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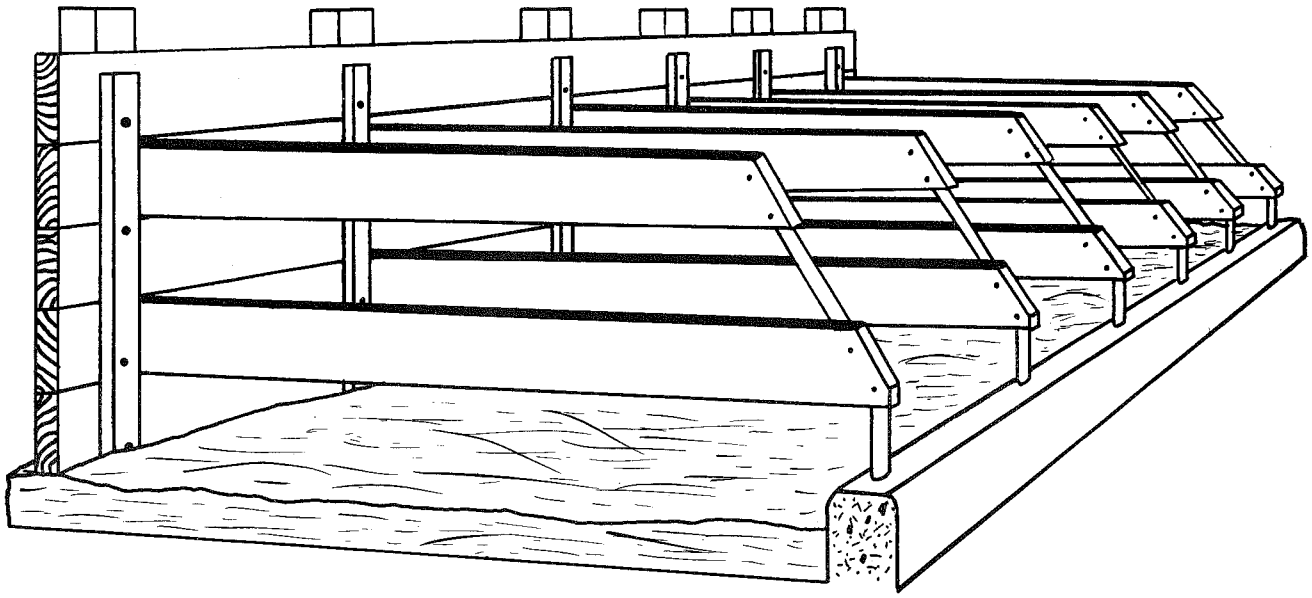
FREE STALL HOUSING IN NEW YORK STATE

PRACTICES AND PROBLEMS
CONVERTING LOOSE HOUSING
BUILDING NEW BARNS



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WHAT IS FREE STALL HOUSING?

A new method of handling the milking herd -- free stall housing -- has aroused the interest of dairymen in New York as well as the rest of the country. It is a form of loose housing, called variously, free stall housing, loafing stalls, free-choice stalls, loose stalls, cow cubicles, and free-loafing stalls. Instead of roaming around in a loafing barn and lying down anywhere on the bedded pack, individual stalls are provided which cows are free to enter and leave as they choose. Cows use the stalls to rest in when not eating or being milked. (Illustration 1).

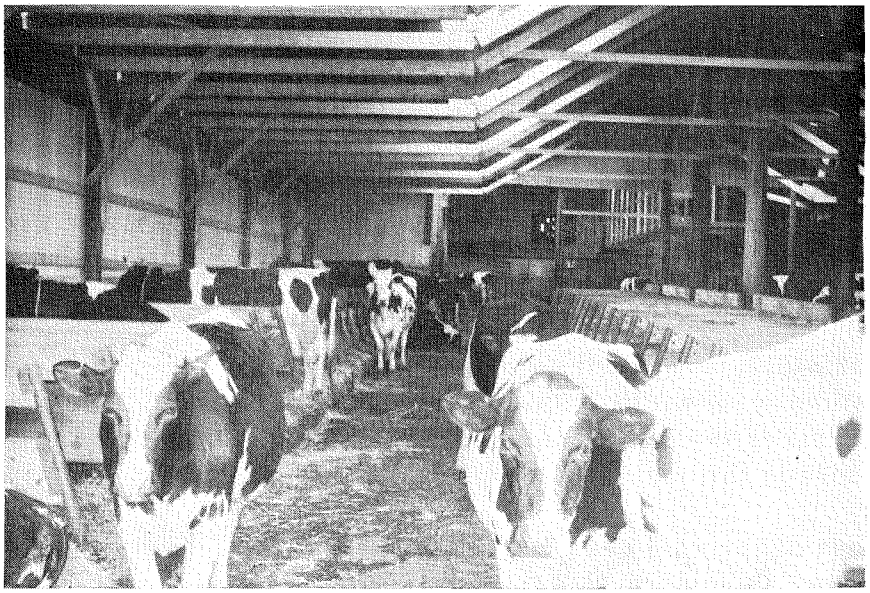
The stalls are lined up on either side of a concrete service alley which can vary in width from eight to sixteen feet. The curb, which generally rises twelve inches above the level of the service alley, keeps bedding inside the stall.

Most of the manure is discharged into the service alley, which can be thought of as a wide, shallow gutter. The service alley is cleaned with a tractor scraper as often as necessary, usually once a day. In most cases, the cows get silage, hay and water in special feeding areas located in or near the free stall barn.

Although the first use of free stall housing in the United States was adopted in Washington State, it was used as long ago as 1957 in Northern Ireland, and farmers in Northwestern Europe have had at least as much experience as farmers in New York State. A list of articles and publications on the subject is provided in the Appendix.

Free Stall Housing in New York State

Free stall housing can be found in every major agricultural region in New York State. Farmers with this type of housing are scattered from the Hudson Valley in the east to the shores of Lake Erie in the west; they are found in the south from the Pennsylvania border in Orange County to the shores of Lake Ontario in Jefferson County on the north. Early adopters were aggressive. The fact they have free stall housing demonstrates their desire to experiment with new methods. Information was obtained from these farmers on the building of free stall barns and the problems and practices in using them if free stall housing had been used by a portion of the milking herd before March 1, 1963. Records were obtained on 34 farms. Four started using their free stalls in November and December of 1961. During the year of 1962, another 24 New York farmers first started using free stalls. By February 28, 1963, the six remaining farmers put their stalls into use. By the end of 1963 about 50 free stall units will be in operation. Observations were made on a total of 45 units although only 34 farmers had had enough experience to warrant complete records.



