



**GREAT PLAINS**  
Center for Agricultural Health

## ***FarmSafe* in the Classroom: Grain Bin Safety: Preventing Engulfment Season 3, Episode 5**

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safety resources for Ag Educators**

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**FarmSafe in the Classroom:**  
 Grain Bin Safety: Motivation and Tips to Prevent Engulfment  
 (Season 3, Episode 5)

The **FarmSafe Podcast** is a place where ag workers and public health experts share first-hand stories and real-life tips for making safer and healthier decisions on the farm. Season 3, Episode 5 discusses motivation and tips to prevent engulfment in grain bins.



Have students listen to the podcast [here](#) (original) or [here](#) (link with assignments) or the then complete one of the following assignments.

1. [Quiz](#)
  - a. 7 questions, multiple choice (multiple correct answers for several)
  - b. Competencies: CTSE 3 (Attend to personal health and financial well-being), AG3 (Examine and summarize the important of HSE management systems in AFNR businesses)
2. [Review of Entrapment Scenarios](#)
  - a. Resources: Grain bin entrapment notes (provided), internet to search for recommendations
  - b. Competencies: CTSE4 (communicate), CTSE8 (critical thinking), RSL9 (compare and contrast information), WSL9 (Draw evidence)
3. [Lockout Descriptions for Grain Bin Entry](#)
  - a. Resources: Internet to find lockout devices and signs; need photos that represent equipment needing lockout at school, home, or “Model Farm” site.
  - b. Competencies: CTSE4 (communicate), WSL2/RSL7 (precise language, visual expression), WSL4 (clear and coherent writing for specific audience)
4. **Model Farm** assignment: Apply the findings from Assignment 3 to equipment needed at the grain handling area of the **Model Farm**.

Competencies mapped to in this lesson:

Activity	Common Core Standards	AFNR Performance Indicators
Quiz	CTSE 3, AG3	CRP.05.02.02b PST.02.02.01a
Review of Entrapment Scenarios	CTSE 4, CTSE8 RSL9, WSL9	CRP.01.02a CRP.05.02.02b FPS.03.03.04
Lockout Descriptions for Grain Bin Entry	CTSE4, WSL2/RSL7 WSL4	PST.02.01.01c; PST.02.02.01a; PST.02.02.02a FPS.03.04.02a
Model Farm	CTSE4, WSL2/RSL7 WSL4	PST.02.01.01c; PST.02.02.01a; PST.02.02.02a FPS.03.04.02a; <b>PST.01.02.02c</b>



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Details of Competencies mapped to in this **FarmSafe in the Classroom** activity options.

**Table 1: Relevant Main Core Competencies**

Standard	Code	Description
CCTE Practices ( <a href="#">link</a> )	CTSE3	Attend to personal health and financial well-being
	CTSE4	Communicate clearly, effectively, and with reason
	CTSE8	Use critical thinking to make sense of problems and persevere in solving them
	AG3	Examine and summarize the importance of health, safety and environmental management systems in AFNR businesses
Common Core: Reading ( <a href="#">link</a> )	RSL7	Integrate or translate technical information into visual or mathematical expression
	RSL9	Compare and contrast information from multiple sources, identifying contradictions and resolving conflicting information when possible
Common Core: Writing ( <a href="#">link</a> )	WSL2	Prepare written informative/explanatory text using precise language
	WSL4	Produce clear and coherent writing targeting a specific audience
	WSL9	Draw evidence from informational text to support analysis, reflection, research

