



Grain Bin Safety: Entrapment Prevention Kits

At SCAFCO Grain Systems Company, we are always focused on safety, which is why we are now offering grain entrapment prevention kits for all flat bottom bins and large hopper bottom bins we sell.

In the past ten years, the number of grain entrapments on farms and in commercial grain storage facilities has increased. Purdue University Professor, Dr. William Field, has tracked these mostly preventable accidents for more than thirty years. The worst year in recent history was the 2010 grain storage season, in which there were over fifty grain entrapments and twenty eight fatalities. The Grain Elevator & Processing Society (GEAPS) had campaigned for awareness of these rising numbers of fatalities before 2010, but after that devastating season, they became more aggressive in their efforts to educate the grain storage industry about the hazards of grain entrapment. They also pursued training for fire department rescuers of personnel trapped inside grain storage structures.

People enter bins for a variety of reasons, but the predominant reason for most entrapments has been “out of condition” grain that won’t flow to the center discharge point. People enter the bin to attempt to dislodge the blockage, and many times the grain collapses under them or starts to flow rapidly to the discharge opening, drawing the person inside the bin into the grain mass, where they become entrapped or completely engulfed by stored grain. Often, a contributing factor in these accidents is failure to shut off the unloading auger or conveyor.

For the past nine years, the American Society of Agricultural and Biological Engineers (ASABE) has partnered with GEAPS in an effort to provide a consensus standard for Grain Bin Entry in order to prevent grain entrapments. Naturally, this effort focused on the bin manufacturers to design bins with tools to assist those who enter the bins to deal with grain that has gone out of condition. SCAFCO’s Daniel Wambeke, P.E., has led this group for the past five years, and this committee has authored the proposed standard, X624 Grain Bin Access Design Safety. This proposed standard has undergone many revisions and is in the process of a final ballot to obtain consensus.

The focus of X624 has been to prevent grain entrapments. The basic tools required to prevent entrapment for personnel entering the bin are relatively simple. There are several basic rules recommended for persons entering the bin to prevent grain entrapment:

1. Never enter the bin unless you believe there is no other way to solve the storage or unloading problem.
2. Always shut off all filling and discharge augers and conveyors. The industry byword for this rule is “Lockout-Tagout” and must be followed in commercial

operations according to the requirement of the Occupational Safety & Health Administration (OSHA).

3. Never enter the bin by yourself. Always have an “observer” watching you outside the bin to assist you in case problems develop.
4. Use a “bin entry kit”. This kit consists of a quality personnel harness, an approved safety rope, a prusik-rope brake and a knot-passing pulley.
5. The bin entry kit is to be used with the new grain entrapment prevention anchor points that North American bin manufacturers are starting to provide their customers for installation in new or existing grain storage bins.



Typical Bin Entry Kit

Bin entry kits may be purchased from SCAFCO Grain Systems and other safety-oriented companies. Bin entry kits typically consist of the items seen above – one rope bag, 100 feet of 12.5 mm rescue rope, 70 N carabiners, two 8 mm prusik-rope sets, one rope pad, one anchor sling, one prusik minding pulley, and 20 feet of webbing.

A simple safety rope attached to the person inside the bin may not be enough to restrain the person from being entrapped in grain. It is very difficult for the attendant standing outside the bin to restrain the weight of the person inside the bin if the grain flow or collapse of a hidden dome pulls him down into the grain. The result would be more typical of the illustration below. If the trapped person is engulfed above his knees, he cannot extract himself from the grain mass and requires assistance to prevent further engulfment.

