



Silo Owner's Manual



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Section 1 – Introduction

A Word from the Brazos Trailer Manufacturing Team

We thank you for choosing a Brazos Trailer Silo. Our Team has worked hard to engineer and deliver a silo that by design and experience, will prove to be the most dependable silo on the market.

The rugged design of the Brazos Trailer Silo will provide you with both reliable structural support, as well as dependable service. Our testing assures that each unit meets all design requirements, no matter the environment it is used in. We hope that you will use your Brazos Trailer Silo in a safe manner, allowing you to obtain the same results.

Building the Brazos Trailer family of products has been exciting for us because we know their capabilities and stand firmly behind their performance. As a commitment to our users, your comments have been reviewed, and many have been incorporated into product design.

Thank you for choosing Brazos Trailer Manufacturing.

NOTE: Photographs and illustrations in this manual may show Brazos Trailer Silo Options.

Section 2 – Safety

Safety Introduction

Following the safety guidelines set forth in this manual will assist you in safely operating, maintaining, and servicing your Brazos Trailer. Before operating the Brazos Trailer check the regulations, restrictions and safeguards for the area. Contact your local authorities for any information pertaining to the area where you will be operating.

Be Prepared - Get to Know All Operating and Safety Instructions

This is the Safety Alert Symbol.



Wherever it appears, either in this manual or on safety signs on the silo, you should be alert to the potential for personal injury or accidents. Always observe safety precautions and follow recommended procedures.

Learn the Signal Words Used with the Safety Alert Symbol

The words “**DANGER**”, “**WARNING**”, and “**CAUTION**” are used throughout this manual, and on labels on the trailer to indicate hazards or unsafe practices. All three statements indicate that safety is involved. Observe the precautions indicated whenever you see the Safety Alert symbol no matter which signal word appears next to the Safety Alert symbol.

DANGER

DANGER INDICATES A HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury. This type of statement is used to draw attention to a procedure that needs to be followed to prevent trailer damage.

Safety Precautions

Since Brazos Trailer Inc. has no direct control over trailer aSince Brazos Trailer Inc. has no direct control over silo application or operation, following the proper safety practices are the responsibility of the owner and/or operator. Remember that this silo is only as safe as those who operate it. Safety tips shown throughout this Owner’s Manual must be followed at all times.

NOTICE

The illustrations, photographs and components described in this manual may be slightly different than what is installed on your model. Contact Brazos Trailer for unit specific information concerning optional equipment installed at the factory.

While silos help solve storage challenges, they also expose workers and other farm users to safety risks from grain handling equipment. Some of the risks include explosions and fires from grain dust accumulation, respiratory or skin infections, or suffocation. A safe work environment begins with a clear understanding of the risks involved.

Different security measures help safeguard farm users against accidents that can lead to death.

Preventing Entrapment or Engulfment

Safeguarding workers from entrapment or engulfment by moving grain starts with establishing safety precautions concerned with silo entry. Powered equipment, if installed in the silo, such as pneumatic, electrical, hydraulic, and mechanical equipment, should remain turned off and locked out before workers enter the silo. This equipment includes augers which move the grain in or out of the bin. They present a serious risk of entanglement and amputation.

Research has identified a link between out-of-condition grain and incidents of grain engulfment. Out-of-condition grain refers to stored grain that has become wet, clumped or has spoiled. Out-of-condition grain can increase occupational exposure to grain engulfment because of a tendency of the grain to stick or clump together. When grain becomes excessively crusted together and/or cakes to walls of a silo, workers may enter the silo to loosen the grain to facilitate its removal, which can result in entrapment or engulfment.

Entrapment or engulfment of workers can happen quickly. Workers should not:

- Enter a silo when grain is flowing (Figure 2-1).

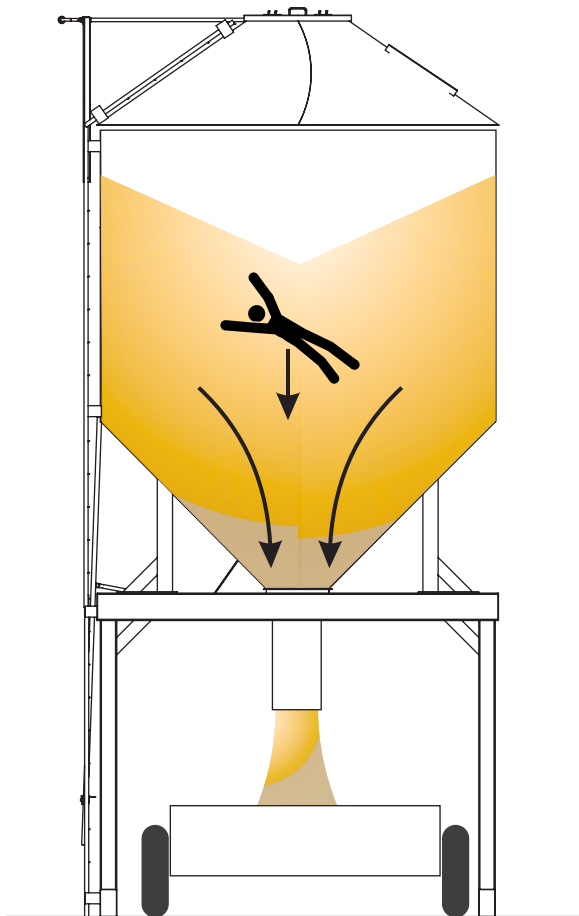


Figure 2-1 – Flowing Grain Entrapment

- Enter a silo on their own. A two-man team is a minimum, with one person outside the silo and in full communication at all times with the worker inside the silo.
- Walk on what appears to be solid grain to make it flow (Figure 2-2). This condition may be a “grain bridge” which can collapse, dropping the worker into a potential hollow cavity.

