



## *Transforming a Milking Parlor at Low Cost*



# Developing Dairy in IOWA

As dairy operators look for ways to make milking easier, some may feel that a modern parlor is not within their budget. However, an up-to-date milking parlor can be an option for every Iowa dairy producer. With relatively low-cost remodeling and retrofitting, old stall barns and parlors can be cost effectively transformed into modern milking parlors when properly designed, installed, and operated.

### **Improve dairy profits and quality of life**

Iowa's dairy industry is in a state of transition as producers seek to improve profits and quality of life. Today's milking parlor is more labor efficient and profitable, and offers a more physically healthy method of milking cows, than stall barns or outdated parlors.

As Iowa dairy profits are analyzed, three things become apparent compared with the rest of the country and many parts of the world.

First, the labor efficiency in many current milking facilities is low—whether measured on a per cow or per hundredweight measurement per person or per hour (or a combination such as cows or hundredweight per person per hour). Rather than milking in the 25-40 cows per person/hour range, the aim is to milk in the 60-80 cows per person/hour range.

Second, physical strain of the operator's knees and back resulting in long-term health problems is a critical area for dairy producers, especially those who milk in tie stall barns or outdated parlors. The goal is for producers to milk cows without bending their knees, neck, back, etc., so physical strain is reduced while using a properly positioned kick rail for safety.

Third, the cost of milking a cow on a per hundredweight basis on various farms in Iowa often is 30 to 150 percent higher than in other areas of the world. The annual labor cost alone milking in a stall barn versus a well designed parlor could justify a \$10,000 to \$50,000 low-

cost parlor expense, with the labor savings realized in less than one to three years.

Thus, improving dairy profits and quality of life is an interrelated issue:

- saving time through labor efficiency,
- saving health through ergonomic improvement (and safety), and
- saving profit by reducing the cost of milking cows.

### **Assess your dairy facility**

Bringing in an "outside" set of eyes, such as an Iowa State University Extension dairy specialist, can help you assess how well your existing facility meets your profit and quality-of-life goals, as well as how to bridge any gap between your current and your desired situations. Facility assessments consider your present buildings on the farm in addition to facilities you may want to build to better meet your goals.

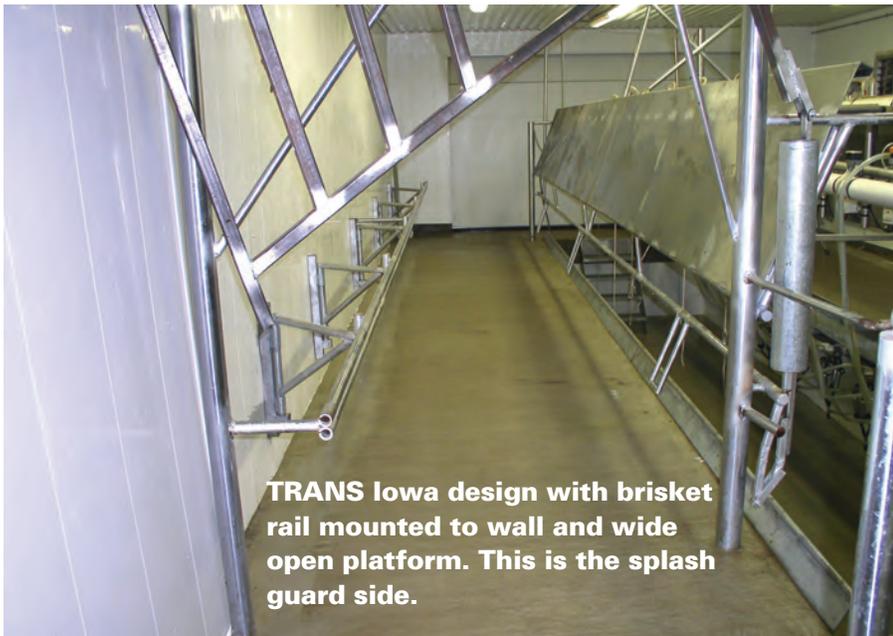
It can be physically painful to milk in an old stall barn or a herringbone or side-opening parlor with shallow pits, gutter grates, and too few stalls that also are too small. But with proper design, an existing facility may be able to be transformed into a labor efficient, low cost, and ergonomically sound option. However, in some cases the structural design of the existing facility would dictate building a new parlor or holding area as a better long-term solution.

