X624 GRAIN BIN ENTRY

Study this draft as an Engineering Practice versus a Standard. One approach is to focus on design issues only for bins/silos.

1 Purpose and Scope

1.1 This standard provides recommendations for new design parameters in grain storage facilities as well as operating procedures for bin entry.

1.2 This standard applies to corrugated and smooth wall steel bins with flat bottoms used to store various types of free flowing grain.

1.3 Only the part of the standard addressing entry through the roof access applies to steel hopper (cone) bottom bins.

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- 1.4 Excluded from this standard are steel hopper (cone) bottomed bins that meet the following criteria:
- - 18 ft. diameter or less.
- - Storage capacity less than 7000 cubic feet.
- - The bin has no sidewall or hopper access door.
- - The roof has no opening intended as an access opening, with the only roof openings exceeding 8” diameter to be the center roof opening, utilized only for filling of the bin.
- - The center fill opening cover has a label warning it is not a personnel access point.

2 Background

2.1 Injuries and deaths occur in grain bins every year. Limbs are injured or lost by entanglement in unloading equipment. Injuries and deaths occur when an individual is drawn into the enveloping grain flow during the unloading process. This may also occur when an individual breaks through a crust that has formed on the top of the grain mass or is buried by an avalanche of grain being dislodged from the sidewalls.

2. While warning decals clearly state that the bin should not be entered with equipment running and no one should enter a bin without an observer present, operators continually ignore these directions.

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3 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies unless noted. For undated references, the latest approved edition of the referenced document (including any amendments) applies.

3.1 ASAE S412, Ladders, Cages, Walkways and Stairs

3.2 ANSI/ASABE AD11684:1995, Tractors, machinery for agricultural and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles

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4 Definitions

4.1 Access point: This may be an opening in the sidewall of the bin or an opening in the roof either of which is large enough to allow a person to enter the structure.

4.2 Restraint: A method to restrain a person in the bin from being drawn into flowing grain or from falling through crusted grain.

4.3 Safety decals: Refers to any safety or warning decals posted at the entry locations. These warning and safety decals are to be made in conformance with ASABE standard ANSI/ASABE AD11684:1995.

4.4 Bin base: The lowest part of the steel bin that sits on the concrete foundation.

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4.4 Bin base: The lowest part of the steel bin that sits on the concrete foundation.

5 Bin Access

5.1 The sidewall access door should be a minimum of 25 inches wide by 30 inches high.

5.2 The sidewall access door should be located no higher than in the second ring (tier) from the base of the bin.

5.2.1 When the door is more than 16 inches above the base of the bin a step must be provided between the base of the bin and the bottom of the door frame.

5.2.2 If bottom of the door frame is more than 4 feet from the ground a work platform with approved hand rails shall be available.

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5.2.1 When the door is more than 16 inches above the base of the bin a step must be provided between the base of the bin and the bottom of the door frame. How big is the step?

5.2.2 If bottom of the door frame is more than 4 feet from the ground a work platform with approved hand rails shall be available. Who decides this?

5.3 The roof access opening should be a minimum of 24 inches round or 22 inches by 35 inches oval so that a patient secured to a backboard, stokes basket or similar rescue device can be removed through it.

5.3.1 If the opening is smaller than the dimensions in 5.3, then instructions must be available to tell rescuers how to remove a roof panel section, or otherwise create a large enough opening without compromising the structural integrity of the roof to allow removal of the patient..

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5.3.1 If the opening is smaller than the dimensions in 5.3, then instructions must be available to tell rescuers how to remove a roof panel section, or otherwise create a large enough opening without compromising the structural integrity of the roof to allow removal of the patient. How will the instructions be displayed? By decals or signs?

5.3.2 Access to the entry point may be accomplished by a ladder or stairs on the roof next to the opening or by a platform on the sidewall beneath the opening. In the case of a platform a short ladder or step may be required to reach this access.

5.3.3 A ladder on the inside of the bin should be directly beneath the roof opening.

5.3.4 Provisions should be made either directly above the opening or at the sidewall next to the opening to support a davit arm, tripod or similar device that can be used to extricate a patient and lower them to the ground.

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5.3.4 Provisions should be made either directly above the opening or at the sidewall next to the opening to support a davit arm, tripod or similar device that can be used to extricate a patient and lower them to the ground. A number of comments about the davit arm! What does it look like? What load will it be required to support? How will it be attached to the bin wall?

5.3.5 The area around such fan opening must be capable of carrying the weight of an extrication device and at least three persons (1000 pound minimum).

5.3.6 The opening may be such that hold down devices will need to be removed prior to removing the cover.

5.3.7 The minimum size of a platform located at access points should be 48 inches x 48 inches.

5.3.5 The area around such fan (an) opening must be capable of carrying the weight of an extrication device and at least three persons (1000 pound minimum). Is this enough load for three persons & rescued individual?