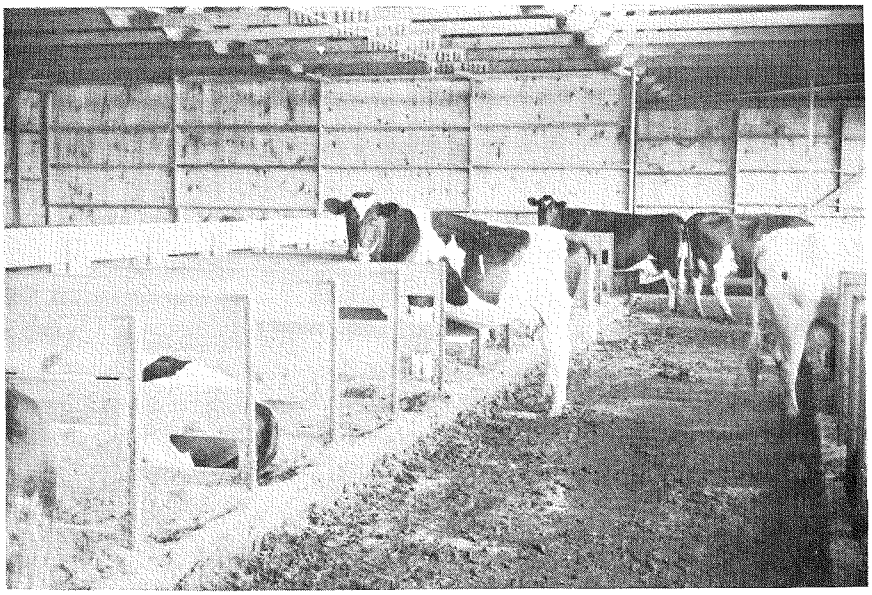


Illustration 1. TWO FREE STALL BARNS FOUND IN NEW YORK STATE

Free stalls have found a place in almost every size of dairy enterprise. Nearly a third of the farmers kept fewer than 50 milk cows during the year of 1962 (Table 1). Six kept an average of 100 or more milk cows. On the average, the farmers with free stall systems are among the top 20 percent of New York dairy farmers in terms of cows per man.

Table 1. FREE STALL HOUSING: SIZE, NUMBER AND EFFICIENCY
34 Farms, New York State, March 1963

Number of milk cows	Number of farms	Average number of milk cows per man
20-49	11	26
50-74	9	29
75-99	8	35
100 or more	6	33

PRACTICES AND PROBLEMS

In deciding whether or not to adopt free stall housing a farmer should consider the experience of others. The problems, practices, mistakes and improvements of those who have already had experience can indicate the desirability and design of the system to be adopted. Farmers should expect some difficulties and problems at first with free stall housing, but experience on 34 New York State farms demonstrates these can be overcome.

Training Cows to Use Free Stalls

The initial problem of operation is to get the cows to correctly use the free stalls. Eleven farmers said their herds took to the stalls almost immediately with no particular problems. The two operators with the most trouble had almost all their cows using the stalls after two weeks. Over a third of the operators emphasized that younger cows and heifers will use the stalls more quickly and with less fuss than older cows.

Some cows may not use the stalls the first few days. They will lie down in the service alley or the feeding area. Several farmers tried with varying success to fasten such cows into the stalls for overnight or

during an afternoon. Experience indicates that if this procedure is going to train a cow, two or three lessons will suffice. Prolonging the operation appears to be a waste of time. A few farmers put a little hay in the front of the stalls to encourage their occupancy during the first few days of use.

About half of the farmers reported they had two or three cows that could not be persuaded to use the free stalls. A few chose to sell the problem cows. The remainder let the cows, which did not use the stalls, lie down where they wanted -- and spent more time in cleaning. Some of the problem cows learned to use the stalls by themselves after a month or two.

Careful attention given to details at the planning stage can do much to insure herd acceptance of the free stall barn. There should be at least as many stalls as there are animals to use them. A few extra stalls will insure that each cow can find one easily.

The stalls must be comfortable and fit the breed. A stall that is too narrow will be refused by a cow. Stalls that are too wide waste space and tempt the cows to turn around inside the stalls. Turning makes the stalls and the cows dirtier. Correct height and spacing of the stall partitions also discourages turning.

Initially it is important that the stalls be the most acceptable alternative facing the cow. Given a choice between cold, wet concrete and a stall with soft, dry bedding, a cow will soon learn the stall is the better place to lie down. The stalls should be bedded with finely chopped material and the level of the bedding should be kept just under the top of the curb. This will prevent the cows from pawing the bedding out into the service alley and lying down there. Extra care should be taken to keep the feeding area clear of any scattered hay or silage, especially during the first few days the stalls are used. It was noted where stalls were being added gradually to loafing barns that most cows chose the manure pack until it was removed.

Cows can be expected to accept stalls more readily in the late fall and winter when the undesirable weather conditions force them indoors. Farmers report that once a herd has used free stalls through the cold season, the cows tend to use them even during warm weather.

Stalls and Bedding

The most common way to build up the floor of a free stall is to use stone fill at the very bottom, then a layer of gravel, topping off with fine gravel or sand. Bedding is added to bring the stall floor up level with

the top of the curb. Some farmers filled the stalls level full of sand and added only a thin layer of bedding. At the other extreme, one farmer used 18 inches of bedding. More than half the experienced farmers left room enough below the top of the curb to allow six to ten inches of bedding.

Six operators did have solid concrete in the bottom of their stalls. Five of these barns had curbs high enough to allow six to ten inches of bedding. One barn had solid concrete platforms. Of these six men, only one felt the solid floor was a problem. Even with ten inches of bedding, he claimed the stalls were too cold for cow comfort.

Kinds of Bedding Used

The type of bedding used affects the amount needed and frequency of adding it. Most of the farmers used long straw, chopped straw, or sawdust (Table 2). One third of the men used long straw or old hay for bedding. This material was added more frequently than any other type of bedding (Table 2). Of these farmers, three added bedding every day, one added every other day, one twice a week, four added once a week, and one added once every two weeks.

Twenty-five percent used some chopped straw and hay, but only three men used it to fill their total bedding requirements. Chopped material was not added as often as long material; two farmers added bedding every two days, two added once a week, three added every two weeks, and two added bedding once every three weeks.