**Table 2: Relevant AFNR Standards**

Program	Performance Indicator	Description
Career Ready Practices Standard (AFNR)	CRP.01.02	Explain the short-term and long-term impacts of personal and professional decisions on employers and community before taking action. <i>(Note: this includes health)</i> (a) Classify impacts; (b) Assess pro/con of impacts on self/others; (c) Evaluate personal decisions
	CRP.05.02.01 & 02	Make, defend, and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts; 05.02.01a List areas; 05.02.01c: evaluate decisions; 05.02.02: review information about E/S/E impacts; 05.02.02b Analyze past decisions and their effects on E/S/E; 05.02.02c: Recommend decisions for a given workplace and community situation based on positive impact in E/S/E.
Foundational Pathway Skill (AFNR)	FPS.03.03	Apply H&S practices to AFNR workplaces .02: Emergency response (ID, Assess, create) .03: ID how to avoid H/S risks; Discuss 1 <sup>st</sup> aid; Evaluate workplace for 1st aid .04: Describe risk of contamination/injury; select responses to contamination/injury; Create plan to mitigate contamination/injury
	FPS.03.04	Use appropriate PPE and demonstrate safe and proper use of AFNR tools/equipment: .01: ID PPE for safe use of tools/eqpt; Demonstrate PPE adherence; design plans to ensure use of PPE .02: ID /demonstrate / chooses standard tools, eqpt. and safety procedures for ANFN tasks .03: Outline/demonstrate/design operating instructions for operation, storage & maintenance of tools and equipment-related AFNR tasks
Power, Structural and Technical Systems	PST.01.02.02c	Design a process to implement the safe use of AFNR related tools, machinery and equipment
	PST.02.01.01	C: design a plan to communicate processes and procedures (LOTO, PFAS) for preventative maintenance and service and schedule for equipment, machinery, and power units used in AFNR power, structural and technical systems.
	PST.02.02.01a	Summarize the safe use of equipment, machinery and power units
	PST.02.02.02a	ID safety hazards associated with equipment, machinery and power units used in ANFR power, structural and technical systems (e.g., caution, warning, danger, etc.)

**Grain Bin Entry Safety Quiz (FarmSafe: Grain Bin Safety: Prevent Engulfment S3E5)**

1. Our storyteller, Norm, highlighted two mistakes that he made that ended in his entrapment in grain while unloading beans. What were they (select 2)?
  - a. Underestimated how much grain was still in the bin.
  - b. No one was around to hear his calls for help.
  - c. Augers were turned on while he was inside the bin.
  - d. Didn't call emergency responders before he entered the bin just to let them know.
  
2. What did Norm say he would do differently in the future? (Select all that apply)
  - a. Not be in a hurry
  - b. Not be in a bin without a harness
  - c. Make sure someone watches him when he is in a bin.
  - d. Never go inside a bin again.
  
3. What benefit(s) does a full-body harness attached to an anchor provide if you are going into a grain bin? (Select as many as apply)
  - a. Suspends you above the grain if crusty grain collapses
  - b. Looks good and gives you places to clip on other equipment
  - c. Prevents you from getting fully engulfed by grain by keeping you from falling further into the grain
  - d. Provides you with hands-free safety
  
4. What steps to prevent grain bin entrapment?
  - a. Power down equipment
  - b. Lock out to prevent someone from turning equipment on
  - c. Always enter in pairs
  - d. Don't enter the bin
  
5. Why information goes onto a tag used to lock out equipment so someone doesn't start equipment when you are inside the bin?
  - a. The phone number for calling emergency
  - b. The address of the farm
  - c. The GPS location of the farm, to get emergency help to the farm quickly.
  - d. The name of the person who is inside, so you know who was inside and who you are protecting.
  
6. Yes or No: If someone is entrapped in grain, do they need to go to the hospital to get checked out?
  
7. What steps need to be in place before entering a grain bin:
  - a. Have someone watching the whole time to see that the entrant is ok
  - b. Wear a harness that is connected to an anchor to prevent full engulfment
  - c. Lock out and tag all electrical equipment, particularly the auger
  - d. Call the local fire department.

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Key: 1 a,c; 2 a,b,c; 3 a,c; 4 a, b, d; 5 d; 6 YES, 7 a, b, c

## Assignment 2: Review of Grain Bin Entrapment Scenarios

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This *FarmSafe Podcast* includes a story of a farmer who was trapped by beans in his grain bin, where he entered without a harness, without locking out the auger, and without making sure someone was watching him throughout the entry. He was lucky because when trapped, his feet hit the bottom of the bin and he knew the grain wouldn't cover his head so long as he remained standing.

This exercise reviews the common ways in which grain bin can entrap or engulf someone inside the bin. Materials are from our online resources (<https://gpcah.public-health.uiowa.edu/grain-engulfment-and-entrapment/>), but critical sections are provided after the task description, for sharing with the class for this review.