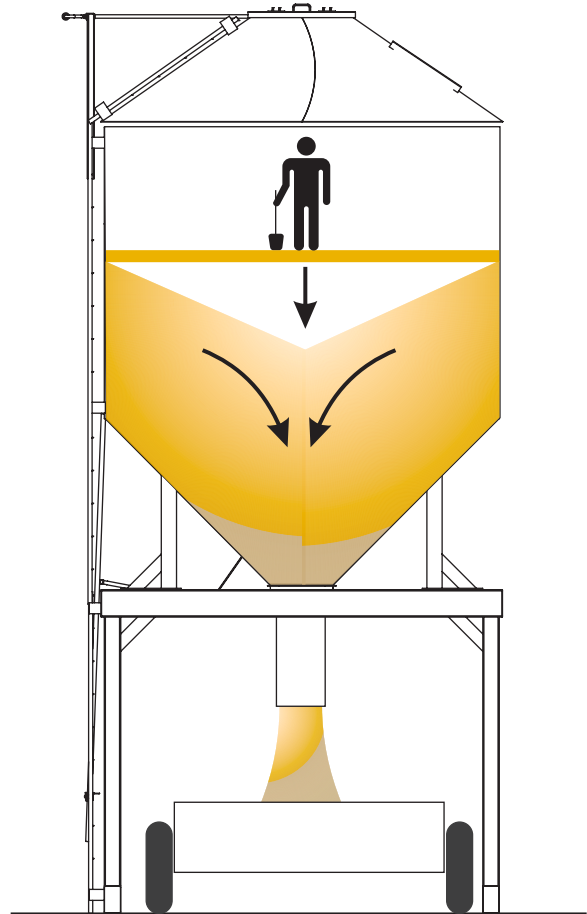


Figure 2-2 – Grain Bridge Entrapment

- Enter a silo with moving grain that can create a suction (Figure 2-3). Moving grain can entrap or engulf the worker within seconds.

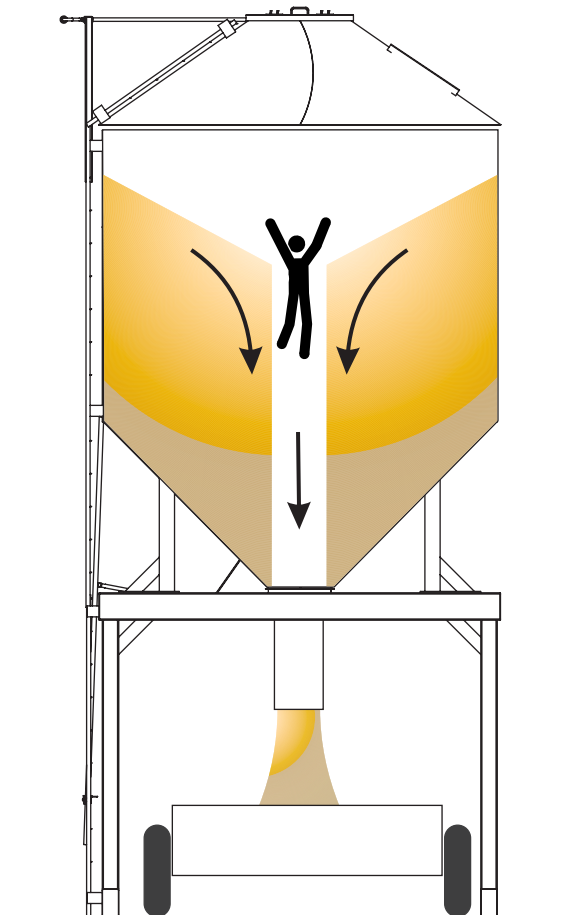


Figure 2-3 – Flowing Grain Entrapment

- Workers should not enter the silo when the grain accumulates, or “cakes” on the sides (Figure 2-4). Falling grain can engulf the worker.

