Farm Structures
FACTSHEET

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PLANNING A FEED-GRAIN STORAGE FOR BEEF OPERATIONS

This factsheet outlines the essential considerations in planning a feed grain storage: location and site preparation, sizing the storage, structural requirements and typical costs.

INTRODUCTION

On-farm storage of bulk feed grain is an important component of most livestock feeding operations. For example, grain stored on farm could be used to supply feed for the early weaning-preconditioning period of a cow/calf operation, for flexibility in feeding calves and yearlings, or to provide supplemental feeding of yearling heifers as well as the entire herd. If the storage bin is large enough, one can take advantage of volume purchases of trainload quantities and provide added flexibility of feed grain supply.

As with all physical facilities on the farm, it is important to plan the location, sizing and construction of the grain storage.

LOCATION AND SITE PREPARATION

Integrate the feed grain storage within the overall farmstead plan. Determine the best location by planning on paper before any construction work begins.

Feed grain storages should be centralized near the feeding area. Locate near a main road for year round, all weather access. If the feed storage uses more than one bin, an overall feed handling system must be worked out to reduce labour requirements. Power may be necessary for auger motors, processing equipment and aeration and drying fans if these are required.

Choose a well drained site with enough space to handle future expansion. If necessary, grade the site and surroundings to improve natural drainage and provide a level construction site. (**Figure 1**)

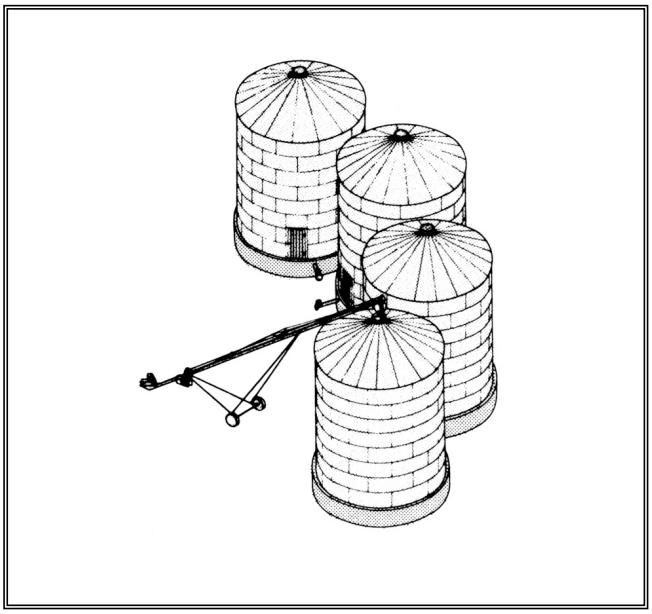

Figure 1 **Well Drained and Planned Feed Grain Storage Site**

BINS vs BUILDINGS

Feed grains may be adequately stored in either circular metal bins or rectangular timber buildings. Although timber buildings may initially be less costly to build, circular bins have many advantages:

- Several circular bins may be constructed in an integrated handling system to provide separate storage for different feeds.
- Metal bins placed on well-constructed foundations have very low maintenance requirements.
- Circular bins are easily adapted to mechanical handling and cleaning.
- Hopper bottomed bins, although more costly, permit gravity unloading and may be used as part of the handling and storage system.

Regardless of whether circular bins or rectangular buildings are used, plan the total system for handling of the feed on the farm **before** beginning any construction.

SIZING THE STORAGE

Consider the following factors in selecting the size of feed grain storage structures:

- Volume of feed grain harvested or purchased. For example, to take advantage of purchase of a B-train load of feed grain (about 26 ton) select a 32 ton capacity bin. The 20% extra capacity provides a safety factor for delays in delivery. If feed is purchased on a monthly, yearly or truck load basis, the storage should be sized accordingly.

Number of animals to be fed and the length of the feeding period. Feed requirements vary with the type of feeding method and the type and size of animal. Typical amounts of feed grain consumption are as follows:

Cows: No grain
Fattening 2-year old heifers:
1.5 to 2.0 lb/100 lb live weight
Yearlings: May substitute for hay at
1 lb.grain/1.5 lb hay
Calves (500 lb): 1.5 to 2 lb/head/day.

Example

A rancher in Vanderhoof wishes to background 100 head of 700 lb average weight for a 100 day period. A grain feeding program of 10 lbs of barley per day per head has been recommended by the livestock specialist. What size storage is required?

Total feed requirement over the feeding period:

$$100 \text{ head} \times \frac{10 \text{ lbs}}{\text{head/day}} \times 100 \text{ days} =$$

$$100{,}000 \text{ lbs} = \underline{50 \text{ tons}}$$

Using Table 1, find the appropriate factor to convert weight to volume (cubic feet):

$$50 \text{ tons} \times \frac{\overbrace{50 \text{ cu ft}}^{\text{conversion factor for barley}}}{\text{ton}} = 2500 \text{ cu ft}$$

From Table 2, select an appropriately sized storage bin:

e.g.
- Behlen – Model 16 with height to eaves = 15.0 ft
- Butler – Model 1418
- Westeel Roscoe – Model 194

