

## The Essentials of Indoor Calf Housing

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From the mid-1980's until recently, the dairy industry had been busy getting calves out of barns (whether they came from a barn shared with cows and heifers, or from calf-only barns). Pneumonia and scours were major issues in these **indoor** calves. Environmental conditions (high humidity, stale or drafty air with high viral and bacterial loads) could only be improved marginally and therefore the only effective strategy was treatment with antimicrobials, but with highly variable success. Dairy farmers moved them **outdoors** into individual calf hutches. "Outdoors" meant fresh air (low bacteria and virus concentration) at all times; and hutches meant that calves were raised in their own "isolation ward". Pneumonia prevalence dropped dramatically, and diarrhea outbreaks were more easily controlled. We had to learn how to feed these calves properly and how to manage these calves through all four of Canada's seasons. It can be argued that over the years, we had nearly perfected raising calves in hutches. We raised **happy, healthy** calves, but there was one problem—WE had to be willing to feed, water, clean and bed these calves OUTSIDE even in the worst winter weather. For this reason, not surprisingly, outdoor calf rearing was not sustainable indefinitely.

The reversal was led by free-choice milk feeding systems and by robotic calf feeding systems. These systems could only function well in environments in which the milk or milk replacer and the associated feeding equipment could not freeze. These feeding systems were embraced enthusiastically by dairy farms because the time, labour and effort required to feed calves was reduced dramatically, and calf feeding was significantly simplified. Under the proper conditions, calves fed by these systems grew better than ever, and changed our paradigm regarding how fast dairy calves could grow in height and weight. However, from a health perspective we returned to the pre-hutch days. Pneumonia is common again, and diarrhea is more prevalent. For the most part, the indoor housing facilities these calves moved into were retrofitted cow or heifer barns, but several farms also built new calf facilities. A great deal of effort and expense was expended to "improve" these facilities. Some worked well, most did not. Did we know from research and/or experience what the correct calf-barn design and ventilation features were that would optimize calf health? The last few years clearly demonstrated that we did not, and that if our primary concern is health, outdoor calf hutches are still the "gold standard". Arguably, we took a step back.

However, it is not realistic to believe that dairy operations will abandon these new calf feeding systems and return to outdoor (hutch) rearing. So what can we do to mitigate the health challenges we see with today's indoor calves?

### Colostrum Management

Suffice it to say that proper colostrum management sets the foundation for success or failure with respect to calf health. Providing the right **amount** of colostrum (minimum of 6 litres in the first 12 hours), at the right **time** (3-4 liters within the first hour of life and

2-3 more litres 12 hours later), of the right **quality** (clean, low bacteria and coliform counts; with high levels of antibodies as measured by a Brix refractometer).

### **Vaccination**

Much has been learned and much progress has been made in calf immunization over the last few years. We now have effective **respiratory** vaccines (both bacteria and viral) for calves. We strongly recommend an intranasal bacterial vaccine and an intranasal viral vaccine for our pre-weaned and post-weaned calves. Clinically, both appear to significantly reduce the incidence and severity of pneumonia.

**Scour-prevention** vaccines have been on the market for many years and are highly effective in reducing the incidence of scours in calves. The vaccines we recommend most vigorously are those in which the pregnant mother is vaccinated to hyper-immunize her colostrum. It is then essential that the calf receive colostrum ASAP after birth as outlined previously in this article

### **Comprehensive Assessment of Existing Calf Facilities**

Many farms have invested significant capital into existing calf facilities whether they were retrofits of cow and heifer facilities, or whether they are new calf barns. Can they be improved? Based on our experience, the answer is definitely **yes**. A comprehensive evaluation of the facility that includes: an assessment of the **ventilation** of the barn which involves “fogging” the barn to determine air flows patterns, drafts, dead or stale air zones; an assessment of the **hygiene and comfort** of the barn which evaluates level of overall cleanliness of the housing and calves, calf feeding and cleaning equipment, the level of bedding provided, whether newborn calves are blanketed in the first month of life when air temperature in the barn is 15 degrees Celsius or lower; and an assessment of the **feeding practices** on the farm whether it is a robotic feeding system, a free-choice acidified or hydrogen peroxide feeding system, or individual pail or nipple bottle system. Is the milk replacer consistently mixed at the correct concentration; is the formic acid added at the correct level? Are these indices monitored? Is the weaning process appropriate? Are the pre-and post weaning feeds appropriate? Is feeding management appropriate?

