THE DAIRY PRACTICES COUNCIL®

GUIDELINES FOR THE SELECTION OF ELEVATED MILKING PARLORS

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GUIDELINES FOR THE SELECTION OF ELEVATED MILKING PARLORS

ABSTRACT

Today, nearly one half of the time for dairy chores is spent with milking and related tasks such as assembling, cleaning, and maintaining milking equipment. Effective milking, coupled with an efficient and economical combination of labor and equipment, is a high priority dairy enterprise goal. Elevated and mechanized milking parlors represent a major development in attaining such a goal. Future improvements are certain, but these guidelines provide much useful information for selecting and constructing elevated and mechanized milking parlors. Key subject areas discussed are: basic considerations, types of milking parlors, automation and mechanization, parlor selection and design diagrams for 7 types of parlors.

PREFACE

This guideline was originally written in October 1987 as *DPC- 54 Selection and Construction of Herringbone Parlors* in large part by Professor W. W. Irish of Cornell University. Dr. W. G. Merrill, also at Cornell University, served as subcommittee co-chairman with Professor Irish. Others who provided helpful inputs were: Mr. C. L. Cassidy, Nupulse, Inc.; Professor F. E. Gilman, University of New Hampshire; Dr. R. E. Graves, The Pennsylvania State University; Professor R. W. Guest, Cornell University; Dr. G. L. Hayes, NYS Mastitis Control; Mr. R. O. Martin, Agway Inc.; Mr. R. A. Peterson, NYS Electric and Gas Corp.; Mr. J. H. Reeder, MD & VA Milk Producers Assn.; and Mr. W. W. Zepp, Maryland Milk Control.

Robert E. Graves, Penn State University as the lead author, undertook this re-write and expansion to cover all Elevated Milking Parlors. Input was received form Bob Engle, Paul Garrett, Gurt Gooch, Dan McFarland, Joe Moreau, John Porter, David Dunn, Stan Weeks and Peter Wright.

Information in this guideline is based on material abstracted from:

- October 22, 1997 draft of *NRAES Milking Center Design Handbook*
- *DPC- 54 Selection and Construction of Herringbone Parlors* – W.W. Irish & W. Merrill *Planning a Milking Center - Smith, Armstrong, and Gamaroth KSU 1996*
- *Parlor Design for Operator Comfort and Convenience - McFarland NRAES -66*
- *Swing Parlors - Kammel, D. W. pp 320 -340 Designing a Modern Milking Center - NRAES 73*

GUIDELINE PREPARATION AND REVIEW PROCESS

The Dairy Practices Council (DPC) Guideline development and update process is unique and requires several levels of peer review. The first step starts with a *Task Force* subcommittee made up of individuals from industry, regulatory and educational institutions interested in and knowledgeable about the subject to be addressed. Drafts, called "*white copies*," are circulated until all members of the subcommittee are satisfied with the content. The final "*white copy*" may be further distributed to the entire Task Force; DPC Executive Board; state and federal regulators; educational and industry members; and anyone else the Task Force Director and/or the DPC Executive Vice President feel would add strength to the review. Following final "*white copy*" review and corrections, the next step requires a "*yellow cover*" draft to be circulated to representatives of participating Regulatory Agencies referred to as "*Key Sanitarians*." Key Sanitarians may suggest changes and insert footnotes if their state standards and regulations differ from the text. After final review and editing, the Guideline is distributed in the distinctive DPC "*green cover*" to DPC members and made available for purchase to others. These guidelines represent our state of the knowledge at the time they are written. Currently, DPC Guidelines are primarily distributed electronically in pdf format without colored covers, but the process and designation of the steps remains the same. Contributors listed affiliations are at the time of their contribution.

DISCLAIMER

The DPC is not responsible for the use or application of the information provided in this Guideline. It is the responsibility of the user to ensure that the information addresses their needs and that any action taken complies with appropriate regulations and standards.

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INTRODUCTION

An elevated milking parlor is a special area where cows are brought to be milked and then returned to their housing facility. An elevated milking parlor is perhaps the most costly and critical component on a modern dairy operation. It usually forms the nucleus of a larger specialized segment of the dairy operation referred to as the milking center. The milking parlor interacts with and can affect many other facets of housing, feeding, and management of the dairy herd. Because of this interaction, it is often necessary to make selections and decisions in one area of the dairy and then "test" them against another area and perhaps go back and make further modifications. It can be a frustrating task but it is extremely important.

Each stall or cow standing position in a milking parlor may have its own milking unit or may share one with a nearby stall. The milking unit is normally permanently attached to the milk line and cleaned in place in the parlor. The milking unit may also be handled similar to those in a tie stall barn milkers and returned to the milk room for washing and storage. A good milking parlor will encourage an organized work routine or assembly line type milking procedure. The amount of time cows spend standing in the holding area or milking parlor away from feed, water and resting areas should be minimized. The actual length of time will depend on number of milkings per day, climate where the dairy is located and production level expected from cows. Typical recommendations are 60 minutes, 45 minutes and 30 minutes for two, three or four time a day milking respectively or a total of about two hours per day away from feed, water and rest. Coordinate the size of the largest cow group and the milking parlor throughput to achieve this goal.

NOTE: Make sure that you contact your Regulatory Agency early in the planning stage to discuss requirements and concerns. Local or state agencies responsible for building construction, zoning and water pollution may also need to be involved.

1. MILKING PARLOR TYPES

Milking parlors are classified by the position the cows stand in relation to each other and in relation to the milker. The most basic distinction is whether the cows are elevated above the person doing the milking (flat parlor versus elevated parlor). This guideline will cover elevated parlors. See guideline DPC #87 for a discussion of flat milking parlors. (Scheduled for publication in 2000).

In elevated parlors, cows may stand in line parallel to the operator's area (walk through, side opening, tandem), at an angle to the operator (herringbone), or side by side facing away from the operator (parallel). The cow's position affects the amount of the cow visible to the operator and whether the milker unit is attached from the side or between the rear legs. Orientation of the cows will also affect parlor length and width, operator walking distance and cow entrance and exit times.

In an effort to minimize time lost due to cow entry and exit and or operator movement from cow to cow there have been various efforts at moving the cow to and from the operator and milking machine. Early attempts involved having cows step onto a moving conveyor belt or rotating platform that moved her past an operator who attached a unit that was later removed automatically or by a second operator. Difficulties with these units included complexity and breakdowns of machinery required to move 1400-pound cows and fixed time milking. These units work best when udder prep and machine attach routines are minimal.

Parlors are further classified based on how the cows enter and leave the area where they will actually be milked. Cows enter and leave side opening stalls one at a time. In a herringbone or parallel parlor, groups of cows enter the parlor in single file. In smaller herringbone or parallel parlors cows usually exit single file through the end of the parlor. In parallel parlors, cows may also reverse direction and exit single file through the same end of the parlor they entered from. To reduce the amount of time it takes cows to exit a large herringbone or parallel parlors, methods to allow all cows to exit as a group have been developed. In so called rapid exit parlors all cows are able to walk simultaneously directly away from the operator area as a group rather than single file along the operator area. Rapid exit stalls require a widened exit area next to the milking platform and a return lane on each side of the parlor. As parlor length exceeds 8-10 stalls per side, considerable time can be saved by allowing all cows to exit as a group.

1.1 Side Open Milking Parlor

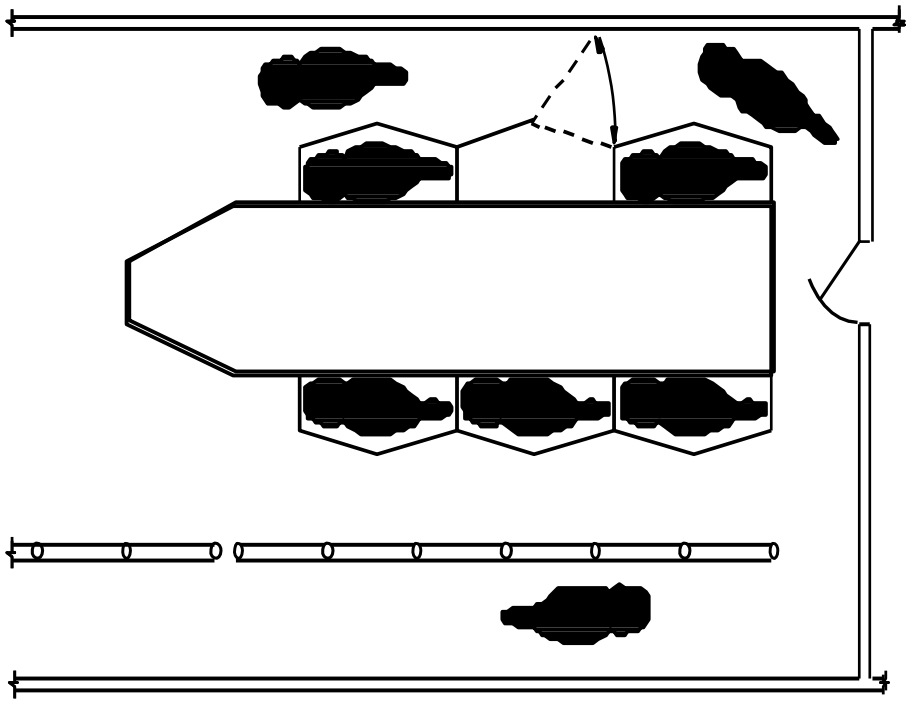


Figure 1. 2 x 3 Side Open Parlor With Single Return Lane

Side opening parlors (Figure 1) handle cows one at a time and have been used for about 60 years. Stalls, on an elevated platform, are placed one in front of the other along one or both sides of an operator work area. Cows enter and exit the stalls individually, so a slow-milking cow does not delay the completion of milking and release of other cows in the parlor. These parlors are often sold to first time parlor owners who are concerned about observing individual cows and individual cow care. The throughput of these parlors is less affected by variations in cow milkout times and the disruptions from feeding grain in the parlor.

