

What is a Secured Lifeline?

A KEY ELEMENT TO MAKING ANY GRAIN ENTRAPMENT PREVENTION SYSTEM WORK

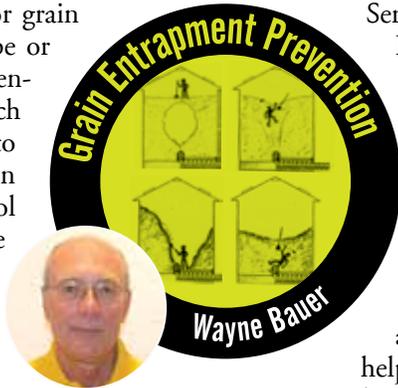
A secured lifeline for grain bin entry can be a rope or cable fastened to the entrant's harness, which allows the attendant to minimize the slack in the line and also control the lifeline during the descent of the entrant into the bin. The lifeline and system involved must allow the attendant to be able to control any incident, if the system is subjected to an unexpected loading event. In order to accomplish this, the rope or lifeline must be secured or fastened to a very solid anchor.

The potential loads for anchors will be studied much more closely under various applications in the next few years. However, this secured lifeline and anchor will be the foundation for all sorts of grain entrapment prevention systems (GEPSs) for use in grain bin entry work, including fall restraint, work positioning, and fall protection.

To use a GEPS for grain bin entry, you need a solid anchor, which is the base or foundation of the entire system. The anchor loads vary for each system, application, and angle formed between the entrant and anchor point.

OSHA has demanded that we do this, but unfortunately, the agency has no idea of how to accomplish this itself while working in a grain bin with *no anchor points*.

However, I am happy to report that OSHA did provide the Grain Handling and Safety Coalition (GHSC) a \$105,000 Susan Harward Grant effective Oct. 1, 2013, for educational material development and training to assist with education concerning bin entry. In addition, the University of Iowa Great Plains Center for Agricultural Health granted GHSC and the Emergency



Services Rescue Training, Inc. (ESRT) a \$15,000 grant to establish lifeline training materials.

In upcoming issues of *Grain Journal*, we plan to address the following issues in separate articles, in an effort to help prevent or reduce the senseless number of deaths we keep experiencing from grain engulfments:

- What is a **grain entrapment prevention system** or **grain bin entry lifeline** (this article)?
- What type of **anchor points** will steel bin firms be providing in the future?
- What is **adequate training** for entrants and emergency responders?
- What are minimal **rescue requirements**?
- What do **inspections by a competent person** look like?
- Reinforce the proper **procedures for safe bin entry** and hazards to recognize prior to bin entry.
- Other topics related to this area.

Due to space constraints, we will have to address the other items above in future articles.

Current Status of EPS

In October 2012, I shared some thoughts regarding GEPSs in this publication. As I pointed out then, there is a huge difference between fall restraint (prevention) and fall protection among GEPSs.

Fall protection is required whenever employees are working four feet or more above a lower level, and there is danger of someone "free falling."

Fall restraint, like work positioning, refers to systems that reduce the possibility of someone being seriously hurt from a freefall. There may be slippage,

but we hope to stabilize the situation and prevent a freefall of three to six feet. The GEPS prevents users from falling any distance or sinking into the grain beyond their waist, as OSHA suggests should be averted.

However, OSHA never attempts to instruct anyone on how to secure the lifeline properly in order to accomplish this, which is really the critical issue, when someone is walking on a grain surface with the potential for grain engulfment.

I am happy to report that the Ag Alliance group in Michigan has been working closely with MIOSHA (Michigan's state plan), and we jointly have been doing much more actual hands-on training with these critical issues.

The CET Division within MIOSHA

To use a grain entrapment prevention system (GEPS) for grain bin entry, you need a solid anchor, which is the base or foundation of the entire system.

is targeting agriculture in its five-year strategic plan for much more awareness level training, not enforcement. The division is intent on helping our ag sector in finding answers and cost-effective, practical solutions, as opposed to the "shame and blame" route, which I feel is counterproductive.

