



*Providing a conducive environment for housing heifers  
may be possible in older facilities*

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Have you considered housing heifers in an old cow barn or are you currently doing it? If so, this article is for you.

Many farmers have expanded herd size, requiring the construction of new facilities in order to house the larger herd. Still others have constructed new facilities to provide a better environment for their lactating cows and to increase labor efficiency. In both cases, the old cow barn is many times targeted to house replacements. Certainly using your old barn is worthy of consideration, but significant changes most likely need to be made to provide a suitable environment. After all, poor environment is one of the major reasons the cows were removed from the barn in the first place.

Before repairing or upgrading an existing facility, a producer should carefully review their overall business and management plans. Almost any barn can be made suitable for heifer housing if sufficient funds are spent. However, this usually will not result in a profitable heifer enterprise.

What is your long-term plan? Does it include using the barn in question for two or twenty years? The cost of barn repairs and upgrades is correlated with the expected duration of use. Increased expenditures can be justified in cases where the barn is part of the long-term facility master plan.

What are the tangible costs? What is the estimated cost to renovate the barn to the extent required so a suitable environment is created for the heifers and it is also labor efficient? A general rule of thumb is that if the estimated cost to repair and upgrade an existing facility exceeds 60 percent of the estimated cost to build a new facility, then it is better to build new. Experience has shown that the estimated cost to renovate an existing facility is almost always exceeded by the actual cost to perform the work.

What are the non-tangible costs/benefits? These are cost or benefits that are hard to define and/or can not be easily estimated. One example could be the change in mental attitude of your employees as a result of providing positive drainage around the



renovated facility. Having less mud and slop to walk through can improve your employees' mindset toward their work.

What is the value of the existing facility? And how much will its value change after the renovations are complete? Typically the existing value of a facility is over estimated. And, after renovations are complete, in most cases, an old facility is still an old facility in many ways. It's usually hard to recover invested cost under this scenario.

What is the expected life of the facility after it is remodeled? Many times the expected life is over estimated unless extensive changes are made.

What management group will be housed in the barn? Does this fit well with your overall management plan for the replacement herd?

### Structural Integrity

Determining the suitability of a barn relevant to housing heifers has three basic components. First, you need to ensure that the barn is structurally sound. Older barns may have suffered damage from elevated moisture levels, typically due to poor ventilation or a long-term leaky roof. Both result in accelerated deterioration of wood members and iron-based fasteners. Insects can also cause significant damage.

Inspect the barn's structural members for visual signs of deterioration. Look for moisture stains, wood discolorations, and pitted or highly porous wood. Use a fixed blade knife to assess the extent of damage in all critical structural members that show visual signs of damage. Minor repairs are usually warranted; but a barn with major damage may not be worth renovating, and a new or different facility should be evaluated.

### Adequate Heifer Environment

The second component is to determine the potential environment that can be economically created to house replacements. Those who have been following this series know that a facility must provide the following basic needs: a clean, comfortable resting area, free access to feed and water, and proper ventilation. Assess the existing facility and determine which of these needs are met and which need to be improved.

Structural columns that support the haymow above in bank and two story barns sometimes do not facilitate an easy renovation. They are commonly placed in the wrong location with respect to desired bedded pack pen or freestall layouts. Relocation of columns also requires moving the beam system that supports the second story floor joists. The distance the beam column assembly can be moved is usually limited by the second story floor joist system. Floor joists are usually spliced at the beams, thus minimizing the amount of possible lateral movement.



### *Resting Area*

A clean, dry and comfortable resting area can only be created by providing ample amounts of suitable bedding. The delivery of fresh bedding and removal of soiled bedding (manure handling) can only efficiently take place with skid-steer loaders or the like. Barn ceiling heights that will not allow free access by such equipment are labor traps and generally should not be considered for renovation.

### *Feed and Water*

Feed delivery can be a challenge since most expanding farms are using a TMR mixer wagon to deliver feed, and they are usually too tall to enter older barns. Sometimes the clearance for the mixer wagon is sufficient, but the spacing of the interior structural columns do not provide the required width. In these cases, exterior feeding is a possibility, but remember that you will need to capture and store or treat lot wastewater runoff to comply with a CAFO plan.