Side opening parlors usually are located on the end of a holding area with two entrance lanes. A gate at the entrance point between the holding area and the milking parlor holds the cow until an empty stall is ready. In parlors with automatic udder spray, there is an additional stall at the entrance to the parlor where the cow waits and is sprayed with a predip solution. In most installations the exiting cow continues up the same lane that is used as an entrance lane and a control gate directs her to a return lane. The parlor may be organized to allow the cows to exit in return lanes on either side of the operator area or cross over to a single return lane on one side. Some designs add a series of extra gates that allow the exiting cow to cross over the entrance lane and directly enter a return lane. In addition to the extra gates, this system requires a return exit area on either side of the parlor.

The number of stalls in a side opening parlor are usually limited to 4 to 8 for one operator and 8 to 12 for two operators. Stall lengths of 8’ to 10’ per stall quickly add up to excessive walking time and difficulty in keeping track of distant milking machines. These parlors have received a recent return to interest because of extra computer controlled automation. By automating entrance and exit gates, adding cow sensing electric eyes or wand switches and automated predip and postdip spray units the amount of time that the stall is empty and the amount of time required to attach a machine can be reduced. If auto detachers are used, the detacher can signal that a unit has been removed and the cow automatically let out, the gate closes and another cow is allowed to enter the stall. This system may be best suited for situations where pre- and post-milking procedures, especially from pastured cows, are greatly reduced. When a more complete pre and post procedure is followed the expected benefits from this additional automation will decrease.

1.2 Herringbone Milking Parlor

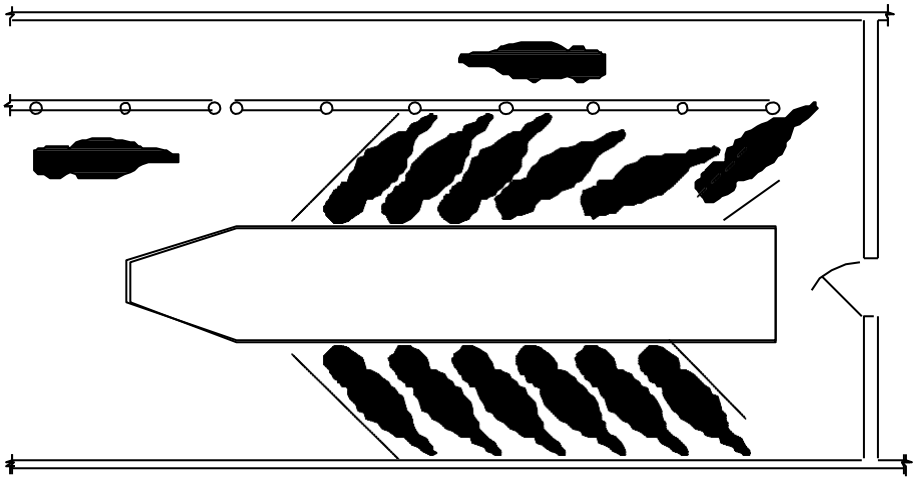


Figure 2. 2 x 6 Herringbone Milking Parlor with Single Return Lane

Herringbone parlors (Figure 2) are probably the most common elevated parlor in use today. Cows stand on an elevated platform in an angled or herringbone fashion facing away from the operator area. This exposes enough of the back half of the cow to allow access to milk her from the side and room for an arm type detacher and associated equipment. Typical spacing places udders about 36 - 45 inches apart. This reduces parlor length and thus walking and site distances for milkers. Because the cows are angled out, the cow platform will be wider than for a side opening parlor. However, as parlors become very large, such as with 40 to 50 cows on a side, even this extra travel distance may reduce efficiency.

The term herringbone parlor usually refers to two rows of elevated stalls on either side of an operator area. This allows the operator to be prepping cows and attaching machines on one side while cows on the other side are either being milked or entering or exiting the parlor. Early arrangements of these parlors often provided only enough milker units to milk one side of the parlor at a time. These were then transferred or "swung" to the other side of the parlor when the first side was completed milking. The units were attached to a milk line and vacuum line running over the operator area or hooked up and unhooked from a low line on either side of the operator area. Using one set of milker units and moving them from side to side is again receiving interest as so called "swing parlors" or "New Zealand swing parlors."

Herringbone parlors are located on the end of a rectangular holding area allowing cows to enter single file as a group directly into either side of the parlor. On completion of milking the cows exit single file by walking straight ahead and out of the parlor. In most layouts the cows make either a 180-degree turn down a return lane back past the holding area or a 90-degree turn and out a side door or across the parlor to a return lane on the other side. Parlors with more than 8 -10 stalls on a side are normally equipped with rapid exit stalls to speed up the exiting process. (Figure 3) In this case the cows walk straight away from the operator area in to a wide exit area. Normal design has a return lane on either side so cows go directly from the exit area past the holding area. However, cows on one side can be directed across the front of the parlor to a return lane on the other side.

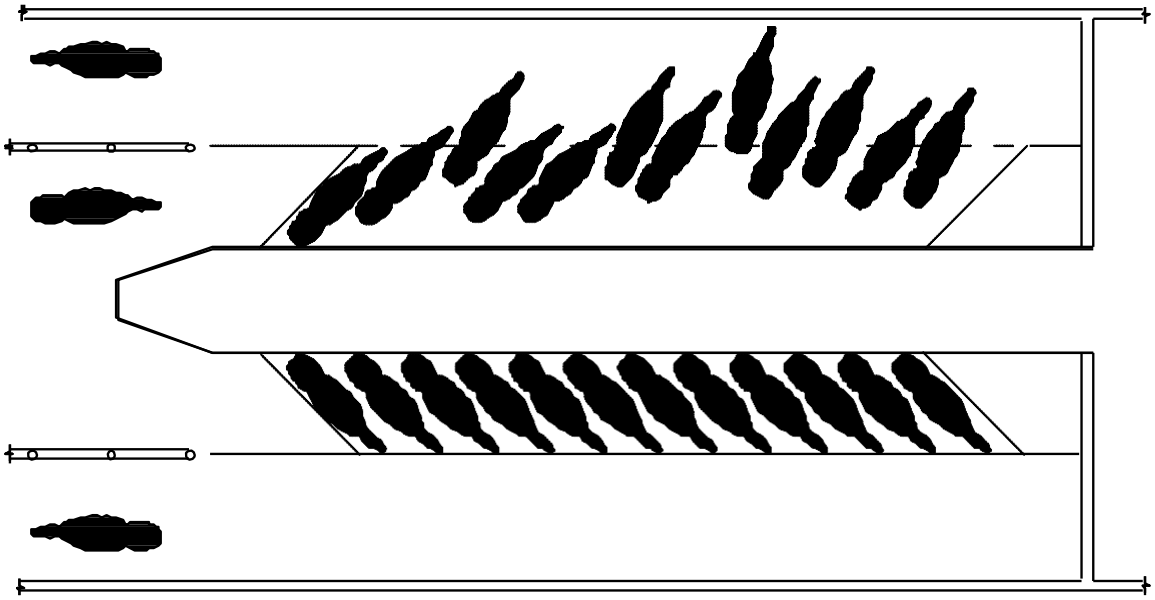


Figure 3. A 2 x 12 Herringbone Milking Parlor with Rapid Exit and Two Return Lanes

As the number of stalls on a side increases it becomes more difficult to keep track of each cow and milking machine. In larger parlors the two rows of stalls may be arranged in a wedge or "V" configuration resulting in a wider operator area on the end away from the parlor animal entrance. This improves the visibility of units and cows from the other side of the operator area. It may also enhance exiting because of the slightly smaller angle of the turn required for cows to exit the parlor.

Rows of stalls in a herringbone configuration may also be arranged in groups of four around a diamond shaped work area to form a so-called polygon parlor. The reasoning behind this arrangement is to speed up cow traffic into and out of larger parlors by having fewer cows in any group of stalls. Rapid exit parlors that allow all cows to exit simultaneously have replaced this arrangement as a method to speed up cow movement.

1.3 New Zealand Swing Parlor

The term New Zealand swing parlor or just swing parlor is often used by grazers to refer to a herringbone type parlor of simple design with cows angled at about 70 degrees. The milker units are attached to a high line over the operator area and often are attached to the cow between the rear legs. The parlor framework has just one rail restraining the cow in the front and the back and a guillotine or swinging exit gate. Often there is no rear gate. More cows are allowed to enter the parlor than there are milker units. The extra cows serve to keep the last cow being milked in position. When the cows exit the quick acting guillotine gate is used to "catch" the cows that haven't been milked. If one or two cows that have already been milked are "caught" by the front gate, the hoses on the units are long enough to move them back to the cows that haven't been milked.

