

## COW COMFORT

By Curt A. Gooch

Concrete remains the material of choice by farmers. Here are some ways to maximize it from a cow's perspective.

# Concrete Floors in Barns

Freestall barns are built to provide cows shelter from winter winds and summer solar radiation.

But beyond that, for cows to meet their genetic production potentials, comfort is important. With well-designed and managed freestalls, dairy cows lie down for about 12 hours each day and by default stand for about 12 hours. Cows may stand/walk on concrete alleys for an entire lactation, or all of their lives. It is important to pay close attention to flooring and how it affects cows. Experience shows the final finish on floors and alleyways is often the biggest oversight made when constructing a new barn.

Floors must provide confident footing for the cow and caretaker, with minimal foot and leg problems for the cow. Floors must be affordable and durable. Cows walk on two floors: those already in-place and those that constructed as part of a capital project.

**Flooring and Cows:** The most prevalent flooring surface in new and old barns is cast-in-place concrete. Concrete is attractive because it is available, durable, comparatively economical, relatively easy to place as it conforms well to irregular areas. It can be finished in various ways to provide some level of traction, but lacks forgiveness

Lameness is a major problem for confined dairy cows and represents one of the major reasons cows are culled. When lameness is not controlled, producers experience economic loss, sometimes substantial. Lameness causes delayed estrus, poor breeding performance, shortened lactation, reduced milk yield and lower components, and loss in body weight. Lameness is not always easy to control since it is a multifunctional condition influenced by many factors.

Environmental factors impact lameness. Research studies about flooring show:

- Poor concrete surfaces and low freestall use caused a high incidence of sole ulcer and white line disease in herds fed low levels of concentrates.
- Hooves of cows confined on new abrasive concrete wore 35 percent more than control cows housed on dirt.
- Hooves of cows confined on new concrete with no special surface preparation wore more than they grew for the first two months.

Field observations reveal improperly finished concrete floors speed foot wear significantly enough to cause excessive culling due to lameness in the first three weeks of new barn occupancy.

At a minimum, floors for cows need to provide a flat surface that uniformly supports weight. This way even pressure is exerted over the entire hoof bearing surface. Additionally, floors must provide confident footing, so the cow can navigate the barn without slipping or falling. Approaches fall into two schools of thought. The first is to provide a textured surface to prevent a slip (**Figure 1**). The second is to provide a means to catch a hoof digit before a cow falls (**Figure 2**). This is referred to as "Slip and Grip."

**Textured Surface:** Floors that are excessively textured to eliminate slipping can wear hooves and smooth floors do not offer sufficient traction. There is a fine line between a concrete floor surface that is too rough and causes injury from abrasion and one that is too smooth and causes injury from inadequate footing.

Textured surfaces can be installed in freshly placed concrete using a bull float that has grooves cast or machined into one side of the float (**Figure 3**). If this method is employed, timing is critical since concrete that is too wet will not maintain the groove formed by the float, and concrete that is too dry will not accept the groove at all. A key to floor longevity is to specify a concrete mix design similar to what is used for applications requiring high strength concrete (4,500 psi or more). Use a water-to-cement ratio that results in a concrete slump of 4" or less. And cover fresh concrete with a 6-mil plastic sheeting or a spray on vapor barrier and allow it to cure for 7 days. Together these techniques provide increased wear resistance to manure scraping equipment, and rubber scrapers further increase the life of a textured floor. Only experienced concrete finishers should texture concrete by this manner.



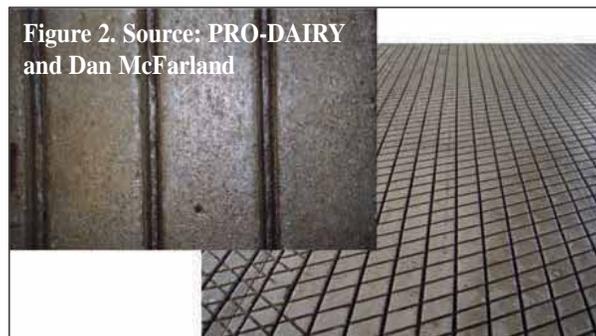
Figure 1. Source: PRO-DAIRY

### FYI

- Curt A. Gooch is a Senior Extension Associate with the PRO-DAIRY Program.
- Additional information is online at: <http://www.ansci.cornell.edu/pdfs/floorconsid.pdf>

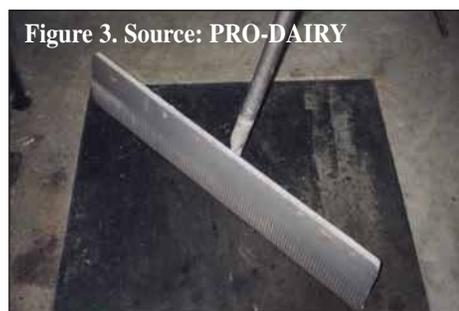
## THE MANAGER

Alternatively, a textured surface can be cut into existing concrete with a floor texturing machine. New floors that will be textured after



concrete placement and initial curing should be floated with the standard flat bottom bull float, lightly power trowled, and allowed to go thru an initial cure (7-days of coverage) before being textured.