Space must be designated for floor mounted frost-free waterers, and free access needs to be provided. Water supply pipes that once were surface mounted to milking stalls need to be removed, and new ones buried below grade. Be sure that water supply pipes are properly sized and that an ample water supply is available. Complete information on sizing water supply pipes can be found in MWPS-15, "Private Water Systems Handbook." Contact the NRAES office at 607-255-7654 or visit them at [www.NRAES.com](http://www.NRAES.com) to order your copy.

### *Ventilation*

Ventilation problems usually exist in older facilities. An appropriate system can be a challenge to retrofit into an existing barn, but with some ingenuity it usually can be accomplished.

Natural ventilation is preferred over mechanical ventilation if the circumstances are conducive for it to be effective. Natural ventilation performance factors for existing facilities include: building orientation, sidewall and endwall openings, and eave and ridge openings.

The type of construction present in a facility dictates whether natural or mechanical ventilation should be used. In some cases, a combination of both can be employed. This ventilation technique is referred to as mechanical assist ventilation.

Barns that are built with post-frame construction or block foundation with stud wall methods and have the intended animal zone above grade are suitable candidates for natural ventilation. Existing sidewalls can be removed and replaced with a curtain system. Insulated ceilings can be ripped out and ridge openings can be created. Second story floors can be removed if the hay mow is no longer in service, thus eliminating the need for the support columns that are inevitably in the way. (Be sure to install sufficient members to ensure the structure is still sufficiently braced.)



Barns that have concrete masonry unit or stone sidewalls are best ventilated with mechanical ventilation. The best type of mechanical system to use is a negative pressure system. This system relies on fans to suck air into the animal zone through properly sized and located inlets so that uniform air distribution is provided. Slotted or baffled inlets are commonly used and are mounted at the ceiling sidewall interface. Fresh air is drawn through the attic or directly from the outside. The amount of air needed is based on the three variables: the size of the animal, the total number of animals in each size group, and the time of year. See Table 1 for the recommended air exchange rates as related to these three variables. Minimum ventilation in the winter is designed to remove moisture produced by the animals, while summer ventilation rates remove heat.


Designing a slotted inlet system can have some challenges. Many older barns have non-uniform spacing of structural members that can make it extremely difficult to install standard sized slotted air inlets. Solutions include using an array of standard sizes available from reputable ventilation companies or fabricating your own from readily available materials from the local building supply store.

Complete information on designing, operating and managing a slotted inlet ventilation system can be found in MWPS-32, "Mechanical Ventilation Systems for Livestock Housing." You can also work with your local county extension educator and ventilation product specialists to develop a design that best meets your needs.

Renovation plans need to include a place to restrain and handle heifers. Headlocks can be used at the feed barrier or a locking head gate can be centrally located. Scales are an all important management tool to track average daily weight gains and should be located for convenient use.