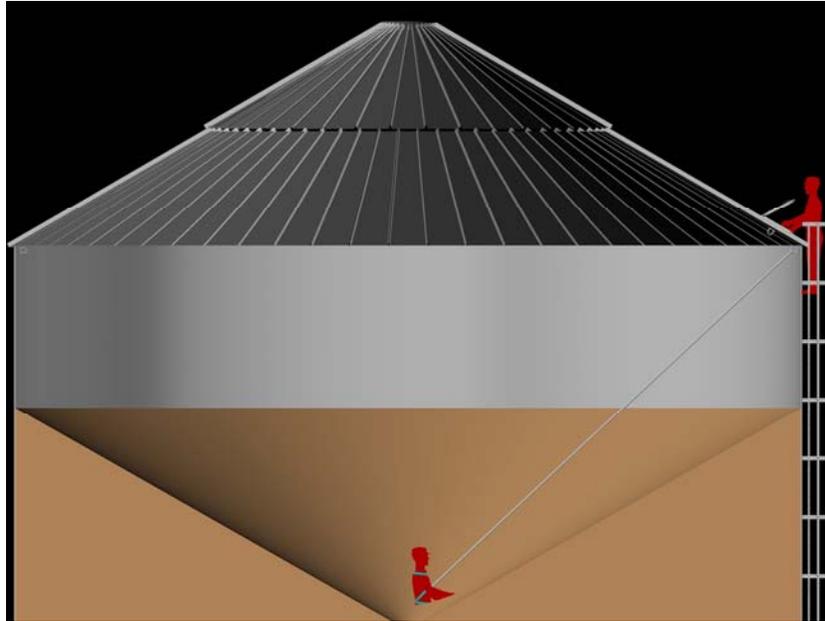
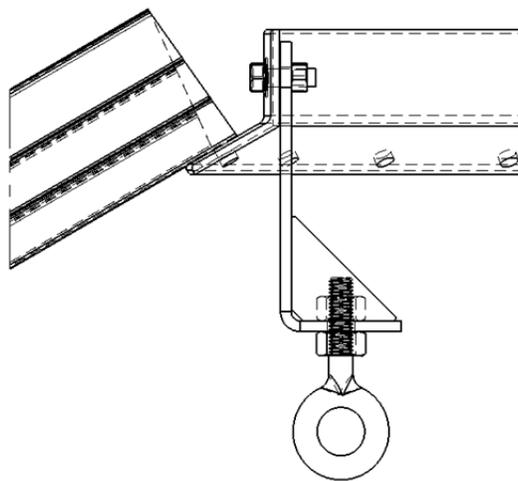


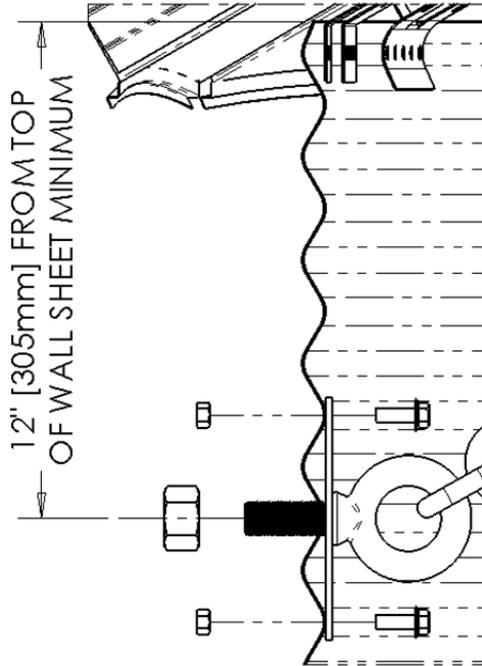
Illustration of inadequate entrapment prevention in a bin

Like quicksand, flowing grain can pull a 165-pound man down to waist level in seconds and bury him in less than a minute. Once grain gets above the knees, the amount of friction and pressure exerted on a person's body makes escape without assistance nearly impossible.

As a result of our constant efforts toward improving bin safety, SCAFCO has developed an Entrapment Prevention Anchor Kit. This kit consists of two "anchor points" for installation in any bin: one to be connected to the roof compression ring, and one to be installed inside the roof inspection hatch. These anchor points include forged eyebolts and their preferred bin locations are illustrated below. Each anchor point comes with a small decal indicating a warning to the users.



Anchor point installed at the roof compression ring



Anchor point installed below the roof inspection hatch



Decals provided for the anchor point locations

Using the anchor points, the safety rope, the prusik brake, and the attendant outside the bin paying out the rope in small increments not more than 12" at a time, the person inside the bin can be restrained from falling more than 2'0" (in grain up to his knees),

keeping him from being engulfed in the grain mass. A quality safety harness is also required for bin entry. Using this system, the person can safely extract himself from the grain around his legs.