**Goal of Activity:** Identify mistakes made in this entrapment and identify sources that recommend the appropriate procedure that should have been followed. Make a list of steps to take to prevent grain bin engulfment. Ask students to either prepare written summary – or – Generate a poster that incorporates what was learned to share with others.

Here is a step-by-step guide for this activity:

1. From the podcast, have the class:
  - a. List all the “mistakes” that Norm mentioned were not taken to prevent his entrapment
  - b. List the best practices that were discussed by the expert that should be taken prior to entering the grain bin
2. Share the information on the dangers of grain bin entrapment to illustrate the different conditions in which grain can engulf someone.
  - a. Visit here: <https://gpcah.public-health.uiowa.edu/grain-engulfment-and-entrapment/>
  - b. Or use the information on the following 2 pages that outlines the four dangerous conditions.
3. Review the four dangerous conditions and have students match the Norm's story to the scenario.
4. Have students, in teams or otherwise:
  - a. Search the internet to identify a few sources (academic, government, or ag group) that provide stepwise grain bin entry procedures.
  - b. Compare these lists and the tips in step 1.
  - c. Finalize a list of the steps to take to prevent engulfment when entering a grain bin, preferably in order that someone could follow when preparing for entry.
5. Final Assignment (pick one):
  - a. Write a short summary that identifies the motivation for the safe grain bin entry procedure and provide an ordered list of steps to take to minimize grain bin entry hazards.
  - b. Prepare a “poster” (11x17” or 8.5 x 11”) that summarizes the potential risks and steps to take prior to entering a grain bin.

## Dangerous Conditions in Grain Bins: Engulfment Hazards

### 1. Flowing grain

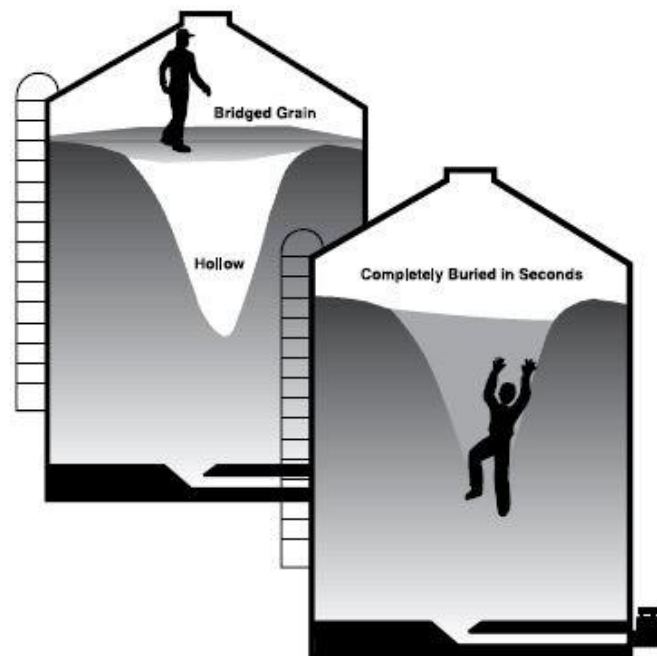
Around 80% of reported engulfment cases involve a person inside a bin or storage structure when grain-unloading equipment is running. Engulfment in flowing grain also occurs in outdoor grain storage piles, grain wagons, rail cars, and semi-trailers that unload from the bottom.

As unloading conveyors or augers remove grain through the bottom outlet, a funnel-shaped flow develops on the surface of the grain. Anyone standing on the surface while grain is being removed from below is at risk of being rapidly pulled down toward the outlet in the column of flowing grain. Submersion takes only seconds and once it begins, the pressure and friction forces of grain on the body are virtually impossible for victim to overcome. If grain unloading equipment is not shut off, victims can be pulled down into the unloading conveyor, auger, or sump. Victims covered in grain are not likely to survive. Cause of death is usually asphyxiation.