1.4 Parallel Parlor

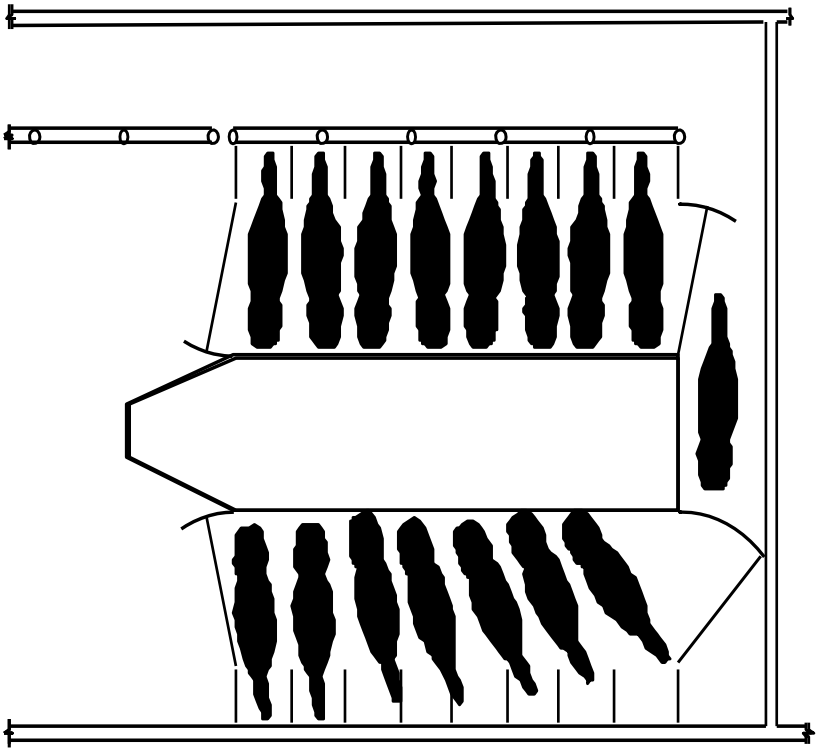


Figure 4. A 2 x 8 Parallel Milking Parlor With Single Return Lane.

Parallel parlors (Figure 4)were introduced in the US around 1980 and have become a popular alternative, especially for very large parlors. They may also be referred to as 90 degree, right angle, or side-by-side parlors. Cows stand on an elevated platform at a 90-degree angle facing away from the operator area. Access to the udder is between the rear legs. Twenty-five to 30 inches are allowed for each cow thus reducing parlor length and travel distance between cows. The cow platform is wider than a herringbone parlor to accommodate the length of the cow. Special front positioners are used to help orient each cow. Cows enter the parlor single file. To assure that each position is filled in order, a series of sequencing fronts prevent a position from being used until the one next to it has been occupied. For parlors with fewer than 8 - 10 cows the front dividers can be raised and the cows allowed to turn and exit from the end away from the holding area. In retrofit situations it is possible to allow the cows to turn and exit in the direction from which they entered. A swinging gate at the entrance end directs them away from the holding area into a return lane. (Figure 5)

Milking between the rear legs of the cow limits udder observation and access. Also, with only 27 - 30 inches of curb length per cow space for automation is limited; for example arm type detachers are usually not available for parallel parlors.

A good indexing front, to move cows back, is essential in a parallel parlor. If cows are not positioned back against the butt shield, the operator must reach farther in to access the udder. Power or gravity systems can be used for indexing cows in groups, gangs or individually.

Larger parallel parlors are usually equipped with rapid exit that allows all the cows to exit simultaneously. (Figure 6) As with herringbone parlors, there can be separate return lanes for each side of the parlor or the cows from one side can cross over the front of the parlor and use a return lane on the other side.

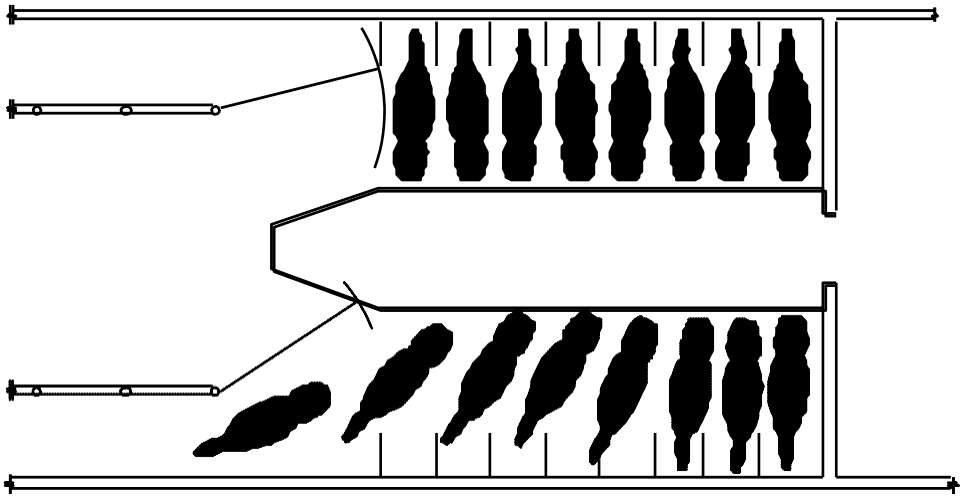


Figure 5. A 2 x 8 Parallel Milking Parlor - Cows Enter and Exit From the Holding Area End.

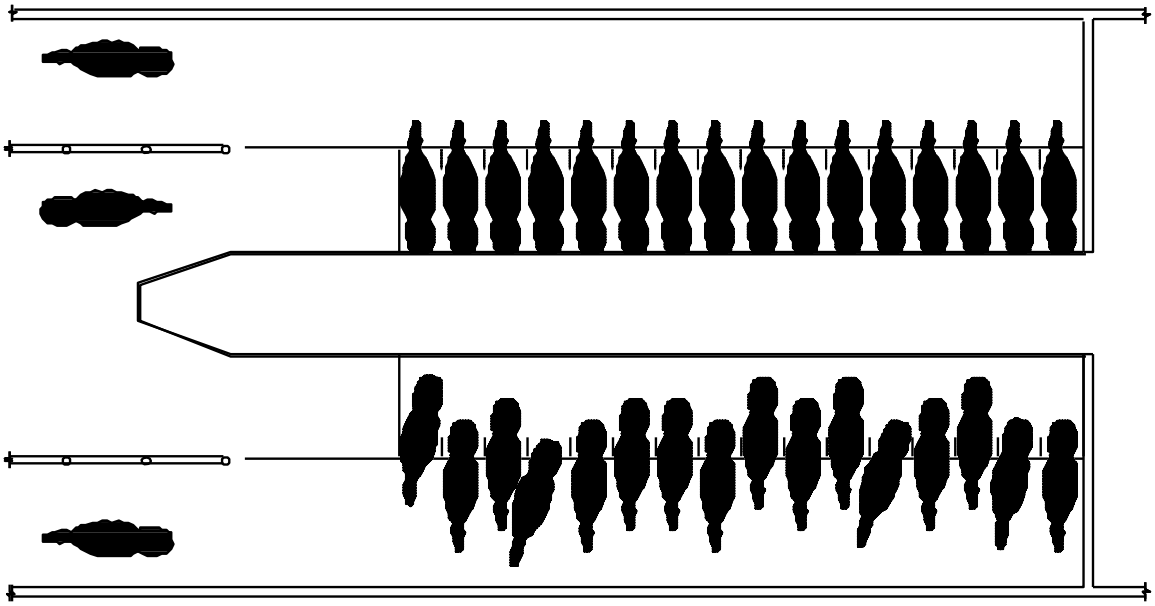


Figure 6. A 2 x 16 Parallel Milking Parlor With Rapid Exit and Two Return Lanes.

1.5Parallel/Herringbone Hybrids

Hybrids of parallel and herringbone parlors referred to by names such as parabone, 70 degree and open parallel are also in use. Their greater appeal may be the simplicity of design and resultant lower cost. They seem to offer no great advantage or disadvantage over either the parallel or herringbone parlors. Typical dimension and cow angles vary between those used for herringbones parlors and parallel parlors. Cow spacing can range from nearly as much as in a herringbone (34 inches) or as compact as a parallel (27 inches). Cows may be angled to the curb between 50 degrees and 75 degrees.

Positioning of cows varies more than other parlors because the angle of the cows is not as well defined. Parlors sometimes overload (extra cows enter), causing problems with mounted automated equipment. However, these parlors can be very compact and efficient. No sequence gates, as required in parallel parlors are needed, reducing initial cost and maintenance.

This type of parlor may be most practical for retrofitting existing herringbone parlors to accommodate more cows. More stalls can be installed in the same length of building. Cows can be placed as close as 26 inches and can exit the parlor single file out the front or with rapid exit.

The cows are placed at a greater angle from the operator (about 70 degrees) than in traditional herringbones but less than 90 degrees as in a parallel. This usually results in a cow spacing of 26 -34 inches. The slight herringbone configuration usually removes the need for front positioners and interlocking fronts as used in a parallel. The sharp angle does not expose enough of the cow's body to allow milking from the side. Procedures and equipment developed for milking between the hind legs are used. This system can sometimes be used in converting herringbone parlors to allow additional stalls. Cows can exit single file to the front end of the parlor or to the sides of the parlor using a rapid exit type front.