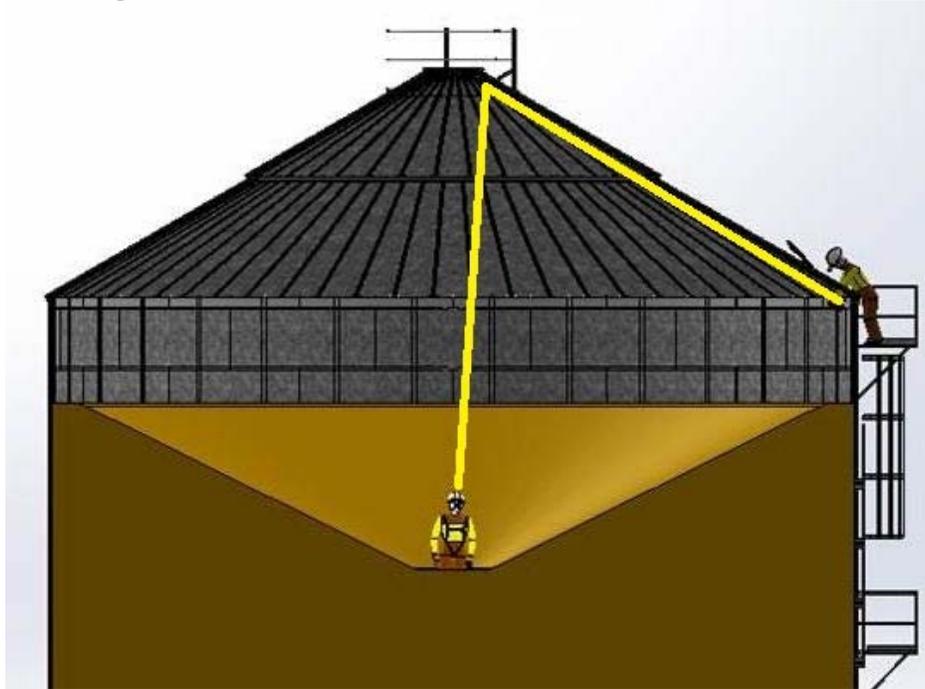
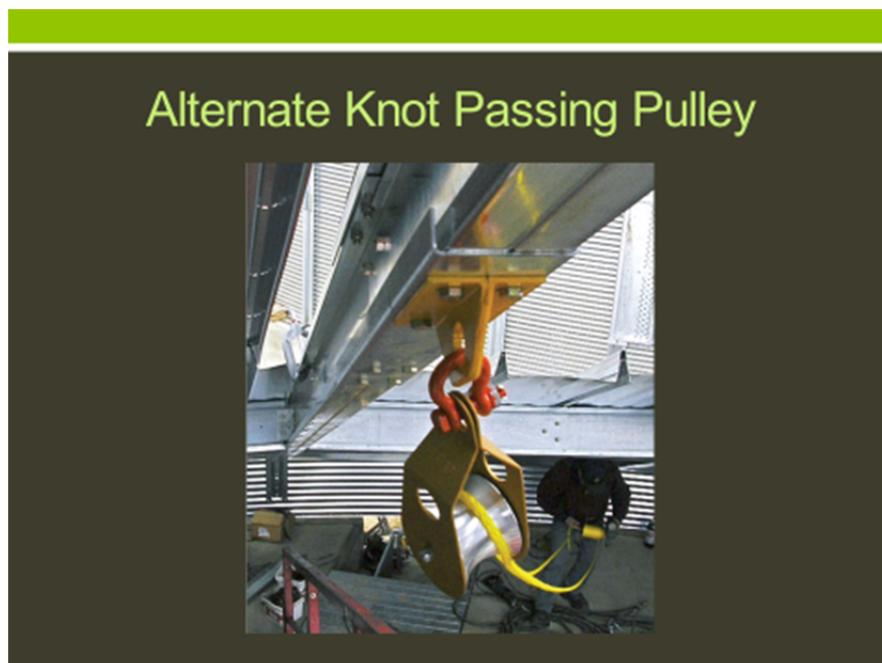


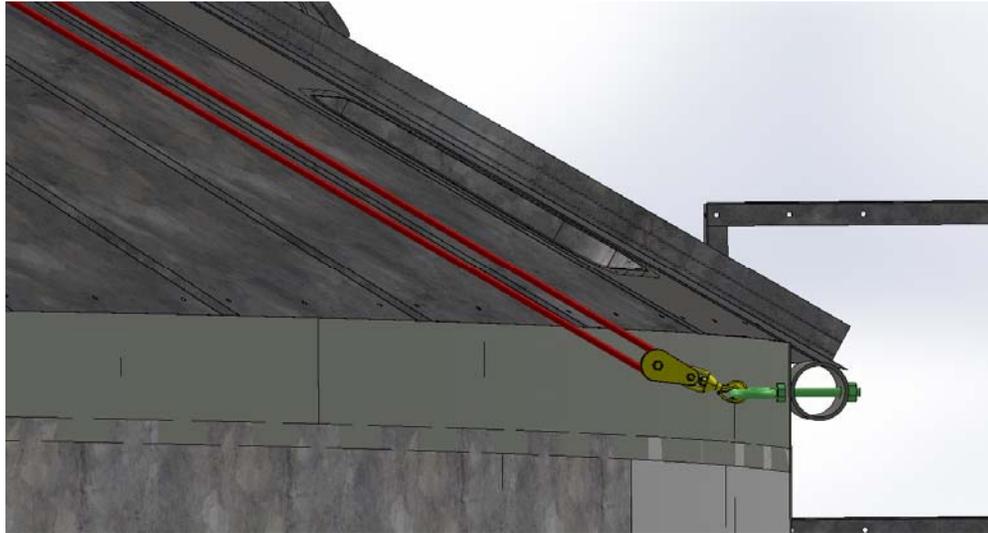
Illustration of proper entrapment prevention in a bin

