

# Affordable Calf and Heifer Housing

William G. Bickert

Agricultural Engineering Department, Michigan State University, East Lansing, MI 48824 USA  
Email: bickert@egr.msu.edu

## ▪ Take Home Messages

- Housing facilities serve as tools for carrying out the essential tasks prescribed by a heifer management program and provide an environment for the animals that is vital to calves, heifers and cows as they grow, mature, reproduce and produce milk.
- The calf hutch is the gold standard for calf housing in terms of the environment it provides.
- Special consideration to housing for calves from weaning to 5 or 6 months of age makes the transition at weaning less stressful and reduces a setback that may be equivalent to two weeks or more of growth.

## ▪ Introduction

The calves and heifers on a dairy farm represent the future of the milking herd. Beginning at birth, the replacement animals should be the best of the lot, genetically superior to the older animals. Accomplishing this is the result of a well managed breeding program; taking advantage of the genetic superiority requires implementing a sound management program based on current recommendations.

From an environmental standpoint, raising healthy, potentially high producing replacement animals requires housing that provides adequate space for water, feed, resting and exercise. High humidity is especially detrimental to animal health requiring adequate ventilation to remove the moisture produced by the animals themselves. Adequate ventilation also removes other air pollutants so that air quality is maintained.

## ▪ **A Management Plan**

Having a definite management plan is essential to raising thrifty heifers, as well as to carrying out all other dairy farm operations. Give careful thought to all factors related to nutrition, health and growth. Group all heifers according to stage of growth, and implement well-planned practices at each stage.

View heifers as a series of management groups, progressing from one stage to the next according to a predetermined plan. Each group is a collection of animals with similar needs and characteristics and, thus, can be treated the same. The buildings and equipment associated with each of these groups actually are tools that allow you to meet the needs of heifers of different ages; the goal being to have them calve at 24 months of age with adequate size and frame.

Begin with providing a clean, dry maternity area for the newborn calf. Maternity pens are preferably separate from other animals. Move the newborn calf to an individual pen after dispensing the proper amount of colostrum, drying the haircoat and performing all health-related treatments. Cold housing is preferred, or stalls.

Give special consideration to newly weaned calves as they adjust to being in groups. A transition area where group size is limited and ample bedding is provided reduces stress during this adjustment period. Providing transition housing for calves from weaning to 5 or 6 months of age emphasizes that this is a special group of calves with special needs.

Six- to 24-month-old heifers can withstand the stress of larger groups. Consider heifer age and size when forming groups. Group size is related to herd makeup, management, and feeding practices. When possible, maintain uniform animal size within a group to reduce stress and injury. Divide heifers into groups according to a management plan that considers differences in nutritional requirements, medical treatments and other procedures, and breeding. For example, it is logical to transfer heifers to the next group when they are bred.

## ▪ **Environmental Aspects**

Besides serving as management tools, dairy facilities provide an environment for the animals. The calves, heifers and cows on the dairy farm must be given an environment that permits them to grow, mature, reproduce and maintain health. If the basic needs of the animals are not being met, no amount of management can assure success.

## **Ventilation**

Animal health and disease are influenced by air quality that is directly related to ventilation. The aerosol exchange of pathogens among animals and the influence of air pollutants on pulmonary defense mechanisms are important, especially to respiratory health. Ventilation continuously replaces contaminated air with fresh outside air that reduces the concentration of aerosol pathogens. Ventilation removes the moisture produced by the animals as well, thus maintaining a more desirable relative humidity. Maintaining a relative humidity in the range of 55% to 75% results in the shortest survival time for the greatest number of potential pathogens. Providing sufficient ventilation for moisture control during the winter apparently minimizes the undesirable effects of airborne pollutants as well.

Manage ventilation to maintain good air quality and to facilitate dry bedding and dry haircoats. Procedures to reduce drafts in winter must be managed carefully, especially during periods of changing weather. Adjustments to ventilation based upon worst conditions will likely result in too little ventilation when conditions are less harsh; e.g., in winter when conditions change from a cold night to a sunny day. Also, excessively high relative humidity can result when too little ventilation allows warm moisture-laden air to accumulate and this air subsequently is cooled as a result of falling outside temperatures.