1.6 Rotary Parlors

Rotary parlors are specialized elevated parlors that receive renewed interest from time to time. The cows must step onto a constantly rotating platform where the milking units are attached and the cows ride around as they are milked. When the platform has made a complete revolution, the cow must get off the platform to make room for the next cow to be milked. Rotary parlors are set up for either the operator area to be inside the platform with the cows rotating around the operators or with the operator area around the outer circumference with the cows facing the center point and the operators outside the platform. The platform either floats in a pool of water or rides on wheels on a metal track. An electric or hydraulic motor is used to rotate the platform. Rotary parlors are usually more expensive and require some different animal handing considerations to direct the cows on and off the rotating platform. The rotary concept is best suited for situations that can justify "two operator" systems. The cost and complexity of these units usually limits their use to large herds. Operator functions in rotary parlors are more specialized, leading to the potential for greater efficiency. Specialized tasks and the continual movement of the platform may result in operator fatigue as a result of continually performing the same tasks, for example attaching milker units for several hours at a time.

The number of cows milked in a given size rotary is directly related to how rapid "prep time" and "milker attachment" is completed. These important tasks may be compromised if the system is "pushed" to achieve a very high throughput per operator. Reduce the anticipated throughput of a rotary parlor when a high priority is placed on cow preparation and milker attachment.

Because of the considerable difference in the operation of a rotary parlor it is especially important to visit many parlors while in operation and become thoroughly familiar with their unique characteristics. You should observe them throughout several complete milkings, and consider the production level and mobility of your herd when evaluating this type of parlor.

Typical complaints or problems with rotary parlors include

- High capital and maintenance costs
- The tendency for "fixed time" cow milking
- Cow prep time is limited
- Interruption of milking caused by slow milking cows or cows that will not get on or off the platform
- Operator fatigue
- Limits to operator's ability to observe all the milker units or to have access to the holding area.

2. AUTOMATION AND MECHANIZATION

A wide range of equipment can be used in milking parlors and more complex equipment is usually found in larger parlors with larger herds. Equipment can be installed to feed concentrates, move and direct cows, operate gates, stimulate milk letdown or spray udders, remove milking units, clean and sanitize equipment, measure and record milk yield, or flush floors. While much of this equipment works best when planned into a new system, it can

be retrofitted to older parlors. Labor accounts for up to 80 percent of the cost for milking cows so slight improvements in milking efficiency can offset larger investments for mechanization. Milking parlors are mechanized or automated to:

1. Increase throughput and milking efficiency,
2. Reduce labor and drudgery or reduce difficult and repetitive tasks,
3. Make milking easier, faster, safer and more pleasant,
4. Make skillful milkers more effective
5. Improve milking practices and milk quality.
6. Enhance record keeping.

2.1**Crowd Gates**

A crowd gate in the holding area is used to shrink the size of the holding area as the number of cows waiting to be milked decreases. Crowd gates should not be used to physically push or scare cows towards the parlor. Crowd gates that can be lifted and returned over a group of cows, will allow a second group of cows to be loaded into the holding area behind the crowd gate while cows from the previous group occupy the parlor end of the holding area. Three basic types are:

1. Manually controlled and operated
2. Manually controlled and mechanically operated
3. Automatically controlled and mechanically operated

Cows learn to associate gate movement with distinguishing sounds. Bells, buzzers, rattles, etc. can alert and train cows to move. A lightweight, electrically charged gate with sound, which is manually operated, is low cost and effective. However, electrically charged wires on any crowd gate makes cows nervous and can interfere with milk let down. Heavy gates must be mechanically operated and should have a safety clutch. Improper use of any crowd gate can result in cow injury or agitation that can interfere with milk letdown. Check with crowd gate manufacturer concerning height and width requirements for crowd gates.

2.2**Power Door and Gates**

Power operated entrance and exit doors or gates on parlor stalls can be opened and closed with pneumatic cylinders. For power, use an air compressor or a vacuum pump separate from the milking system. Controls at the front, middle and rear of a parlor reduce the walking and routine time for an operator. Alternative choices include manually opened and weighted self-closing doors or gates.

Powered "rapid" front exits allow all cows on one side of a parlor to turn into an exit lane at the same time so that time to change groups in a parlor is reduced. Front rails or feed managers are usually raised to let cows exit into return lanes wide enough for two cows. Check with parlor manufacturer concerning ceiling requirements for rapid exit equipment.

2.3**Indexing/Positioning**

Many parlor manufacturers offer an indexing option, which if properly designed, position the cows closer to the operator, making preparation and unit attachment easier. They also may provide a more open and easy to negotiate walkway for cows entering and exiting the parlors. They can be power operated or use gravity. All cows may be indexed together or individual or sub groups of cows may be indexed.

2.4**Automatic Detaching Units**

These devices are loosely coupled to the milker claw and remove the milking unit from under the cow upon completion of milking without allowing that unit to drop on the floor. Sensors detect the endpoint of milking based on a minimum predetermined milk flow rate. At this time a positive vacuum shut-off allows the cords, cables, or

links to support the milker unit. Automatic detachers eliminate the decision to remove milkers and concerns about over-milking.

2.5 Milk Meters and Recorders

Data about milk yield from individual cows is important for good cow management. Milk meters are increasing in use and replacing weigh-jars. "Weigh jars" are expensive, visually read, and sometimes in the way or hard to clean. Milk meters usually measure a portion of the volume produced during a definite time interval. Data collected must be recorded and evaluated to be useful, preferably via a computer programmed to provide necessary management information in the most useful format. Electronic data can also be utilized to automatically feed individual cows in relation to their production.

2.6 Back Flush Milkers

Back flushing and sanitizing milking units before another cow is milked helps to control the spread of mastitic organisms. Evaluate the cost and expected effectiveness of back flush equipment versus other changes in management practices for improved udder health.

This system, in about one minute will back flush (rinse), sanitize (with at least 30 sec. contact time), and post rinse the milking units. The system automatically starts when a parlor exit gate is opened. These systems typically use a gallon of water per cow per milking. Back flush units require monitoring to insure that sanitizer is being properly metered into the system. Units with compressed air drying will also require additional compressed air capacity. Check with equipment manufacturer concerning precise needs for systems being considered.

2.7 In Parlor Unit Washers[1]

Unit washers provide automatic cleaning for the inside of the milker claw and teat cups during the pipeline cleaning cycle. Several different designs are available. Hoses and a manifold divert cleaning solutions through four apertures into the liners or inflations and through the milker unit. To be effective and acceptable, a unit washer should be:[1]

1. Conveniently located but out of the way during milking
2. Easy to use (to put on and take off milking units)
3. Easily and effectively air tight and free of leaks
4. Effective in cleaning and sanitizing milking units
5. Easy to clean and keep clean

2.8 In Parlor Feeding Equipment

Feeding grain or concentrates in milking parlors:

1. Supplements the ration for individual lactating cows,
2. Facilitates the entry of cows into the parlor, and
3. Must fit with the operator's preferred management scheme.

The advent of crowd gates, total mixed rations, and computer feeders has reduced feeding in parlors. Problems with feeding in parlors include:

1. Dirty conditions from dusty or spilled feed,
2. Delays when cows enter or exit and stop to check feed bowls,

[1] The PMO (FDA Pasteurized Milk Ordinance) requires covering the four apertures when not in use if located in the parlor

3. Decisions and time for feeding tasks slows down milking,
4. Amounts eaten are limited because cows milk faster than they eat,
5. Equipment is costly and should be kept clean and calibrated, and
6. Cows learn to butt feeders or pull control ropes to get extra feed.

2.9 Feed Gates or Feed Bowl Covers

Feed bowl covers are used in automated parlors to prevent cows from stopping and eating as they walk past feed in mangers. Covers can open in sequence as cows enter or close in sequence as cows exit parlors. This helps to reduce the time, stress and strain to move cows.

2.10 Parlor Cleaning

Clean-up of milking parlors after milking is an important and often time-consuming job. In small parlors a hand manure scraper and garden hose may be adequate. As parlors become larger various items can be included to speed up this job.

High-pressure washers with various outlets for hoses can reduce the time required to scrub walls or move manure along floors.

High volume moderate pressure creamery hoses are especially helpful in moving large quantities of manure along floors to collection drains.

Flush tanks hold and release water for "flush" cleaning of parlor floors. Floors should slope about 1% and curbs installed to contain the flow of the flush water to the holding area and a collection trench. Holding tanks with large gates, siphons or dumps rapidly discharge 500 to 1,000 gallons in 20 seconds or less. Tanks should be properly sized for the length and width of flushed surface. If used or "gray" water is held in tanks, clean and sanitize the tanks frequently to prevent algae build-up.

Large pipe or valve flushing systems use high volumes of flush water delivered through large (10” or larger) diameter pipes. The water is supplied either by a large external standpipe or a high volume pump. Plan the parlor to allow location and installation of the large diameter flush lines and valves.

2.11 Manure Gutters with Grates

Manure gutters and grates located to capture urination or defecation that occurs while a cow is being milked are sometimes located in parlors. These gutters will minimize splashing from urination and reduce the amount of manure that needs to be hosed away during milking. Cows do not like to stand or walk on grates. A wide flat bar is superior to a bar on edge or a round bar. Care must be taken to assure the grates have adequate support at the edge; if they “rock” as the cows enter the parlor it will greatly increase loading and exit time. A manure collection pan or gutter on the bottom of the splash pan is usually employed in parallel parlors. For information about treating and handling milking center wastewater see DPC-15 Guideline for Milking Center Wastewater

2.12 Tri-Level, Tunnel or Basement Design

In recent years the tri-level or basement design has found favor with dairy managers, sanitarians, and milking equipment installers. It is most often found with new large (double 8 and larger) herringbone and parallel parlors. Basically, the milk, wash, and vacuum lines and the ancillary components are located in an area directly below the cow platform and /or operator area. Getting these components out of the milking parlor eliminates their exposure to manure, urine, wash-down chemicals, etc. The milker unit, CIP unit washer, and automatic detacher are the only equipment in the parlor. Installing and servicing equipment in the room(s) below the parlor is much easier for service personnel. An additional advantage is that this design provides more wall height for slope of a long pipeline. Care must be given in the design of these facilities to assure the rooms are adequately drained, sealed from the area overhead and ventilated. Access to this area must also be carefully planned. Most milking equipment companies offer plans for incorporating their equipment into these designs.

