

# Improving Calf Barn Ventilation With a Bit of Fresh Air

## *Positive Pressure Ventilation Ducts for Nursery Calf Barns*

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### **What are positive pressure ventilation ducts?**

Positive pressure ducts are used to deliver fresh outside air into individual calf pens to dilute the concentration of pathogens (Figure 1). The air is delivered to the vicinity of the calf in such a way so as to avoid a draft. This fresh air delivery system has proven to improve the health of calves housed where the concentration of bacteria has been too high. The system uses a fan located in the barn end wall (Figure 2) to deliver outside air to a distribution duct. The duct carries the air along the barn length and discharges air through holes in the duct, into each pen. The fan is sized based on a winter minimum ventilation rate of 15 cubic feet per minute (CFM) per calf. The maximum velocity in the duct should be less than 1,000 feet per minute. The discharge velocity as the air leaves the duct is usually in the range of 700-1,000 feet per minute determined by the distance the air must be delivered to the vicinity of the calf. The velocity of air in the vicinity of the calf should be limited to 50-100 feet per minute to limit drafts in cold weather. A single duct system can be used in barns up to 30 feet wide (Figure 3), but two tubes are needed in wider barns (Figure 4). If the barn is longer than 100 feet, use a fan on each end of the duct.

When used in naturally ventilated barns, the barn ventilation system should be designed to provide good barn ventilation (air exchange). A properly designed naturally ventilated calf barn should have the barn oriented with ridge line running east-west, a 4/12 roof slope, a minimum 10 foot eave height, a continuous open ridge sized for 2 inches per 10 feet of building width, continuous eave openings (on both sides) of 1 inch per 10 feet of building width, and both sidewalls openable for

summer to at least 8 feet height and no obstructions to wind flow down wind.

### **What are the limitations of positive pressure ventilation ducts?**

These ducts do not supply enough airflow and velocity to provide heat stress relief in hot weather. They do not provide enough airflow rates to provide good mild weather or summer ventilation for the barn.

### **How do you know if you need positive pressure ventilation ducts?**

If more than ten percent of calves are treated for respiratory disease before weaning in your barn, you should look seriously at the ventilation system. Respiratory symptoms include: temperature above 101<sup>0</sup>F, coughing, ocular discharge, nasal discharge, droopy ears and tilted head. The more symptoms and the higher the symptom severity, the higher the likelihood of respiratory disease. Respiratory disease is under-diagnosed in the industry. Contact your veterinarian to get an assessment of this condition amongst your calves.

The first step to improve ventilation is to modify the building as much as possible to meet the criteria for good natural ventilation as mentioned above. If many of the criteria can not be met by changing management of the existing system or minor modifications to the structure, you may have to install a mechanical ventilation system to provide good air exchange for the whole building for all seasons.

The next step is to look at the calf pens. Pens with four to five solid sides/top severely limit air exchange within the pen. Pens should have no more than three solid sides and in the ideal pen only two sides

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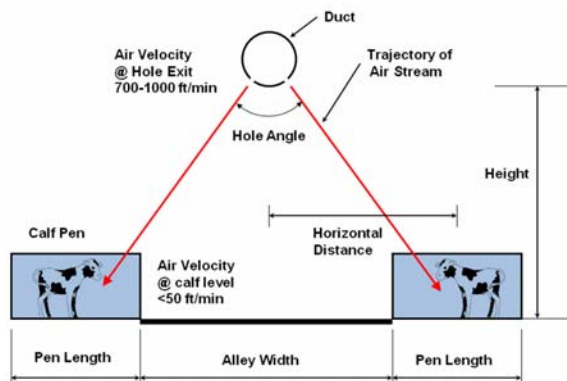
solid. The solid sides limit calf face to face contact and force pathogens to move farther as they move from the sick calf to healthy calves. If two sided pens are used in well ventilated barns, a positive pressure ventilation duct may not be required. Positive pressure ducts can be beneficial in pens using three solid sides.

**What materials are ducts made from and where do you get them?**

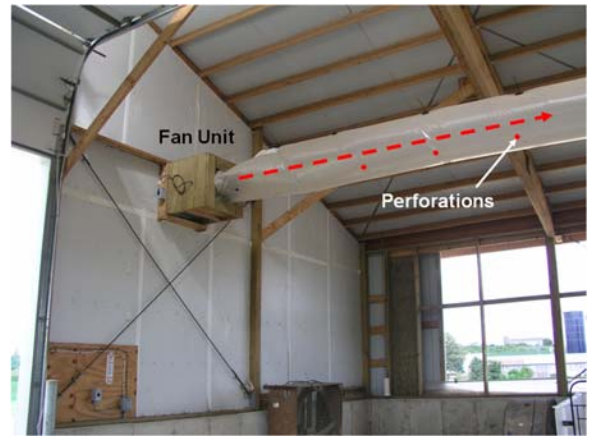
Polyethylene plastic tubes (Figure 2) are common and are available from many ventilation equipment supply companies. The sizes of holes and their locations can be specified upon ordering. They are relatively low cost and easy to install. Producers have experienced wind damage to these light weight tubes suspended from cables. Some producers have used corrugated or smooth plastic pipes or wooden ducts to substitute for the polyethylene tubes. This requires more expense and on-farm labor to construct the system but they will have a longer life.

**The design sounds complicated, where do I get a design?**

A spreadsheet design tool has been developed by this author. Contact your UW Extension county agent to use the tool. Most of the input variables are shown in Figure 1. You will also need to provide: building length and width, number of rows of pens and number of pens per row.

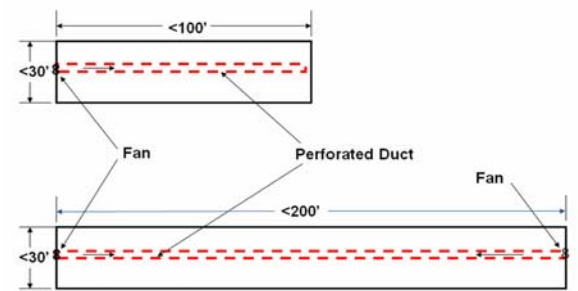


**Figure 1.** Cross section of positive pressure duct delivering air into two rows of calf pens.



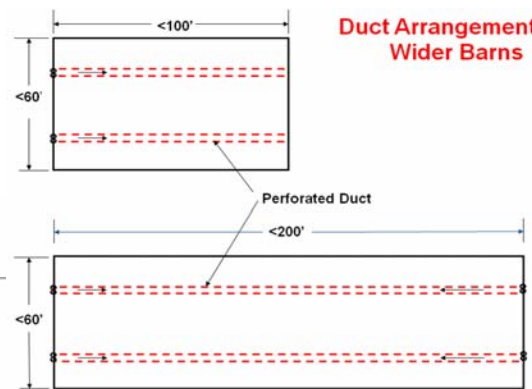
**Figure 2.** Positive pressure duct receiving air from a fan blowing outside air into the duct.

**Duct Arrangements – Narrow Barns**



**Figure 3.** Single duct used in barns less than 30 feet wide. Duct length is limited to 100 feet per fan.

**Duct Arrangements – Wider Barns**



**Figure 4.** Double ducts used in barns less than 60 feet wide. Duct length is limited to 100 feet per fan.



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