GEPSs and/or most grain bin entry lifelines require an anchorage point, which is a secure point attachment for the lifeline. The ANSI Z359.2 standard refers to loads for various systems such as:

- Restraint – 1,000 lbs.
- Work positioning – 3,000 lbs.

Unfortunately, there has been no testing of these forces and loads while



Setup for a horizontal lifeline and anchor point appropriate for side access into a grain bin. Photos courtesy of the Grain Entrapment Prevention Initiative.

working inside grain bins in various applications that we typically find employees involved with in the grain industry.

What is the distinction between restraint systems and positioning systems among GEPSs? What loads would we see on the systems when using a knot-passing pulley under the roof vs. using a bin-entry kit with a side access door? The industry will be doing much more testing of these various systems and applicable loads in the next 12 to 18 months.

Anchor Points

When anyone builds additional grain storage in the future, whether on-farm or off-farm, especially with steel storage,



OSHA regulations don't tell the entire story about how to make a safety harness and lifeline an effective tool in bin entry situations.

all parties involved need to agree on some type of anchor for the GEPS or grain bin entry lifeline. If access points or doors are provided on the roof and/or side of the bin, anchor points must be provided.

Fall protection is required whenever employees are working four feet or more above a lower level, and there is danger of someone "free falling."

When the steel bin manufacturer and contractor install entry doors, they are implying that people are going to enter the grain bin and walk around on grain, with the potential for entrapment. Should something happen because a secured lifeline was not available, I feel that there will be more shared liability in this area by everyone involved in the future, including the steel bin manufacturer, contractor, and grain operating company together.

The American Society of Agricultural and Biological Engineers (ASABE) initiated an attempt to develop a new consensus standard referred to as (x624) **Design Parameters** regarding new grain bin entry design in 2012. The initial effort generated a lot of discussion over construction and design parameters vs. operating procedures and/or rescue procedures.

What came out of this was not a formal consensus standard but rather a general acknowledgment that new steel bins need some type of anchor points for

grain bin entry lifelines. In the future, steel bin manufacturers will be asked to provide a suitable anchor point where you can secure or anchor your GEPS.

In the next issue of *Grain Journal*, we will illustrate examples of anchor points that we would consider suitable in steel bins and anchor points for concrete silos.

System Selection

It will be up to the operator within the grain handling firm to determine what type of GEPS or bin entry kit he or she utilizes, and he or she will be responsible for training any entrant and attendant on how to use these systems efficiently. An appropriately designed lifeline system can be installed easily and used in a grain bin for under \$1,000.

Common components for most systems will include a safety lanyard, carabiners, belay device, and body harness. Anchors will be provided by the steel bin firm.

The system can include a knot-passing pulley as an anchor in the peak and a second anchor attachment near the side access door. New training materials with appropriate procedures also are being developed by the Grain Handling Safety Coalition (GHSC) and the Safety & Technical Rescue Association (SATRA).

These anchor points are required, if anyone hopes to meet the OSHA regulation 29CFR 1910.272(g)(2), which refers to the use of harness and lifelines: "The lifeline shall be so positioned, and of sufficient length, to prevent the employee from sinking further than

Fall restraint, like work positioning, refers to systems that reduce the possibility of someone being seriously hurt from a free fall.

waist deep in the grain." I will address the issue of anchor points in more detail in a future article.

In the meantime, I would encourage you to look at the ANSI/ASSE Z359 family of standards for the definitions and scope that are expanded beyond fall arrest into other work applications. The five standards encompassed by the

