ties to hold the handle in place so that when the operator releases the handle the sweep auger will continue to operate.

When using the safety handle alternative, only one employee may be inside the grain bin, silo, or tank while the sweep auger is operating or energized. More than one employee may be inside the bin, silo, or tank when the sweep auger is locked and tagged out.

Limited Exception: Observer 2 may be posted inside the bin, silo, or tank with the employee when the sweep auger is operating or energized, but must be protected from the hazards associated with the sweep auger by implementing any of the protective measures identified.

- Attached Standard Railing: A standard railing mounted to the Sweep Auger. A protective covering shall be attached across the back of the standard railing. The size of the openings of the protective covering shall conform to Table O-10. See Exhibit B.

Before entering the bin, silo, or tank to work behind the standard railing, either allow the sweep auger to operate and clear enough of an area to stand and work safely, or dig out and clear such an area before operating the sweep auger.

- Portable Standard Railing: A portable, self-supported standard railing set in place behind the sweep auger. A protective covering shall be attached across the back of the standard railing. The size of the openings of the protective covering shall conform to Table O-10. See Exhibit B.
- Operator Enclosure: A portable enclosure made of standard railing inside of which the Sweep Auger Operator can be stationed with a dead man switch or kill switch while the sweep auger is operating. Alternatively, other electrical controls may be used as long as they shut off the sweep auger when the employee steps outside the enclosure.

When using the operator enclosure alternative, first either allow the sweep auger to operate and clear enough of an area to set up the enclosure on flat ground, or dig out and clear such an area, before entering the enclosure to work behind the sweep auger. Also, only one employee may be inside the grain bin, silo, or tank while the sweep auger is operating or energized. More than one employee may be inside the bin, silo, or tank when the sweep auger is locked and tagged out.

Limited Exception: Observer 2 may be posted inside the bin, silo, or tank with the employee when the sweep auger is operating or energized, but must be protected from the hazards associated with the sweep auger by implementing any of the protective measures identified in this standard operating procedure.

- Operator Stand: A stand inside the grain structure mounted to the bin, silo, or tank wall or elevated from the grain structure floor above the moving parts of the

sweep auger, from where the Sweep Auger Operator can operate and/or observe the sweep-cleaning operations. The Sweep Auger Operator shall have access to a dead man switch or safety switch. Alternatively, other electrical controls may be used as long as they shut off the sweep auger when the employee dismounts the stand.

When using the Operator Stand alternative, only one employee may be inside the grain bin while the sweep auger is operating or energized. More than one employee may be inside the bin when the sweep auger is locked and tagged out.

Limited Exception: Observer 2 may be posted inside the bin with the employee when the sweep auger is operating or energized, but must be protected from the hazards associated with the sweep auger by implementing any of the protective measures identified.

- Light Curtain: When it is demonstrated to be a feasible option, a light curtain may be installed with a triggering distance of seven (7) feet around the sweep auger, which would shut off the sweep auger whenever an employee moves within the triggering distance.
- Future Options: As additional feasible options are developed, this list of additional sweep auger protection measures may be modified.

SAFETY REQUIREMENTS FOR ALL SWEEP-CLEANING OPERATIONS

Employees shall ensure the following safety requirements are implemented during sweep-cleaning operations, regardless of which additional sweep auger protection measures are used:

- All electrical equipment associated with the sweep auger (including remote operating systems or safety handles), shall be appropriately rated for the hazardous classification of the areas where the equipment will be used. (i.e. Class II for combustible dusts)
- Employees are prohibited from walking in front of the sweep auger in the area between the sweep auger and the sweep auger stop unless the sweep auger is locked and tagged out and the grain is determined not to present an engulfment hazard. If the sweep auger stop is temporarily disabled in order to allow the sweep auger to begin an additional pass around the grain structure, then employees are prohibited from walking on grain in any area in front of the sweep auger unless the sweep auger is locked and tagged out.
- Employees are only permitted to work within seven (7) feet behind sweep augers when additional sweep auger protection measures are implemented that will adequately protect an employee from falling into or otherwise contacting the moving parts of the sweep auger, such as the use of attached standard railing or portable standard railing as described in this standard operating procedure.

- The sweep auger or other equipment dislodges a sump guard from a sump, both the sweep auger and the discharge equipment shall be deenergized and locked and tagged out so that the sump guard can be put back in place.
- If the condition of the grain indicates a hazardous condition, immediately stop the sweep-cleaning operations and exit the grain bin, silo, or tank. Sweep-cleaning operations may resume only after the condition is resolved.
- **Never** use hands, legs or other similar means to manipulate the sweep auger while it is operating.
- **Never** attempt to clean, clear out plugged grain/debris, or conduct maintenance on the sweep auger unless it is locked and tagged out.
- No employee may make an entry into or attempt to exit a grain bin, silo, or tank when the sweep auger is operating or energized and located in the area within seven (7) feet of either side of the bin, silo, or tank entry point.
- The Sweep Auger Operator may be inside the grain bin, silo, or tank with a sweep auger that is energized but shut off, so long as the Sweep Auger Operator is the only person who has complete control over the operating controls that cause the sweep auger to operate.