Many stall barns can be retrofitted for a swing 8 or swing 10 parlor with a holding area that can accommodate herds of 80 to 120 cows. Many herringbone or other older-design parlors can be remodeled—such as

Improving dairy profits and quality of life is an interrelated issue of saving time through labor efficiency, saving health through ergonomic improvement (and safety), and saving profit by reducing the cost of milking cows.

converting a herringbone double 6 to a parabone (70 degree angle) swing 10. One Iowa dairy producer remodeled his parlor in that fashion for \$2,000. Creativity and sweat equity often lead to innovation, so take advantage of opportunities to see how other producers have remodeled their facilities. Ask ISU

Extension to assess your facilities. Consider visiting the Northeast Iowa Dairy Grazing Center in Calmar, Iowa, for a firsthand look at this low-cost design. More information on the TRANS Iowa Low-Cost Parlor Design<sup>1</sup> can be obtained at [www.extension.iastate.edu/dairyteam](http://www.extension.iastate.edu/dairyteam) or by contacting the author.



**TRANS Iowa design with brisket rail mounted to wall and wide open platform. This is the splash guard side.**



**Open chop gate. This is the manure pan side, same parlor as above. Recycled chrome steel is used here for the frame.**

### Why install a low-cost parlor

Dairy producers with herds of more than 50 cows should seriously consider installing a low-cost milking parlor for these reasons:

- an approximate 2:1 labor efficiency of a parlor over a stall barn in typical situations
- an approximate 3:1 improved efficiency of not feeding in a stall barn (whether TMR, pasture, and/or component feeding)
- an approximate 2:1 improvement in manure handling efficiency by going from daily manure hauling to weekly or bi-weekly hauling

### Option: Remodel a stall barn

Most stall barns that are structurally sound are good candidates for a low-cost pit parlor milking system, holding area, palpation area, and possibly even maternity/sick pen area for an 80- to 120-cow herd. A 32' wide stall barn can quite readily accommodate all four areas.

1. The area closest to the milk house normally would house the enclosed parlor. An area that is 18' to 22' wide by 27' long would accommodate a swing 8 parlor.
2. The area beyond the parlor would become the holding area. At approximately 20' to 22' wide by 40' to 72' long, this holding area would accommodate 55 to 100 cows depending on cow size (with 16 cows already in the parlor for a 70- to 120-cow herd). Additional holding area can be added to the barn. The parlor and holding area can be closed off by a garage door or rolling doors. This parlor and holding pen area takes up two-thirds of the barn, usually closest to the milk house.

<sup>1</sup>The goal of TRANS Iowa Low-Cost Parlor Design is to transform the dairy industry by making the milking parlor option available to every dairy operator's budget situation.

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3. The adjacent area (approximately 12' wide) running the length of the parlor is used for an exit lane and palpation rail/headgate area.
4. The remainder of the barn down from the palpation rail and adjacent to the holding area can be used for maternity/sick pens and over time, additional holding area if needed.

## Option: Build a new low-cost facility

A new low-cost facility could be built on a new or adjacent site if current facilities are not structurally sound or are not in a strategic long-term location. Also consider building a new facility if the cost of remodeling is more than 50 to 60 percent of the cost of new construction or if a remodeled facility involves putting up with major inconveniences just to save money. The same dimensions could be used.