Sawdust and shavings were used for bedding on 20 farms. The frequency with which one needs to add sawdust is flexible. Two farmers added sawdust once a week, six added every two weeks, seven added every three weeks, two added about once a month, and three farmers reported going for six weeks without adding any sawdust. Several operators pointed out that a week one way or the other made little difference in herd cleanliness. Some farmers had used more than one kind of bedding, thus the numbers shown in table 2 exceeded the number of farmers interviewed.

Commonly operators using long straw added bedding more often than once each week, chopped straw was added commonly every two weeks and sawdust every three weeks. Because it has to be added least often, sawdust appears to be the best alternative.

Table 2. FREQUENCY OF ADDING BEDDING TO FREE STALLS
34 Farmers, New York State, 1963

Time span	Long straw	Chopped straw	Sawdust
	Number of farmers		
Less than 1 week	5	2	0
1 week	4	2	2
2 weeks	1	3	6
3 weeks	0	2	7
4 weeks	0	0	2
More than 4 weeks	0	0	3
Total number*	10	9	20

* Some farmers had experience with two or more types of bedding

Bedding suitable for free stalls is not limited to the three types listed above. Fine sand, chopped corn stalks, rye silage, peanut shucks, and chopped corn cobs have been used successfully as well.

Equipment Used to Bed Stalls

More than half the operators were able to drive into the free stall barn with a trailer or truck. Bedding was then shoveled directly into the stalls. In other barns the bedding was dropped at one end of the service alleys. With a tractor scraper the bedding was then placed in small piles in the service alleys. From these piles the bedding was shoveled into the stalls by hand. Moving bedding into the stalls was essentially a manual operation on one-quarter of the farms.

Five free stall operators used unloader wagons to move bedding into their stalls. Of these five farmers, only three were able to drive through their service alleys and place the bedding without hand labor.

One man went through his service alleys with a wagon and dropped a bale of old hay or straw at each free stall. A forage harvester equipped with an engine, grass head and rear mounted tractor hitch was then pushed down the alleys chopping and blowing the bales directly into the stalls.

Bedding Requirements per Stall

Each free stall operator was asked how much bedding he used during the winter months. There were twelve farmers who had used their free stalls during the whole winter and had used straw or old hay to fulfill their total bedding needs. The estimated amount was divided first by the number of days the stalls were in use during the 1962-63 winter season and secondly by the number of free stalls used to get the amount per stall per day. This ranged from 1.7 to 8.1 pounds per stall per day and averaged 3.5 pounds. On the basis of seven months or 210 days, an average of about 0.4 tons of straw was used per free stall per year.

To compare the amount of bedding needed with free stalls and other types of housing under similar management each experienced free stall operator was asked to estimate how much bedding he saved compared to his previous housing system.

Twenty-one farmers compared their free stall to loose housing (Table 3). Fifteen said they used from 10 percent to 33 percent as much in free stalls. Six operators indicated they used less, but were not specific in their comparisons.

Table 3. OPERATORS' ESTIMATES OF BEDDING REQUIREMENTS IN FREE STALLS
34 Farmers, New York State, 1963

Bedding required in free stalls	Number of farmers
Amount compared to loose housing:	
10% to 20%	4
25%	7
33%	4
Less*	6
Amount compared to stanchion barn:	
25%	2
50%	2
Less*	7
Same as rubber mats	2
	34

* Could not give a definite percentage figure

Of the 13 farmers who compared free stalls to stanchion barns, four said that free stalls used 25 percent to 50 percent as much bedding. Seven farmers said that free stalls required less bedding but did not say how much less. Two operators figured stanchions with rubber mats used the same amount of bedding as do free stalls.

It would appear that free stalls require less bedding than stanchion barns and that the savings are much greater compared to loose housing.

Cleaning Free Stall Barns

Experience on 34 New York farms with free stall barns indicates that keeping the cows clean and minimizing manure handling problems on a 60 cow operation takes about 10 minutes twice daily in cleaning the stalls by hand at milking time while moving the cows to the holding area and about 45 minutes per day in scraping out the alleys.

Manual Stall Cleaning

Free stalls, which are in constant use, require some manual cleaning using a rake, dung fork, or shovel to flip manure and soiled bedding into the service alley. Many operators level out the bedding at the same time. This operation can be done by slowly walking up and down the rows of stalls, often when cows are being driven to the holding area for milking. The farmers who did the chore daily took between 5 and 35 minutes per day depending upon the number of stalls.

Half said they cleaned their stalls by hand twice a day. Another third said they cleaned their stalls once a day. The remaining operators did this chore less often, some going as long as a week between cleanings.

There is some question as to whether or not each free stall should be entirely cleaned out about once a year and fresh bedding added. Due to the limited experience of free stall operators in New York State, this question was not discussed.

Scraping Service Alleys, Feeding Areas, and Other Paved Areas

Service alleys and other paved areas should be scraped regularly during the winter season. Most operators scraped their alleys once a day. Two did so every other day. The longest regular period reported between cleanings was one week.

A few farmers cleaned the alleys at milking time when the cows were in the holding areas. Most of them scraped the alleys as part of the after breakfast chore routine. Several operators mentioned going an extra day or two between cleaning the alleys when other jobs were pressing. No undesirable effects were noticed.

Each operator was asked how long it took him to scrape up the manure and get it into the manure spreader or out to the pile if it was stored near the barn. The answers ranged from 10 to 120 man minutes each time the job was performed. The barn design and manure loading facilities appeared to have a greater effect on this time than did the number of free stalls.

Equipment Used for Cleaning

Special consideration should be given to equipment for cleaning when planning the barn. For example, it takes more space to maneuver a medium sized tractor with a front mounted loader than it does a small tractor with a rear mounted blade.

Eighty percent of the operators used blades to scrape their alleys. Nearly half had the blades rear mounted, but some used front mounted blades. The rest used bucket loaders for cleaning. A few alternated blades and buckets on their loader frames depending on the conditions.

Tractor scrapers can be attached close to the rear wheels of a small tractor providing excellent maneuverability and relatively small cost. Dead end alleys can be cleaned out leaving little hand work to be done. Rear mounted blades require a manure ramp or elevator to load the spreader. When manure in the alleys is pulled out, the blade can be turned around and the manure pushed into the spreader by using the tractor in reverse. But this can be awkward and possibly dangerous. With a rear mounted blade the use of down pressure, which is often desirable, lifts the drive wheels and reduces traction.