## **Feed and Water**

Provide feeding space sufficient to allow all animals in a group access to feed at the same time. The feeding area should be smooth, clean and free of leftover feed and other debris. In new construction, use high-strength concrete to prolong the condition of the manger surface when feeding silage and other feeds. Or, line the manger with a resistant material such as ceramic tile or epoxy paint.

Water is an essential nutritional ingredient. Thus, a continuous supply of fresh, good quality water is an integral aspect of health, growth and development.

A preferred waterer location is at the interface of the feeding alley and the resting area. But, to help keep the resting area dry, the waterer should be guarded so as to allow access only from the alley. To protect the resting area, the waterer may be located along the feed manger. But this makes the waterer more vulnerable to contamination with feed and may result in the feed manger area being more difficult to clean.

Select a frost-free waterer and locate it at a height that corresponds to the age and size of the animals in the particular group.

## ▪ **Calf Housing**

From birth to age of weaning (two months), provide individual hutches, pens or stalls. Cold, naturally ventilated housing is preferred.

A calf hutch that is clean and dry with ample amounts of dry bedding has proven to be a desirable option. From an environmental view, the benefits of a hutch are:

- ▶ No contact between calves (reduces spread of disease)
- ▶ Well-ventilated (air inside hutch is similar to outdoor air)
- ▶ Adequate space (dry bedding is easier to maintain)
- ▶ Can move to a clean spot (breaks a potential disease cycle).

The calf hutch is the gold standard for calf housing in terms of the environment it provides. Any decision to choose something other than hutches in the interest of working conditions for people or for equipment must be made in full view of the potential consequences. Thus, before making a decision to choose something other than hutches for housing calves, consider the attributes listed above. Whenever an attribute is lost, calf health is placed in greater jeopardy—the more attributes that are lost, the greater the jeopardy. For example, choosing group housing over individual housing places risk on calf health from the standpoint of spread of disease and competition. Moving calves to pens inside a building may compromise ventilation or the ability to provide a clean, fresh place for the newborn calf. Thus, as in all facilities decisions, choice of calf housing is the result of a compromise, a process of making choices after carefully considering all of the consequences.

## ▪ **Transition Housing**

Aside from the process of birth itself, probably the most dramatic change in the life of a calf occurs when, being newly weaned, the calf is moved from individual housing and grouped with others. Often, the stress associated with this transition is sufficient to cause a setback that may be equivalent to two weeks or more of growth. But this setback in growth need not occur. By giving special consideration to the calf's environment, we can make the transition at weaning less stressful as the calf adjusts to being with other animals and learns to compete for space, water and feed.

An important management category is comprised of calves from weaning up to 5 or 6 months of age—the transition group. From an environmental standpoint, these calves have special needs that differ from older heifers.

Provide transition housing for calves from weaning to 5 or 6 months of age. Maintain small groups. For a 100-cow dairy, 4 to 6 calves per group will sufficiently minimize the difference in size among calves in the group. Well-bedded pens should allow 2.3 to 2.8 sq m (25 to 30 sq ft) per calf—a 3.65 m x 3.65 m (12 ft x 12 ft) pen will hold up to 5 calves.

The environment should be similar to the environment to which the calves have already become acclimated with sufficient ventilation for moisture control and protection from the elements in winter. In cold weather, a thick, dry, erect haircoat is essential to reduce heat loss from the calf and accompanying environmental stress.

### **Super Hutches**

Portable calf shelters or super hutches (Figure 1) can provide transition housing for calves that have been raised in individual hutches or other cold housing. Use these open-front shelters, typically 3.7 m by 5.8 m (12 ft by 19 ft) and mounted on skids, in combination with a small pasture or a paved lot where feed and water are provided (Figure 2). Keep the shelters well bedded. Top capacity is 6 to 8 calves that weigh up to 180 kg (400 lb).