## Parlor design specifications

ISU Extension can help you determine the specifications for building a low-cost milking parlor to meet your situation. The following specifications are averages for illustrative purposes.

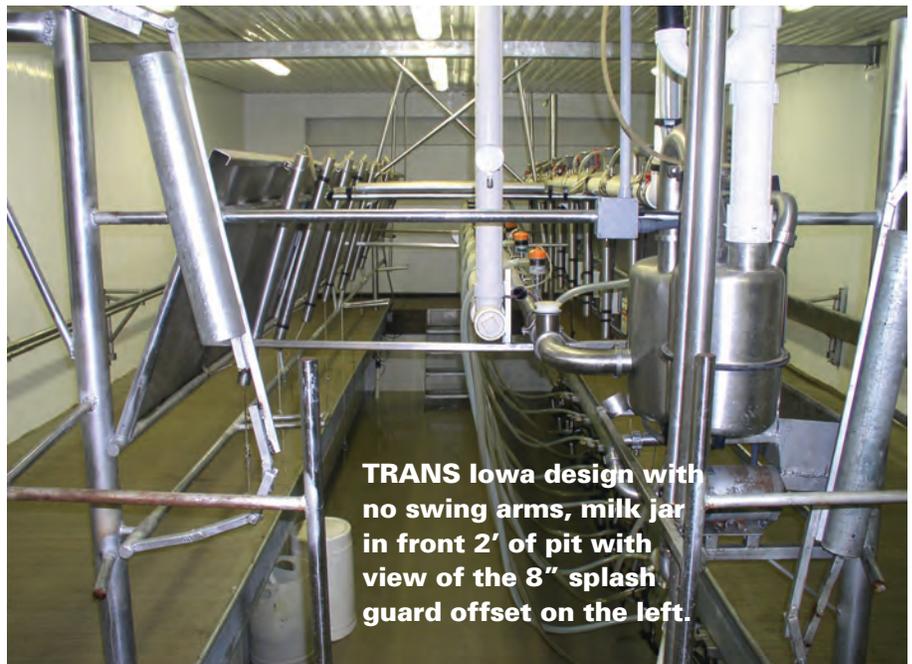
## Overall points

- In most cases, the minimum width to be considered for the parlor would be 17' for smaller dairy breeds and 18' for larger breeds, though some have been adapted into smaller widths by shortening the pit width to 4'.
- Accurate measurements are crucial for a well-designed parlor. Being off even a couple percentage points on the parlor floor slope or a

couple inches on positioning the manure splash guard or kick rail can result in the operator having to reach or bend over to wash cows or put on milking units.

- The parlor frame structure is supported by posts in each corner

of the pit and one or several A-frames welded to an overhead I-beam supported by the parlor walls. These I-beams also could support hay mow beams. Consult an agricultural engineer to determine loads and strengths of steel I-beams.