Table 1 DENSITIES OF FEED-GRAIN MATERIALS

Grain and Feed Material	lb/cu ft	lb/bu	cu ft/ton
Grains :			
Barley	40	50	50
Oats	25-35	31-44	57-80
Ground or rolled	19-25	24-31	80-105
Rye	45	56	44
Wheat	48	60	42
Wheat, ground	38	47	53
Concentrated Feeds:			
Alfalfa meal, dehy	16-22	20-27	91-125
Alfalfa pellets	41-43	51-53	46-49
Wheat, bran	11-16	14-20	125-182
Pelleted ration	37-39	46-48	51-54
Crumbled ration	34	42	59

Table 2 GRAIN BIN DIMENSIONS AND VOLUMES

Make	Model	Diameter		Height to Eaves		Volumes to Eaves		
		(ft)	(m)	(ft)	(m)	(cu ft)	(bu)	(cu m)
Behlen	12	12.2	3.7	10.0	3.0	1169	939	33.1
				15.0	4.6	1753	1409	49.7
	16	15.8	4.8	10.0	3.0	1971	1584	55.8
				15.0	4.6	2957	2376	83.7
				20.0	6.1	3944	3169	111.7
	22	22.0	6.7	10.0	3.0	3792	3047	107.4
				15.0	4.6	5689	4572	161.1
				20.0	6.1	7589	6098	214.9
Butler	1411	14.0	4.3	11.0	3.4	1693	1360	47.9
	1415			14.7	4.5	2259	1815	64.0
	1418			18.3	5.6	2825	2270	80.0
	1811	18.0	5.5	11.0	3.4	2809	2257	79.5
	1815			14.7	4.5	3747	3011	106.1
	1818			18.3	5.6	4686	3766	132.7
	2111	21.0	6.4	11.0	3.4	3803	3056	107.7
	2115			14.7	4.5	5074	4077	143.7
	2118			18.3	5.6	6346	5099	179.7
Westeel	144	13.8	4.2	10.2	3.1	1516	1218	42.9
Roscoe	145			12.7	3.9	1887	1516	53.4
	146			15.2	4.6	2259	1815	64.0
	194	19.0	5.8	10.2	3.1	2890	2322	81.8
	195			12.7	3.9	3599	2892	101.9
	196			15.2	4.6	4307	3461	122.0
	197			17.7	5.4	5035	4046	142.6
	198			20.2	6.2	5743	4615	162.6

STRUCTURAL REQUIREMENTS OF A FEED-GRAIN STORAGE

Engineering drawings should be prepared and followed when constructing feed grain storages. These should also show how the storage fits into an overall feed handling layout if and when expansion is required:

- The storage wall must be designed to resist the heavy loading of a full grain bin. If a circular steel bin is purchased "off-the-shelf", install only according to the manufacturer's recommendations. Make sure that the wall does not extend higher than intended by the manufacturer. If a timber bin is to be built, the wall must be properly designed to resist the grain loading. Engineered plans are essential for timber storage buildings.
- Steel Quonset buildings may be used for grain storage. These require special engineering consideration to ensure well designed foundations, sidewalls and endwalls. Construct only according to manufacturers recommendations.
- Construct a properly reinforced concrete foundation which is high enough to be well above grade and therefore well drained. (**Figure 2**).
- Install tubes in the concrete foundation floor during construction floor during construction to permit installation of unloading and/or aeration systems at a future date.

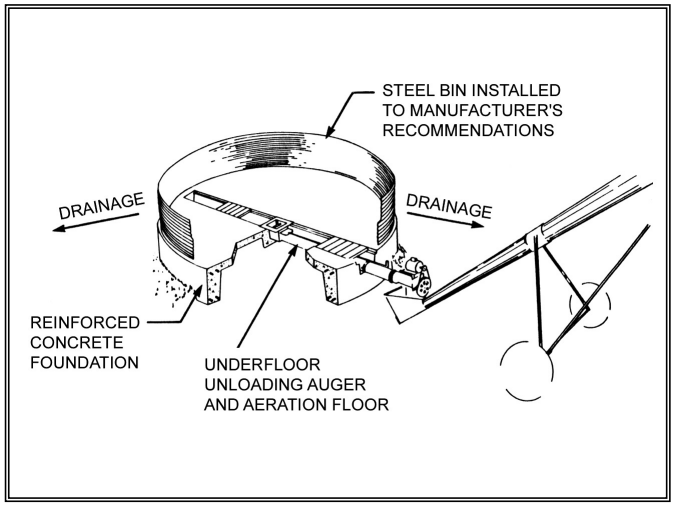

Figure 2 Grain Bin Floor

TYPICAL COSTS TO ERECT A FEED-GRAIN BIN

Costs for grain storage will vary depending upon local availability, type of structure and labour costs.

A typical bin with capacity to store 2500 cu ft (2000 bu or 50 tons barley) with a concrete pad could cost:

Site preparation	$ 250
Concrete foundation	1,000
Circular steel bin materials	2,500
Labour and construction	1,000
Underfloor unloading auger	600
TOTAL	5,350

or **$2.14 per cu ft**

Other costs, which should be considered for handling and aeration, are typically as follows:

Aeration fan	$ 600
7"dia x 46' PTO driven auger	$2,000
Perforated floor (40%) for aeration (19' dia bin)	$1,000

Check with the suppliers in your area for local costs.

USEFUL CONVERSION FACTORS

1 cubic meter = 28.38 bushels
1 cubic meter = 35.31 cubic feet
1 meter = 3.28 ft
1 kg = 2.205 lbs
1 ton (short) = 0.907 tonne (metric)
1 bushel = 1.244 cubic feet

FOR FURTHER INFORMATION CONTACT
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