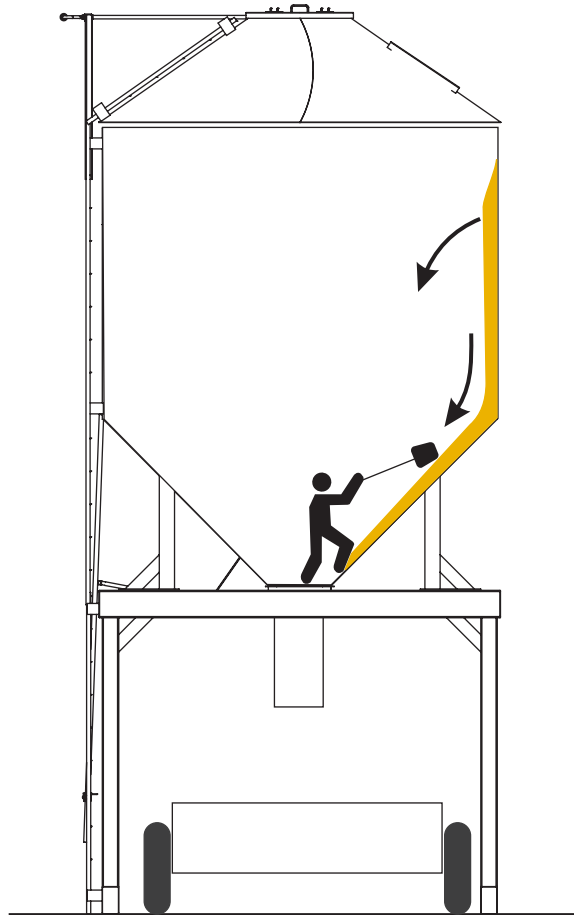


Figure 2-4 – Grain Caked on Side Walls

If entry to the silo is necessary,

- Let everyone on the farm know that there will be people working around the silo and that no one is to start any equipment at the site.
- Workers who walk or stand on grain must be wearing a safety harness, have a lifeline always connected and have immediate access to a boatswain’s chair. This makes it easy for other workers to pull them from the silo if the grain starts moving unexpectedly.
- Prior to entering the silo, open the top of the silo for at least an hour to help remove any toxic gas.
- Before entering, take a gas reading to make sure the gas levels are safe.
- When the team is ready to go to work, tag out and lock out all grain handling equipment. This helps prevent accidental operation of this equipment while working inside.

Brazos Trailer Silo

A silo must have safety gear for each of the workers who enter the silo and establish a rescuer outside the silo as long as workers are in the silo. The rescuer remains outside the silo and maintains clear visual, signal, or oral communication with those inside. Through this constant communication, the rescuer will continuously monitor the workers inside and react immediately in case of any danger.

More than 70% of entrapments have occurred on small or family farms that are typically exempt from OSHA grain-handling regulations. Following safety rules are extremely important.

Falls from Heights

Falls from height can occur throughout a grain-handling facility. Relatively short falls, from only 12 to 20 feet, can be fatal. Examples of surfaces that could present a falling hazard include floors, machinery, structures, roofs, ladders, unguarded catwalks, platforms and manlifts. Additionally, workers are also exposed to potentially fatal falls as they move from the vertical exterior ladders on grain silos to the silo roof or through a silo entrance.

Worker exposure to falls can largely be prevented through following basic safety practices. A few of these safety practices include:

- Keep all ladders in good condition.
- Avoid climbing ladders in wet or icy conditions.
- Use a locking cover and/or pull-down section for the first 6–8 feet of permanent ladders to prevent access by children or other unauthorized persons. Silo designs may offer a removable ladder section, normally the first, or ground access section. If equipped, this ladder should be removed at the end of silo work and safely stored.
- Waist belt or body harness and dual lanyards (Figure 2-5) should be used to limit the distance a worker can fall.



Figure 2-5 – Dual Lanyard Safety Harness

The body harness arresting lanyard should not be longer than 6 feet. When climbing a silo ladder or working on an elevated platform, make sure that the body harness lanyard is securely clipped onto the silo. It is also recommended that a dual arresting lanyard harness be used. This will allow the worker to clip the first lanyard onto the structure, climb or transition to a horizontal platform, clip on with the second lanyard, then unclip the first lanyard. In this process, the worker is always safely secured to the structure.

- Passing a rope around a sharp corner or over an edge will reduce the rope's strength by about 70 percent.
- Sunlight, moisture and many chemicals can compromise rope strength.
- Synthetic materials such as polypropylene, polyester, and nylon can offer some cushioning if a worker does fall; this cushioning may reduce the probability that the worker suffers an injury.
- Safety ropes are required to be replaced every seven years (even if they do not appear to be damaged).

Preventing Fires and Explosions

Grain dust is highly flammable and presents a serious risk of explosions or fires. These risks can occur when the accumulated grain dust encounters a heat source, such as hot bearings, sparks or fire. In a silo where oxygen levels are high, the risk of explosion or fire from grain dust accumulation is high.

- Do not do any work, either inside or outside of the silo, that increase the risk of fires and explosions during loading and unloading of the silo. Grinding or welding in silos containing grains can cause sparks that, if they contact grain dust, can cause an explosion or fire.
- No worker should smoke anywhere near the silos and “NO SMOKING” signs should be posted on or near the silo.
- Before any loading or unloading occurs in a silo, make sure there is no sparking or defective wiring that may contact grain dust.

Silo fires most frequently occur in the top layer (approximately the top 10 feet) of dry, loosely packed silage. Such fires are often caused by spontaneous combustion. Spontaneous combustion can occur when new silage having a too-low moisture content (less than 45%) is placed in the silo, when fresh silage is placed on top of old silage, or when the silo has poorly maintained doors and walls. Putting new silage on top of old silage is especially risky if the old silage is too dry. The dryer the material is, the more air that will be trapped when fresh,

wetter material is placed on top of it. That trapped air can allow excessive heating and support a smoldering fire.

It is suggested to follow these steps for harvesting and storing forages to decrease the risk of a silo fire:

1. Chop forage at the correct theoretical length cut (TLC). As an example, the TLC for hay crop silage is 3/8 inch, and the TLC for corn silage is 1/4 inch.
2. Store silage at 30%–50% dry matter content (i.e., 50%–70% moisture content). Using this approach will optimize fermentation.
3. Leave the silo sealed for at least 14 days to allow complete fermentation to occur. Brazos silos provide venting for any gasses that may occur.
4. Unload 2–6 inches per day and maintain a smooth surface. Using this unloading schedule will help you stay ahead of any spoilage. Spoilage is caused by the bacterial action that can cause heating.
5. Discard deteriorated silage. Performing this step will help eliminate a fuel source for potential fires and minimize animal health problems.