VII. TRAINING

- Employees shall receive training in this standard operating procedure before they are permitted to participate in sweep-cleaning operations.
- Training must include a physical demonstration of the sweep auger controls, related safeguarding devices, and related safe work practices.
- After completion of training and prior to allowing employees to perform sweep-cleaning operations, employees must demonstrate that they are both knowledgeable and competent with the set-up, installation and operation of the sweep auger controls, safeguarding devices and safe work practices by successfully passing a performance evaluation. The performance evaluation will be a written document identifying the criteria evaluated and whether or not the employee passed or failed. In the event of a failure, corrective actions and additional training will be documented for each individual case until the person has successfully passed the performance evaluation. The evaluation will also include the date of the evaluation, signature of the employee and signature of the management person who conducted the performance evaluation. This will be kept on file for documentation purposes.
- Refresher training, including the employee performance evaluation, shall be conducted at least annually. Refresher training will also occur when the nature of the work, the workplace, or the implementation of this standard operating procedure changes, or if the employee demonstrates a lack of understanding of the standard operating procedure.

VIII. DISCIPLINARY ACTION

Employees are required to follow all of the procedures contained in this written program. Employees are not allowed to deviate from these procedures for any reason. If there is an issue or question regarding this written sweep auger program, the employee must bring these questions or concerns to the attention of top management for proper review. Any employee who knowingly violates the procedures in this program or bypasses/defeats any machine safeguarding devices such as but not limited to safety switches or dead man switches, will be subject to KSU Disciplinary Policy.

EXHIBIT

A

Criteria for Sweep Auger Alternative Protection Measures to Lock-out/Tag-out

1. Workers may not enter a grain bin, silo, or tank until after issuance of a bin, silo, or tank entry permit, certifying that the precautions contained in paragraph §1910.272(g) have been implemented.
2. Before any worker enters the bin, silo, or tank to either set up or dig out the sweep auger, the subfloor auger and the grain entry points must be de-energized and locked-out.
3. Before operation of the sweep auger, the grate/guard on the subfloor auger must be in place and secured.
4. Employees may not walk on the grain where the depth of the grain presents an engulfment hazard.
5. All sweep augers (including portable sweep augers) must be provided with guards.
6. An Observer, in accordance with §1910.272(g), must always be positioned outside the grain storage structure monitoring the activities of workers inside the grain structure.
7. If a worker enters the bin, silo, or tank while the sweep auger is energized, the employer must utilize engineering controls within the grain bin, silo, or tank to prevent the worker from coming into contact with the energized sweep auger. Acceptable engineering controls may include:
 - a. A sweep auger equipped with an attached guard that prevents the worker's contact with any unguarded portion of the auger, in accordance with 29 CFR 1910 Subpart O, Machinery and Machine Guarding.
 - b. A sweep auger equipped with a control mechanism, such as a dead-man switch or other similar device, which will allow for the sweep auger's operation only when the operator is in contact with the device.
 - c. Any workers other than the operator of the sweep auger present in the storage bin, silo, or tank while the sweep auger is energized must also be protected in a manner that keeps them out of the zone of danger. For example, this may include the installation of guardrails or catwalks that prevent workers from entering the area within the path of the auger.
8. The auger is provided with a positive speed control mechanism or bin, silo, or tank stop device that prevents its uncontrolled rotation around the grain structure.
9. Workers may not use their hands, legs, or other similar means to dislodge or otherwise directly manipulate the sweep auger while it is energized.
10. If maintenance/adjustments are necessary to the sweep auger, the auger must be unplugged or locked-out in accordance with lockout/tagout procedures: http://www.ksre.k-state.edu/agsafe/manuals_forms/LOTO_08.17.15.pdf.

EXHIBIT
B

Table O-10

Distance between Protective Covering and Moving Parts of Equipment	Maximum vertical opening (Horizontal openings are unlimited)
½ to 1 ½ inches	¼ inches
1 ½ to 2 ½ inches	3/8 inches
2 ½ to 3 ½ inches	½ inches
3 ½ to 5 ½ inches	5/8 inches
5 ½ to 6 ½ inches	¾ inches
6 ½ to 7 ½ inches	7/8 inches
7 ½ to 12 ½ inches	1 ¼ inches
12 ½ to 15 ½ inches	1 ½ inches
15 ½ to 17 ½ inches	1 7/8 inches
17 ½ to 31 ½ inches	2 1/8 inches
31 ½ inches to less than 7 feet	6 inches
More than 7 feet	Protective Covering not required

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