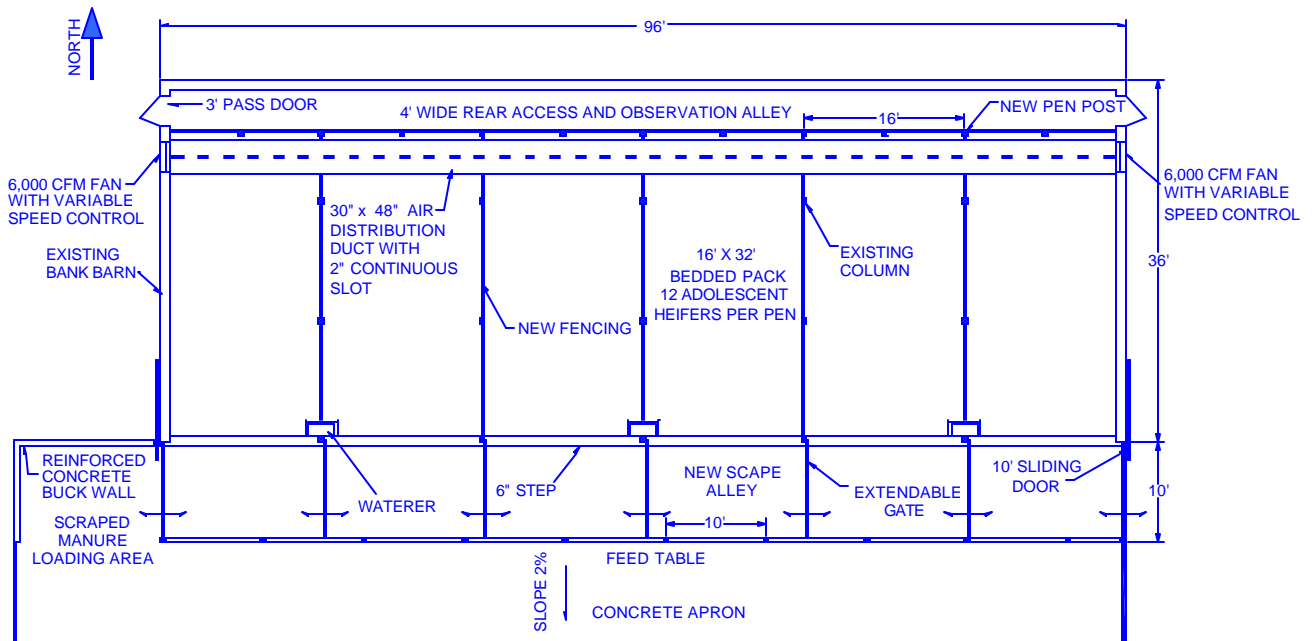
Let's look at an example to illustrate how an older facility can be effectively renovated to provide quality housing that is labor friendly.

Assume that a dairy producer has an existing bank barn that is 36 ft. wide and 96 ft. long with vertical wide plank wood boards as siding. The haymow is used to store hay and light farm machinery, but the old tie stall milking area located in the lower level has

been abandoned. The barn is oriented so that the old barnyard is located on the southern side of the barn and the at-grade entrance to the haymow is on the northern side of the barn.

This producer needs to provide housing for the adolescent management group (400 to 1,200 lb. animals) which consists on average of about 70 heifers.

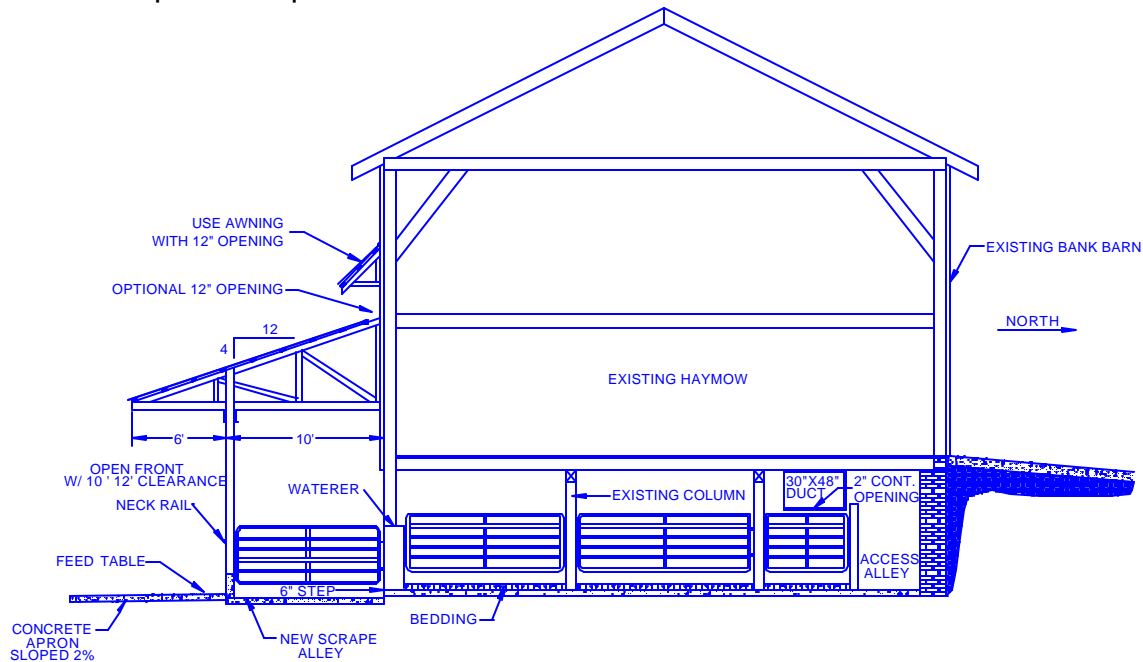
The existing location of the structural columns supporting the mow area can not be economically relocated in a lateral manner, making renovation into a freestall barn a poor option. However, with the even column spacing of 16 ft. o.c. longitudinally down the barn, a gated bedded back area can easily be developed. This is facilitated by removing the exterior wooden siding and wall girts which creates 16 ft. wide pens that are easily accessible from the old outside barn yard lot. The sidewall and intermediate columns are used to support the gates that form the pens (see Figure 1).