2.13 Adjustable Height Operators Platform

An adjustable height operator's platform uses winch and cable, airbags or hydraulic systems to raise and lower the operators walking surface. This allows workers to observe the cows' udders at a convenient height for productive work.

2.14 Light, Heat, Ventilation

Since new parlors are typically operated more hours of the day than previously, it is imperative to provide an environment that optimizes both cow and operator comfort.

Lighting and ventilation can be achieved by:

- Skylights
- Large doors, windows or curtains on sidewalls.
- Supplemental light provided by energy efficient sources such as mercury vapor, metal halide or cold weather ballast fixtures.
- Supplemental heat provided by in -floor circulating warm water, radiant heaters, hot air furnaces, unit heaters or recovered heat from mechanical room.
- Select equipment and fixtures that will stand up in the harsh, moist environment often found in milking parlors.
- Providing high velocity fans to give adequate ventilation during hot weather for operator comfort.

3. PARLOR SELECTION

Selecting a milking parlor is a difficult and often frustrating task that has a long-term affect on profitability, convenience and growth of a dairy farm. There are a multitude of choices among parlor type, size, configuration, basic equipment and accessories. Ability and deployment of labor, personal preference, and local traditions also affect parlor selection. There are usually several choices that will work well in the same situation. The challenge is to select a parlor that meets your requirements and that your cows can afford.

A milking parlor can be like buying a pickup truck. The bright shiny new one with alloy wheels, overdrive and extended cab would sure be nice. On the other hand the well kept 10 year old pickup, with a bench seat and standard transmission may also get the job done with significantly less investment. Careful selection can increase both productivity and your enjoyment as a dairy manager or worker. Careless selection and lack of planning can result in long-term difficulties and even financial disaster. Unfortunately a mistake in selecting a milking parlor is harder to remedy than trading in a pickup that wasn't right for the job!

3.1 Reason for Considering a Milking Parlor

A primary reason for considering a milking parlor is usually labor productivity and availability and concerns over uniformity and quality of milking.

Labor concerns can be divided into:

- *Labor conserving* - a desire to reduce the amount of time spent in milking cows. This is often the reason given on a general purpose farm where milking labor also performs large amounts of other farm duties such as barn work, manure handing, crop work and management. The costs involved with this kind of decision must be covered by the revenue generated from whatever is done with the labor that results from milking in less time. If it results in less pay to labor, this is what is available to cover the extra costs of the parlor. If it frees up labor to do other activities, then these other activities must generate the revenue to pay for the cost of the parlor.

- *Labor enhancing* - in this situation the amount of labor devoted to milking cows will stay the same. The milking parlor or extra features of the milking parlor are intended to allow the same labor to milk more cows or ultimately harvest more milk. This is most easily understood in a situation where full time milkers are

employed. The cost of this labor can be considered a fixed cost. Any parlor improvement that allows this same amount of labor to milk more cows (produce more milk) must be paid for by the value of increased milk sales.

- *Labor Health and Well Being* - A compelling reason for selecting an elevated milking parlor can be to eliminate the strenuous activities of bending over to work on cows and carry milk and or milking machines. Determining the value of this in terms of offsetting the parlor cost is difficult but important. It may be difficult to put a price on allowing valued family members or other workers to continue working with the dairy herd.

- *Labor Acquisition* - A worker friendly, functional milking facility that reduces the drudgery often associated with milking cows will expand the potential labor pool available to milk. Existing farm workers may find milking more attractive and access to non-traditional off-farm labor can become easier.

3.2 Specific Information Required for Selecting a Milking Parlor

In addition to your personal preference, the following specific information is needed when selecting a milking parlor:

- Number of cows to be milked
- Production level of herd
- Number of workers that will be involved in milking
- Milking routine to be used
- Frequency of milking
- Hours a day the milking parlor will be used
- Largest group size in the housing area.
- Future growth of the dairy herd (10% a year is not uncommon)

With this information various combinations of parlor type, size and degree of automation can be evaluated. Many times it's hard to get started because several of the variables are unknown. Also, changes in one of the items may affect one or more of the others. Since parlor selection usually involves several tries, it doesn't hurt to make your best guess and proceed. As you work along, evaluate what the overall picture looks like and go back and make changes, as they seem necessary. It's cheaper and easier to ask "what if" questions on paper than to make the mistakes in concrete and stainless steel.

3.3 Relation to Farmstead and Farm Business

A milking parlor affects the entire farm business and interacts with most other activities, buildings and equipment involved with the milking herd. Therefore you need to consider your entire farm business when making a decision on a new or renovated milking parlor. If you don't have a good long range business plan and farmstead layout plan, picking an appropriate parlor will be more difficult.

The goal of most changes on the dairy farm is to reduce costs of production and increase profitability. However, a poor decision on a milking parlor investment can increase the cost of producing milk and reduce profitability and in the worst case actually bankrupt the farm. A good long range financial plan will help you see how much capital can be tied up in a milking parlor for the number of cows that will use it.

A milking parlor/holding area affects or interacts with or is influenced by: size and layout of milking center buildings, labor requirements (total labor, number of workers, scheduling of workers), total number of milking animals, size of producing animal groups, location of cow housing, observation and selection of animals for special attention and future expansion. If the housing area already exists or the group sizes have been determined then the parlor must be selected to coordinate with them. If a complete new dairy is being designed various combinations of parlor capacity and housing group size can be considered.

Other activities associated with the dairy must also be considered. Will the dairy only house and milk cows, include young stock and dry cow facilities, or be part of a farm where a major amount of the feed for the dairy is produced? This may affect other activities that will occur in the building that houses the parlor and the type and level of management needs.

3.4 Long Range Planning

Parlor selection is a critical part of the long range planning of any dairy farm.

The following steps are recommended:

1. Determine long-range management plans for the farm. How will you want to operate the farm and where do you hope to be in 5, 10 or 15 years?

2. Select productivity and performance benchmarks for the proposed parlor, workers and milk production. What will be the timetable for reaching these benchmarks or intermediate steps towards these benchmarks?

3. How much will herd size increase? Think about your growth experience in the past and also what others are doing. Most herds get larger and many farmers assume unrealistic numbers for the size or rate of this growth. Growth may be encouraged as a method to spread out the high costs of a new system over more cows or because the new system makes it easier to care for more cows.

4. Present and planned housing systems will determine the largest group size and maximum number of cows to be milked. This will determine holding area size requirements and the required parlor throughput. For continuous parlor operation the holding area needs to be large enough to load a new group of cows while the last few cows from the previous group are waiting to be milked.

5. Determine how many workers will be expected to milk at any one time and their chore routines. Will workers only milk, do other animal chores, or also be responsible for fieldwork? Single worker parlors usually result in higher productivity per worker. Other considerations may result in choosing a multiple worker parlor.

6. Choose the desired milking time and total chore time. A smaller parlor operated for longer periods of time makes best use of investment dollars. Other situations on the farm may dictate a shorter time period. Consider whether you want workers to work split shifts, continuous 8 hour shifts or if you will use part time workers.

3.5 Influences On Parlor Selection

Many items influence the selection of a milking parlor. These may be inherent in the farm, existing management and staffing practices or the traditions of the community where the parlor is to be built. The following are some areas to consider:

Cows

Total cows to be milked - in combination with parlor throughput and frequency of milking will determine total hours required daily to milk.

Number of cows in largest group to be milked - determines minimum size of holding area.

Number of groups - will affect the amount of time spent moving cows to and from milking parlor/holding area. If the person milking leaves the parlor to change groups, the parlor will not be operating during these times.

Frequency of milking - 2X, 3X, 4X? - Affects milkout time for cows and total time spent in set up, wash up and cow movement.

Cow management - will cows be observed during milking and isolated for later health care or breeding? In addition to the affect on milking routine, the milking center design must accommodate necessary cow sorting and holding facilities.

Expected change in total cow numbers - will there be capacity for milking additional cows or will parlor and housing units be sized for maximum capacity from the start?

Labor/Work Requirements

Amount of labor - will the parlor be selected based on a set amount of labor or will labor be hired to meet the requirements?

Full time/part time - do you expect to use all full time workers, regular part time, and a mix of each as needed, split shifts...?

Work Requirements - will parlor workers only milk, get and return their own cows, be responsible for parlor set up and wash up, other animal chores, breeding and health, field work?

Minimum number of workers - do you plan to have one person milking with no one else around, a second person doing other chores but available if needed, at least two in parlor at all times?

Management

Experience and ability of existing management - do you or the person who will be responsible for the milking parlor have experience managing a milking parlor? Is the ability level adequate to effectively utilize features of a new milking parlor and provide training and oversight for those working in the parlor?