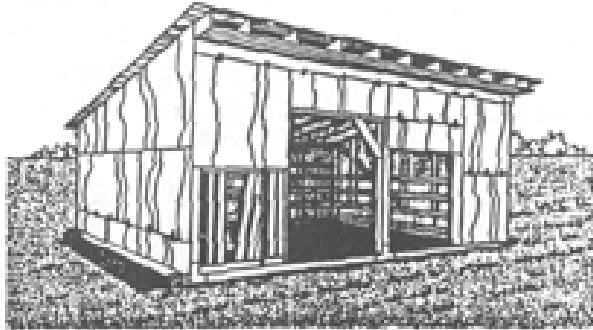
To improve summertime conditions, remove sidewalls from super hutches. Cover sidewalls and endwalls with fabric in winter. Thus, the shelter serves the purposes for which it is intended—a sunshade in summer and a windbreak in winter.

### **Existing Buildings**

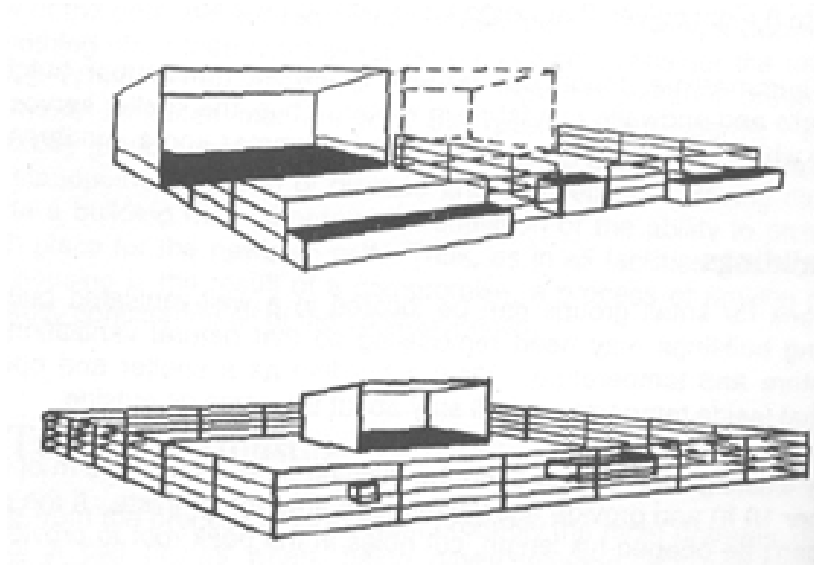
Transition pens for small groups can be located in a well-ventilated building also. Existing buildings may need remodeling so that natural ventilation will control moisture and temperature. View a building as a shelter and open it enough so that inside temperatures will stay about the same as outside.

Remove any existing ceilings and open the building peak 5 cm per 3 m of barn width (2 in per 10 ft) and provide equivalent open area for air inlets. If the peak of the roof can't be opened full length, cut holes in the peak roof to provide an air outlet area equivalent to a continuous opening. For summer, open fully the sidewalls and endwalls, removing all possible obstructions to air flow. Cover the sidewalls and endwalls with fabric in winter.

Install a thermometer in the barn as a check for adequate ventilation, especially in winter. Inside temperature should be no more than 3 to 6 °C above outside temperature during colder weather and about the same as outside temperature in summer.



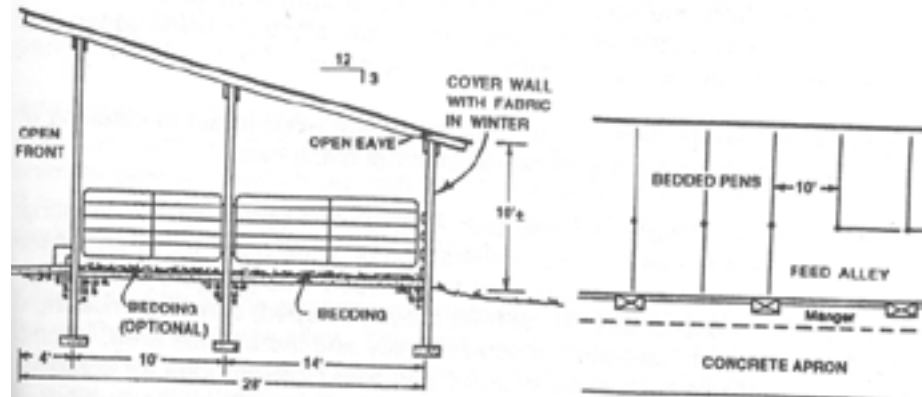
**Figure 1. A super calf hutch.** Fabric may be substituted for plywood sidewall cladding, the fabric being removed in summer to provide ventilation.



