

Facility Design for the Transition Cow-- Part 1

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[Part 2](#) | [Part 3](#)

This is the first of a three part series on transition dairy cows. "Transition cows" describes groups of cows in various stages of lactation including far-off dry cows (first 40 days), close-up dry cows (20 days before calving), maternity cows (calving), and recently fresh cows (14 days after calving). The groups defined for a particular farm may be slightly different than those defined in this article.

On many farms, facilities and management are not matched to different transition cow groups as well as they could be. However, it is being recognized by more producers that managing different transition group more intensely can have a significant impact on total herd health and performance during lactation. Properly designed facilities can also significantly reduce the labor required for managing and caring for animals.

In small herds, transition cow groups have small numbers and cows are usually handled either as individuals or as combined groups. For example, only two transition groups may be defined for a farm a dry cow group housed in the dry cow barn and a calving cow group in a maternity pen. There might be no practical way to separate the transition cows and there might not be special places for close-up cows or fresh cows. But as herd size increases, the number of cows in each transition group increases. This creates opportunities to design specialized facilities to meet the management needs of different transition cow groups.

A good design process is important for developing a functional and practical facility. The process allows for input from all the dairy design team members, including the owner, herd manager, nutritionist, veterinarian, employees, and other allied professionals. Using a planned design process makes it easier to investigate and consider alternatives, and to evaluate how different parts of the operation connect and interact. The design process includes several distinct steps:

1. Develop a transition cow management plan.
2. Investigate and develop alternative designs.
3. Evaluate alternatives and options.
4. Choose the "best" system design.
5. Troubleshoot and implement the design.

Facilities designed for the transition cows should allow implementation of the transition cow management plan developed by the dairy team. Developing the transition cow

management plan is the first step in the design process. In many cases, the need for a new management plan arises when a farmer says, "What we are doing now with the transition cows is not working." The dairy operation might be experiencing a range of problems such as calving difficulty, displaced abomasum, cows off feed, ketosis, milk fever, or mastitis at freshening. These symptoms are associated with the limitations of how the transition cows are managed. The management plan describes each group's nutritional, health, housing, and environmental for each of the groups defined by a particular farm. The transition cow management plan helps identify design requirements for the transition cow facilities. It defines the groups and describes feeding requirements and animal restraint and handling facilities needed by each group. As the dairy design team develops the transition cow management plan, it is important to get everyone's input on what features are needed (required) or wanted (desired) in order to manage each group. These required and desired features are then used to plan and design the facility.

The next newsletter article will discuss in more detail how the transition cow management plan is developed and how the facility design can be adjusted to meet the requirements defined in the management plan.

Transition cows will be the focus of meetings sponsored by the Four-State Dairy Extension group to be held in Wisconsin and Minnesota this February. Check the [following article](#) for more information on these meetings.

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Facility Design for the Transition Cow- Part 2

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This is the second part of a three part series on transition cows. In the last article we talked about the design process and how the facility design should meet the transition

cow management plan developed for the farm. In this article, we will discuss how to develop a transition cow management plan.

The transition cow management plan helps to identify the design requirements for the transition cow facilities. The plan lists and describes each animal group, their feeding requirements and health care needs, any animal restraint and handling features desired, and the facility design features required for animal comfort, efficient labor use, proper management, and animal care.

Grouping Transition Cows

The transition cow groups to be managed and the number of cows in each group need to be defined in a farm's management plan. The transition cow group descriptions, names, and time frame are somewhat arbitrary. The number of animals in each group will fluctuate depending on calving interval, conception rate, culling rate, and other management practices. These factors should be considered when planning facilities to avoid overcrowding.

For discussion purposes, *far-off dry cows* are defined as cows 60 to 20 days prepartum (before calving). *Close-up dry cows* are defined as cows between three weeks prepartum and calving. *Maternity cows* are defined as cows in a one- to three-day period around calving. *Just-fresh cows* are defined as cows between calving and two weeks postpartum (after calving).

In all likelihood, calving cows may need only one day of housing in a maternity pen, but some flexibility in time frame for this group is warranted due to calving difficulty and/or the possibility that the due date is off by a few days. Just-fresh cows usually require daily observation and attention until they are shown to have no problems and can be moved into the milking herd.

Additional groups may be defined in the management plan, for example, other dry cow groups (i.e., thin cows or bred heifers) or a post-fresh cow lactating group (more than two weeks after calving). In small herds, some groups will have only a few animals and may need to be combined with other groups for practical reasons. But as herd size increases, groups can have a significant number of animals and may warrant a space designed just for them.

Table 1 gives six examples of transition cow management groups. The table gives group name, time frame that cows and heifers are in each group, typical group size, and health-care activities performed for each group. This information can be used as a model.

