

# **Remodeling a Tie Stall Barn for an Interim Milking Parlor**

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## **Introduction**

Remodeling a tie stall or stanchion stall barn into a milking parlor is just one part of the deliberate decision to change how a dairy farm changes the way they house, feed, and milk the dairy herd. Changing how the cows are milked seems to be the key to starting the changeover from a relatively labor intensive stall barn system to a more labor efficient parlor/freestall system. (Freund ,1995)

From a construction point of view, the milking center is one of the more complex facilities on the farm. The construction requires coordination of multiple contractors. It also needs to have a time line that is realistic and definite. The owner needs to understand that construction takes time. The contractors involved need to know that delays in any phase of construction have an affect on the final completion date. Communication and coordination between the owner and contractors can eliminate mistakes, reduce delays and keep the project on schedule.

Remodeling any space offers additional challenges above and beyond the new construction. In the case of a remodeled parlor the additional coordination of milking the herd during the construction period might be considered too overwhelming a task to attempt. However there are farms that have gone through the process and are benefiting from a new milking center. Much of this discussion is based on what has been learned from farms that went through the process and identifying areas that could be improved to save costs and time. Information on the design of a remodeled or retrofit parlor are available from other references. (Graves, 1996, Kammel, 1995, Kammel et. al. 2001)

## **Construction Process and Relationships**

In many cases the farmer will act as the general contractor hiring and coordinating the sub contractors such as the carpentry, concrete, and dairy equipment contractors. Acting as the general contractor can save money, but it does require time to coordinate contractors, oversee construction, and deal with conflicts. Gooch, 1995 offers a comprehensive discussion of construction management issues for a dairy producer acting in that capacity.

As a dairy farmer acting as the general contractor, be aware of the other side of the coin. Be prepared to spend the necessary time to manage the project during construction. If the time is not available for you to manage the construction process, or the expertise is not available, then it is probably better to hire someone who knows what they are doing. 10-

15% of the project cost is commonly charged by a general contractor for providing those services.

One advantage of having a general contractor is the connections the contractor has with other sub contractors. Sub contractors are more likely to bid and work with a general contractor that they have a long standing relationship with compared to an individual farm who they may never work with again.

### **Construction Phases and Scheduling**

Although the milking center project must be considered in its entirety, the construction phases can be broken down into a defined and manageable list. The phases in the construction process are defined below according to timeline and action necessary.

#### **Planning Phase**

This discussion assumes that a plan and design have been decided upon by the owner and the information is available to share with contractors involved to determine cost, duties and responsibilities of all the parties involved.

#### **Construction Coordination Meeting**

A coordination meeting should be held with all the contractors involved in the project well in advance of the beginning construction date. Discuss the plan and timeline with dairy equipment supplier, concrete, carpentry, plumbing and electrical contractors that have been selected to work on the project. The owner is typically acting as the general contractor, but may need to select an appropriate (sub)contractor to take on some of the project management coordination. (possibly the dairy equipment dealer ) Key dates in the construction must be identified. The contractors all must be made aware of who needs to be on the site on a particular date and what their responsibilities are at that time.

A site visit should be part of the meeting. The plans should be reviewed and the group should walk through the process of construction to define what will be done and who needs to be involved. This is the time to determine the coordination between the contractors involved so they can anticipate any problems from their perspectives.

Contractors that are likely to be involved in the project are:

- General Contractor
- Excavation Contractor
- Concrete/Masonry Contractor
- Carpentry Contractor
- Dairy Equipment Contractor
- Plumbing Contractor
- Electrical Contractor

## **Change to Temporary Milking Arrangement**

Some of the space in the stall barn will be used for the new parlor area with the remaining space likely used for the holding area. This is the time to look at the preliminary layout for the new construction. The construction area should be defined as well as the number of interim milking stalls with consideration given to the transitions between milking systems and construction areas in each phase of the project.

