

Dangers of Storage and Unloading of Ensiled Forages

Silages are feed ingredients fed primarily to dairy and beef cattle. Silages are usually produced a few times per year and stored on the farm for year-round feeding.

The ensiling process involves cutting and chopping the whole forage plant to smaller pieces in the field while simultaneously loading into trucks or wagons. Once loaded, the fodder is hauled to the storage site where it can be stored via upright silo, ground pile/bunker, or in bags. In all storage types the goal is to tightly pack the material and exclude as much oxygen as possible. Under anaerobic conditions the silage will start its fermentation process which takes approximately 3 weeks to complete.

Each silage storage structure has its own life safety concerns. Some of those concerns are addressed below along with some safety considerations.

Ground Pile and Bunker Silos

The largest life safety concern for ground piles and bunker silos is a silage avalanche that can crush, bury, and asphyxiate the victim. For that reason, great care should be taken to: 1) not create an avalanche condition and 2) not place victims in a position of danger from avalanche.

- A proper unloading technique for ground piles and bunkers includes shaving silage down the feed out face. The feed out face is the side of the pile where unloading is taking place.
- Never dig silage out from the bottom of the pile. This creates an unstable face that will eventually avalanche down.
- Do not drive the unloader along the face of the silage pile or bunker.
- Do not park or walk along the face of a ground bunker or pile.
- When removing tires or tarping materials from the top of the bunker or pile stay at least three feet away from the pile face. If you must reach into the three-foot space a metal rod or hooked pole can be used.

Upright Silos

The largest life safety concern for upright silos is asphyxiation from silage gases. Nitrogen dioxide is a highly toxic gas produced by fermenting silage early in the process. Nitrogen dioxide is characterized by a strong bleach-like odor and yellow or red fumes. In low concentrations nitrogen dioxide causes severe irritation to the nose, throat, and lungs. In higher concentrations nitrogen dioxide can cause immediate death, or even death hours and days later. Carbon dioxide is also frequently found in high concentrations in upright silos. Carbon dioxide is an odorless, colorless gas that can cause the victim to black out and suffocate in high concentrations.

Like carbon dioxide, nitrogen dioxide is heavier than air, so it will seek a path to lower lying areas which can include buildings attached to the silo.

- Be alert for gas odors and yellow/red fumes, especially for the first week following the filling of the silo.
- Do not enter the silo for four to six weeks following the filling. Whenever entry to the silo takes place, a gas meter capable of monitor nitrogen dioxide and carbon dioxide should be used. A self-contained breathing apparatus is recommended until acceptable gas levels have been observed.
- Recognize that a silo is a confined space. As such confined space procedures apply, with special emphasis on the practice of having one or more spotters in attendance.
- Before entering, feeding systems should be locked out/tagged out.
- Keep all feed chute doors closed to the silo during the fermentation process and ventilate any rooms with gas potential.
- Ensure that children and livestock are not allowed in rooms or low-lying areas absent ventilation near the base of the silo.

Bagged or Tube Silos

Bagged silage will have the same life safety concerns as both upright and pile silos. Gases can accumulate, and avalanches can occur, though both on a smaller scale.

- Consider where silo gases (including nitrogen dioxide) may drift and collect.
- Cover immediately when harvesting is complete.
- Do not puncture bubbles in the plastic that may release gas into a worker's airway.
- Use caution when opening bags and keep enough distance to not be trapped by avalanching silage.
- The storage area for bagged or tube silos should be away from areas where children or visitors may play or travel.