Front mounted blades are available for small tractors that provide maneuverability, but the attaching frame may need to be more elaborate and hence more expensive. A blade can be attached for little additional cost if a front mounted loader is used. The blade must be used with a ramp or elevator if it is to load the manure spreader. Front mounted blades can usually lift higher allowing them to be used with a steeper ramp. The front mounted blade can make effective use of down pressure. It also leaves the rear of the tractor free for use on other jobs. It can not be used successfully in dead end alleys.

A front end loader with a large bucket or scoop can also be used to clean alleys. The manure bucket must be at least as wide as the tractor to clean next to the curbs. This bigger scoop may call for a larger tractor thus will reduce the maneuverability. The scoop does a good job of handling the soupy manure found in free stall barns, it can reach into a dead end alley and do a complete cleaning job, and it can be used to load the spreader without using a special ramp. However, a pit or wall is needed to trap the manure. This extra operation may take more time than scraping with a blade. Down pressure and hydraulically controlled scraping angle give the scoop a valuable advantage in handling frozen manure.

Problems With Cleaning Service Alleys

Manure dropped in the service alleys and paved feeding areas has practically no bedding mixed with it and, after the cows have walked around in it, it is closer to being a liquid than a solid. Owners report that because of these wet, sloppy conditions, service alleys look moist and dirty when the barn is in constant use. Although this appearance disturbed a few operators, they were quick to say that the cows stayed clean.

Soupy manure causes trouble when the alleys are scraped. If too long a push is attempted, the manure will flow around the ends of a blade or over the curb into the stalls. The liquid manure is difficult to push around corners. To solve these problems, several operators attached sides or wings to their blades. A scoop with its solid ends is another solution.

Frozen manure is difficult to handle. With New York State's cold winters, manure will freeze around doorways and in cross alleys. This is especially true when the temperature drops to 10 degrees F or lower.

One-third of the operators reported no difficulty with frozen manure, but most of these had insulated barns and could operate the system as warm housing. Most free stall barns will not be insulated because of increased building costs. Several operators met the problem with free stall barns by having drop-down panels in the side walls. Open, these panels provide the necessary ventilation to run a cold barn without building up condensation during the cold season. Closed, the panels prevented manure from freezing in the alleys during periods of extremely cold weather. Condensation during these short periods of time was tolerated.

Service alleys directly behind the free stalls gave relatively little trouble. Fresh droppings and urine tended to keep them thawed out and cold weather just served to thicken the soupy manure making it easier to handle. Several operators said that even on the coldest days, it warmed up enough by midday to clean out the alleys.

About a third of the farmers said that when manure froze they either scraped over the top or did not clean the alleys at all that day. Around the first of January, 1963, New York State experienced a prolonged period of extremely cold weather. A few farmers reported going for a week at that time without being able to clean. The manure froze dry and solid so there was no trouble with the cows getting dirty. These farmers were quick to say that when the temperature rises, one should go in immediately and get the alleys cleaned out. In some cases this job involved manual labor with pick and crowbar.

A few operators prevented trouble by using blades or scoops with down pressure for cleaning. Down pressure can be obtained by weighting the scraper frame if a hydraulic cylinder is not available. By using down pressure to remove frozen manure, there need be no accumulation in the alleys. Trouble begins when the first layer of frozen manure is allowed to stay on the concrete.

Manure Disposal

Disposal of manure from the barn was accomplished in a variety of ways. Fifteen operators used ramps to load the manure into their manure spreaders while 13 others used tractor loaders. Five farmers used manure elevators to load the spreaders. One man took the manure directly to the field in his rear mounted scoop, spreading out the resulting piles with a spike tooth harrow. A few farmers pushed the manure out the end of the alleys into a pile during the winter and spread it in the spring or summer.

Manure ramps should be inclined only slightly at a level above the service alleys. A safety rail is desirable to stop the tractor from dropping into the spreader.

The most convenient ramp location is at the end of the free stall service alleys so the manure can be pushed directly into a manure spreader. Obviously, this location will prevent driving straight through with any equipment. Another location for the manure ramp is on the side of the barn. This leaves the service alleys open for driving straight through with equipment but also means the ramp should be nearly perpendicular to the direction of the service alley. The manure must go around

a square corner; the high liquid content makes this a difficult maneuver. Ramps should be placed where future expansion of the barn system is least likely to occur.

Manure elevators or short gutter cleaners may be used to handle liquid manure if protection against freezing is provided. When placed in a central location between the feeding and the free stall area, they make possible easy loading of a spreader. A small tractor and blade can be used to advantage without building a ramp. If a free stall barn is added to a barn that already has a gutter cleaner, the manure can be pushed from the service alley directly into the gutter cleaner.

Piling near the barn is practiced by some farmers. One of the advantages of a free stall operation is being able to get the manure into the field every day, thus providing more efficient use of labor during the year. Much of this advantage is lost if the manure is piled just outside the barn. The manure will still have to be loaded into a spreader and hauled away in the spring or summer.

A farmer changing to free stall housing should be able to get along with his present manure spreader. To handle liquid manure, several operators plugged their conventional spreaders with old hay, dry manure, or tailgates. Frozen chunks that might damage conveyor chains or beaters should be kept out of conventional spreaders. If a farmer is planning to get a new spreader anyway, he may wish to consider one of the tank type spreaders. Owners report they are more expensive and require a large tractor (40 H. P. in winter). They can be unpleasant to operate. However, they handle both liquid and frozen manure with little trouble, an important consideration in free stall housing.

Feeding in Free Stall Housing

The main purpose of free stalls is to provide a clean dry place for the cows to lie down. As a rule, cows do not eat or drink while in the stalls. A separate feeding area is provided. A free stall operator should consider the size and location of silage bunks and hay racks the same way any loose housing operator would.

All the free stall housing systems had special feeding areas where the cows got hay, silage, or both. On nearly a third of the farms, the feeding area was separate from the free stalls and under a different roof. These barns were of the "L" or "U" design. Two-thirds of the farmers had the feeding area at one side or one end of the free stall area. Both areas were under one roof and were connected by cross alleys and service alleys.

On every free stall operation, cows were fed grain while being milked. Three farmers milked in stanchions and fed grain there. The others fed grain in their milking parlors.

Only one operator fed hay in the free stalls. He built a slatted "V" rack at the top front of each stall. It was filled with hay by hand. Each stall had a solid concrete platform and was only seven feet long; when the cow ate, she was only half way in the stall. Silage was fed in a bunk adjacent to the free stall area.