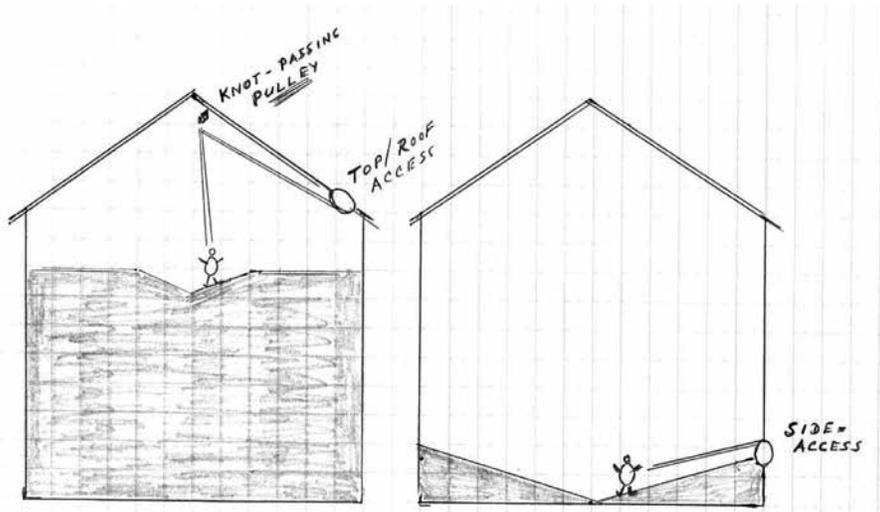


Illustration shows proper setup for lifelines and anchoring points for lifelines and anchor points for top and side entry into a steel bin. Drawing courtesy of Wayne Bauer.

codes adhere to the systems approach:

Z359.0 – Definitions and Nomenclature Used for Fall Protection and Fall Arrest (defines nearly 150 terms).

When anyone builds additional grain storage in the future, whether on-farm or off-farm, especially with steel storage, all parties involved need to agree on some type of anchor for the GEPS or grain bin entry lifeline.

Z359.1 – Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.

Z359.2 – Minimum Requirements for a Comprehensive Managed Fall Protection Program.

Z359.3 – Safety Requirements for Positioning and Travel Restraint Systems.

Z359.4 – Safety Requirements for Assisted Rescue and Self-Rescue Systems, Subsystems, and Components.

Industry Confusion

The industry—steel bin manufacturers and grain operators—both have totally ignored trying to design and install GEPSs to secure the grain bin entry lifeline in the past, because no one could determine how to use systems that would support

5,000 lbs. in the roofs of these bins. No one could suggest practical and/or cost-effective ways to accomplish this. There also has been much confusion, when various people started throwing around terms like:

- Safe working load.
- Tensile strength.
- Dynamic strength test.
- Static loads.
- Breaking strength.
- Other terms.

Average grain operators do not know how these terms affect what they do or

to what extent they have ever been tested with systems for walking on grain. How do you determine effectively the various loads a knot-passing pulley may see if anchored to the top compression ring or a simple 2-inch eye bolt might see if attached within a seam next to the side access door?

Dr. Carol Jones at Oklahoma State University will be testing various forces on the body when you are engulfed in grain and also testing various anchor designs in the future, along with others in the industry.

An appropriately designed lifeline system can be installed easily and used in a grain bin for under \$1,000.

We also read statements like the following in various pieces of literature:

Front D-rings on a harness are limited to a maximum fall arrest load of 900 lbs. (per Z359). The front attachment for fall arrest and connection at the front D-ring, near the sternum, is limited to systems that restrict free fall distance to 2 feet or less and limit the maximum fall arrest loads on the front D-ring to

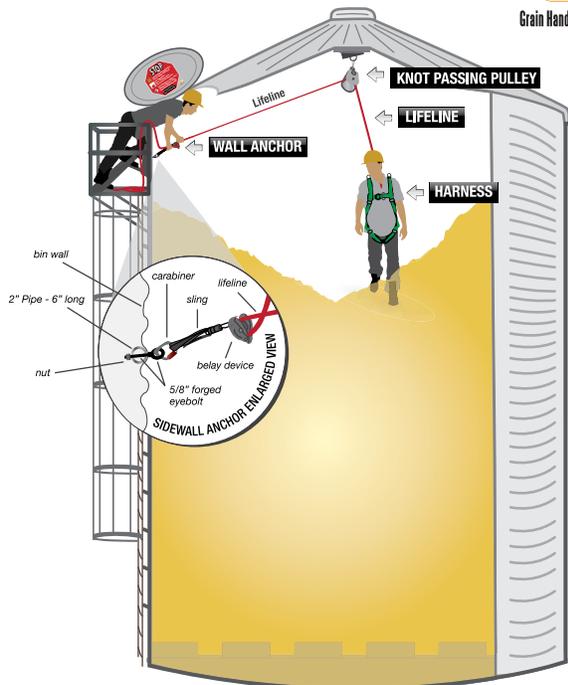


Components of a bin entry kit available from SATRA.