**Figure 2. Portable calf shelters or super hutches for transition housing.** Used with paved outside lots (upper), adjacent lots are alternated between groups of calves. Combined with a fenced pasture area (lower) choose well-drained sites and move shelters to new locations as required.

### Transition Barns

For a larger herd (100 cows or more), constructing a building specifically for the transition stage may be justified (Figure 3). The barn would house several groups of calves from weaning up to 5 or 6 months of age. Locate pens 3.0 m wide and 7.3 m deep (10 ft x 24 ft) in a building with a single-slope roof.



**Figure 3.** A transition barn for calves from weaning to 5 or 6 months. The front is open year-round; back and end walls are left fully open in summer and are covered by fabric in winter. Gate arrangements simplify cleaning the barn and movement of calves in and out.

If the front 3 m (10 ft) portion of the pen is scraped, maximum capacity is 6 calves per pen. If the whole pen is bedded, capacity is 8 calves per pen.

Number of pens needed depends on herd size and the number of calves per group. For example, on the average, a herd of 200 cows will have 32 calves in this category. At 6 calves per group, this gives 5 or 6 groups; at 8 calves per group, 4 groups. Allowing for some seasonal variations in calving and for leaving a pen or two vacant for a period of time during the rest of the year results in a barn with 8 or 6 pens, respectively. Also, providing even one more extra pen gives an ideal storage area for grain, hay or bedding.

The barns have a single-slope roof with no insulation and are open to the south or east. The eave in the back wall is left open to aid in moisture control during winter. During summer, fabric or other coverings on the back wall and the end walls are removed to make use of available winds for natural ventilation.

A solid back wall, 0.45-0.60 m (18-24 in) high, contains the built-up manure pack. Form this solid portion of concrete or treated lumber. Spaced boards or pipes above this wall to a total height of 1.2 m (4 ft) allow increased air movement in summer.

In winter, both ends of the barn should extend across the full 8.5 m (28 ft) to help alleviate wind whipping around the corner of the barn. To reduce the potential of circulating wind currents within long barns, attach plywood to gates and hang fabric from the underside of the roof to form a more or less solid partition between alternate pens. Position a row of straw bales along the bottom edge of the gates to stop drafts under the gates.

Gates serve as pen dividers. In turn, the gates are used to aid in cleaning of pens and when moving a group of calves in or out of the barn.

Pens must be well bedded, usually with a concrete floor under the bedding. Some farmers bed the whole pen. Others bed only the back 1/2 to 2/3 of the pen and scrape the front portion next to the feed manger (the feed alley). Either approach is acceptable. If the feed alley is scraped, consider installing a 13 cm (5 in) high curb between the scraped alley and the bedded area. A curb 38 cm (15 in) wide protects support posts and gates swung open for scraping. But scraping the front portion reduces total bedded area; thus, the number of calves per group should be reduced accordingly.

Sloping the back portion of the pen floor toward the front is not necessary. A sloped floor gives the impression that drainage from the bedded area is to occur. But if the resting area is well bedded, there should be little or no drainage. Thus the slope in itself makes little difference in a properly managed transition barn. Except, its presence may lead to skimping on bedding--violating one of the most important performance criteria for transition housing.

If older animals are housed in these barns, the number of animals per pen must be reduced in order to satisfy larger bedded space and bunk space requirements. Older animals should be housed in these barns only as a temporary measure. Reserving transition barns for weaned calves up to six months of age helps to maintain their status as a special category of calves with special needs.