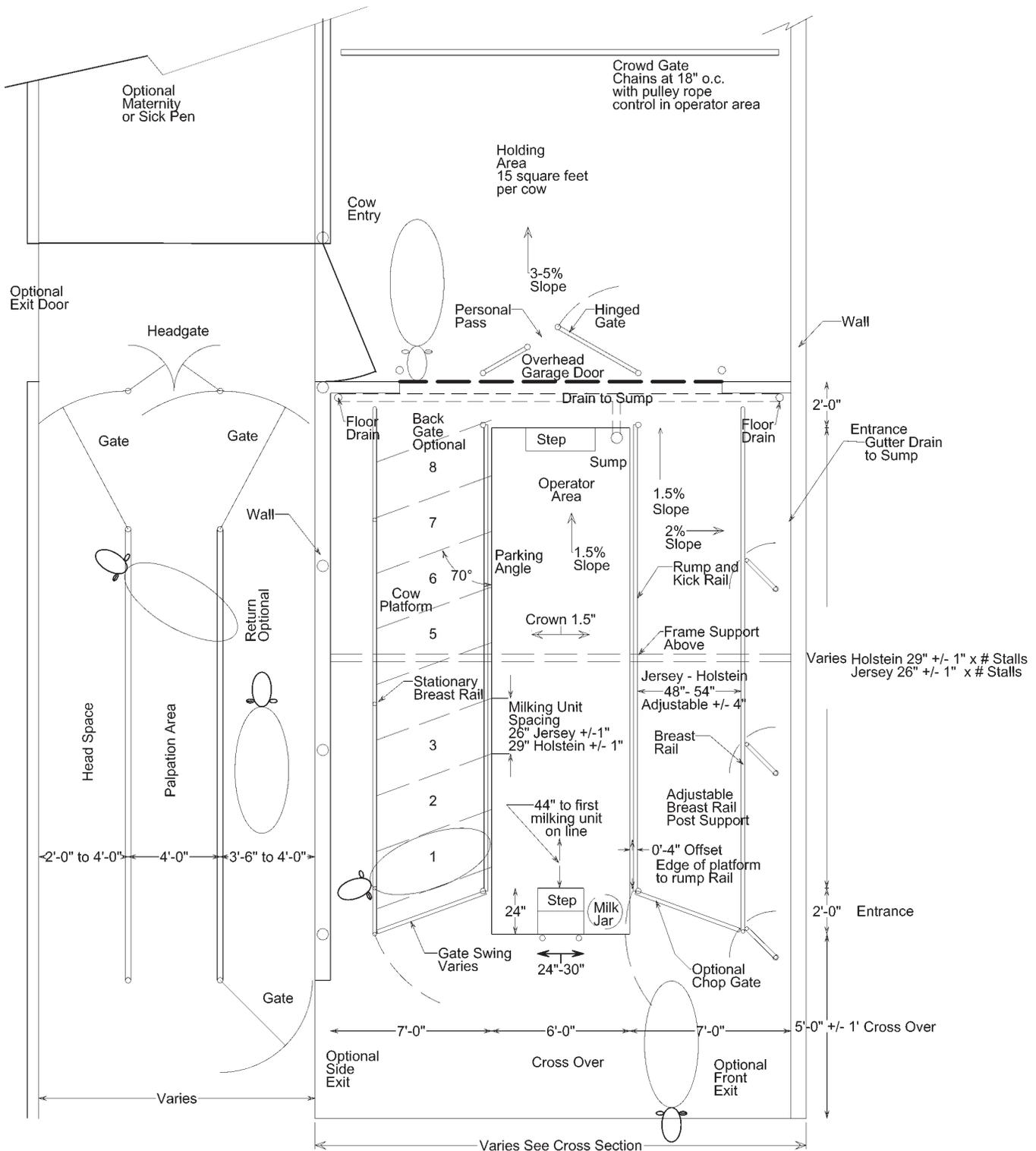
**TRANS Iowa design with no swing arms, milk jars in front 2' of pit with view of the 8" splash guard offset on the left.**



**Swing arm with take-offs attached; recycled galvanized steel used to build frame.**

With proper design, an existing facility may be able to be transformed into a labor efficient, low cost, and ergonomically sound option.