Lifeline System Set-up



Grain Handling Safety Coalition



A sidewall anchor is NEVER attached to any part of the inside bin ladder.
The inside bin ladder was omitted from this drawing for illustrative purposes.

Note: Figures above are for detailed reference ONLY and are NOT drawn to scale.
The bin access ladder, cage, platform, roof and other structural elements are for illustrative purposes ONLY and as drawn may not comply fully with OSHA standards or have detail.

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900 lbs. of force or less.

The forces on an actual anchor used for a GEPS for someone walking on grain likely will never exceed 800 to 900 lbs. Even with a 2-1 safety factor, this only would increase the potential forces involved to 1,600 to 1,800 lbs., which are realistic for these types of systems, if entering through a side access door and attempting to secure the grain bin entry lifeline properly.

Others would suggest that these should be engineered to a minimum of 3,000 lbs. or more. However, they have no testing data to refute the 1,800 lbs., either, as of the time of this writing.

Two Choices

The point I have made for years is we can pursue one of two directions.

1. We can start providing anchor points and installing GEPSs to control and secure the grain bin entry lifeline that will accommodate at least 1,800 to 3,000 lbs. in steel bins immediately, which is practical and workable and will make bins safer.

2. We can do nothing, which has been the case for the last 20 years, while people keep dying in grain bins. We can just have more committee meetings for another five to seven years and argue: Should it be 1,800 or 3,000 or 5,000 lbs.?

Personally, I would opt for getting started with reasonable anchor points and start using a bin entry kit as a grain bin entry lifeline right now. We can measure and/or determine the exact forces involved over the next couple of years, but we need to

start securing these grain bin entry lifelines, if your employees and/or family members are attached to these and walking across a sufficient volume of grain potentially to engulf them.

System Components

Fall restraint means securing the worker to an anchor, which limits the distance in a fall to prevent the worker's center of mass from reaching the fall hazard. This system includes the following components:

- Anchorage point.
- Connectors.
- Lifeline.
- Harness.
- Inspection and rescue plan.

The NFPA 1983 standard establishes requirements for rope, harnesses, and equipment components. You should look at these.

The ANSI Z359.2 standard establishes strength criteria for travel restraint systems and design requirements for fall arrest, horizontal lifelines, work positioning, rescue systems, etc. The static strength of a noncertified anchor in a restraint or travel restriction system is 1,000 pounds.

Ideally, the lifeline is attached to an overhead anchor point. The restraint system must minimize the slack in the lifeline and be able to handle an unexpected 500-800-lb. jerk on the line.

To be effective, your lifeline must be anchored and controlled properly, and the attendant must maintain a maximum of 12-18 inches of slack in the lifeline, if it really is going to be useful to the entrant in a crisis situation.

The Safety and Technical Rescue Association (SATRA) has developed a bin-entry kit, which is a practical and cost-effective way of accomplishing the objectives above, with a simple anchor strap, tandem prusik, carabiner, and prusik-minding pulley.

Bottom Line

Any steel bins constructed after 2013, whether on-farm or off-farm, should have an anchor point accessible near the entry doors. The operator will be responsible for implementing the use of a GEPS that can be connected to the anchor point. The grain handling firm or farm family involved also will be responsible for adequately training the entrants and attendants in the use of these systems.

We need to help provide more awareness level training in these areas and suggesting appropriate equipment for farm families and local emergency responders alike. If we can be of any assistance, don't hesitate to call.

Have a safe day.

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