Three of the farmers interviewed said they had tried feeding hay in the stalls but had given it up. The first had built a manger along one row of stalls which could be filled easily from the hay mow. The cows would stretch and reach to get the hay on the far side of the manger and in the process paw up and waste a lot of the bedding in those stalls. The stalls were dirty and required so much bedding that he stopped using the manger and built a hay bunk in the exercise yard.

The second man who mentioned feeding hay in the stalls did so first as a training device. He kept this up for several days, but realized the cows were just wasting the hay in the stalls and were filling up at the hay bunk.

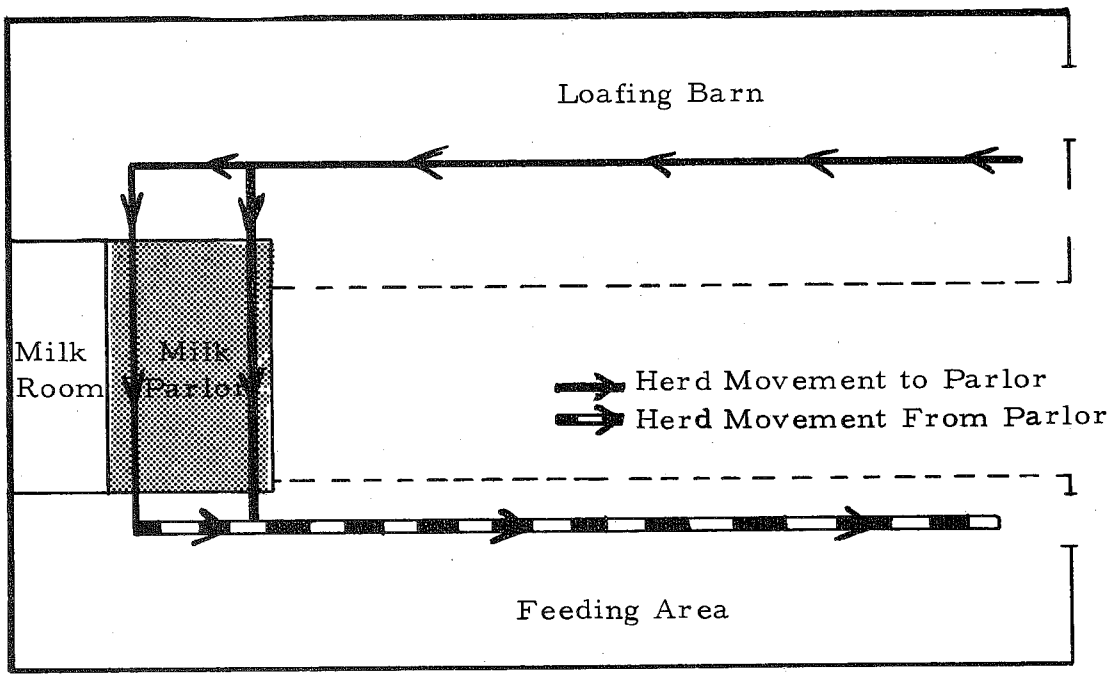
The third operator installed a brisket board along one row of stalls and fed some hay ahead of it. He soon noticed that the boss cows would prowl up and down the alleys looking for stalls with hay. They would drive out any smaller cows already in the stalls. This was messing up the stalls and endangering many cows, so he stopped the practice.

CONVERTING LOOSE HOUSING TO FREE STALL HOUSING

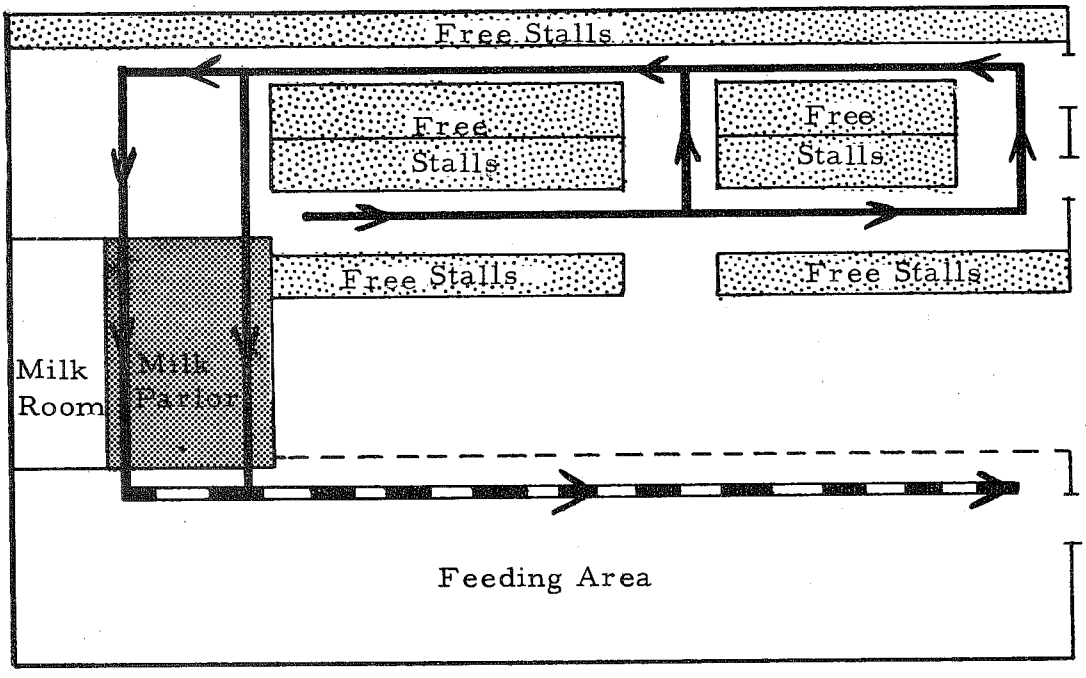
The typical loose housing system has a milking parlor with holding area, a feeding area, and a loafing barn (Illustration 2). Farmers with this type of housing should seriously consider converting to free stall housing. This can readily be done because the farmer only has to add free stalls to the loafing barn. The job involves pouring the concrete service alleys and building stall partitions. The milking and feeding are done as before with the same facilities. The operator has gained the advantages of free stalls while eliminating some of the problems associated with loose housing.