**Figure 1. TRANS Iowa low-cost parlor plan<sup>1</sup>**

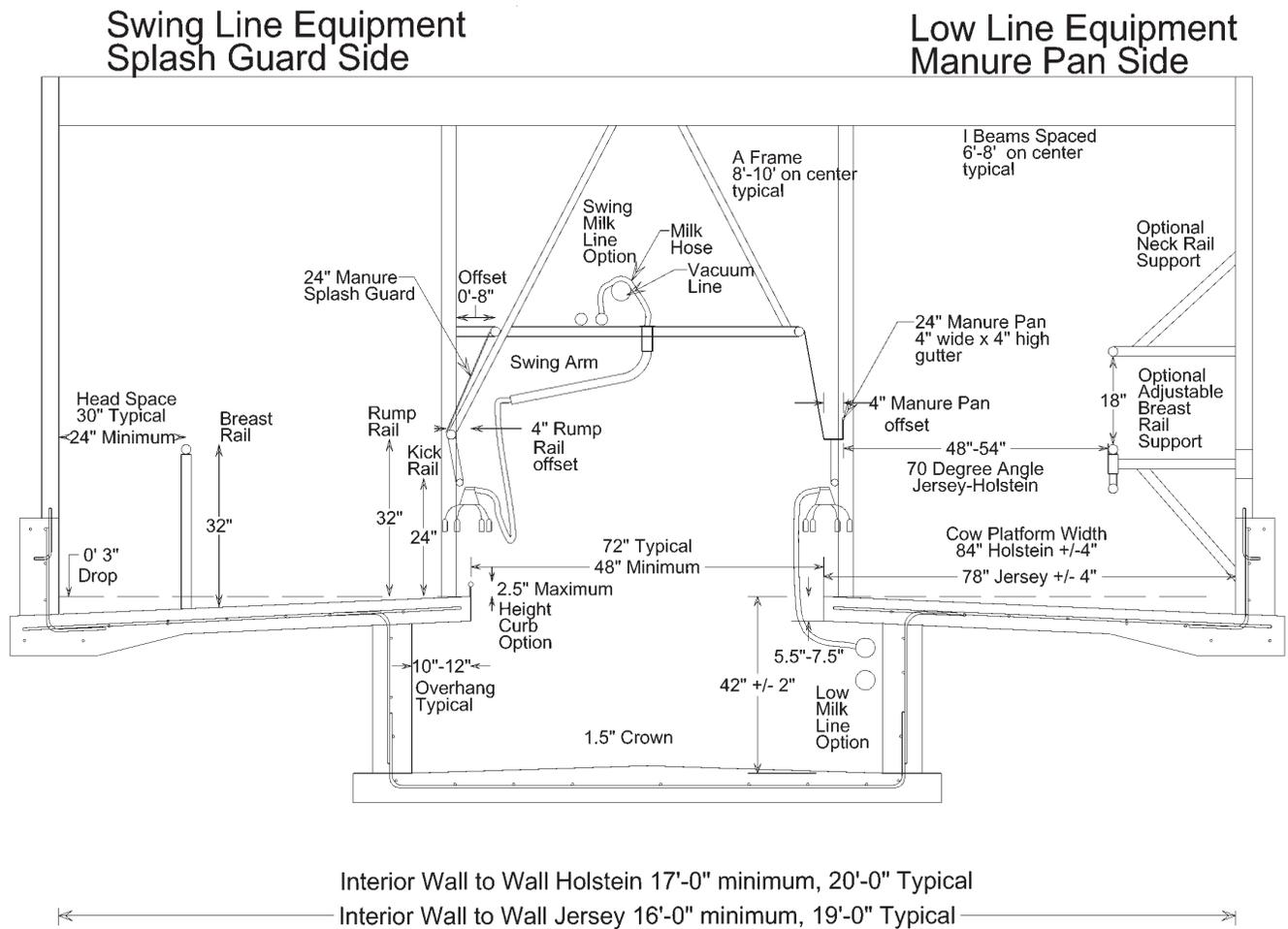


<sup>1</sup>Copyright 2007, Larry F. Tranel. Designed by Larry F. Tranel, dairy specialist, Iowa State University Extension. Drawn by David W. Kammel, professor, Biological Systems Engineering, University of Wisconsin Extension.