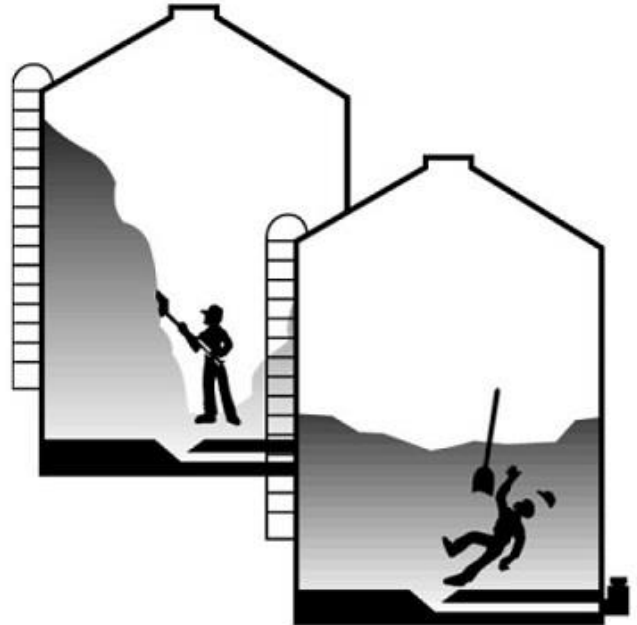
### 2. Bridged grain

Spoiled or “out-of-condition” grain clumps together and can develop a crust on the top surface. This crust appears solid, but it is unstable and may hide open voids below that develop as grain is removed. Bridged grain can collapse under a person’s weight, resulting in the victim being buried by falling and shifting grain. If unloading equipment is running at the time this occurs, the victim can be rapidly pulled down toward the bottom of the bin.



### 3. Vertical grain wall avalanche

Spoiled grain can form a clumped mass that adheres to the vertical wall of a bin. Entering a bin to dislodge a vertical wall of grain that is higher than the victim is dangerous because the grain wall can suddenly break loose and fall like an avalanche, burying or injuring the victim.



### 4. Grain vacuums

Some fatal engulfments have occurred while individuals were using grain vacuums to remove grain from bins. When the grain vacuum nozzle is placed below the grain surface, a funnel flow of grain develops as grain is sucked into the tube. An operator can be pulled into the downward flow of grain if this nozzle is released or becomes buried below the grain surface near the operator's feet. Maneuvering the vacuum tube can be awkward, increasing the operator's risk of slipping or losing balance as he tries to reposition the hose in flowing grain. If the operator falls or struggles for position, his movements can trigger an avalanche of grain if the slope of grain ("angle of repose") is steep.



### Assignment 3: Lockout Descriptions for Grain Bin Entry

This *FarmSafe Podcast* includes a story of a farmer who was entrapped by beans in his grain bin, where he entered without a harness, without locking out the auger, and without making sure someone was watching him throughout the entry. He was lucky because when entrapped, his feet hit the bottom of the bin and he knew the grain wouldn't cover his head.

One of the contributing factors to this entrapment case was associated with lockout: The auger was turned on when Norm (our storyteller) was inside of the grain bin. This activity asks students to identify where to lock out all equipment that results in grain flowing into or out of a grain bin. To do this exercise, a visit to a grain bin or photos is necessary. This could be at a local farm, at the local coop, or a school's grain bin. Photographs of the system and power supply will be helpful for the assignment.

*Goal of Activity:* Understand why and how to lock out equipment prior to entering a grain bin.

Here is a guide for this activity:

1. Introduce the layout of the grain bin and identify systems that move grain into or out of the bin. Locate the power supply for these systems. Show key photographs that identify where power is supplied to equipment that operates the grain auger (and other critical components).

Switches may vary, so obtain images that look like on/off systems at your example so students can find devices that fit the switch type



2. Have students look on the internet for images of lockout devices that fit over devices that need to be locked. Also have them locate signs that warn to lock out augers, particularly for grain bin safety, such as:





## Grain Bin Engulfment Activities (S3E5)

3. Have students prepare instructions for locking out the grain bin, selecting specific equipment (that they found) and signs to post to remind farmers about safety precautions to take when entering the grain bin.

*NOTE: If you are performing **the Model Farm project**, have students perform or establish methods to perform this task for each of the grain bins on their model farm, locating where each lockout location is for each bin and where to post danger/warning signs. Have them tally up the cost for supplies to comply with the recommendations they have made (signs, locks).*