

Key design features to consider before building a new calf barn

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AT A GLANCE

Designing a calf barn can be a daunting task. So much can go wrong. Choosing the right ventilation, housing style and layout are critical to building the right barn the first time.

Proper barn planning saves time and money. For every decision, it is important to understand its associated ramifications. In calf barns, housing style and pen configuration decisions impact ventilation options, which in turn affects the overall success of the barn. Before building a calf barn, think about the ventilation requirements for every season. Allocate at least 10 percent of the overall building cost for the purchase of a well-thought-out ventilation system, and ask these three questions as you consider your ventilation options:

- 1 Will the system deliver a consistent source of fresh air into the barn during all seasons?
- 2 Will the system effectively control the air speed at calf level?
- 3 Can the ventilation system rapidly adjust to the changing weather conditions of spring and fall when there are warm days and cool nights?

Housing style impacts ventilation choices

Ventilation options vary according to the calf housing style. Group-housed and individually penned calf barns face different limitations when it comes to providing good air quality. These limitations need to be addressed while considering the three routes of ventilation: natural, mechanical or a hybrid of the two. Decades of past experience show that natural ventilation alone does not perform well without mechanical support. For that reason, most barns today are ventilated either strictly mechanically or naturally with mechanical assistance.

Group pens typically have very open spaces with little obstruction to airflow. This allows air to be delivered to the calf at their level from any direction. The concept of an open area broadens ventilation options. Fresh air can be drawn from open curtains, and panel fans can increase the speed of fresh air during warm weather to help with heat abatement. Both positive-pressure tube ventilation and

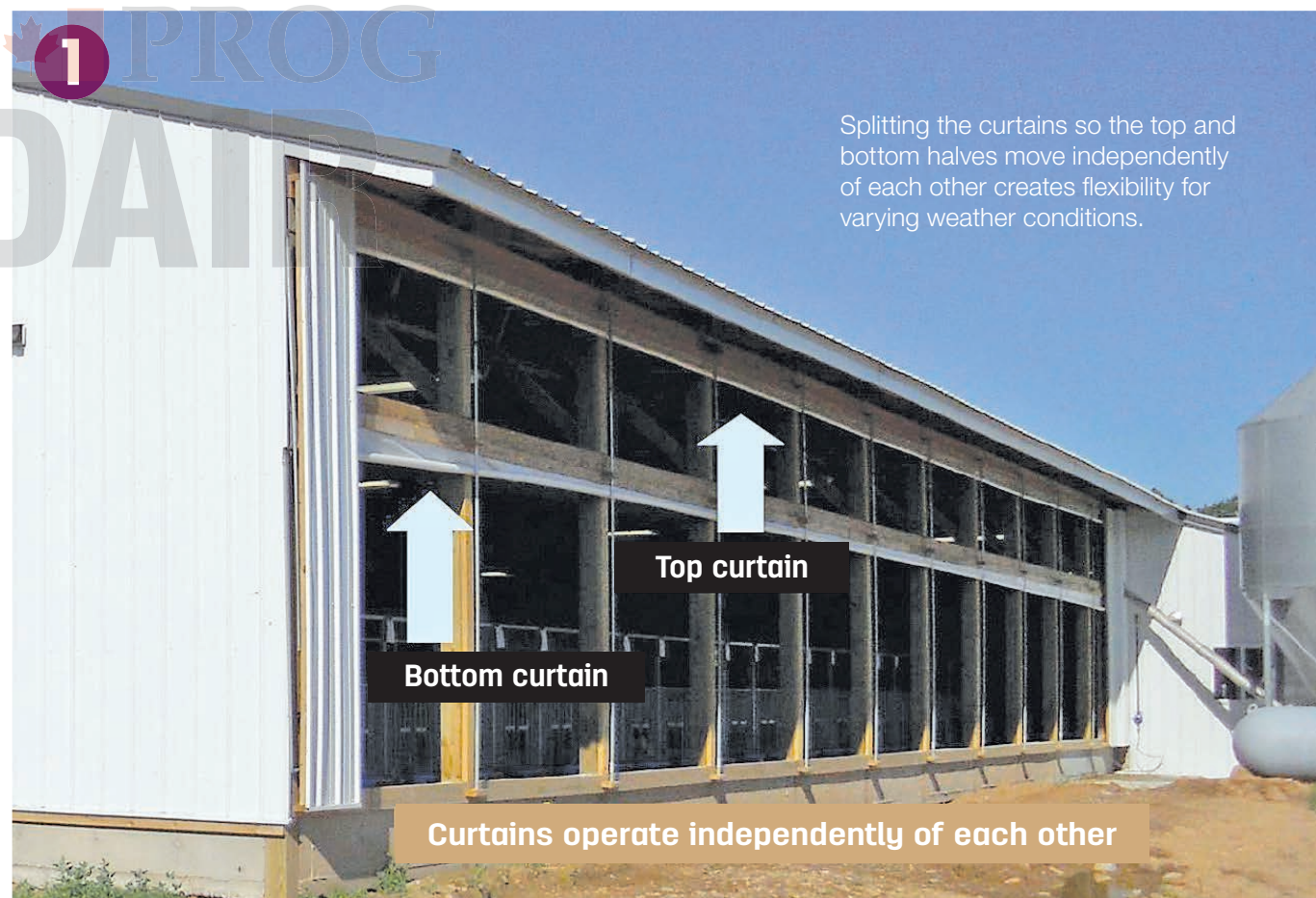
tunnel ventilation can be designed to provide seasonally appropriate airflow. The key to successfully ventilating group housing is ensuring there are no solid barriers in the path between the fresh air inlet and the calves. Keep in mind that group pens pose a larger risk

of contagious pneumonia spread by nose-to-nose contact. As a result, it is possible to have increased respiratory disease rates in group-housed calves, despite excellent air quality inside the pens.