The space where the new parlor is placed will be vacated for demolition and construction, reducing the number of existing stalls used for milking (and housing) the cows. Cows can be housed in the new freestall barn nearby, or if the project is done in good weather the cows may be housed on pasture and fed outside in temporary bunks. To minimize the number of changes the cows are subjected to, it is best to move the herd into the housing and feeding system well in advance of the change over of the milking system

One option is to milk the herd by switch milking the herd through the reduced number of stalls that are still available. A temporary holding area and gating can be set up to make cow flow through this temporary setup as easy as possible. (See Figure 1)

Another option for a temporary milking system is to set up a temporary flat barn parlor system. For example if the farmer has 5 (five) milking units, 10 (ten) tie stalls can be identified with a milking unit shared between two adjacent stalls. This eliminates carrying units from stall to stall. This also requires some training of the cows to enter and exit the flat barn system, but may be even more efficient than the around the barn milking system.

## **Reposition Milk Line and Other Services**

The existing milk pipeline must be moved to open up the space and accommodate the new parlor. The best location to reposition the milk line will depend on the plan for new construction. (See Figure 1) Vacuum lines, water lines, and electric lines may also need to be moved to accommodate the construction. This requires an equipment dealer and contractors to be on site on the date decided beforehand and ready to work between morning and evening milking. The contractor(s) must have enough help to get the job done in a timely manner.

This changeover must be completed in a relatively short time. Consider starting the morning milking early and the possibility of starting the night milking late to accommodate the schedule of making the change. Make sure that the milk inspector is informed if an inspection is needed any time the milk line is moved.

It has been suggested by some farmers that rather than moving the milk line to one side of the barn, that it would have been just as easy and cost the same to move the line completely out of the construction area. This will prevent potential damage to the milk line during construction. The milk line could be moved to the outside of the barn and

**(Note Insert Figure 1 on page 4 landscape to make as large as possible)**

back into the milk house to keep it out of the way of any construction in the new parlor space. (See Figure1)

Positioning the temporary milk line in this way may eliminate the need to make additional milk line moves to accommodate placing concrete, installing milking stalls, and/or interior finishing. Each time the milk line is moved it will require coordination with the dealer and a labor charge.

### **Demolition Phase**

The existing stall barn concrete floors and curbs are almost never at the correct slope or elevation to fit into the new parlor design. Existing concrete will almost always have to be removed in the parlor area to lay out the new operator area, parlor walls, curbs and flat work. Most dairy farmers dread the thought of tearing out old concrete, it in fact is relatively simple task if the right equipment is used.

The demolition phase will most likely require access by a skid steer for demolition of the concrete and removal of the spoils. A large barn door or wall opening and the necessary ceiling height must be available to allow access by a skid steer loader. If an existing door is not available, consider making a new opening to allow access. Consider a properly placed new doorway as part of the new cow entry into the holding area or as a more convenient exit from the parlor.

A skid steer with a hydraulic jackhammer attachment can be used to demolish old concrete relatively easily. There may be a need to saw cut parts of the old floor, or cut off existing curbs to make the existing concrete floors functional without replacing the entire floor. An accurate plan should be made for the transition from old concrete floor surfaces to new concrete floor surfaces to provide the proper slopes on the new floors. Elevations and slopes of the new concrete should be confirmed at this stage. The initial concrete floor construction should extend into the new holding area space 5-10'. Figure 1 (Phase 1) shows the initial construction area. After this is complete, Phase 2 construction of the holding area can proceed. This will allow easy access by the cows into the new parlor from the old stall area while it is changed over to holding area space.

### **Excavation Phase**

The old concrete and sub-base will need to be removed from the construction area. New water lines, plumbing drain lines and manure transfer lines may require trenching. The operator area, which is usually below the existing concrete floor level, will also need to be excavated for placement of the footers, floor, and walls. Elevations for the new operator floor, cow platforms and the slopes on drain lines should be confirmed during this phase. A skid steer with tracks is better suited to excavate the operator area. A backhoe attachment can be used to trench in any plumbing and drainage lines. The skid

steer is also used to move and compact the new sub-base fill. Alternatively a portable vibrating compactor can be used to compact the fill to the correct level.

### **Rough Plumbing and Electric Phase**

New underground water lines and drain lines according to the plans are installed at this time. The location, elevation, and terminating points for the drain lines should be confirmed and/or adjusted as needed. Underground wiring is also installed at this time.