Managing silo fires involves monitoring silage to detect a fire early, taking the proper steps when you suspect or discover that a fire is burning, and understanding how fires in different types of silos are extinguished.

The first step in managing a silo fire is early detection, so monitor a silo for three weeks postharvest. This length of time is the critical period for fermentation and heating to occur. Because silage burns slowly, detecting a fire early allows you time to evaluate your options and develop a plan for addressing the fire.

If you suspect or discover a silo fire, contact your local fire department immediately. A silo is a confined space, and firefighters must follow the US Department of Labor, Occupational Safety and Health Administration (OSHA) Confined Space Standard for entry into a silo. When you contact the fire department, indicate the type of fire so that the fire department can dispatch the correct personnel and equipment (e.g., thermal imaging camera, infrared heat gun, self-contained breathing apparatus).

Wait for the fire service personnel to arrive. Do not enter the silo or climb the chute because unknown factors, such as fire gases or burning embers falling down the chute, may exist. Only fire service personnel with self-contained breathing apparatuses or supplied-air respirators should enter an upright silo because of toxic gases that can be present due to the fermentation process or the fire. The most typical gases in silos include carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, and nitrogen tetroxide.

While waiting for fire service personnel to arrive on the scene, take the following steps:

1. Close the bottom of each chute to reduce airflow that may be fanning the fire. Use sheet metal or another noncombustible material to close the chute.
2. Remove all livestock from any exposed or adjacent buildings.
3. Spray water to wet down the area around the silo chute to prevent the fire from spreading.
4. Place noncombustible shields (metal siding, etc.), if possible, over any openings in the silo or chute to prevent sparks and embers from flying into or onto other buildings.

Because a conventional silo is not airtight, fire service personnel cannot smother the fire by eliminating the air source. The best approach is to locate the heat source and remove it. If possible, fire service personnel should avoid flooding the silo with water for the following reasons:

- Doing so could ruin good feed.
- It is difficult to unload wet silage.
- Water can damage the silo.
- The introduction of water can actually cause additional fires in the silo.

Preventing Respiratory or Skin Hazards

Silos contain various harmful gases, chemicals and grain dust that can pose respiratory and skin health risks to workers engaged in loading and unloading. Prolonged contact with grain dust can cause dust-induced breathing complications, stomach problems, skin rashes or digestion problems. These complications can include lung edema, central nervous system damage, cancer, and heart and vascular diseases. Harmful gases may also result from the chemicals used to preserve the produce or from spoiling grains.

Workers should use the proper protective wear, including respirators to prevent dust inhalation. The respirators should be suitable for specific chemicals or dust. Workers should avoid dusty areas. The silo may also need to be fumigated regularly. Depending on the instructions of the pesticide manufacturer, fumigated silos should stay ventilated for several hours before anyone can safely enter.

Safety Inspections

A silo inspection program, supported by a proper preventive maintenance schedule, will uncover inconspicuous wear or damage that can compromise structural integrity, lead to unsafe working conditions and reduce silo value.

All silo construction types are subject to deterioration and potential collapse without a proper inspection schedule and ongoing maintenance program. Like any construction material, steel is subject to deterioration from environmental conditions and structural stress from loading, unloading and daily silo operations during normal usage.

This stress can cause cracking and deterioration of silo foundations, walls and linings, roofs and discharge cones. Many other issues can only be identified through a more in-depth inspection process.