## ▪ Heifers

In colder climates, heifers are usually housed on a bedded pack or in free stalls, at least in winter. Another alternative is based on sloped, self-cleaning floors and is intended for use with little or no bedding. Regardless of housing type, animals should be grouped according to a management plan. Variations in size and nutritional health and reproductive needs can then be accommodated.

### **Bedded Pack**

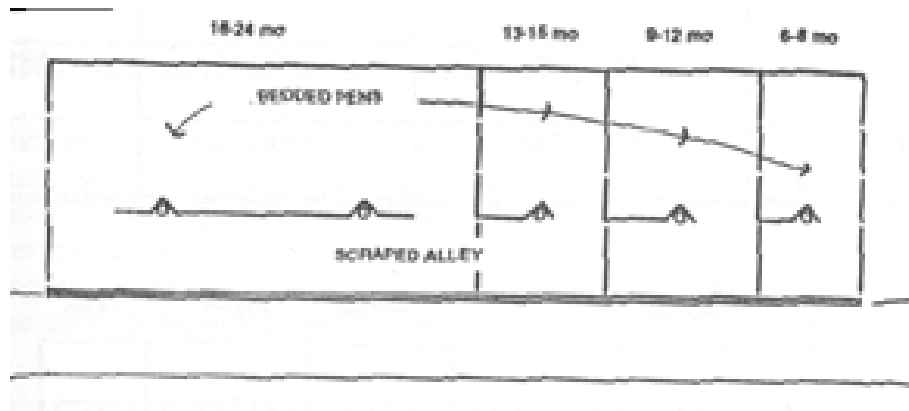
Bedded pack housing is used in conjunction with an outside exercise area and outside feeding or in a barn that includes feeding so that all animal traffic areas



are covered. The bedded resting area should provide at least 2.8 to 3.3 sq m (30 to 35 sq ft) per head for animals 9 to 15 months of age and 3.3 to 3.7 sq m (35 to 40 sq ft) for 15 to 24 months. If feeding is to be inside, provide a separate paved feed alley, 3.0 to 3.7 m (10 to 12 ft) wide, that will be scraped periodically (Figure 4).

Add bedding to the pack on a regular basis. Daily removal of manure deposits from the surface of the pack will reduce bedding requirements and keep animals cleaner. Remaining manure and bedding are then removed as a solid 2 to 4 times per year. The large amount of bedding required to maintain the pack is the main drawback to this system.

Keep the width of the passageway from the scrape alley to the pack equal to the width of the scrape alley. Then the same gate that separates groups at the scrape alley can be used to confine a group to the pack while the alley is scraped. A curb between the scrape alley and the pack facilitates scraping and saves bedding, but hinders access to the pack area from the scrape alley.



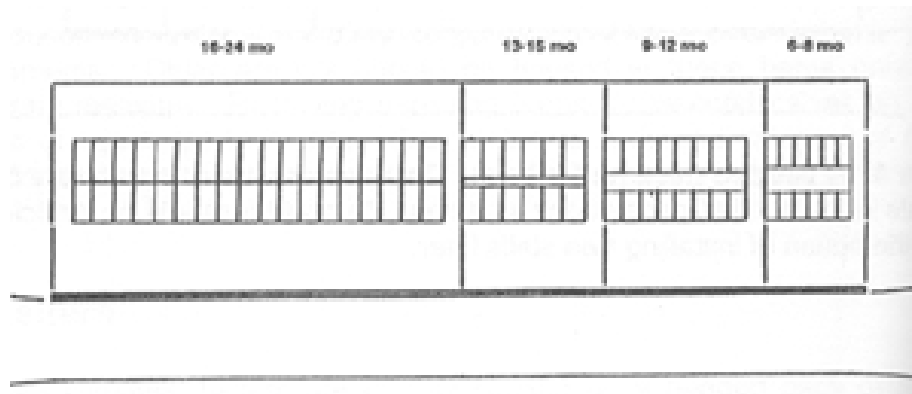
**Figure 4. A bedded pack heifer barn.** Gates across the scraped alley hold animals in the bedded pens during scraping. Barn width should be sufficient to allow the option of installing free stalls later.