Farm Site and Layout

Site - if a site has been selected consider constraints such as slope, orientation, cow lanes, driveways, utilities and dimensions and shape of building footprint that are allowable. Drive through access for large milk trailers where over the road tandem tractor-trailer combinations are used is essential. Easy, one back up access by an over the road tractor and trailer should be the minimum requirement. In no cases should milk pick-up trucks have to back in from, or out onto, a public highway. If the site is too constraining, give serious consideration to finding an alternative site. Also consider existing and future animal buildings and their relationship to the milking center for animal travel lanes, ventilation, drainage, wastewater collection and drain lines, and snow removal and storage.

Milking center building - dimensions and shape of the proposed building are reasonable to build. Holding area, travel patterns etc. are properly proportioned and located.

3.6**Economics**

Dairying is a risky business. The rate of return is typically low compared with the level of capital investment required. Profitable dairying requires highly specialized knowledge in a large number of different subject areas. Increasing the debt load increases the risks associated with a dairy enterprise. Reducing debt and financial risk will give the dairy operator more management options to deal with other risks such as low milk prices, bad weather, poor feed quality and disease.

Milking facilities are often the single largest investment on a modern dairy farm and can vary from 20 to 60 percent of total capital investment. The intent of a new milking parlor is usually to improve performance and ultimately profitability. Over investment in a milking parlor can easily result in a severe decrease in profitability due to the high interest costs. During expansion, its vital that investments in improved milking facilities is coordinated with cow numbers. Building too much parlor too soon can easily result in an unprofitable and possibly failed farm business. The expression “buy what you need and what the cows can pay for” is extremely important.

The ratio of capital investment in milking facilities to annual gross milk sales is a useful tool for determining reasonable capital investments for different herd sizes. The ratio for large herds that typically make full time use of a milking parlor is around 20% or less of annual gross milk sales. To be competitive with large herds, smaller herds should keep milking facilities investments at a similar level.

A 1000 cow dairy with $2,400,000 Gross annual milk sales and a $480,000 milking center (double 20) has 20% of its total sales invested in the milking center. The same milking center investment on a 500 cow dairy would represent 40% of annual milk sales. It’s apparent that the 500 cow farm will have a higher capital cost per cow or

per pound of milk. Larger herds also have the advantage of being able to support full time milkers that allow full-time usage of the expensive parlor investment. Smaller herds often face the problem of identifying a milking facility with a reasonable investment cost that will not be used full-time. This tends to encourage a larger parlor that spends too much time idle.

4. MILKING PARLOR/HOLDING AREA SPACES

The following terms, illustrations, and dimensions represent the major areas within the milking parlor and holding area portions of a milking center. The space occupied by these areas must be known before final design or construction of a milking center.

Cow Platform (CP) - Area occupied by standing cows and parlor framework during milking. The rear side of the cow platform is considered the operator area curb and front side is the line of mounting posts or wall required by the parlor framework (In some rapid exit designs the cows' heads may extend beyond the mounting posts). For herringbone parlors, the cow platform includes the triangular areas outside the entry and exit gates necessary to form a rectangle.

Drip Pen (DP) - Area required for cows while they dry off following washing in the wash pen. This may be part of holding pen, separate, but in holding area building or in a separate building or area.

Entrance Area (E) - Area required for cows entering cow platform area from holding pen. If a wall is placed between the holding area and milking parlor, space required for the wall should be included in the entrance area dimensions.

Entrance Funnel Area (F) - Transition area that directs cows from holding pen to cow platform. This includes area required for loading lanes and free-swinging gates used in some parlors in an effort to improve cow flow.

Exit Area (X) - Area required for cows leaving the cow platform area. This includes the cross over lane in a single return lane parlor.

Holding Pen (HP) - Area required for confining cows prior to their entrance into the milking parlor. The holding pen is located in the holding area building.

Operator Access Area (OA) - Ramp or steps leading from operator area in milking parlor to holding pen.

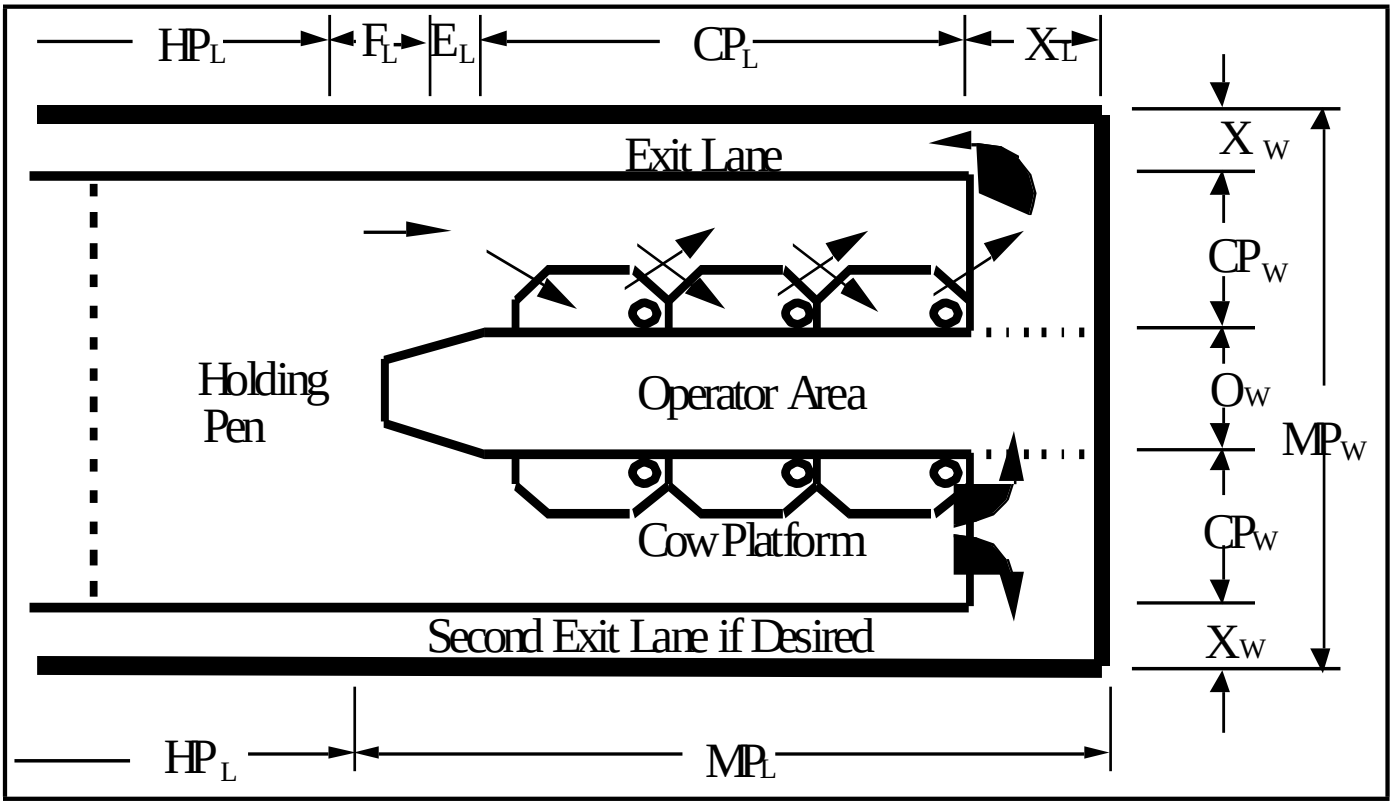
Operator Area (O) - Area where operators stand and move about during milking process.

Return Lane (R) - Area required for cows leaving the milking parlor and passing through the holding area building. Lanes may be single file, multiple single file, holding lanes or wide lanes allowing side by side animal movement and tractor access.

Wash Pen (WP) - Area used for washing cows' udders with floor mounted sprinklers. This may be part of holding pen, separate, but in holding area building or in a separate building or area.

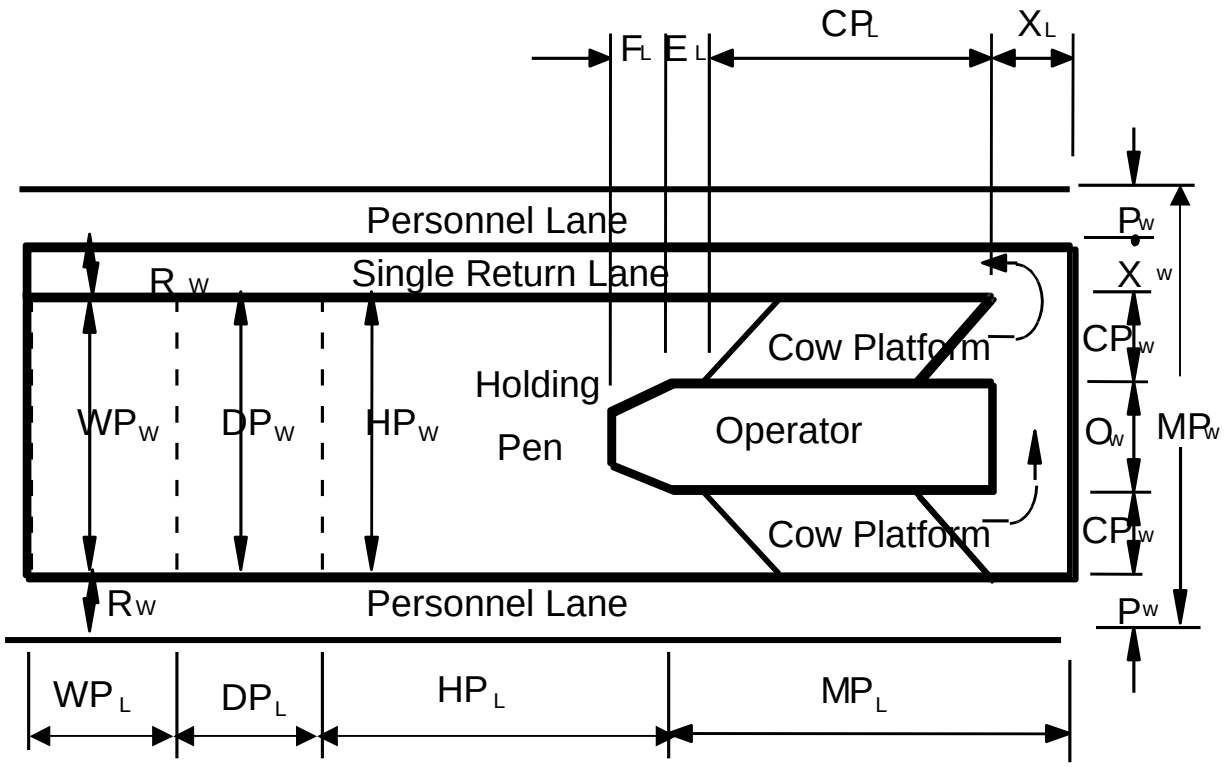
4.1 Side Opening Milking Parlor with One or Two Return Lanes