Section 3 – Silo Orientation and Specifications

Silo Orientation

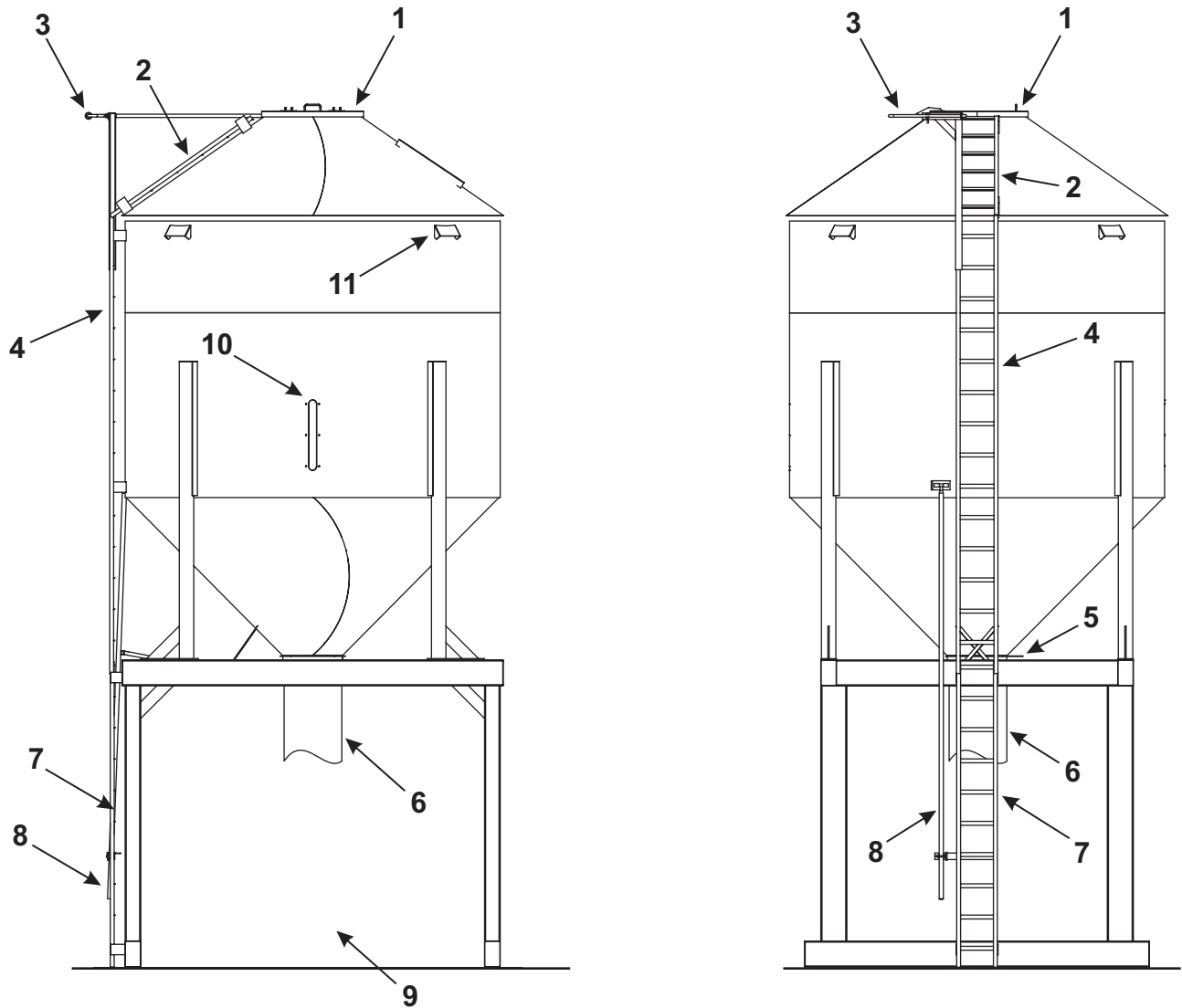


Figure 3-1 – Orientation

Item No.	Description
1	Top hatch
2	Upper access ladder
3	Top hatch opening lever
4	Access ladder
5	Feed chute valve
6	Feed chute extension
7	Removeable lower ladder
8	Feed chute valve control lever
9	Drive through
10	Product level sight gauge
11	Air vent