Illustration 2

CONVERTING TO FREE STALL HOUSING BY PUTTING FREE STALLS IN THE LOAFING BARN



LOOSE HOUSING



FREE STALL HOUSING

Free stalls were added to existing loose housing barns on 26 of the 45 free stall operations in New York State. In 22 of these operations, the overall dimensions of the loafing barn remained unchanged, although many changed doorway positions or partially closed up one side of what had been an open shed. On the remaining farms, a portion of the free stalls were built in a new structure. In these four cases, the new building is an integral part of the previous housing system, sharing a common roof or wall. All the farmers use the same milking facilities that went with their previous housing systems. In a few situations where the change to free stalls meant a significant increase in herd size, alterations were made in the feeding area. Otherwise, few changes were made in the feeding areas. Provisions for young stock, maternity pens, and milking parlor holding areas remained unchanged for the most part.

Reasons Farmers Converted From Loose Housing

Every one of the farmers interviewed was asked what factors influenced his decision to build free stalls. The most common reason cited was the saving in bedding (Table 4). To have cleaner cows and keep more cows were the next most common reasons given. Ten of the 26 were generally impressed by what they saw at other free stall operations.

Table 4. REASONS GIVEN FOR PUTTING FREE STALLS IN LOOSE HOUSING
26 Farmers, New York State, 1963

Reasons	Number of farmers mentioning
Save bedding	26
Cleaner cows	14
Expanding herd	13
Had visited successful free stall operations	10
Avoid hauling manure pack in spring	8
Save labor	4
Tried as an experiment	3
Unhappy with loose housing	3
Consolidate herds	2
Encouraged by farm supply dealer	2
Less trouble from cows in heat	2
More gentle cows	2
Avoid injuries to cows	1
Provide a place to feed hay	1

Less bedding was mentioned by all the farmers as a reason for changing. For farmers who used sawdust, the free stalls meant that they did not have to worry as much about short supplies. In a few cases, the reduced needs meant that a season's supply could be stored during the fall. In several instances, the farm could supply enough straw to bed the free stalls, where before extra straw had to be bought.

Cleaner cows was a consideration for 14 operators. Many said that in loose housing the cows were never clean, no matter how much bedding was used. A few were being pushed by the milk inspector to keep their cows cleaner.

Herd expansion was a reason for changing on 13 operations. The four farmers who built new additions to their existing loose housing had this as a definite goal. The others found that more cows could be kept in a free stall barn than in a loose housing barn having the same total area.

Ten operators mentioned visiting other successful free stall operations. They were impressed with the advantages they saw. A few said they waited an extra season just to see how well their neighbors with free stalls made it through the winter before going ahead with their own conversions.

Eight farmers said they wanted to get away from building up a manure pack. The pack had to be hauled out in the spring at the same time men and equipment could have been doing other things. One man said that spring manure hauling caused too much soil compaction. Others were able to get on to their more poorly drained fields during the winter freeze, making wider use of the manure.

Four operators hoped to save labor by adding free stalls. They found after changing that less time was necessary to wash cows at milking time. Also, less time was spent bedding the herd.

Three farmers tried free stalls in their loafing barns as an experiment. These stalls formed part of the loafing barns and were of a temporary nature. All three said their experiments were so successful they had plans ready to build more stalls that would be permanent.

Three operators had a definite dislike for loose housing in general. These men had experienced most of the disadvantages associated with it, but did not want to return to stanchion barns. When they heard of free stall housing, they thought it would solve many of their problems.

Cost of Putting Free Stalls in Loose Housing

Conversion of loose housing barns to free stall barns had an average cost of $20 per stall. To obtain this information each owner was asked how many hours were supplied by the regular farm labor force, how much lumber was supplied from the farm woodlot, and how much cash outlay was required in making the conversion. The figures include the shell of any new building required to house the free stalls, any building alterations needed to handle manure, and the building of the stalls and service alleys. Alterations in the feeding area or milking parlor are not included. Money spent on manure handling equipment like loaders, blades, or spreaders was treated separately as well. In computing costs regular farm labor was valued at $1.75 per hour and lumber from the farm woodlot was valued at $50 per thousand board feet. All other labor and materials were valued at their cash cost to the farmer.

The cost for the 19 operations on which the free stalls were added to the existing loafing barn with no alterations in the overall dimensions ranged between $3 and $50 per stall. The common range within which most situations fell was from $10 to $30 per stall (Illustration 3) for labor and materials in the initial conversions. The data indicates that there are no clear economies associated with building any particular number of free stalls.

On four farms the conversion to free stalls meant building a new addition to the existing loafing barn. The cost to farmers for these was generally higher than the above figures. The lowest cost was $24 per stall, the only one which came within the range of $10 to $30 per stall. The others paid $40, $97, and $176 per stall for their conversions.

Making the Decision to Add Free Stalls

In addition to cost there are many factors which should be considered by New York State farmers before changing their loose housing to free stall housing.

Bedding is a major consideration. Experience indicates that a farmer can save bedding by putting free stalls in his loafing barn. How much he can save will depend upon his management practices. Pennsylvania State University research shows that the straw required in a loose housing barn is six to eight pounds per cow per day. In free stall housing the average was 3.5 pounds per stall per day. A farmer could thus save about 50 percent of his bedding costs by adding free stalls to his loose housing system. In a 210 day winter period a saving of perhaps 0.4 ton per stall could be expected. At $25 per ton, this would be a saving of $10 per stall per year and in two years the amount would equal the average investment of $20 per stall. If straw were purchased at $15 per ton the saving would correspondingly be reduced to $6 per stall per year.