5.3.6 The opening may be such that hold down devices will need to be removed prior to removing the cover.

5.3.7 The minimum size of a platform located at access points should be 48 inches x 48 inches. Where did this size come from? Is it from a referenced standard? What if there isn't 48" available due to an adjacent structure? Who is responsible for this platform? Contractor? Bin manufacturer? Who knows when it is required?

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5.3.8 When there is an overhead catwalk and conveyor system, if the roof access opening is not located at the 1 or 5 o'clock positions relative to the above mentioned structure, a second access point at this location shall be an option to the customer to facilitate the attachment of extrication equipment to said structure.

5.4 All ladders and walkways shall meet ASABE standard S412.

5.3.8 When there is an overhead catwalk and conveyor system, if the roof access opening is not located at the 1 or 5 o'clock (change wording to avoid o'clock positions) positions relative to the above mentioned structure, a second access point at this location shall be an option to the customer to facilitate the attachment of extrication equipment to said structure.

Comment: The location of the roof hatch and ladder are not within the responsibility of the bin manufacturer!

5.4 All ladders and walkways shall meet ASABE standard S412.

ASABE Standard S412 revision has been balloted and there were dissenting votes to be resolved.

6 Restraint Anchor

6.1 The bin shall have the means to install a restraint anchor point(s) that will allow a person to traverse the entire 360 degree circumference of the bin and at any level of the bin from top to bottom.

6.1.1 The restraint anchor point(s) must support a minimum of 1800 pounds and employ a method to keep the worker from falling more than two feet.

6.1.2 The restraint anchor should also consist of a secondary system that would prevent the attached individual from being pulled into flowing grain.

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6.1 The bin shall have the means to install a restraint anchor point(s) that will allow a person to traverse the entire 360 degree circumference of the bin and at any level of the bin from top to bottom. **This could require a large number of anchor points on the wall only depending on bin diameter!**

6.1.1 The restraint anchor point(s) must support a minimum of 1800 pounds and employ a method to keep the worker from falling more than two feet. **Where did this 1800 lb. load come from? What is the reference?**

6.1.2 The restraint anchor should also consist of a secondary system that would prevent the attached individual from being pulled into flowing grain. **How does the restraint anchor prevent this?**

Suggested language for 6.1

- **6.1 The bin shall have the means to install a restraint anchor point(s) to support attachment of a restraint, knot passing pulley or other device. Anchor point(s) at or near the bin center collar that comply with the requirements of 6.1.1 – 6.1.2 shall be deemed to meet this requirement.**
- **6.1.1 The restraint anchor point(s) must support a minimum of 1800 pounds in a direction of vertical to 45 degrees from vertical. Roof supported anchor points in bins with roof panels or roof plates less than 10 gage in thickness shall be attached to the roof center collar or roof support members such as rafters, trusses or similar members or members that are provided and approved for installation by the bin manufacturer to be installed specifically for support of the restraint anchor point.**
- **6.1.2 The restraint anchor point(s) shall be clearly identified on the bin and in the owner's manual and state that the maximum capacity per anchor point is 1800 pounds.**
- **6.1.3 The restraint system provided by the owner shall employ a method to keep the worker from falling more than two feet.**

- **The comments on roof plates would be strictly with regard to smooth wall tanks. Corrugated tanks will have roof panels thin enough that the support point would not be the unreinforced panel itself.**

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7 Bin Entry Operational Procedures

7.1 Prior to anyone entering the bin through any opening all power should be turned off and locked out.

7.2 All personnel should be properly trained in all entry and operational procedures including but not limited to types of safety devices, how to use these devices, duties of the observer etc.

7.3 No one should enter the bin without having at least one observer present at all times.

Standard dissenters believe these are operational issues and do not belong in a design standard or engineering practice.

7.4 When entering the bin through the roof opening the restraint system must be attached to the individual entering the bin. When an individual is in the bin trying to dislodge grain caked on the side of the bin, the restraint system must be used to keep the individual above the grain in case of a collapse of the grain mass.

7.4.1 The observer should be at the same opening and have provisions available to call for help if required. If the restraint system allows for a retrieval line, the observer should have access to that line and maintain a minimum amount of slack (no more than 18 to 24 inches) in the line and have it secured properly to a substantial anchor.

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How does the restraint system prevent the individual from becoming engulfed in grain?

“observer” should be called “Attendant”.

8 Safety Signs

8.1 All entry points must have required safety signs prominently displayed.

8.2 All safety signs must conform to ANSI/ASABE AD11684:1995.

Perhaps this paragraph could remain in the standard/engineering practice.