Silo Dimensions

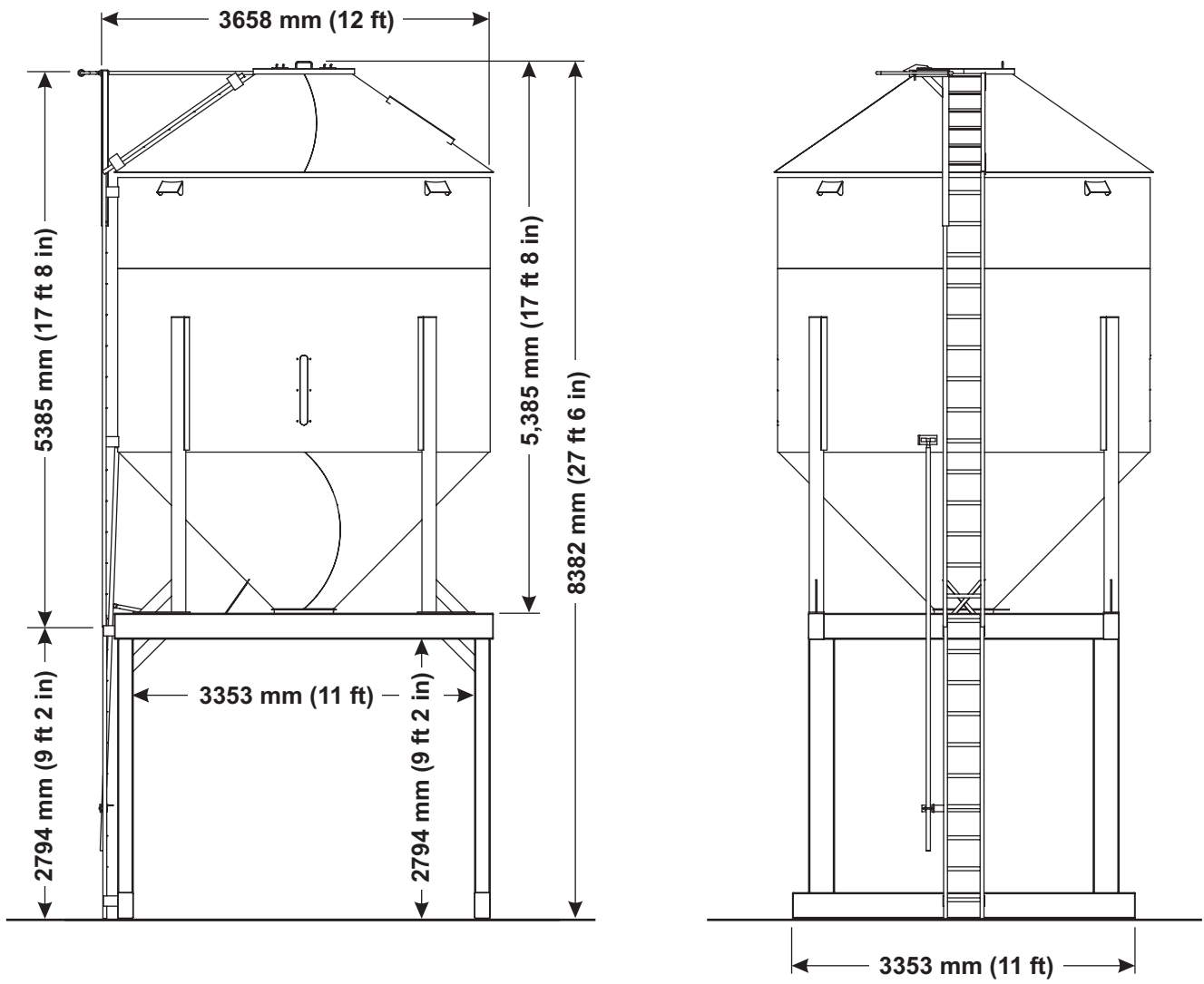


Figure 3-2 – Silo Dimensions

Section 4 – Installation

The silo owner is responsible for the construction of the silo mounting pad. Basic mounting pad design specifications are shown in Figure 4-2, with the detailed plans in Figure 4-3. The use of embedded weld plates (Figure 4-1) in the concrete pad is mandatory.