### **Structural Change Phase**

To reduce costs, the area where structural changes are needed is usually limited to the parlor area only. Posts will need to be removed from the parlor operator area to provide a clear span for the new parlor space. However a good design should not be compromised based on the limitations of the existing structure. If necessary a better design may require additional structural changes and may not add too much to the overall project cost. The posts in the holding area can usually remain in place. The holding area can either include space on each side of the post row or the holding area space can include only the space between the post rows. (See Figure 2)

Temporary shoring of the construction area may be required during the demolition or changes made to the structure to accommodate the parlor space. During the structural changes, proper shoring and blocking should be used to support the existing structure to keep the work area safe during construction.

New support structure beams and posts, or trusses will need to be added to accommodate new parlor space. An experienced contractor and/or engineer should be consulted to properly size the replacement beams and posts. This is too important a design change to allow a quick uninformed fix.

Typically new beams are positioned to span the width of the parlor. They are spaced at approximately the same spacing as the old post spacing. These beams are supported by posts at the wall and at the existing line of posts. (See Figure 2. Cross Section) In some cases the full width of the barn may be spanned by these beams which are then supported on the existing barn walls. These cross beams may be placed under the existing beam to support it from below. An alternative is to place the new cross beams over the top of the existing beam and supporting it with saddles.

Alternatively the mow floor, beams, and posts are removed completely from the parlor space and replaced with clear span flat trusses and ceiling. In some cases this may be easier than shoring the existing structure.

### **Temporary Services Installation Phase**

Depending on the extent of the remodeling a temporary electrical system for power and lighting may need to be installed in the construction area and also to maintain service in

the old milking stalls. This should include lighting, and power outlets, including the need for an outlet for a portable welder in the construction area. Temporary plumbing for the water system in the old stalls may also need to be installed at this stage. In cold weather a heating system may be required to maintain a working temperature in the construction area.

**Note insert Figure 2 on page 7 landscape to make as large as possible**

### **Manure and Milking Center Waste Handling**

The manure and waste handling and storage system from the holding area and parlor should also be addressed at this stage. The system should be ready for collecting wastes when the parlor is finished. It is advantageous and cost effective to adapt any existing manure handling and storage system to the new parlor and holding area setup. However, this will vary from farm to farm. In many cases the milk house center waste system will not be able to handle the larger amounts of water generated in a parlor situation. If manure storage is not available, it is common to bury a 2,000-5,000 gallon storage tank to collect the parlor and milk house waste water. Holding area manure is usually handled separately by scraping to a collection area where it can either be transferred to storage, stored temporarily, or hauled daily. (See Figure 2)

### **Footers and Foundation Phase**

New footings for posts and/or foundations for walls will need to be placed to support the structural changes that are planned for. The operator area (pit) will require footings and walls. Elevations for the footings, operator area floor, and cow platform floor should be confirmed at this time. Old wall openings and windows may be closed in to match the plan and/or new wall openings may be installed at this time. Backfilling and sub-base installation and compaction is also done at this stage.

### **Concrete Placement Phase**

The operator area walls and floor are installed at this time. The final elevation and slope for cow platforms and remaining floor sections are confirmed. The sub-base is compacted and the concrete flat work is placed at the proper elevations. Consider how concrete will be moved into the space. The concrete truck may be able transfer concrete through window and door openings. For longer distances, the concrete will have to be moved by motorized buggy, skid steer, or wheel barrow.

The plumbing contractor may need to be involved at this stage to install the in floor heating piping before new concrete is placed. The electrical contractor may also be needed to provide the bonding of the equipotential plane to the stall work and to the electrical service panel. The dairy equipment contractor will be involved to place milking stall support posts if needed.

The concrete should be allowed to cure properly. Time in the construction schedule should be allowed for this to occur. A moist cure for at least 7 days is necessary for good quality concrete.(up to 28 days if possible) Wetting the concrete and/or covering with plastic or wet burlap will provide a good cure. A large amount of moisture will be given off during the curing process and depending on the time of year the concrete should be protected from drying out as it cures. In cold weather the concrete should be protected from freezing either by insulation blankets or straw on the plastic.

### **Milking Stall Installation Phase**

Depending on the stall type this phase of construction must be coordinated with concrete placing phase since some of the stall work posts may require placement in the concrete. It is critical that the concrete contractor and the milking equipment dealer are communicating with each other and the owner to define exactly what needs to be done. In some designs the stall work is suspended from beams and post structure that may be integral to the building support structure. This minimizes the number of post penetrating the concrete floor. Welding of the stall system will also occur at this time.