If a 4 ft. wide observation and access alley between the rear of the pen and the inside bank wall is provided, six pens with dimensions of 16 ft. wide by 32 ft. deep can be developed. Allowing an average of 40 sq. ft. of bedded pack pen space per head in this management group puts the average number of heifers per pen at 12. With the six pens, all of the management group can be easily housed.

A rafter or truss-framed lean-to addition can be constructed along the southern wall to protect the feed bunk and 10' wide scrape alley, as shown in Figure 2. A post and rail feed barrier (see the third paper in this series for appropriate dimensions) or head locks can be fastened to the new post installed to support the lean-to framing. The post and

rail feed barrier allows 16 in. of feed space per head which is less than typically recommended for this management group, but with appropriate feed bunk management this should not present a problem.



Frost-free water bowls are located at the scrape alley/bedded pack interface in such a manner that they are accessible by multiple pens. High backs on the waterers preclude consumption of water from the pack area thus helping to keep it dry.

Ventilation is best handled by utilizing natural ventilation in combination with mechanical ventilation. The high open front of the new lean-to addition, coupled with the removed board siding, will improve the environment in the animal area. However, to ensure adequate ventilation during periods of little natural ventilation, a force air duct system can be installed along the rear of the pens. (This is not a slotted inlet system as previously described.) Fans are retrofitted into the gable endwall foundation in such a manner that fresh air is drawn from the outside and subsequently evenly distributed by the positive pressure air duct placed longitudinally down the barn.

Positive pressure fans are sized so that their capacity provides sufficient fresh air based on the total number of animals and the time of year. For this example, assume there will be 36 heifers in the adolescent A & B group and 36 in the C & D group. The summer time fan capacity should be 11,880 cfm  $\{(36)(150)+(36)(180)\}$  assuming no contribution from the natural system – which is the worst case scenario. Two 6,000 cfm fans, one of each, can be located at the opposite ends of the duct.

The duct needs to be sized sufficiently so no significant air flow is lost due to resistance. Allow 1 sq. ft. for each 600 fpm of velocity. So in our example, with one (1) 6,000 cfm



fan at each end of the duct, we will need a duct cross sectional area of 10 sq. ft. (6,000 cfm / 600 fpm). A duct with dimension 30" x 48" will provide the required area and fit within the vertical space available.

Provide uniform distribution by cutting a continuous slot down the centerline of the bottom of the duct that is 2 in. wide. This will allow an inlet velocity of approximately 600 ft./min. Run this positive ventilation system at full capacity during the dog days of summer. By installing a variable speed controller, the total fan capacity can be reduced, making it adaptable for transition ventilation periods when minimal or no natural ventilation is occurring.

Old cow barns can easily be evaluated for their potential for use to house the replacement herd. First, be sure that the facility is structurally stable, and then see if you can come up with a plan to make it friendly for the heifers and also labor efficient. Determine the cost for upgrading the existing facility, and compare it to the cost of building a new facility. By following these basic principles, the best option for your dairy business can be determined.