Many times improving the ventilation involves installing positive-pressure tubes, and/or tunnel ventilation and/or additional fans. It may involve opening up the sidewalls of the barn and removing other barriers to air-flow such that adequate clean fresh air can enter the barn and stale contaminated air can exit the barn without causing drafts.

Existing facilities should be evaluated at least in the spring or fall, as well as mid-winter to make the necessary adjustments to the ventilation system as ambient temperatures and weather change.

### **Constructing New Calf Facilities**

Construction of new facilities is the surest way to provide all the necessary requirements for a healthy calf environment. When constructing a new facility there are six important factors that **MUST** be considered to maximize calf health. Those are:

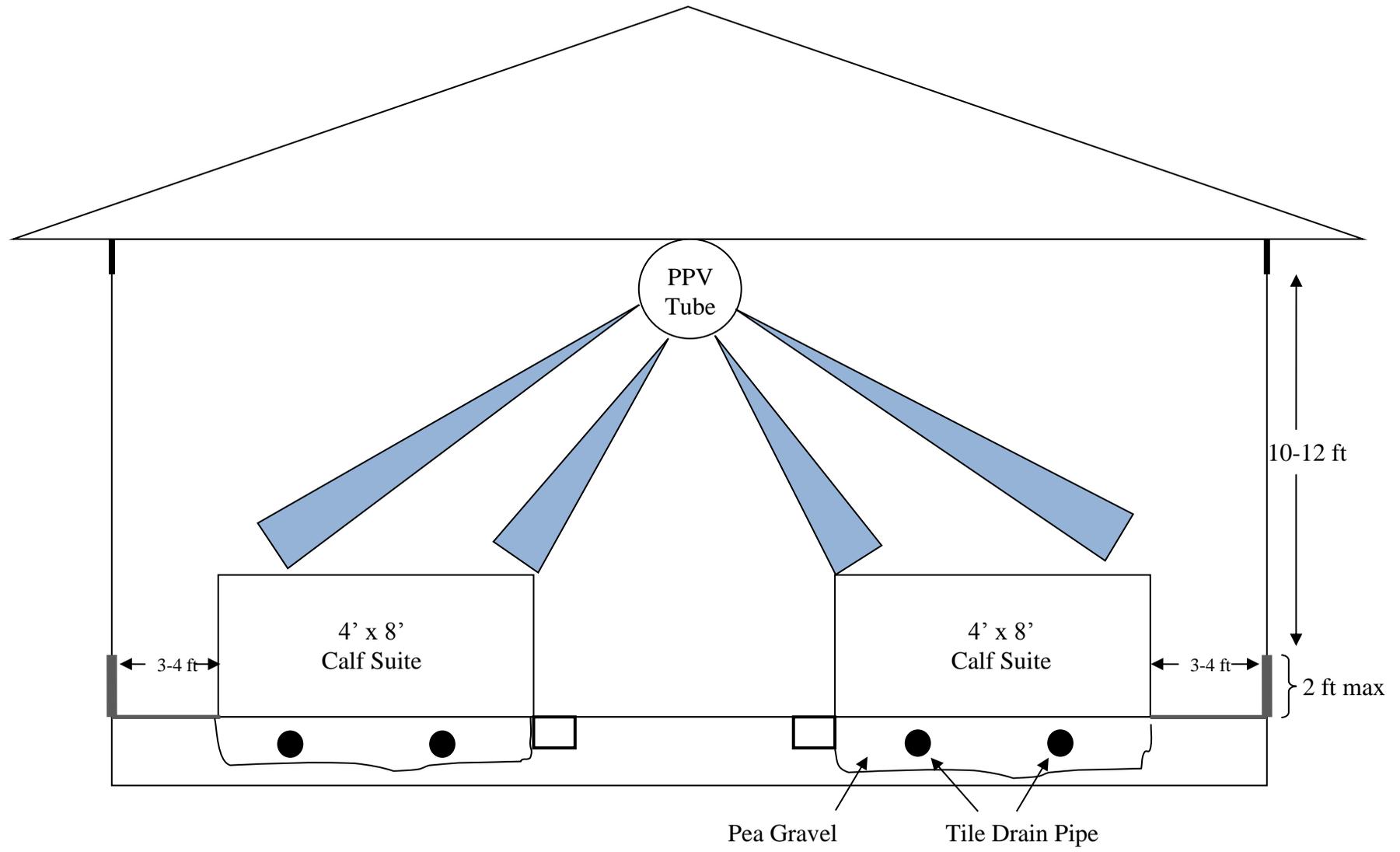
1. High open side walls. We need to get as much fresh, pathogen-free, outdoor air into the barn as possible. We do this by taking advantage of outside airflow and installing supplemental mechanical ventilation systems. Therefore recommended sidewall