## Freestalls

Freestall housing requires considerably less bedding than bedded pack housing. Heifers are grouped by age or size and freestalls are sized accordingly (Table 1). Freestalls have been constructed in bays under roof with animals having access to an outside lot for exercise and feeding. However, the trend is toward having both the freestalls and feeding included under the building roof (Figure 5). In this design, the continuous feed manger allows convenient feeding and the straight scrape alleys allow efficient manure removal. All animal traffic areas are covered which reduces the risk of environmental pollution. Outside exercise areas may still be provided with optional use during periods of inclement weather.

Table 1. Freestall sizes for heifers.

Age (mo)	Weight (kg)	Stall size	
		Width (cm)	Length (cm)
6 - 8	163 - 222	76	152
9 - 12	222 - 295	84	163
13 - 15	295 - 354	94	183
16 - 24	354 - 544	107	198



**Figure 5. A freestall heifer barn.** Feeding is along open south or east side. In summer, back and end walls are fully open also.

Having two or three rows of freestalls along one side of a single bunk, all under roof, provides flexibility in feeding system design. Depending upon the particular layout, feeding may be accomplished with a feed cart, a mechanical bunk feeder or a mobile scale-mixer.

### **Self-Cleaning, Sloped Floor**

A youngstock housing facility based on a sloped resting floor and a sloped feeding floor separated by a tractor-scraped alley was developed in Virginia in the early 1980's. The design was patterned after a similar design for beef feeding facilities. The resting and feeding floors, both sloped 1:12 toward the center alley, are self-cleaning. Bedding is optional but rarely used. When no bedding is used, heifers tend to be dirtier than in well-designed and well-maintained bedded pack and free stall barns.

A variation on this design which has become popular in some area is to remove the sloped floor in front of the feed manger. Thus the animals stand in the scrape alley to eat. Slopes on the self-cleaning resting pad of 1:12 to 1.5:12 work well. The main advantage of the self-cleaning resting pad is low investment—less than 50% of the investment required for a free-stall facility. But heifers are usually housed in these barns only until breeding age.

### **▪ Handling, Restraint and Treatment**

Provide means of restraining calves and heifers for medical examination, treatments such as vaccinations and dehorning, weighing, artificial insemination, estrus synchronization, and other procedures as needed. Include provisions for observing animals for signs of heat, injury, etc., and a means of separating an animal from the rest of a group. As a general rule, one person should be able to separate, restrain and perform necessary treatments on an animal.

Each management group must be provided with a method of restraint. Choice of method will vary with age or size and the particular housing facility. Options include rope and halter (for smaller animals), individual stanchions, headgates and gang-lock stanchions. Use these in combination with corrals, chutes and pens. In addition, a properly designed loading chute facilitates moving animals into and out of a facility. Do not examine or treat animals in the milking parlor. It is not designed for these purposes.

Give uppermost consideration to safety in all cases; safety of persons handling, examining and treating animals and safety of the animals themselves. Skid-resistant walking surfaces reduce injuries, besides improving movement of animals to feed, water and resting areas and helping heat detection.

### ▪ **Observation and Access**

Locate and design buildings to allow convenient observation of animals. Buildings located near regularly used drives or walkways allow passing employees and others to easily observe animals.

Allow for easy access to each group. A gated pass-through at the feed manger for each group or a walkway at the rear of the building can fulfill this need. A walkway (32 in wide) at the rear may also be used to move heifers in or out without interfering with other groups.

### ▪ **Summary**

The buildings and equipment that comprise dairy facilities serve as tools for carrying out essential tasks prescribed by the management plan. These facilities, in fact, make it possible to implement a management program. In addition, dairy facilities provide an environment for the animals. This environment is vital to calves, heifers and cows as they grow, mature, reproduce and produce milk. If the basic needs of the animals are not being met, no amount of management can assure success.