The other elements required to supplement the anchorage points are a simple “clothesline” rope (a 1/4” [6 mm] nylon rope) and a knot-passing pulley to attach to the peak anchorage point.



Installed knot passing pulley

Attach the clothesline rope to the anchorage point near the roof inspection hatch with a pulley and wrap it around the knot passing pulley at the peak anchorage point. This rope is used to pull the rated safety rope up to the peak, through the knot passing pulley attached to the peak anchor point and back to the entrance point. Once the person entering the bin is inside the bin, the safety rope can be attached to his harness.



Proper installation of the lower anchor point and clothesline rope

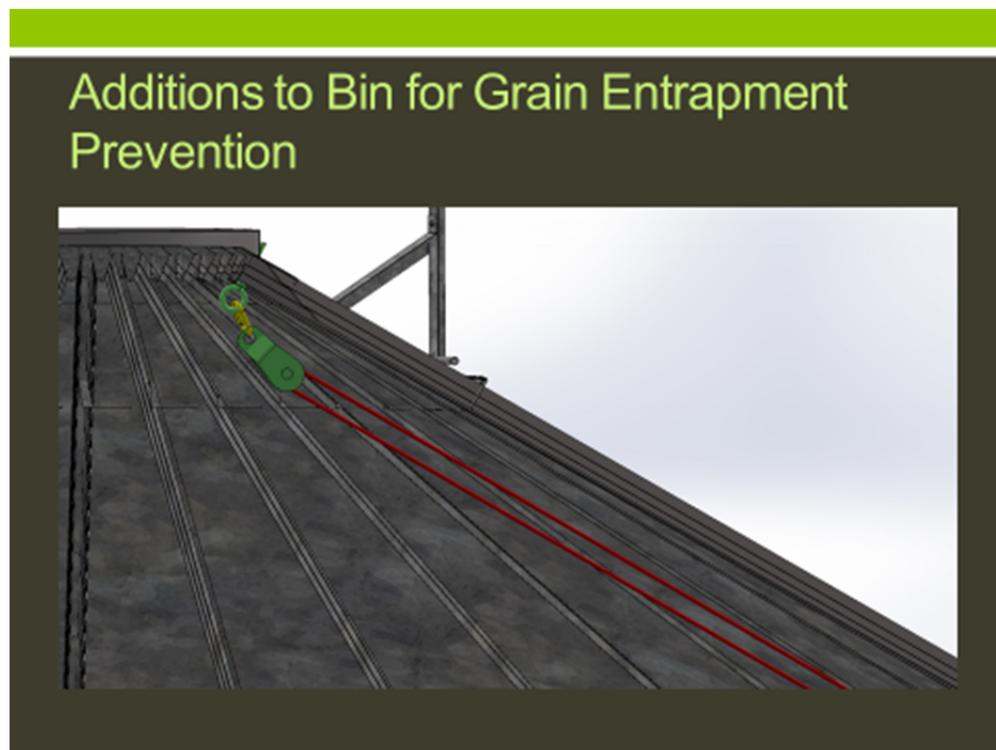


Illustration of the upper anchor point and clothesline rope



Given the risk of grain entrapment is so high and more than half of entrapments historically result in fatalities, it is very important to SCAFCO to inform everyone of the importance of installing simple Entrapment Prevention Anchor Kits and the use of Bin Entry Kits. Use of this equipment with all bins will improve safety, meet OSHA requirements, and help prevent grain entrapments.

Please also remember: Always have an attendant outside the bin before entering any bin with grain.

Safety Items available from SCAFCO Grain Systems:

<u>Description</u>	<u>SCAFCO Part Number</u>
Grain Bin Entry Kit	Contact SCAFCO for options
Entrapment Prevention Anchor Kit:	219522
Knot Passing Pulley:	291575

For more information on safety and bins, contact us at info@SCAFCOgrain.com.

As always, safety is our first priority at SCAFCO Grain Systems.