

Compost Bedded Pack Barn Construction

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In the August 2008 issue of Kentucky Dairy Notes, we discussed issues to consider in deciding whether or not to build a compost bedded pack barn. So, if you've decided to build one, what do you need to know about how it should be constructed?

First of all, as with any dairy facility, site selection is critical. To maximize natural ventilation, the barn should be located to take advantage of summer winds in an area with a slight elevation to minimize rain and snow runoff entering the pack. Although the pack likely will not be wet enough for drainage out of the bottom of the pack, selecting a location with minimal potential for contamination through seepage from the pack is also important. The base may be either clay or concrete, though there are probably no advantages to having a concrete base in a new facility. Most newly constructed compost bedded pack barns are built by modifying 2-row, 3-row, or 4-row freestall barn designs using wood, steel or hoop structures. Some Kentucky producers have even built their barns with dimensions that would allow for flexibility to add concrete alleys, freestall platforms, dividers, and waterers if the facility does not meet their needs or if changing market conditions necessitate changing facilities.

A guide for sizing a compost bedded pack barn is provided in Worksheet 1. Minnesota researchers recommend regardless of design, that the pack area should provide at least 85 square feet (65 square feet for Jerseys) of resting space per milking cow. However, because of the increased heat and humidity in Kentucky, which alters the amount of moisture in the composting environment, providing at least 95 to 100 square feet of resting space per cow is recommended in Kentucky. In efforts to build a low-cost facility, the temptation exists to shortcut feed and water access. Feed bunks may be located within the barn, outside of the building under a roof, or outside. For optimum animal performance and health, feed and water should be easily accessible and readily available at all times. Provide a minimum of 24 to 30 inches of feed bunk space per cow and two feet of water tank perimeter per 15 to 20 cows. Cows will generally use space provided more efficiently when they have access to the composted bedded pack along the long side. If the entrance to the barn is on the short side, a wet, dirty area may develop.

Providing adequate ventilation is essential to successful management of a compost bedded pack barn in order to remove heat and moisture created by the cows and the compost throughout the year. Proper ventilation is also important to keep the surface of the pack dry which minimizes bacterial growth and keeps cows clean. Moreover, it can help eliminate respiratory problems. During the summer, ventilation helps keep cows cool affecting their overall health, immune status, and performance. Sidewalls in a compost bedded pack barn should be higher (16 feet) than in freestalls because the pack and wall depth block some of the air flow. A ridge opening of 2 inches for each 10 feet of building width is recommended. Fans (ceiling or big box) also help keep the pack dry and ensure even air flow throughout the barn. Many Kentucky farms have installed high volume/low speed ceiling fans in their compost bedded pack barns which seem to be working well. Without fans, cows may congregate in areas where natural air flow is higher. When installing fans, care should be

taken to ensure that the fans are high enough for tillage equipment to work under at maximum pack depth. Roof gutters may be installed to reduce runoff from blowing into the pack and 3-foot eave overhangs should be built to prevent rain from getting on the pack. Curtains may also prove beneficial to block cold winter winds and weather.

While a number of different barn designs exist, a potential suggested layout from the University of Minnesota is depicted in Figure 1. With this design, 4 feet walls surround the bedded pack on all sides including a wall to separate the bedded pack from the feed alley. These walls may be cast-in-place concrete, moveable concrete panels, or wood panels. In constructing these walls, it is important to consider the amount of pressure that manure and cows will place on the walls. A concrete feed alley, located along the long side of the barn, allows cows to access feed and water without traveling long distances. Furthermore, keeping waterers away from the bedded pack minimizes excessive moisture in the pack, keeps water cleaner, and eliminates concerns with altering waterer height as the pack depth changes. Cows should only have access to waterers on the feed alley side to avoid moisture accumulation in the pack resulting from cows congregating around waterers. Keep in mind that cows defecate and urinate more around feed and water. Concrete feed alleys should be 12 to 14 feet wide with walkways located every 120 to 160 feet and at each end. To prevent cows from falling into the feed alley, a fence should be built on top of the wall.

Compost bedded pack barns can be an excellent housing system for dairy cattle when constructed properly. It is always a good idea to visit existing structures prior to building a new barn. You can find more information about compost bedded pack barns from the University of Minnesota web site:

(<http://www.extension.umn.edu/dairy/managementcompostbarns.htm>).

Worksheet 1. Calculating Compost Bedded Pack Barn Dimensions				
Sample Calculations for a 100 Cow Herd				
Step	Calculation	Formula	Example Inputs	Example Answer
1	Required Pack Area (RPA)	$RC \times NC$	$100 \times 100 =$	10,000 square feet
2	Barn Length (BL)	$(MC \times NC)/12$	$(24 \times 100)/12 =$	200 feet
3	Pack Width (PW)	RPA/BL	$10,000/200 =$	50 feet
4	Total Barn Width (TBW)	$PW + FAW + EW$	$50 + 12 + 1 =$	63 feet
5	Total Barn Area (TBA)	$TBW \times BL$	$63 \times 200 =$	12,600 square feet
Inputs Required: Resting Space Per Cow (RC), Manger Space per Cow (MC), Number of Cows (NC), Feed Alley Width (FAW), Exterior Walls (EW)				
Recommendations: RC=100 sq ft/cow, MC=24 inches/cow, FAW=12 feet, EW=1 foot				

Figure 1. Compost barn layout for 100 cows with three walkways to access the pack, drive-by feeding and 6 foot overhang. Waterers are against the concrete wall separating the bedded pack from the feed alley and are accessed from the feed alley only. Not drawn to scale. **Source:** University of Minnesota