Transition	Time frame	Typical	Health-care activities
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group name	(days)	group size (head)	
Case A - 130 cow herd			
1. Dry cow and heifer	60 to 21 days prepartum (before calving)	15 to 24	Dry cow treatment
2. Close-up/Steam-up	21 to 1 days prepartum	5 to 10	
3. Maternity	1 to 2 day prepartum to calving	1 to 3	Calving
4. Fresh cow and heifer	1 to 10 days postpartum (after calving)	5	Temperature monitoring; Milking; Treating with propylene glycol, magnets; Lactobacillus bolus; Calcium gel; Vaccinations
Case B - 180 cow herd			
1. Dry cow group	60 to 30 days prepartum	15	Dry cow treatment
2. Steam-up group	29 to 4 days prepartum	3 to 12	Giving vitamin E, Body clipping
3. Maternity	3 days prepartum to 14 days postpartum	1 to 5	Calving, Milking, Temperature monitoring
Case C - 370 cow herd			
1. Dry cow and heifer	55 to 21 days prepartum	60	Dry cow treatment, Hoof trimming, Vaccinations
2. Close-up/Steam-up	21 to 1 days prepartum	23 to 30	Vaccinations, Temperature monitoring, Udder monitoring
3. Maternity	1 to 2 days prepartum to calving	8	Temperature monitoring, Calving
4. Fresh cow and heifer	1 to 5 days postpartum	12	Milking, Drenching, Vaccinations, Temperature monitoring
5. Early lactation cow and heifer	>5 days postpartum until moved to next group	90	Milking, Breeding, Hoof trimming, Udder flaming
Case D - 600			

cow herd			
1. Dry cow	60 to 21 days prepartum	50	Dry cow treatment
2. Close-up/Steam-up cow and heifer	21 to 1 days - cows 28 to 1 days - heifers	50	Monitoring every two hours
3. Maternity	1 day	5 to 8	Calving, Milk once
4. Fresh cow and heifer	up to 20 days postpartum	38	Milking, Temperature monitoring
Case E - 1200 cow herd			
1. Dry cow	60 to 21 days prepartum	100	Dry cow treatment, Hoof trimming, Vaccinations,
2. Close-up cow and heifer	21 to 1 days prepartum	40 to 60	Vaccinations
3. Maternity	1 day		Calving, Milk once
4. Fresh cow	0 to 3 days postpartum	15 to 20	Milk 3 x, Temperature monitoring
5. Post fresh cow	up to 20 days postpartum	34	Milking, Recording milk weights, Temperature monitoring, Vaccinations
6. Early lactation cow	20 to 80 days postpartum	140	Dry cow treatment
Case F - 1050 cow herd			
1. Far off dry cows	60 to 21 days prepartum	140	Dry cow treatment
2. Close-up	21 to 2 day prepartum	70	Vaccinations, Hoof trimming
3. Pre-calving	2 to 0 day prepartum	4 to 8	
4. Maternity	1 day	1 to 4	Calving
5. Fresh cow/Sick cow	1 day		Milking, Udder flaming, Checking for mastitis
6. Just fresh	10 days	30	Milking Observation

Cow Care Tasks

The activities listed in Table 1 can be helpful in determining what facility features are needed for each group. With a list of the activities or jobs that need to be done and facility features needed to get the job done conveniently and efficiently for each transition group, different design options and ideas can be considered and evaluated.

Cow Comfort Design

Cow comfort is especially important for transition cow groups. Cows that are heavy with calf, calving, and just fresh are all subject to high stress. Inadequate facility design can result in metabolic problems and injuries that could keep the cows from entering the milking herd at the appropriate time and in the best condition possible. Prepare a list of cow comfort features desired in the management plan and a short description of building design features needed to provide these comfort features for each transition group.

Develop a group list, a cow comfort list, and a cow care list for each transition group defined in your transition cow management plan. Keep these three lists handy for the facility planning and design phases. Identify the required (must have) features and prioritize the desired (would be nice to have) features. This will help in making decisions during the design phase—especially when the budget has to be met and some features need to be left out. Required features that are absolutely necessary can be retained and other desired features that would be nice can be kept in priority order if you have the money to spend on them.

In the final article, we will present design options and features that can fit into a facility design for your transition cows and show some plans that can be adapted to your particular situation.

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Facility Design for the Transition Cow-- Part 3

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[Part 1](#) | [Part 2](#)

This is the last of a three part series on transition cows. In the previous articles we discussed the design process and management plans. In this article, we discuss a variety of options and some design recommendations for housing transition cow groups to keep them clean, dry, and comfortable.