### **Rough Carpentry Phase**

Rough wall framing will be installed at this stage. New door, window and fan rough openings are framed out in the existing and/or new walls. This work may be occurring simultaneously with other contractors.

### **Rough Electrical Wiring Phase**

Rough wiring for lighting and other equipment is installed into the open stud walls and ceiling at this stage. If the electrical wiring and fixtures are surface mounted the installation will have to wait until after the interior finish of the walls is completed. Surface mounting electrical wire in conduit is a preferred method of wiring in agricultural applications.

### **Finish Carpentry Phase**

Insulation is installed in the wall cavities and a vapor barrier retarder is installed on the interior surface. Interior ceiling and wall finishes are installed at this stage. Windows, doors and finish trim are also installed at this stage.

### **Milking System and Other Equipment Installation Phase**

The milking equipment dealer, electrical, and plumbing contractor may all be on the site at the same time during this phase of the project. The installation of the receiver group, milk line, vacuum line, electrical wiring, plumbing lines, will all be taking place at this stage. The old receiver group may or may not be reused and repositioned for the parlor. Coordination will be needed between the old milking system and the new milking system equipment. Some of the existing milk line may be used in the new parlor, or it can be

traded back to the dealer for the new line needed in the new milking system. Final wiring, plumbing and heating system including lighting fixtures, plumbing fixtures, fans, and any other equipment will also be installed at this stage.

### **Transition from Old Milking System to New Parlor**

Much of the work to make the parlor functional should have already been in place before the day of the transition. Gating, stall work, plumbing, drains, electrical, and lighting should all be functioning in the new parlor. The major change that needs to be accomplished is to replace the plumbing needed for the milk line and receiver group changes. If the receiver group is being placed at a different location, that will require extra effort compared to just routing the new milk line and making a few plumbing connections. The amount of work that needs to be done on this day should be minimized as much as possible.

The dairy equipment dealer should have the new milking system in place with only a few connections to make to change over from the old system to the new system. The transition from the old milking system to the new milking system will be scheduled between the morning milking and the night milking. Make sure all contractors needed for the switch to occur are aware of the date and time that work will begin. This is a hectic day and a meeting among the contractors should be done in advance. Each contractor must know what needs to be done and what order it will happen. Concrete work may be needed, dairy equipment will require final installation, and the plumbing and electrical installation necessary to the milking system will also take place.

### **The First Parlor Milking**

Most milking equipment dealers will provide help during the first milking in the new parlor. Contractors involved in the project may also provide the additional labor needed. Family and friends may also be willing to help. Ask at the beginning of the project if the contractors would be willing to help in the transition. Some farms have asked for the contractor's help as a condition of accepting the contractor's bid and work. It is probably best to have too much help than not enough. Extra help would be beneficial in the first 7-10 days of the transition to the new parlor.

The concrete floor transition from the temporary holding area to the new parlor must also be finished at this time. This may require temporary gating and old concrete to be removed. Temporary lanes may need to be developed to place the finished concrete and allow a proper cure. Temporary gravel or sand fill can be placed to provide a cow traffic lane into the parlor during the new concrete placement. The chance that new concrete can be formed and placed in such a short time when all the other work needs to be done to milk cows may not make it a priority for this day. That work may be better left for another day.

Gating can be used to make a temporary holding area between post rows, or to one side of the post rows. The holding area may require some new concrete work as well. How



cows will enter the parlor during the construction in the holding area must also be determined. Eventually the concrete in remaining stall barn space will be redone to create new holding area. (See Figure 2) A temporary waste storage handling system for parlor waste and holding area manure may also have to be developed while the long term handling and storage system is being constructed. If possible it is beneficial to use the existing manure handling system such as a pump station or collection tank.

Parlor startup and training is a high stress activity for both the cow and the operator. Minimizing the stress will help reduce potential problems but will not eliminate them. The new milking routine should be defined before hand so that everyone milking is familiar with the steps. It has been suggested that the parlor be wet down to ease cleanup and that manure be spread around a new parlor to cut the odd smells of new concrete and equipment. If possible, on the initial visit, cows should be allowed to enter the holding area and parlor at their own pace. This could be done for several days, increasing the pressure to move through the parlor. At some point in this training the cows should be held in the line but not milked, released and allowed to exit the parlor. On the first day of milking additional help should be available to move cows into and out of the parlor if necessary. The goal should be to have the parlor operating with the correct number of operators in the first month if at all possible. Most farms report that within 2 weeks most cows have adapted to the routine.