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- The parlor platform should slope 1.5% downward toward the holding area. This will benefit cow entry into the parlor and, according to some farm operators, reduce cows pushing forward and thus reduce manure being brought into the parlor. The parlor platform should slope 2% (2" to 3") downward from the edge of the pit toward the sidewalls. This will encourage the cows to back up closer to the operator, reducing operator back stress.
  - The cow platforms, pit, and pit walls contain rebar at 2' to 3' centers that often are welded together and to the cemented-in posts of the parlor frame and brisket rail. These continue into the holding area. Copper wire often is laid on top of the rebar, and both the wire and rebar are connected to copper ground rods driven at 45-degree angles just into the holding area. Consult your electric company for technical advice to eliminate stray voltage.
- Pit**
- The pit can be dug with a skid steer or a backhoe.
  - The recommended width for the operator pit is 6'; however, pit width can range from 4' to 7'.
  - The middle of the pit floor should be 1.5" higher than the sides. Thus, when attaching milking units, the operators' toes are lower than their heels, reducing stress on their backs.

**Figure 2. TRANS Iowa low-cost parlor cross section<sup>1</sup>**



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Consider building a new facility if the cost of remodeling is more than 50 to 60 percent of the cost of new construction or if a remodeled facility involves putting up with major inconveniences just to save money.

- The overhang is 1' under each cow platform—meaning the floor of the pit is 8' wide.
- Pit depth is sized for a taller operator. For someone 6' tall, the pit should be 42" deep. Mats can be used if shorter operators feel the pit is too deep. It is easier for

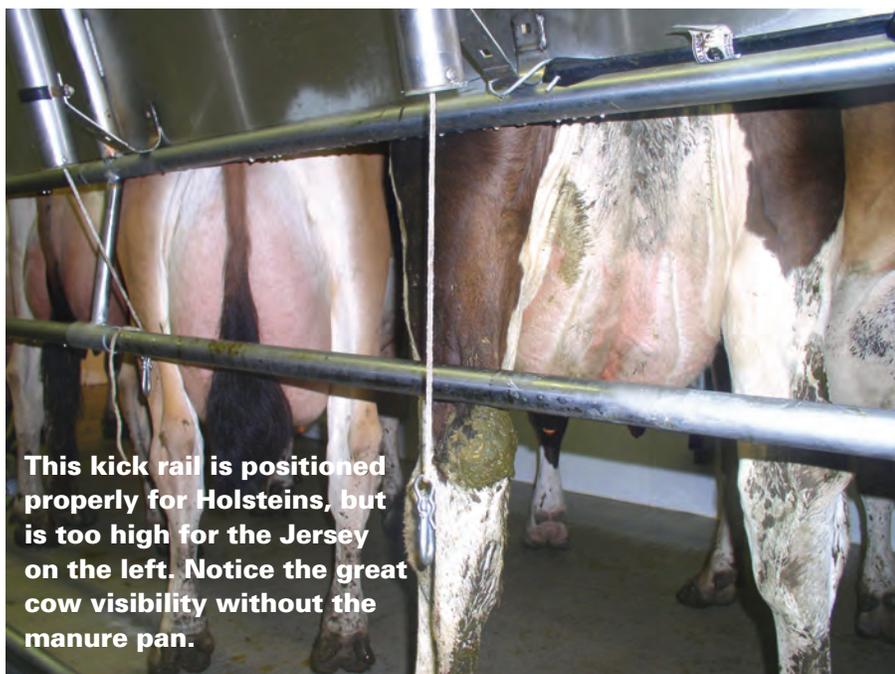
shorter people to reach up than for taller people to bend down.

### Cow platforms

- For 1,300 lb. cows, allow 30" per cow on center. However, this measurement ranges from 24" per cow for small Jerseys to 32" per cow for very large Holsteins.