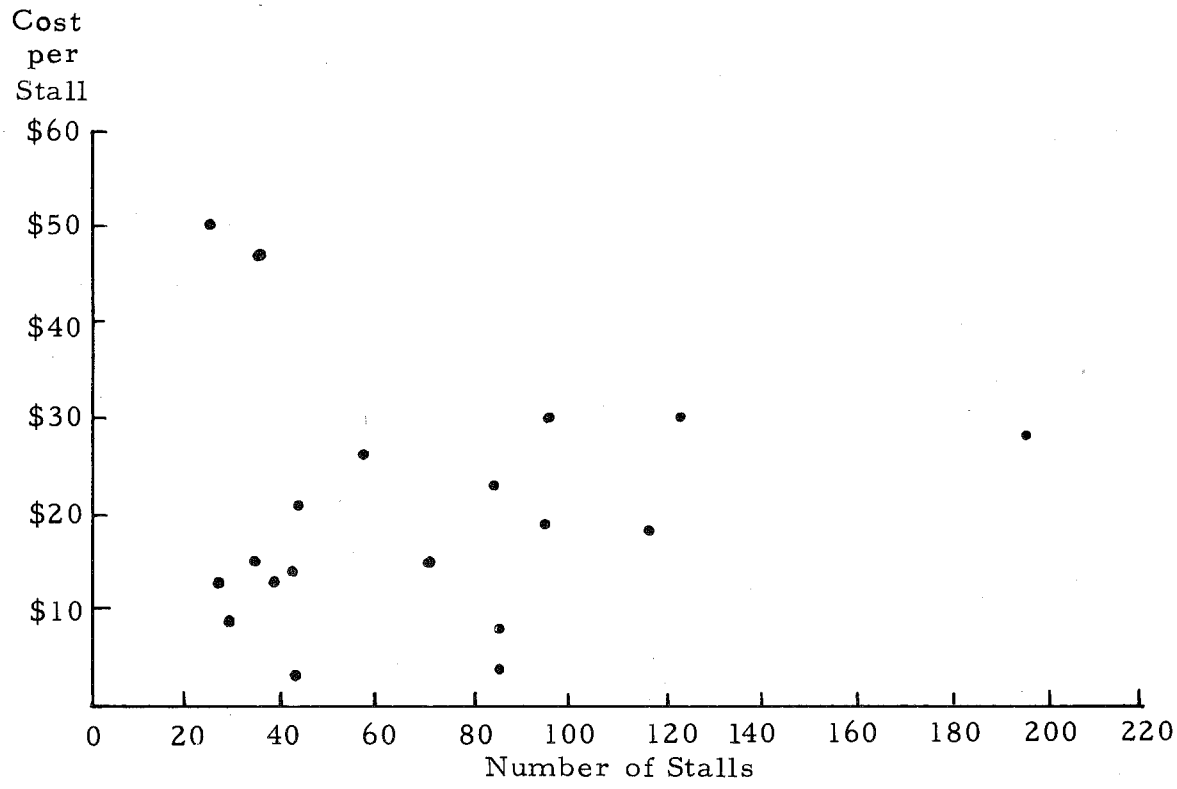


Illustration 3. COST PER STALL: CONVERTING LOOSE HOUSING TO FREE STALLS
19 Farms, New York State, 1962-63

A New York State study by Hoepner in 1955 indicated the average New York State loose housing system required 1.4 ton of bedding per cow during the winter season. If the average free stall barn required about 0.4 ton of bedding per stall for the winter, the free stalls would save 1.0 ton of bedding per stall per year. At $25 per ton, a man could afford to spend $25 per stall and would save the investment in bedding alone in one year.

When considering free stalls a farmer should place a realistic value on the possible bedding savings. A farmer with ample straw for loose housing and little market for extra straw would have little gain from bedding alone. Likewise if a farmer can obtain sawdust or shavings by paying only the hauling cost, the savings would be small. In these situations, a farmer would have to justify conversion in other ways.

Cleaner cows is another possible benefit. Although no attempt was made to measure cleanliness in a quantitative way, the exceptionally clean, dry appearance of cows found in free stall barns was noticeable. Two farmers made a special point of telling how much cleaner their unclipped cows were compared to other herds kept in stanchions and it appears that with the same management cows will be cleaner with less effort in free stalls than on a manure pack.

Space requirements are a third consideration. For several operators the difference in space requirements between loafing barns and free stalls made it possible to expand or consolidate their milking herds. A standard rule in constructing a loose housing loafing barn is to provide 60 square feet per cow. In a free stall barn between 45 and 50 square feet are needed per cow, depending on service alley width. With 4 x 7 1/2 foot stalls and an eight foot alley, 46 square feet are required per cow. A loafing barn designed for 60 cows should have 3600 square feet of floor space. At 48 square feet per cow, conversion to free stalls will enable the owner to keep 75 cows in the same barn. In practice, physical characteristics of the building may prevent making complete use of this extra space. On the farms studied the extra space was divided among more cows, cross alleys, bedding storage, more pens, and manure handling facilities.

Elimination of the manure pack is a consideration. By removing manure from the free stall barn and hauling it to the field every day, men and equipment do not have to be tied up in the spring and early summer cleaning out a manure pack. Free stall housing may thus improve labor distribution.

Labor saving is not likely to be significant. New York State dairymen considering putting free stalls in loose housing systems should not plan on reducing or increasing the amount of labor needed for barn chores. A University of Massachusetts budget analysis indicated little difference between free stall and other loose housing systems in labor required during the winter season. For a 50 cow herd, 46 hours per week were estimated as needed in the free stall barn; the loose housing barn needed 45 hours per week.

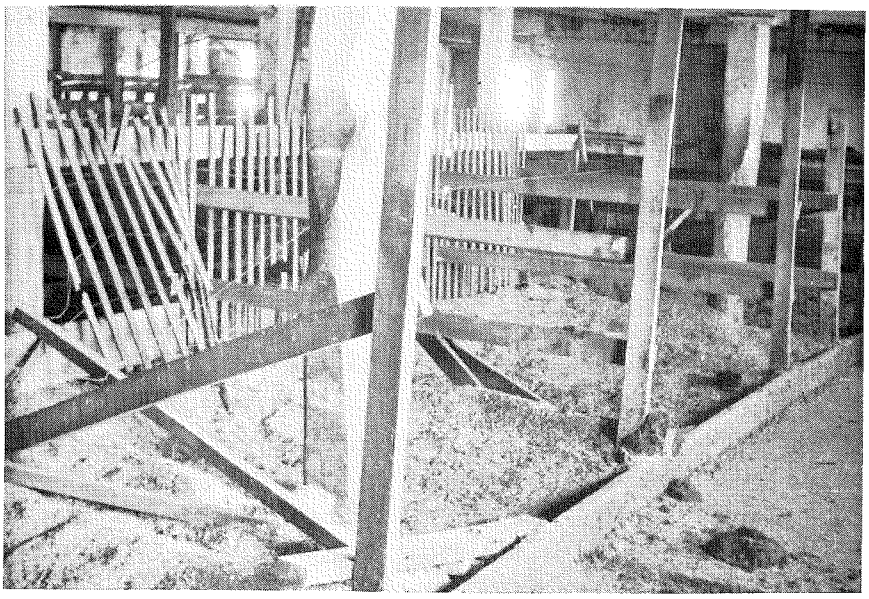
Injuries may or may not be less with free stall housing. No attempt was made to study this question. However, one operator said he converted to free stalls to avoid injuries. On the other hand, three farmers who put free stalls into their loafing barns reported bruised cows as one of the disadvantages of the system. They blamed concrete curbs for causing the bruises. Due to the privacy of the stalls, it is reasonable to expect fewer injuries caused by cows stepping on each other.