Figure 4-1 – Embedded Weld Plate

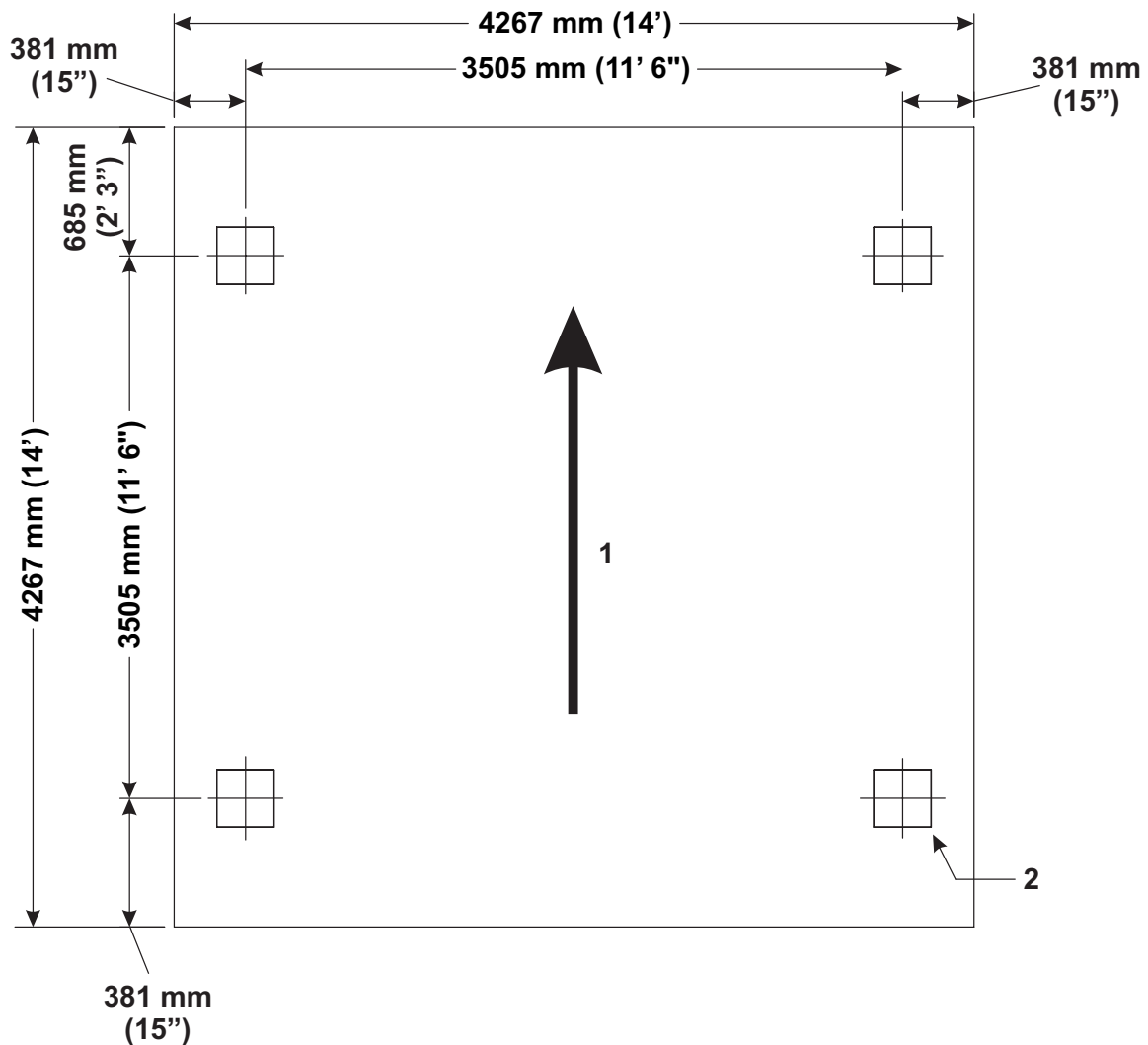


Figure 4-2 – Concrete Mounting Pad Dimensions

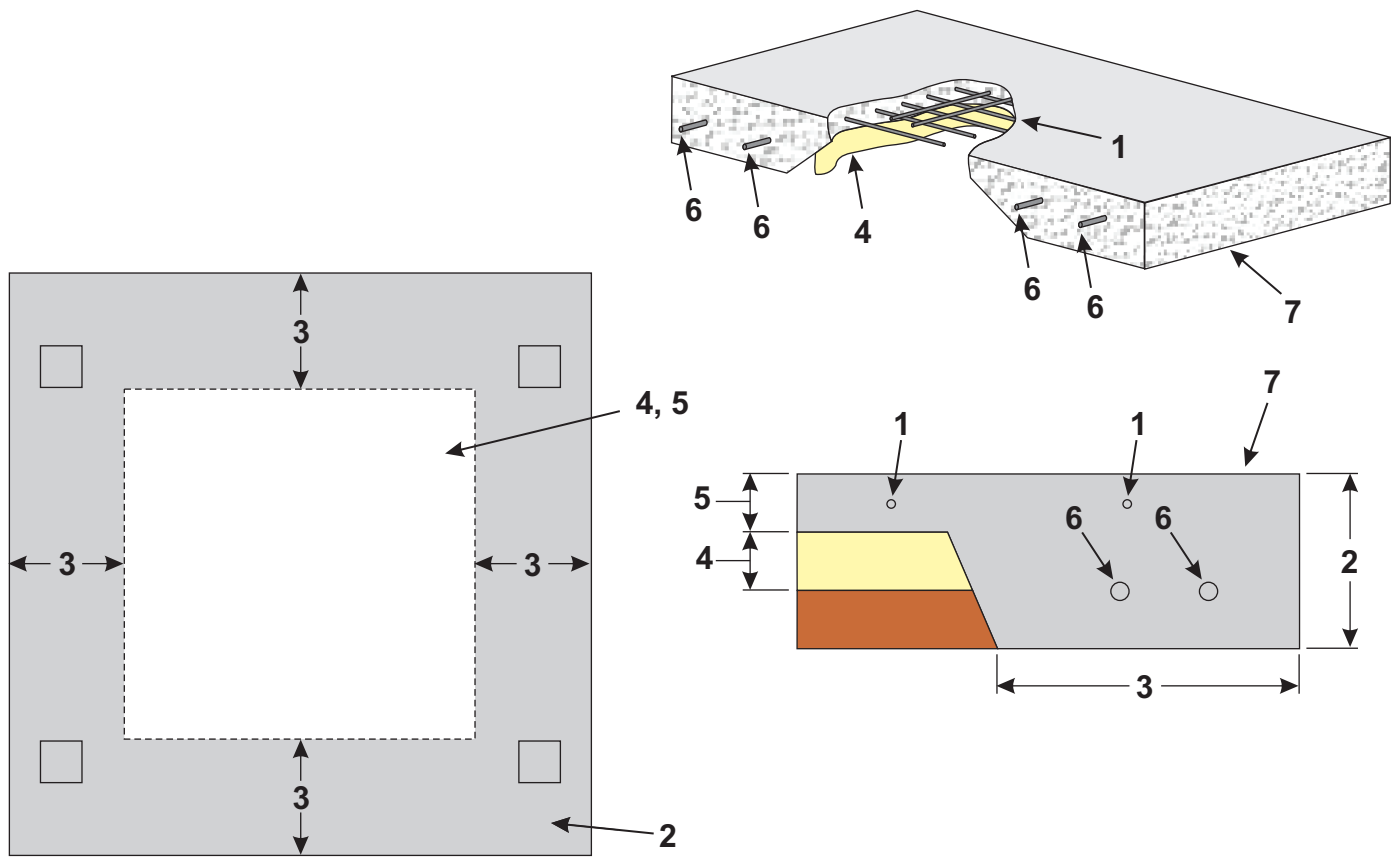


Figure 4-3 – Concrete Mounting Pad Foundation

Item No.	Description
1	#3 rebar on 406 mm (16 in) centers – in both directions to form grid.
2	305 mm (12 in) minimum 20,684 kPa (3,000 PSI) concrete thickness around the entire perimeter of the pad forming foundation footing.
3	533 mm (21 in) minimum 20,684 kPa (3,000 PSI) concrete width around the entire perimeter of the pad forming foundation footing.
4	102 mm (4 in) minimum of sand or gravel in center of mounting pad area.
5	102 mm (4 in) minimum of 20,684 kPa (3,000 PSI) concrete in center of mounting pad.
6	# 5 rebar around all four foundation footing edges.
7	20,684 kPa (3,000 PSI) concrete for entire mounting pad.

The mounting pad construction must be completed following detailed drawings furnished by Brazos Trailers Manufacturing. In summary, the mounting pad must be formed as follows:

1. Mounting pad dimensions – 4267 mm (14 ft) per side (Figure 4-2).
2. Locate the embedded mounting plates (Figure 4-1) centered on 381 mm (15 in) from each corner (2, Figure 4-2).
3. Create a 305 mm (12 in) thick x 533 mm (21 in) wide footing (2, 3, Figure 4-3) around the entire perimeter of the mounting pad.
4. Build up the center of the mounting pad with a 102 mm (4 in) layer of sand or gravel to allow for a minimum 102 mm (4 in) concrete thickness in the drive through section of the mounting pad.
5. Pour mounting pad with 20,684 kPa (3,000 PSI) concrete.

Installation

1. Brazos Trailers Manufacturing will deliver the silo, move it into the final position, and erect the silo.
2. Position the silo so that the silo legs (1, [Figure 4-4](#)) and mounting brackets (3, [Figure 4-4](#)) land on the embedded weld plates (2, [Figure 4-4](#)).

