FeedFIT®

FEED CENTER DESIGN

Forage Storage

GPS® DAIRY® CONSULTING LLC

This area will focus mainly on piles and bunkers and things to consider when incorporating them into new designs or updating facilities.

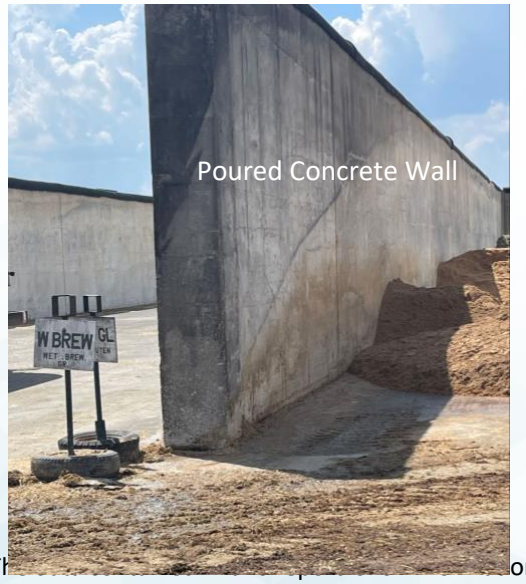
Forage Storage Breakdown

Piles	Bunkers
• Simple to alternate which side of the pile you add to for consecutive cropping years • Larger face/more exposure • Face needs to be sized for at least 8" (20 cm) of removal per day	• Smaller footprint per ton of storage • Requires extra storage/management to ensure that enough bunks are empty before next harvest • Easier to manage forages with multiple harvests per year • Greater upfront cost than piles

1) **Drive-over piles:** There are several ways to design and shape your pile, depending on the space you have available. Side slope angles should be a minimum of 3' run to 1' rise (91 cm run to 31 cm rise). There should also be enough room around the entire pile to provide a clear path for cleaning. Below are a few calculators:
    i. UW-Madison Pile Sizing Calculator: https://fyi.extension.wisc.edu/forage/harvest/
    ii. Pioneer Example Size and Tonnage Charts: https://www.pioneer.com/us/agronomy/silagecapacities.html
    a. Forage inventory calculators
        i. UW-Madison: https://livestock.extension.wisc.edu/files/2020/09/forage-inventory-and-needs.xlsx

2) **Bunkers:** Sizing and construction

Lego blocks	Pre-cast L/T-wall panels	Poured walls
Pros • Budget friendly • Easily adjustable/movable/ expandable in terms of height, width, location • Retain salvage value • Potential temporary solution	Pros • Similarly priced to poured • Less gaps for air and spoilage than blocks • Quicker install than poured when available • More consistent than poured walls; mass produced in consistent environment • Able to be moved if necessary	Pros • Similarly priced to pre-cast • Customizable sizes, widths, heights • No joints for air, water, etc. resulting in minimal spoilage • Potential to be built taller than precast available heights
Cons • Results in more spoilage due to poor seal • Relatively limited safe height of ~9' (2.7 m). • Imperative to cover walls in plastic	Cons • More air penetration than poured walls • Less easily moved than blocks • No vertical expansion	Cons • No movement or vertical expansion • Less consistent; quality dependent on installer, weather, other factors



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Flooring: Asphalt and concrete are the most used flooring options for forage storage. Pros and Cons of each are discussed below. Both concrete and asphalt require a good, compacted base to hold up well, but the base is especially important with asphalt. There are specialty products with increased acid resistance and durability for silage bases that are available for concrete and asphalt.

- Breedon asphalt- https://www.breedongroup.com/products-and-services/gb/our-products/asphalt/breedon-agricultural-hra

Asphalt	Concrete
Pros: • More resilient to silage leachate • Less upfront cost • Easier to repair/redo if first layer was done correctly	Pros: • Holds up well to heavy equipment traffic
Cons: • Easier to accidentally tear up with equipment buckets or aggressive tread tires making snow removal and cleaning precarious • Larger, heavier equipment can cause cracks, especially in the spring during thawing	Cons: • More susceptible to leachate wear

Densities: Having a good density, regardless of the storage structure, is very important to maintain forage quality and minimize losses. To achieve the highest density, it is suggested to keep a 3:1 run to rise on the sides of any piles. A good goal density is at least 18 lbs/cu ft. Another calculation that is often used to determine packing weight needed is the "Rule of 800."