Individual pens typically have solid sidewalls which obstruct

airflow at the calf level. Air must be directed into the pen from above the calf or through the back of the pen if an open material such as a cattle panel is used. When designing a ventilation system for individual

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Splitting the curtains so the top and bottom halves move independently of each other creates flexibility for varying weather conditions.

Top curtain

Bottom curtain

Curtains operate independently of each other

Photo courtesy of Crystal Creek.



These 18-inch knee walls create better airflow at the level of the calves.

Photo courtesy of Dairyland Initiative.

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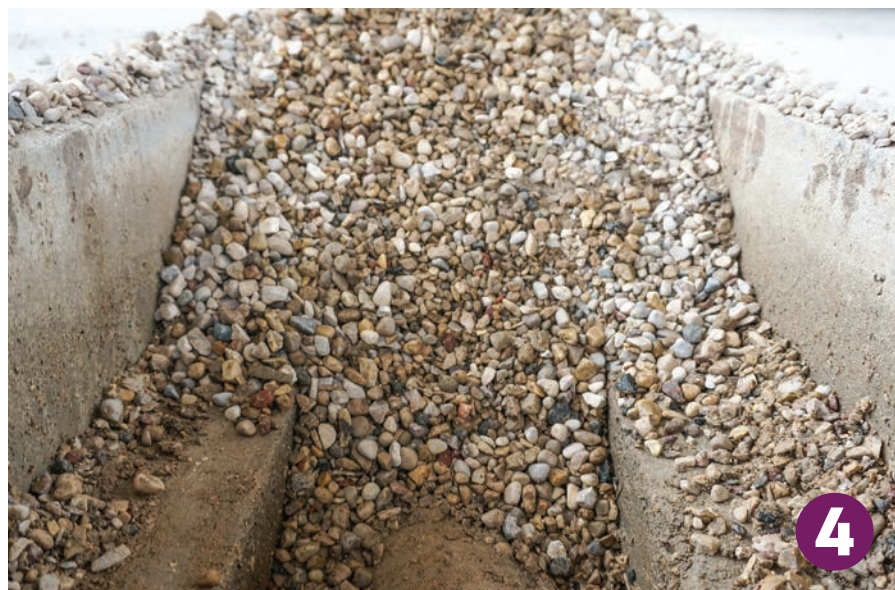


Photo courtesy of Dairyland Initiative.

Photo courtesy of Crystal Creek.

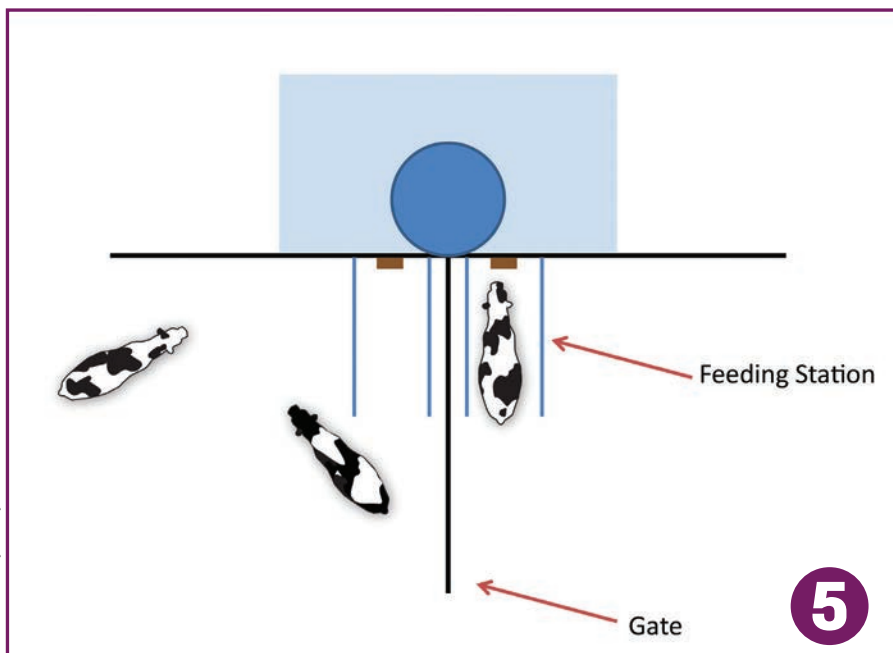


Photo courtesy of Crystal Creek.