Design Features

A transition cow facility should be designed and built to implement the chosen management plan and provide a clean, dry environment with plenty of fresh air and feed and water for the animals. A well-designed facility should also be labor-efficient, economical, safe for both workers and cows, and environmentally friendly. This section provides design recommendations for facility elements or systems including freestalls, bedded packs and pens, walking surfaces, restraints, cow alleys, access to feed and water, ventilation, and lighting.

Freestall systems

Freestalls can be used to provide a clean and dry place for cows to lie down. They should be sized to prevent unnecessary forces on cows or injuries as cows get up and down. Freestalls should also be easily accessible from walk alleys. A freestall should be 45 to 48 in. wide and either 7 or 8 ft long depending on the stall divider and location in the building. The brisket board and neck rail should be 5½ feet from the rear curb.

Bedded pack system

A bedded pack can be used for both far-off and close-up cows. The bedded pack should be sized to provide 50 ft²/cow for far-off dry cows and 100 to 300 ft²/cow for close-up cows. The space needed for per cow depends largely on bedding frequency and ability to keep the animals clean. This space does not include the feed bunk alley and scrape alley used for accessing feed and water. Bedding needs to be added regularly to provide a clean and dry place for cows to lie. The pen arrangement should allow easy bedding addition and manure pack removal with a skidsteer or front-end loader. Well-designed facilities are convenient to use and they limit labor requirements.

Pastures and open lots

Some farmers like to give transition cows a “vacation” from concrete or slatted floors by giving them access to dirt lots or pasture. Many farms would like to have cows calve on pasture when possible. Transition cow facilities can be designed to allow limited access to either pastures or open lots depending on the weather. A pasture is an area that is stocked at an animal density that maintains vegetative growth throughout the growing season. Excessive use of a pasture can result in a muddy lot, which is not recommended. A dirt lot usually does not have vegetative growth and cow access should be limited depending on the weather. A dirt lot should not be used when it is muddy. Cattle mounds

may be incorporated into outside lots to improve drainage. Muddy conditions can also be limited by using geotextile fabrics in a designed all-weather surface. More information is available in MidWest Plan Service AED-45, Using All-Weather Geotextile Pads and Lanes (copies can be purchased from either the University of Wisconsin Biological Systems Engineering Department or the University of Minnesota Biosystems and Agricultural Engineering Department). Lot runoff needs to be handled according to local and state regulations to prevent pollution.

Maternity or treatment pens

Individual pens should be approximately 12 ft x 12 ft or 10 ft x 14 ft (approximately 140 ft²/cow). They can have a concrete, clay, or sand base with at least six inches of organic bedding placed on top. Although concrete floors are more easily cleaned, they might not provide the best footing surface for cows. Clay, soil, or sand bases allow better footing for cows and allow relatively easy cleaning of pens with skidsteer loaders. Sanitation is an important design consideration in maternity and treatment pens. In maternity pens especially, manure must be removed frequently to prevent the transmission of diseases such as Johnes to newborn calves through contact with the cow's manure. Treatment pens should also be cleaned before use by another animal to prevent disease transmission.

Restraint for treatment

Tie stalls or stanchions can be used to provide cow restraint, but they are not necessarily the best choice for housing cows. There is a significant amount of hand labor involved in feeding cows and removing manure from these stalls. The number of cows housed in this way should be kept to a minimum.

Headlocks are a popular restraint option for group freestall or bedded pen arrangements. The headlocks are placed at the feed bunk and are used consistently by the animals. Animals can be caught and restrained at any time. Individual pens with a gate positioned to swing towards a head gate can be used to catch and restrain a cow.

Each group should also have appropriate and convenient access to health care and treatment facilities. A squeeze chute, hoof trimming table, or surgery table are nice features for any size herd, but they are becoming very popular for larger herds that have regular herd health checks by a veterinarian. These facilities should be easily accessible to a veterinarian's truck and to the farm's vet supply area or office.

Alleys

Freestall and bedded pack group pens should have feed bunk alleys and scrape alleys to allow cows to access feed and water. Scrape alleys should be laid out for easy manure removal. Gates at appropriate locations allow for easily moving cows from one group to another or for sorting individuals from a group. The alley and gate layout should allow one person to sort and move an individual or group of cows safely. Concrete alley surfaces should be made non-skid to prevent cows from slipping. Alleys should be

grooved when the concrete is placed, or grooves can be sawn in when the concrete is green. Grooves can also be cut into old concrete alleys.

Personnel safety passes

Personnel safety passes are 12- to 14-in. clear openings placed in pen partitions to allow easy access and escape from any pen. Personnel passes should be placed in all group pens and individual pens. Also, pen partitions and gates should be hung at a height that allows people to roll under the gate or fence to escape the pen in an emergency.