**Slip and Grip:** Often the spacing, depth and configuration of deep grooves used in the slip and grip approach favor the concrete finisher or concrete subcontractor charged with creating the grooves, rather than benefitting the cows. Most notably, the grooves are spaced too far apart and result in poor performance as cows' hooves slip, and gain sufficient speed to slip past grooves, and the cows



go down, giving this approach poor marks. Grooves spaced closer together require more effort for the concrete finisher to install, but they limit the distance a cow's hoof slips, if at all, before gaining purchase by the edge of a groove.

Research-based recommendations for grooved concrete floors to provide low-abrasion footing that maximizes slip and grip are:

1. Groove dimensions: ½" wide x ½" deep.
2. Groove spacing: 2" on center. This minimizes, perhaps precludes, slippage as cows are likely to almost always to have "grip."
3. Orient grooves lateral to the cow's backbone when possible, as this orientation produces less slip than longitudinal grooves.

For flush barns, grooves need to run parallel to the flush, when barn alleys are longer than a few hundred feet, or less if the volume or delivery rate to the alley of flush water available is limited. Otherwise, the grooves perpendicular to the direction of water flow will reduce flush water velocity below the amount required to scour and convey bedding and manure to the end of the alley.

Similar to developing a textured floor, wider grooves used in the slip and grip approach can be formed in wet concrete and cut in after the concrete goes through an initial cure. For the former method, commercially available bronze grooving attachments can be used with standard bullfloats to create grooves in freshly placed concrete. These grooving attachments on a bullfloat can create parallel grooves (Figure 4). Proper moisture content of concrete grooved by a bullfloat groover makes grooving easier for the bullfloat operator

and results in a quality finished product. Bullfloating grooves should be formed after the concrete is placed and screeded, but before excess bleed water accumulates on the surface, when normal bullfloating should occur. When concrete is too wet, the bullfloat is hard to operate because resistance is increased and the grooves fill in with displaced concrete soon after creation. When concrete is too dry, the grooving attachments do not fully penetrate the surface, which results in less than desirable groove depths, exposed aggregates along the edge of the grooves, and a poor finished product.

For the latter method, new concrete floors are grooved after initial curing. Older concrete floors can be re-grooved to enhance traction. A saw, similar to one used to cut expansion joints in concrete roadways, can be adapted with a series of diamond dato blades to cut grooves in cured concrete. Companies that specialize in grooving existing concrete floors advertise in popular press dairy magazines.

Cutting grooves in hardened concrete eliminates the need for contractor experience to groove wet concrete and time-sensitive completion. Concrete slabs-on-grade in barn alleys can be placed, screeded, floated and trowled to provide satisfactory results by readily available concrete finishing crews. However, the additional requirement of installing a specific groove pattern in the slab that is free of rough edges is only successfully accomplished by an experienced crew. Even experienced crews can fall behind because of erratic delivery of ready-mix concrete to the job, resulting in poor grooving.

Diamond and hexagonal patterns can be created in green concrete using a metal stamp. The metal stamp is fabricated from round stock material that is cut and meticulously welded together. The stamp has a metal handle assembly attached, which allows it to be pushed into and removed from concrete while workers are in a standing position. The stamp must be moved several times to fully pattern a barn alley.



Personal experience shows that stamping concrete is more difficult to accomplish properly than bullfloat grooving, and stamping is more sensitive to moisture. Concrete that is too wet will stick to the stamp, which causes undesirable rough edges and fins, and results in a sloppy finish. Concrete that is too dry will bulge in the space between each round stock used to form the pattern. This concrete bulging results in the floor having several convex areas that do not uniformly support cows' hooves. Also, when the concrete bulges, it cracks on the surface. The quantity of cracks and their size depends on the moisture content of the concrete at the time the stamp was applied, the design of the stamp, and how far it was pushed into the concrete. Surface cracks are not desired as they provide an opening for moisture to penetrate and cause premature floor deterioration due to freeze-thaw action.

Floors cows are exposed to should be comfortable enough for you to walk on barefooted. If the floor would hurt your feet or be uncomfortable, don't expect cows to walk on it either. □