TOP LEFT: Placing a drain under the bed space of the calves has been shown to help keep bedding dry. **TOP RIGHT:** Aggressive concrete slopes rapidly move liquid waste to a centrally located drain tile. **BOTTOM LEFT:** Locating the feeding station along a wall or gate eliminates access from that side, leaving only one side available to approach the station. **BOTTOM RIGHT:** Locating the feeding station in the middle of a pen, away from gates or obstructions, will allow access from all sides and improve access for timid calves.

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pens, it is important to recognize that the air quality above and around the pens does not accurately reflect the air quality of the calf's immediate pen space. It is quite challenging to direct fresh air into

the calf's small, obstructed area and as a result, many ventilation systems today do not provide individual pens with the necessary air volume changes. Tunnel ventilation systems may deliver fresh air to the barn,

but may not effectively deliver fresh air to the calf level. Similarly, panel fans move air over the top of pens but do not effectively deliver fresh air at the calf level. Positive-pressure tube ventilation is arguably the best

way to ventilate individual pens, as the tubes can uniformly distribute fresh air down the length of the barn and direct it straight into the pens. Since the fresh air comes from directly above, the solid walls of the

pen no longer pose obstacles. With individual pens, the layout should be designed to start 2 to 3 feet from the outside walls. This arrangement will help prevent drafts from the sidewall curtains, facilitate bedding delivery and avoid straw contamination of the milk and grain buckets.

Whether or not sidewall curtains will benefit your ventilation plan is another option to consider when designing a calf barn. Sidewall curtains offer a great way to naturally ventilate calf barns, with many different arrangements to consider from the height of where the curtain starts to the direction which it rolls. Rolling curtains from the bottom up allows fresh air to enter at the calf level. It can also keep natural gusts of air from interrupting air streams directed out of positive-pressure tubes.

Imagine in the spring or fall, when top-down curtains are open at the top for some extra fresh air. Unfortunately, the air coming through the cracked curtain will flow high above calf level and will likely disrupt the streams of fresh air coming out of the positive-pressure tube. This scenario not only fails to provide fresh air at the calf level, it also limits the effectiveness of the assisting mechanical ventilation.

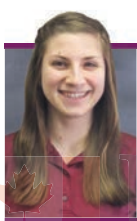
Splitting the curtains so that the top half and bottom half move independently of each other is the ideal option (**Picture 1**, page 59). This creates more flexibility with adjusting curtains according to varying weather conditions.

In addition to determining the height and direction of the roll of the sidewall curtain, the height of the concrete knee wall must also be determined. Historically, naturally ventilated barn blueprints required 4-foot-tall concrete knee walls, upon which fabric curtains were installed. Tall knee walls interfere significantly with natural ventilation because they create a wind shadow that leaves large, stagnant air spots around the perimeter of the building.

Lower concrete knee walls (1 to 2 feet) save concrete cost and provide better airflow at the level of the calf when curtains are open during warm weather (**Picture 2**, page 59). Bedding type and frequency of cleanout need to be considered when determining concrete knee wall height. The height of the knee wall must be tall enough that bedding does not build up over the height of the wall or spill over to the outside when cleaning out pens.

Floor plan layout

Besides ventilation and housing style considerations, the floor plan layout needs to address issues such as drainage and feed delivery. When considering a new facility, under-the-bed drainage is often used. A pre-weaned calf will generate roughly 4 litres of liquid waste every day. Placing a drain under the bed



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space of the calves has been shown to help keep bedding dry and make a more comfortable calf environment (**Picture 3**). This concept applies to both bedded pack and individual pen barns. Aggressive concrete slopes of 1 inch per foot are used to rapidly move liquid wastes to a centrally located concrete trench that contains a drain tile covered by pea gravel and 2-inch rock (**Picture 4**). The drain tile removes the liquid waste from the barn and moves it to a holding tank. Visit the Dairyland Initiative website (<https://thedairylandinitiative.vetmed.wisc.edu>) for information on the most current building ideas and techniques.

In an open housing situation, automatic calf feeders are most commonly used. Competition at the feedbunk is a common occurrence in adult cow housing and as an industry, we take steps to minimize its negative effects. Likewise, feedbunk competition in group-housed calves can negatively affect their performance. The auto-feeder nipples on automatic calf feeders are small, discrete points that must be shared by a number of calves, further exacerbating the competition. It is extremely important that feeding points are easily accessible to increase the chances that smaller, or less aggressive, calves feel comfortable approaching the feeding station.

How the feeding station is placed within the pen can make a dramatic impact on its accessibility. Locating the feeding station along a wall or gate eliminates access from that side, leaving only one side available to approach the station. This configuration will limit access for timid calves (**Picture 5**). Locate the feeding station in the middle of a pen, away from gates or obstructions. This will allow access from all sides and improve access for timid calves (**Picture 6**).

With proper planning, the investment of building a new calf barn can pave the way for years to come with sizeable returns in calf health, performance and eventually, milk production. Air quality and calf comfort are critical factors that can influence the success of any calf barn. Seek out professional industry consultants to help you plan your barn before pouring the concrete. Your calves, and your chequebook, will thank you. 🐾

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