O_W Operator area width	6 - 8’
CP_W Cow platform width	72 - 74”
X_W Single exit lane width	32 - 36”
X_L Length of exit turning area	48 - 60”
CP_L Cow platform length	7 - 8’ per milking stall
E_L Entrance area length	2’
F_L Length of entrance funnel area	10 -12’
HP_W Holding Pen width	
HP_L Holding Pen length is related to width	15 sq ft per cow to be held
MP_w Total Milking Parlor Width	2Xw +2CPw +Ow



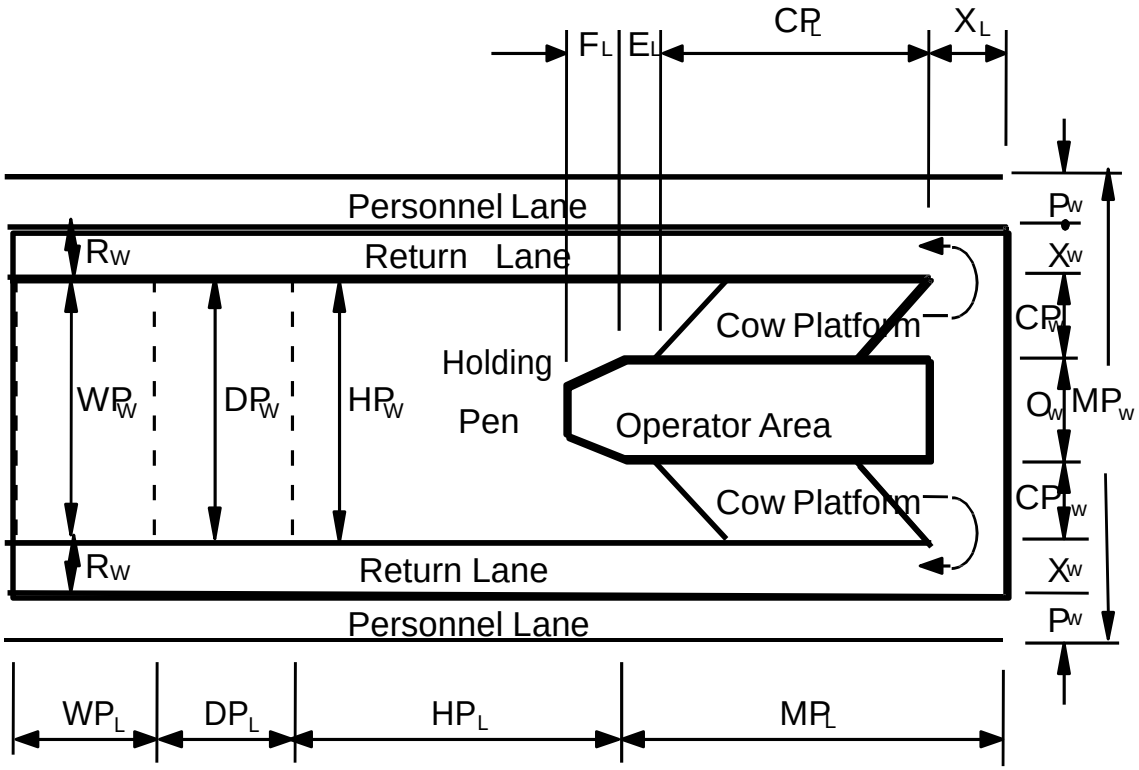
4.2 **Herringbone Milking Parlor, Standard Exit, With One Return Lane**

O_W Operator area width	6 - 8’
CP_W Cow platform width	5 - 6’
X_W Single exit lane width	32-36”
X_L Length of exit turning area	48-65”
R_W Return lane width	32-36”
P_W Personnel lane width	30 - 36”
CP_L Cow platform length	36-45” per milking stall plus 42-75”
E_L Entrance area length	2’
F_L Length of entrance funnel area	8-12’
HP_W Holding Pen width	16-20’
HP_L Holding Pen length is related to width	15 sq ft per cow to be held
MP_w Total Milking Parlor Width	2Pw + Xw +2CPw +Ow



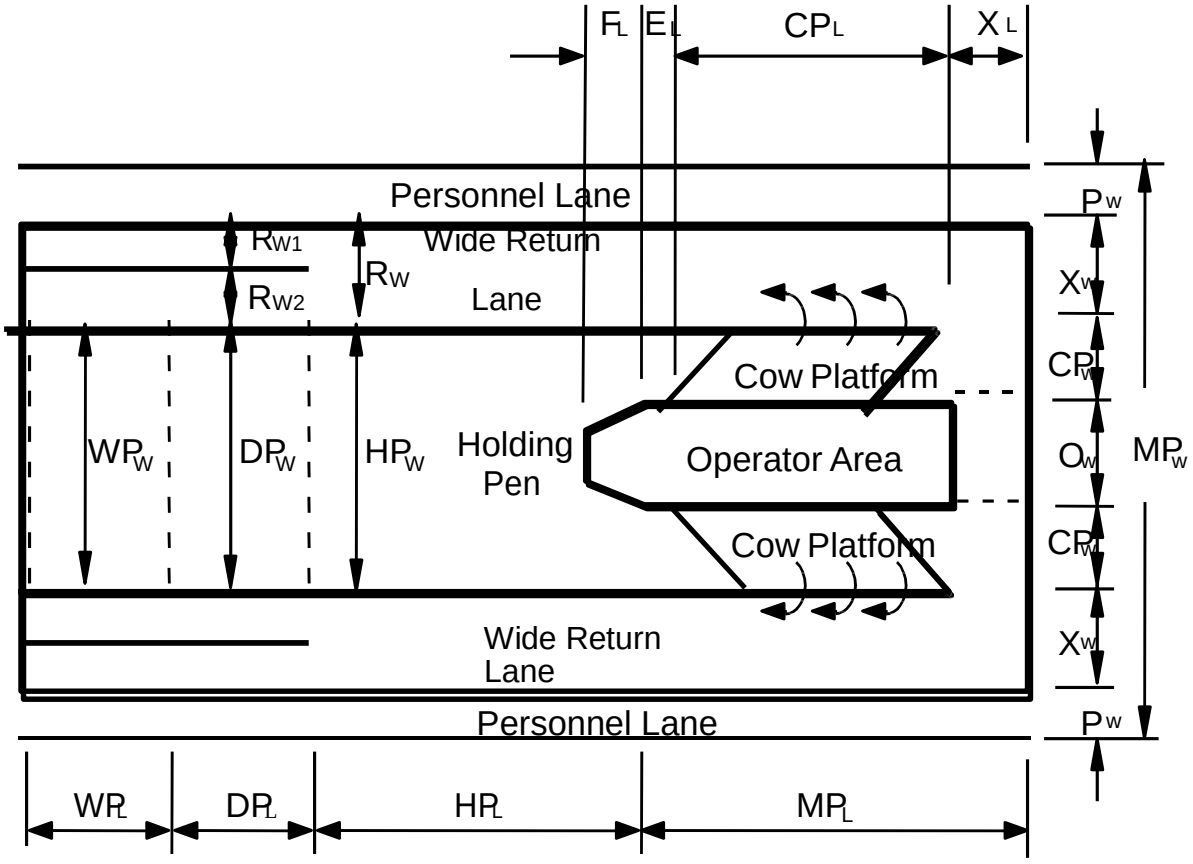
4.3 **Herringbone Milking Parlor, Standard Exit, With Two Return Lanes**

O_W Operator area width	6-8’
CP_W Cow platform width	5-6’
X_W Single exit lane width	32-36”
X_L Length of exit turning area	48-65”
R_W Return lane width	32-36”
P_W Personnel lane width	30-36”
CP_L Cow platform length	36-45” per milking stall plus 42-75”
E_L Entrance area length	2’
F_L Length of entrance funnel area	8-12’
HP_W Holding Pen width	16-20’
HP_L Holding Pen length is related to width	15 sq ft per cow to be held
MP_w Total Milking Parlor Width	2Pw + 2Xw +2CPw +Ow