**This swing 16 TRANS Iowa parlor uses galvanized steel, a floor-mounted brisket rail, and swing arm take-offs.**



**This kick rail is positioned properly for Holsteins, but is too high for the Jersey on the left. Notice the great cow visibility without the manure pan.**

- In this parabone style, the cows are parked at a 70-degree angle. To create the angle, the back legs of the first cow are 2' back relative to the front feet. The receiver jar can be placed in this unused space at the front of the pit.
- If the milking units are swung, mount the first unit on the milk line at approximately 44" back from the front of the first cow on the platform to create the proper unit angle alignment for the first cow. If the units are low line, then mount the first unit at 6" back from the center of the cow to accommodate the 70-degree angle.
- Cow platforms range from 4' wide for Jerseys to 4'9" for large Holsteins. A 4'6" platform is most common and can accommodate various sized cows in a herd. Due to the floor being sloped down to the sidewalls, small cows still will back up to the operator.
- The bottom of the splash guard is 32" to 33" above the cow platform and 2" to 3" in from the platform's pit-side edge. The splash guard is 24" wide.
- The bottom of the manure pan (if used instead of the splash guard) is 32" above the cow platform and centered over the pit-side edge of the platform. Consider manure pans carefully, as they tend to take additional cleaning time, make the chop gate more difficult to work, and cause milking time issues for taller operators.
- The top of the kick rail is 24" above the cow platform for Holsteins—22" for Jerseys.

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## **TRANSforming the Iowa Dairy Industry One Parlor at a Time: A Producer Profile of Pat and Sheila Brehm, Dubuque County**

Pat and Sheila Brehm dairy with their five children ranging from age 3 to 17. Their dairy herd has been growing with their family. In 2003, Pat decided to follow Iowa State University Extension's "Millionaire Model Dairy Farms" path to dairy profitability and the process has served his goals well.

In 2003, the Brehms were milking about 60 Holstein cows and grazing "a bit," but after attending ISU Extension's beginning and transitioning dairy producer sessions, Pat decided to get more intense with his grazing operation and do some crossbreeding. In consulting with Larry Tranel, ISU Extension dairy field specialist, Pat decided to follow Tranel's model since he knew other producers had benefited from it. The Brehms now milk 90 cows with a goal of 120-150 cows like the other model farms. The farm went organic last year.

The model farms milk in low-cost parlors and use TMRs, free stalls and most other farm technologies. A major key to the whole system is the low-cost TRANS Iowa parlor, which was the latest edition to the Brehm dairy in 2007.

"Larry said I couldn't afford to milk in a stall barn or small parlor at my young age. I was milking less than 30 cows per person per hour in the stall barn. Now with my Swing 16 TRANS Iowa parlor, we'll be able to milk over 120 cows an hour with two people or 60 cows per person/hour. Also with Larry's recommendations we remodeled a machine shed and put three rows of free stalls in it. We finished it in the fall of 2005 to prepare for the parlor and added cows. More cattle housing is still in the works," Pat said.

When asked what he thought were some defining features of the parlor, Pat mentioned the front chop gate, the simple splash guard and kick rail, the floor slopes, the generous amount of light, the unit swing arms and the pre-cooler. "The stall work is so simple and cheap but fits the cow so well that I am really sold on these



With all new equipment and labor Pat Brehm's parlor cost less than \$2,400 per stall. Depending on equipment and labor needs, some low-cost parlors have been built for \$1,200 to \$2,000 per stall. Herringbones can be remodeled for even lower cost, increasing from 6 to 9 stalls on a side in the same space.

low-cost parlors. The chop gate allows me to load and unload cows as fast as any rapid exits I've seen."

The Swing 16 TRANS Iowa Low-Cost Parlor and holding area cost less than \$75,000 and was built into the existing stall barn. This price includes 16 new units with pulsators, take-offs, and swing arms; a pre-cooler; a 10 hp milk pump; a variable speed milk pump; a used 3" line; and stainless steel milk jar. A variable speed transfer motor on the milk jar allows the milk to pass through the plate cooler slower to cool better, Pat added.

Pat credits ISU Extension for assistance with instructing the builders on the importance of the TRANS Iowa parlor stall design details like the sloped splash guard, the chop gate, the 4' entrance gate, and swing arms. "They had a few interesting discussions and I'm glad Larry was there to provide recommendations." A 14' garage door opens the parlor to the cows in the holding area, another feature Pat loves.

