

Capital Cost of Pads for Bunkers, Piles, and Bag Silos

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This information was prepared for an Outagamie County Forage Field Day to address a question posed by the planning committee. The question related to the cost for various floors for bunker silos, silage piles, and silo bags.

WARNING:

- These costs are not your costs. They are provided as guidance only.
- Do your own design and obtain cost estimates for your case.
- This is not a complete cost analysis. For example, bunker walls are not included, nor are annual costs.

To make a comparison of the three storage system floor costs, some assumptions of a specific case were needed. For each of the storage systems, three types of floors were considered: concrete, asphalt, and Macadam-crushed stone. The Macadam base construction method was used under the concrete and asphalt surfaces. Some of the major assumptions used in the design of the storage sizing are presented in Table 1.

TABLE 1. Assumptions Used in Sizing Storages

300 cows and 300 heifers	
corn silage – 32% of forage ration	
hay silage, two qualities – 68% of forage ration	
bunker/pile face removal = 12 inches/day	
bunker/pile height = 10 feet	
bag diameter = 10 feet	
level site	
no overflow storage capacity	
haul distance for crushed stone, concrete, asphalt = 15 miles	
bunker silos: number = 9	
	length = 134 feet
	wall = T-panels
	wall toe width = 10 feet
	wall cost not included
silage piles:	number = 6
	length = 194 feet
	side slope = 3 horizontal : 1 vertical
	distance between piles = 6 feet
	pile height = 10 to 11 feet
	top width = 3 to 11.5 feet
silo bags:	number = 39
	bag length = 180 feet (filled)
	distance between bags = 3 feet

The assumptions used for constructing the floor surfaces are indicated in Table 2. These were the basis of the cost estimates provided by local contractors.

TABLE 2. Assumptions about Constructing Floors

Macadam:	no geotextile breaker rock (packed) = 8 inches screenings (packed) = 4 inches slope to provide surface drainage = 1 inch per 8 feet = 1% topsoil removed = 8 inches backfill for slope – on-farm source of material
asphalt:	base – same as Macadam thickness = 4 inches (2 inches + 2 inches) no sealant cure 10 days
concrete:	base – same as Macadam (whole area under the concrete and bunker walls) thickness = 5 inches with rebar cure 30 days concrete used between toes of bunker walls and full length of 30-foot wide apron

Several contractors doing work on storage floors in the Outagamie County area were contacted and asked to provide cost estimates for the various storages based on the specifications in the assumptions. Their cost estimates are summarized in Table 3.

TABLE 3. Capital Cost of Floors

Cost Item	Bunkers (\$)	Piles (\$)	Bags (\$)
excavate topsoil	1,530-2,450 (2,090)*	1,440-2,310 (1,975)*	2,570-3,852 (3,425)*
fill – farm source	1,550-4,650 (2,975)*	2,530-6,960 (4,930)*	4,015-10,038 (7,345)*
base	12,240-23,830 (19,610)*	11,550-22,490 (18,440)*	20,545-40,995 (33,090)*
Macadam – total	24,675	25,345	43,860
Macadam – per ft ²	0.40	0.43	0.42
asphalt surface	45,215-76,000 (57,150)*	52,650-82,250 (64,470)*	88,400-164,000 (136,470)*
asphalt – total	81,825	89,815	180,330
asphalt – per ft ²	1.32	1.54	1.73
concrete surface	115,550-160,770 (141,600)*	134,550-193,050 (163,245)*	234,000-332,800 (292,085)*
concrete – total	166,275	188,590	335,945
concrete – per ft ²	2.68	3.22	3.23

* Value in parentheses is an average of 3 to 4 estimates.

The cost estimates of Table 3 are based on the specific assumptions used in the analysis and provided to the contractors. As several contractors emphasized, the actual cost for a specific farm could vary widely from these values, based on conditions at that site. Some conditions that could drive up costs at a specific site are:

- terrain requires more excavation/site preparation
- haul distance for materials greater than 15 miles
- bunker walls
- site drainage – geotextile, tile drains, diversions
- seepage/runoff catchment/treatment
- sealants
- overflow feed storage capacity
- contractor availability
- increases in cost of materials
- fill materials delivered from off-farm

In the process of obtaining the cost estimates for the case of a 300-cow herd, an opportunity arose to find installed costs for various similar storage floors. Those results are summarized in Table 4. Because of differences in conditions at each farm, use caution when doing cost comparisons from one site to the next.

TABLE 4. Actual Farm Values

Farmer	Pad Size	Macadam		Asphalt		Concrete	
		\$	\$/ft ²	\$	\$/ft ²	\$	\$/ft ²
A. Janesville (estimates)	100 × 300	---	---	30,370	1.01	40,800	1.36
	175 × 300	---	---	53,810	1.02	73,600	1.40
B. NE WI	250 × 250	30,000	0.48	---	---	---	---
C. NE WI 1998	140 × 350*	---	---	52,000	1.06	---	---
D. NE WI	pile pad** (100 × 200)	---	---	---	---	41,500	2.08
	2 bunkers [†] (40 × 200)	---	---	---	---	32,000	2.00±
E. NW WI	30 × 150	5,000	1.10	---	---	17,000	3.78
F. NW WI	92 × 420 ^{††}	---	---	45,000	1.16	56,000	1.45

* 8 inches gravel, 4 feet excavation, 2 inches + 2 inches asphalt

** 6 inches gravel under 5+ inches concrete

[†] Concrete only

^{††} Includes 8-inch tall perimeter curb

Farm work is a dangerous occupation. Workers should be ever-vigilant to protect themselves from injury and death while working on or around horizontal forage storages. Some of the safety concerns are:

Filling bunker/pile

roll over
drive off
tractor collision

- other tractor/truck
- people
- walls

crush under bucket
entanglement – wagon PTO

Covering bunker/pile

fall off
tractor collision
crush under bucket

Emptying bunker/pile

fall off
tractor collision
avalanche
tire fall on
crush under bucket

Filling bags

entanglement – bagger
and wagon PTO, etc.
tractor collision
silo gas

Emptying bags

tractor collision
crush under buckets

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