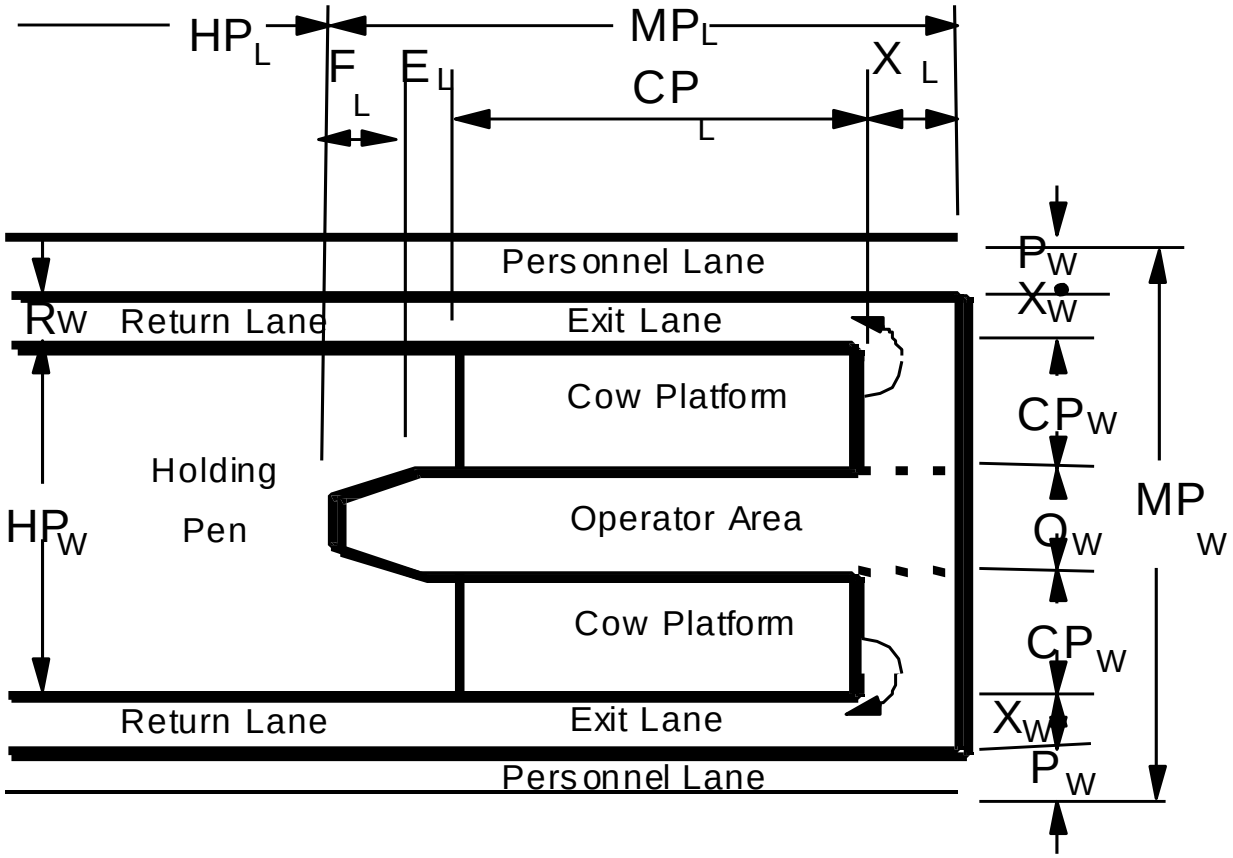
4.4 **Herringbone Milking Parlor, Rapid Exit, With Two Wide Return Lanes and Multiple Return Lanes**

O_W Operator area width	6-8’
CP_W Cow platform width	5-6’
X_W Exit area width	8-12’
X_L Length of exit turning area	48-65”
R_W Return lane width	8-12’
R_{W1} R_{W2} Multiple return lane widths	32-36” each lane
P_W Personnel lane width	30-36”
CP_L Cow platform length	36-45” per milking stall plus 42-75”
E_L Entrance area length	2’
F_L Length of entrance funnel area	8-12’
HP_W Holding Pen width	16-20’
HP_L Holding Pen length is related to width	15 sq ft per cow to be held
MP_w Total Milking Parlor Width	2Pw + 2Xw +2CPw +Ow



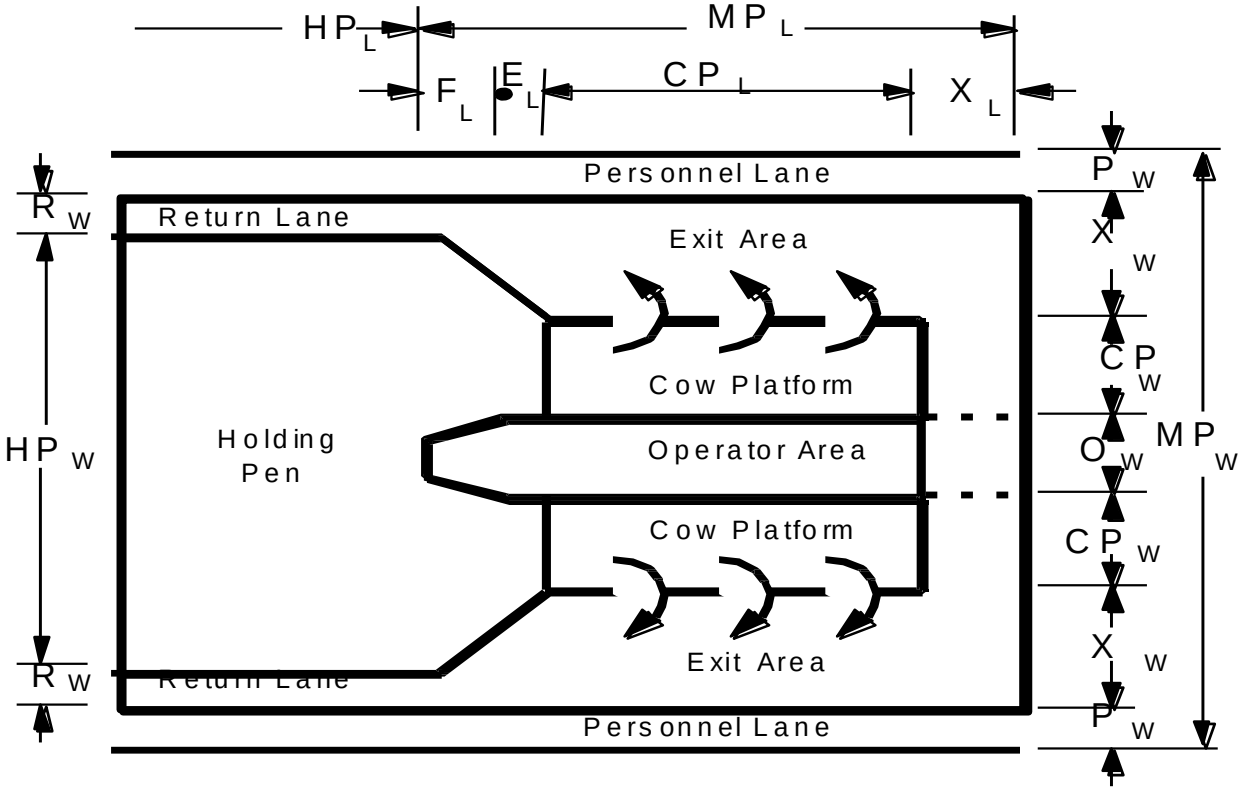
4.5 **Parallel Milking Parlor with Standard Exit and Two Return Lanes**

O_W Operator area width	6-8’
CP_W Cow platform width	8’
X_W Single exit lane width	32-36”
X_L Length of exit turning area	48-65”
R_W Return lane width	32-36”
P_W Personnel lane width	30-36”
CP_L Cow platform length	27-30” per milking stall
E_L Entrance area length	2’
F_L Length of entrance funnel area	10-12’
HP_W Holding Pen width	22-24’
HP_L Holding Pen length is related to width	15 sq ft per cow to be held
MP_w Total Milking Parlor Width	2Pw + 2Xw +2CPw +Ow



4.6 Parallel Milking Parlor with Rapid Exit, Single File Return Lanes and Expanding Width Holding Area

O_W Operator area width	6-8’
CP_W Cow platform width	8’
X_W Exit area width	6-12’
R_W Return lane width	32-36”
P_W Personnel lane width	30-36”
CP_L Cow platform length	27-30” per milking stall
E_L Entrance area length	2’
F_L Length of entrance funnel area	10-12’
HP_W Holding Pen width	28-42’
HP_L Holding Pen length is related to width	15 sq ft per cow to be held
MP_w Total Milking Parlor Width	2Pw + 2Xw +2CPw +Ow



4.7 Parallel Milking Parlor with Rapid Exit and Wide Return Lanes

O_W Operator area width	6-8’
CP_W Cow platform width	8’
X_L Length of exit turning area	48-60”
R_W Return lane width	32-36”
P_W Personnel lane width	30-35”
CP_L Cow platform length	27-30” per milking stall
E_L Entrance area length	2’
F_L Length of entrance funnel area	10 -12’
HP_W Holding Pen width	22-24’
HP_L Holding Pen length is related to width	15 sq ft per cow to be held
MP_w Total Milking Parlor Width	2Pw + 2Xw +2CPw +Ow