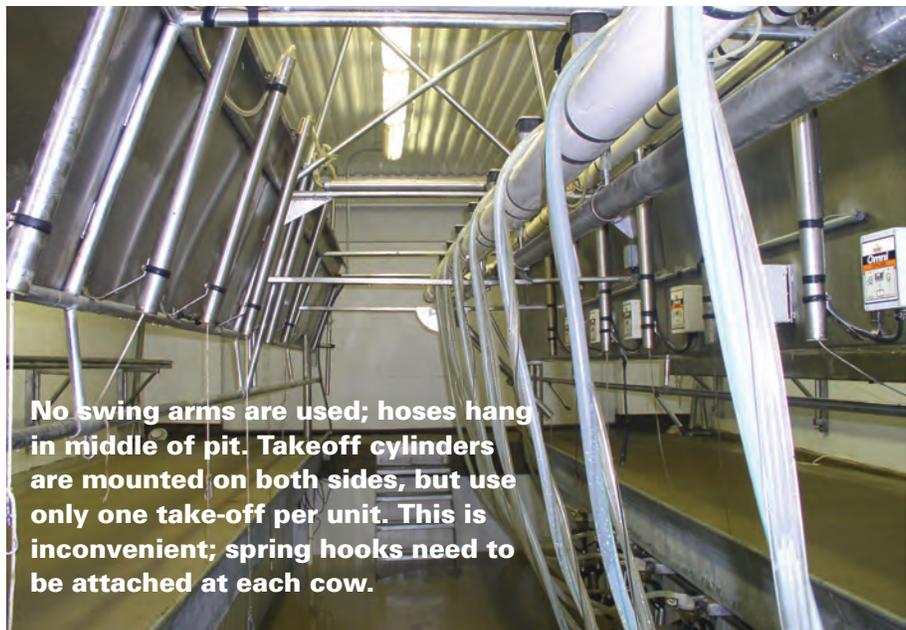
**"These TRANS Iowa parlors are a great option for these old stall barns and old herringbone parlors." – Pat Brehm**

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- The four pit corner posts are mounted 3" in from the pit-side of the platform. The bottom of the splash guard is mounted to the pit side of the post; the kick rail is mounted 2" back toward the pit; the top of the splash guard slants back 8" from the bottom. These measurements are critical to reduce reaching.
- From an overhead view, the bottom of the manure pan is centered directly above the edge of the platform; the kick rail is centered below the manure pan; the top of the manure pan slants back 3" into the pit if used instead of a splash guard.
- Nib rails are not necessary. If nib rails are used, they should be only 2" to 3" high and either straight or only slightly angled. Larger nib rails tend to keep operators further from the cows—thus, kick rails, splash guards, and manure pans need to move further toward the pit.
- The top of the brisket rail is 30" to 33" above the cow platform, most often at 32".
- The chop gate can be raised and lowered for loading and unloading cows. A well designed chop gate in many situations can increase loading efficiency as much as a rapid exit feature.
- Include a 4' to 5' wide door/exit platform unless cows can exit the parlor straight out from the cow platform.



**Alternative type of swing arm; notice design of kick rail under manure pan, the extra reach needed, and less visibility because of the 6" manure pan. Sleeved kick rail opens the chop gate by pulling a handle.**



**No swing arms are used; hoses hang in middle of pit. Takeoff cylinders are mounted on both sides, but use only one take-off per unit. This is inconvenient; spring hooks need to be attached at each cow.**



Prepared by Larry Tranel, ISU Extension dairy field specialist; Laura Sternweis, communication specialist; and Jane Lenahan, graphic designer. Reviewed by Jay Harmon, professor, ISU Department of Agricultural and Biosystems Engineering.

File: Animal Science 5 (Dairy)

**... and justice for all**

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