Rule of 800 = Divide the total weight of all packing tractors by 800 to determine the number of tons that should be delivered per hour. For example, if we have 80,000 lbs of pack tractor on the pile, we would take 80,000/800=100 tons, which means we can handle 100 tons of silage coming to the pile per hour for adequate packing.

There are ways to increase compaction:

1) Increasing tractor numbers
2) Increasing tractor weight with custom three-point weights
3) Decreasing harvest speed

Below are some examples of custom three-point weights. The top two pictures show a custom weight that is wired with lights since the box will likely block some of the tractor mounted lights, which are extremely important for safety when backing up.

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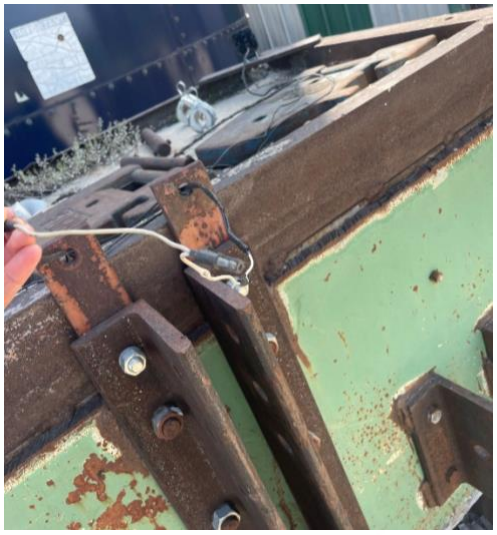
Forage Storage

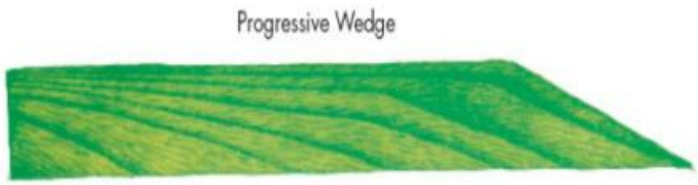



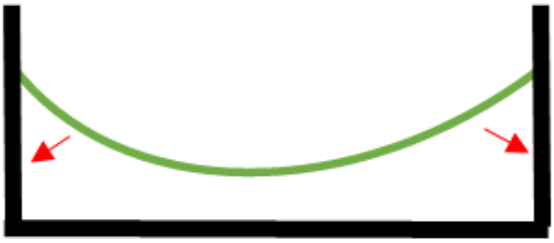




Filling: The most common filling technique is the progressive wedge, which aims to push and pack silage in layers of 6” (15 cm) deep or less. Concavely filling bunkers shifts more weight towards the bunker wall

in order to have better compaction against walls and reduce sidewall spoilage. However, the bunker still needs to be convexly filled when finished.





Filling partially full bunkers: For better compaction, it is recommended to either fill the entire bunker width (use both walls) or use neither wall when only putting a small amount of forage in a bunker.

Sealing: Covering bunker sidewalls with plastic prior to filling a bunker is one recommended practice to help store the best quality forage possible and prevent bunker wall degradation. To do this, drape plastic down the height of the wall prior to filling the bunk (wall unroller tool for this is shown below). Tile at the bottom corners of bunkers helps move excess water away from the bunker sidewalls and prevents spoilage. Covering the top and end of bunker walls with tile or other material helps prevent tearing of plastic when covering and storing forages in bunkers.

Wall covering: The Stout Equipment Wall Unroller is an attachment on a pivot, allowing plastic to be lifted with a front-loader, makes rolling out over bunker sidewalls easier, and is safer than walking down the wall pulling plastic.

Facing: There are a few main equipment options when it comes to feeding out of drive-over piles. Below we discuss the pros and cons of each.

Rakes	Facers
Pros • Much faster option • Much more practical for a larger pile or when taking multiple feet of face per day • Less moving parts • Quick attachment/detachment	Pros • Can result in a smoother face, especially in haylage piles • Minimizes pile disruption while maintaining an anaerobic environment • Minimizes forage shrink • Creates a safer feed area • More uniform mix of feed by mixing silage from entire pile height
Cons • Can result in a rougher face than facers • Difficult to face the bottom several feet/meters of the pile	Cons • Difficult/timely to hook up • More parts to break