openings are 10 to 12 foot on top of a maximum 2-foot high solid side wall base. Sidewall openings less than 10 feet will limit the **amount** of air that can enter the barn as well as the **depth** into the barn that the fresh air can travel. A solid side wall higher than 2-feet (commonly seen in retrofits) prevents wind currents from getting down to the level of the calves.

2. Positive pressure ventilation tubes for summer and winter. Supplemental ventilation systems are extremely important in calf facilities for two reasons. *First*, in the winter (unlike in adult cow facilities) natural ventilation alone does not provide adequate ventilation because calves do not produce enough heat to provide thermal buoyancy. Calf barns therefore require a supplemental ventilation system to achieve the minimal **winter** ventilation rate of 4 air changes per hour (ACH). This is best achieved using positive pressure ventilation (PPV) tubes specifically designed by a properly trained expert in PPV systems. PPV systems bring fresh outdoor air indoors and directs that air down onto the calves and bathes them in fresh air. Each barn should be designed with a winter tube(s) and a larger **summer** tube(s) to provide the recommended minimum 60 ACH during summer. *Secondly*, supplemental ventilation systems are required in the winter because in winter, barns need to be closed up enough to prevent drafts, making 4 ACH impossible without the PPV tubes.
3. Good drainage beneath bedding. Good drainage in calf pens is important to remove moisture from the calf's environment. Moisture from urine and water not only spoils clean, dry bedding, but also contributes to excessive moisture and contaminants (including respiratory pathogens) in the air, contributing to calf sickness. The ideal drainage system consists of tile drain pipe buried 15-18 inches below a pea gravel base. In an **individual calf suite** system, the pea gravel is the entire base of the pen and the drainage pipe runs the length of the row. Cleaning this facility involves a skid steer easily removing all the organic material (bedding) and the top few inches of the pea gravel, which gets replenished each time. In a **group-housed pen**, we recommend the bedded area have a cement base sloped to a 1 to 3-foot wide trough running down the centre filled with pea gravel and a buried tile drain pipe. Urine and water can easily drain through the bedding and pea gravel and be carried away by the tile drain. According to Dairyland Initiative researchers, this type of drainage system results in the use of 40% less straw than in more conventional systems, resulting in potential significant cost savings along with improved calf health.
4. Calf pens separated from the outer wall by at least 3 feet. High open walls with curtains and PPV tubes make this type of facility a cold environment in the winter. For this reason, it's vital that drafts are not able to fall on the calves and chill them. Calves seem to have an innate desire to lay with their backs facing a solid surface. When colder outside air enters the barn through an opening in the wall it will fall immediately towards the floor as it mixes with warmer inside air. Therefore, we recommend the outside of the group pen or the back of the individual calf suites be separated from the outside wall by at least 3 feet.

5. In group housing, minimum 40 square feet per calf bedding space. If group-housed pens are over-crowded, the calves are at much higher risk of becoming sick because they are forced to be in close proximity with each other and therefore can more easily transmit disease to each other. Research experts have determined that the required bedded pack space per calf is no less than 40 ft<sup>2</sup> per calf.
6. A labour efficient design easy to clean and bed. Finally, the facility needs to be designed in a way that allows the calf manager to efficiently handle and restrain calves, clean out pens/suites, and add bedding on a timely basis. Removal of waste and maintenance of a clean, dry environment is paramount in reducing pathogen exposure and minimizing stress. This means overhead doors on the end-walls need to be located to easily allow entry of manure-handling and bedding equipment; gating in group pens needs to be set up in a way that allows easy movement of calves and easy removal of waste; calf suites need to consist of removable panels; and space should be provided in the barn for storage of bedding so that it's easily accessible and easy to be added to pens/suites.

The following 3 diagrams illustrate these six essential design features:



**Optimal Pre-weaned Calf Facility Floor Plan (Group-Housed)**