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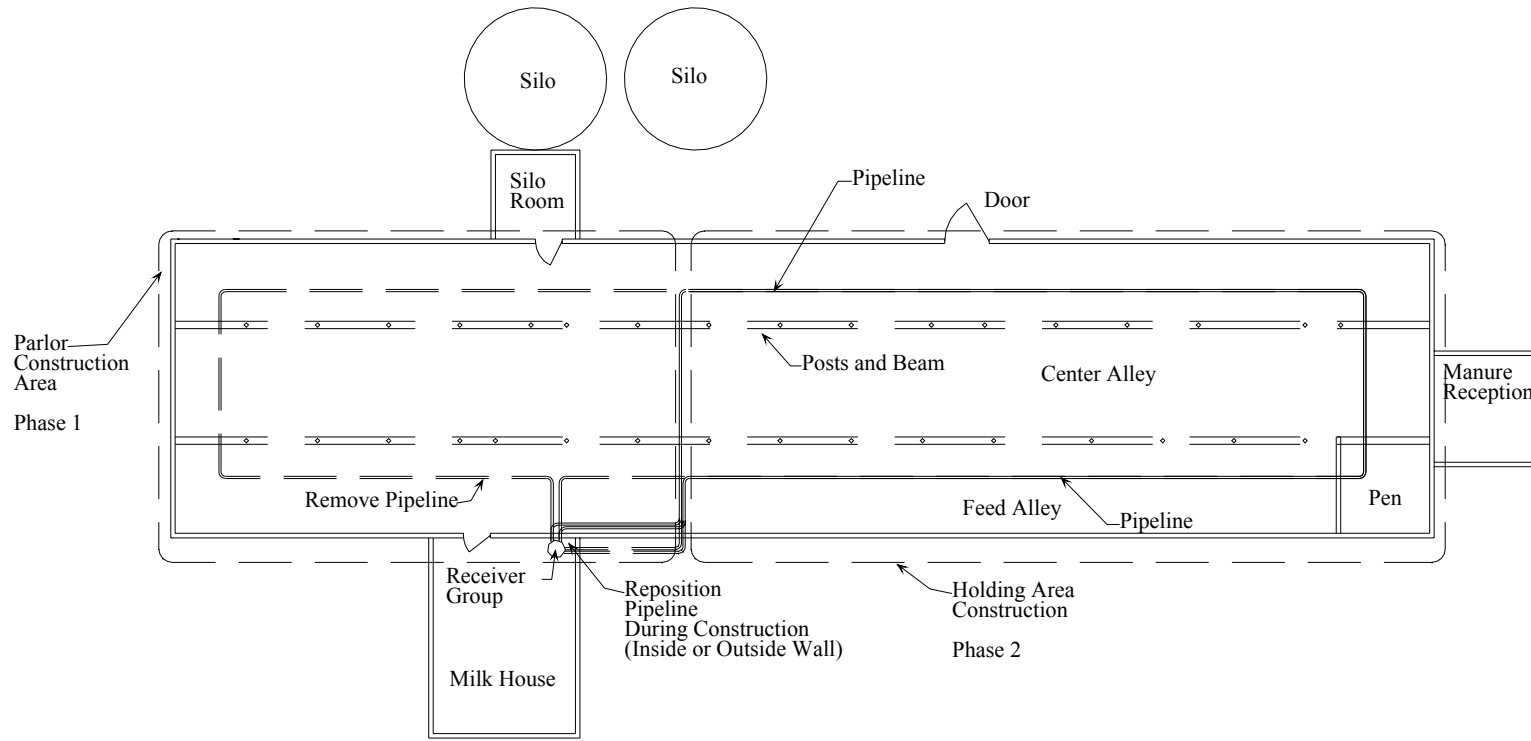
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Figure 1. Existing Tie Stall Barn Arrangement



Plan View  
Existing Tie Stall Arrangement

Figure 2. Remodeled Parlor Arrangement