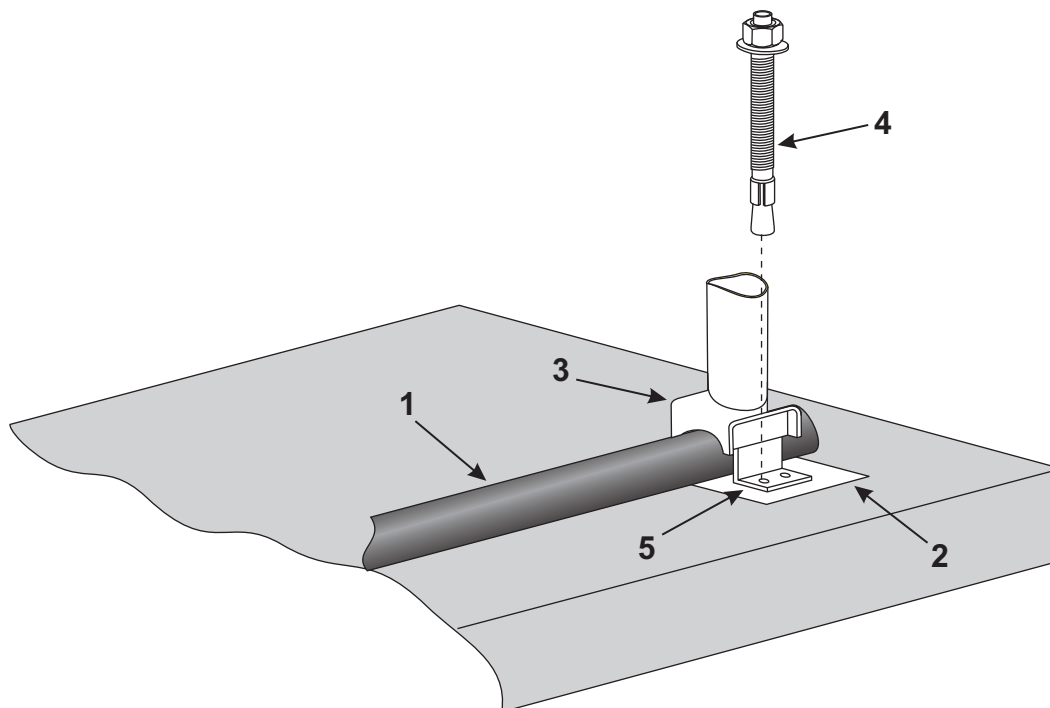


Figure 4-4– Securing the silo

3. Secure the silo to the mounting plate by either using concrete anchor bolts (4, [Figure 4-4](#)) or welding to the mounting bracket (5, [Figure 4-4](#)) to the embedded weld plates.

Section 5 – User Instructions

Loading and unloading the silo requires following several safety requirements:

WARNING

- Do not enter a silo when grain is flowing.
- Do not enter a silo if only one person is working.
- Do not walk on what appears to be solid grain to make it flow.
- Do not enter the silo when the grain accumulates, or “cakes” on the sides.

Silo Loading

WARNING

When climbing an exterior ladder, make sure to wear and use a dual lanyard safety harness (Figure 5-1).



Figure 5-1 – Safety Harness

CAUTION

- Securely install the removeable lower ladder section (1, Figure 5-2) onto the exterior silo ladder.
- When silo work has been completed, remove and safely store the ladder.



Figure 5-2 – Removable Lower Ladder

1. Using a remote lanyard or by climbing the exterior silo ladder, open the top silo hatch.
2. Load grain into the silo.

NOTICE

Watch the view window on the side of the silo to make sure the silo is not overloaded.

3. When silo loading has been completed, using a remote lanyard or by climbing the exterior silo ladder, close the top silo hatch.
4. If equipped with a removable ladder, this ladder should be removed at the end of silo work and safely stored.

Silo Unloading

1. Position the feed trailer under the feed chute (3, [Figure 5-3](#)).
2. Pull the feed chute valve lever (1, [Figure 5-3](#)) outwards, opening the feed chute valve (2, [Figure 5-3](#)) to load the trailer.
3. When the feed trailer is filled, push the feed chute valve lever inwards to close the feed chute valve.
4. Drive the feed trailer out from under the silo.

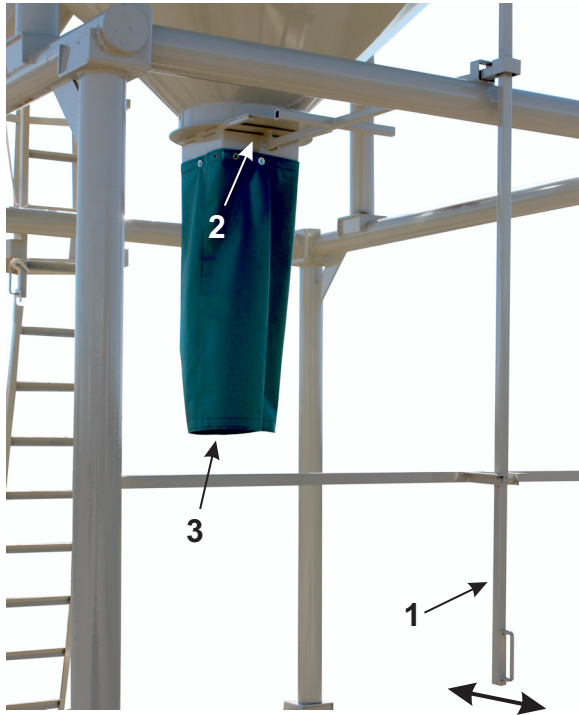


Figure 5-3 – Silo Unloading