Waterers

At least one waterer should be available to each group or individual pen. Waterers placed at opposite ends of a freestall row or bedded group area allow access even if a “boss” cow is dominating one waterer. Waterers should have shallow water depth (6 to 8 in.), be mounted at the correct height (32 in.), and allow easy cleaning and draining.

Feed manger

The separate transition cow groups are usually fed different rations. Flat feeding floors with post and rail-feeding fences allow easy cow access to feed. Flat floors also allow easy feed delivery, pushing up of feed, and cleaning by workers. Headlocks are a common option as a feed barrier.

Lighting

Lighting is important for cow observation and care, especially in maternity and treatment pens. Metal-halide and high-pressure sodium lamps are popular, energy-efficient options for cold areas where lamps can be mounted at least 11 ft high. Fluorescent lamps are also energy efficient and they can be used in warm areas along with incandescent lamps. Fluorescent lamps are usually mounted 7- to 8-ft high. Special high light output (HLO) fluorescent lamps can be mounted 8- to 12-ft high. Fluorescent lamps with electronic ballasts can start at colder temperatures (down to 0F). Lamps with electromagnetic ballasts need warmer temperatures (40F or higher). Spot lamps or flood lamps may be needed in treatment areas used for surgery. Colors are truer when observed under lamps with higher color rendition index (CRI) values. Incandescent, halogen, fluorescent, and metal-halide lamps have higher CRI values than high-pressure sodium and mercury-vapor lamps. Mercury-vapor lamps are not recommended for cow areas.

Ventilation

Ventilation is necessary for providing fresh air and for removing moisture and animal heat. The majority of newly designed dairy facilities use natural ventilation where wind and thermal buoyancy (warm air rises) provide the driving force for air exchange. Air enters through side wall and eave inlets and exits through the open ridge and downwind sidewalls. Insufficient inlet and outlet openings lead to condensation on building surfaces

in cold weather and heat build up in hot weather. Naturally ventilated barns are designed to provide shade in the summer and draft control with curtain sidewalls in the winter. Supplemental cooling fans may be used in the summer on hot, still days.

In some designs, supplemental heat is needed to improve working conditions for the veterinarian or herd manager in a hospital area. Radiant heaters, which heat surfaces, work well in open areas while unit heaters are generally used for heating mechanically ventilated spaces. Mechanical ventilation is generally used only for small hospital areas or for retrofitting existing mechanically ventilated stall barns. Mechanically ventilated spaces need sufficient fan capacity, well-distributed and properly sized inlets, and controls.

Manure handling

Animal manure will be generated wherever cows are housed (i.e., free stall group pens, manure pack pens, and maternity pens). Different housing and bedding choices will require an appropriate manure handling system and equipment. Consider manure form, bedding use and storage, manure collection and storage, and the equipment needed. These options can be considered during the design process to develop an overall manure management plan.

Choose the System Design

There is no single “best” design. Every design involves trade-offs. The difficult task is to incorporate as many of the design criteria desired into a functional, practical, and buildable plan. Some design principles might have to be compromised slightly to be part of the overall design. If the design principles have been prioritized, the job of deciding which features to keep or eliminate can be made more easily because the decision process is already in place. Well-designed transition facilities fit the management plan, provide cow comfort and care, are convenient and safe for workers, and are economical.

Assess the trade-offs of each design option. Try to determine which combination of design choices provides the most balanced design. The solution should meet all of the required criteria set forth in the management plan and building specifications, and most of the highest ranked desired features. The selected design should be somewhat “better” than other alternatives.

Implement the Design

Finally, draw a scaled plan for bidding or building purposes. The plan helps define the space and conveys the specifications of what is to be built to the builder and to others involved. The specifications of the building will describe the facility in terms that a builder or contractor can understand. A complete plan will help the builder and other contractors to build the facility the way you planned it.

The scaled plan can be used to evaluate the overall design and its impact on all aspects of the management plan. The dairy design team can review and critique the design. The herd manager and other employees can consider how they will perform their assigned tasks. The scaled plan can be used to evaluate cow, feed, manure, and employee routines.

Retrofitting Existing Facilities

In some cases, existing facilities can be used to house and manage a transition cow group defined in the management plan. Evaluate the existing facility to determine its function in the plan. If the space can meet the needs described in a reasonable fashion with cost-effective modifications, then it might be a viable alternative. If the retrofit does not meet the functional design, then it might not be a good decision even if it is a very low cost modification.

Summary

Facility design is a fluid process involving give and take. It is easy to lose sight of the original intent along the way. Design the facility to implement the transition cow management plan and consider each of the design features to develop a comprehensive facility design.

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