A farmer planning to put free stalls in his existing loafing barn may have to acquire some different equipment to handle manure. He can use his present manure spreader. However, a new blade or wide bucket may be needed to clean out the service alleys. In some instances a different tractor may be needed. The outlays for these items are very much a part of shifting to free stalls and should be given due consideration.

Planning the Loafing Barn Conversion

Cost considerations are important in planning the conversion. Four farmers who converted loose housing hired contractors to do a portion of the job. Two operators hired extra labor to help construct the free stalls. These farmers had some of the higher costs per stall. A farmer planning to do all his own work and provide some of his own wood products will be able to put in free stalls for a cash outlay less than the average of $20 per stall. Unnecessary expense can be avoided by using stone fill and gravel from the farm and using enough concrete to provide the required strength (usually 5 inches of concrete). Some operators used second hand pipe for stall posts and partitions to cut expenses.

However, a farmer should not cut his costs at a sacrifice of strength and durability. Operators reported that when their cows were learning to use the stalls, they would bump against the posts or try turning around inside the stalls. To hold up under these pressures, a stall must be well built. Some operators said they had failed to build their stalls strong enough (Illustration 4). This was the most frequently mentioned disadvantage associated with free stall housing.



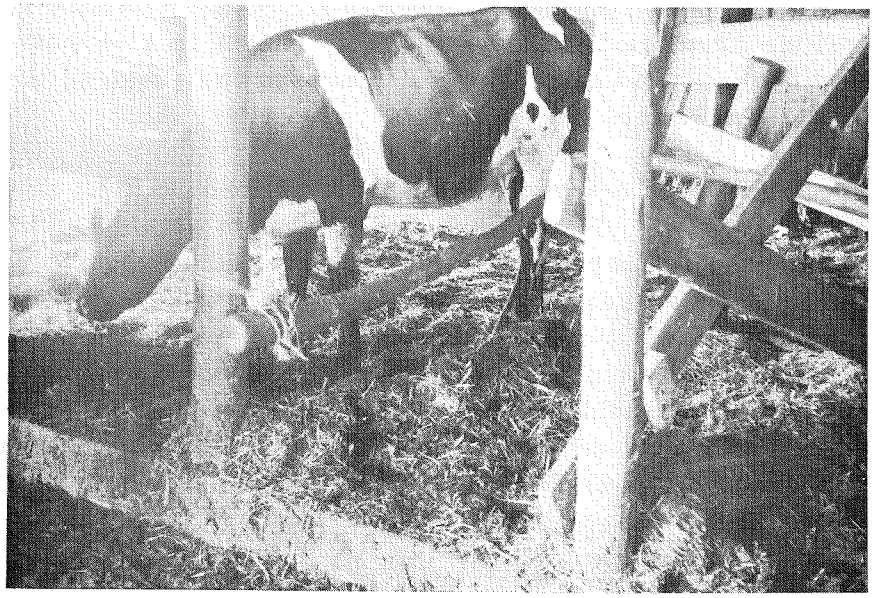


Illustration 4. WHAT HAPPENS WHEN FREE STALLS ARE NOT BUILT STRONG ENOUGH

Experience has indicated the following suggestions. Wood partitions should be of two inch material. If one inch boards are used they should be hard wood. Partitions should be bolted, not nailed, at both ends. Pipe for posts should be two inches in diameter and set into a concrete curb. It may prove worthwhile to brace wooden posts at the top.

Floor Plans

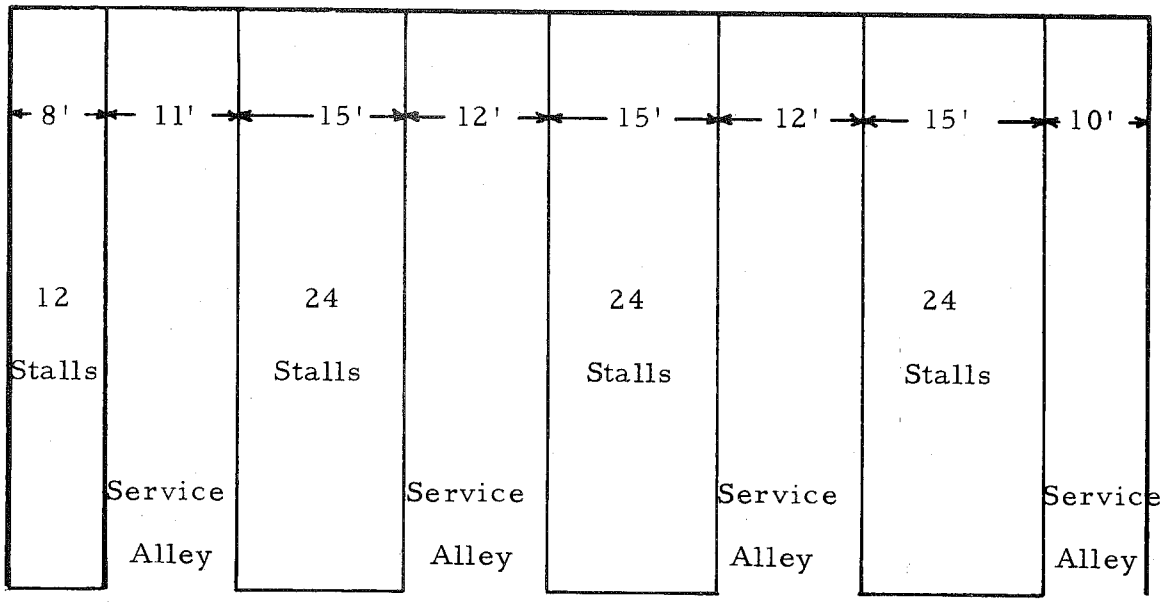
The design for converting loose housing to free stalls will have to be adapted to the existing building. A new extension for an existing barn can be planned more nearly as the farmer wishes. The farmer who wants to put free stalls into an existing barn without changing the overall dimensions of that barn has two basic layouts from which to choose. These alternatives are shown in Illustration 5 and are assumed to be part of the housing system shown in Illustration 2. It is further assumed the existing loafing barn is 50 feet wide and 100 feet long with an open side towards the feeding barn.

The service alleys may be constructed perpendicular to the long axis of the barn as shown in alternative 1. As one side of the barn is already open, no additional doorways are needed. However, the opposite side is solid, which means that equipment cannot be driven straight through. Doorways in the ends of the existing barn have become useless. These smaller dimensions are feasible. Only two New York State conversions have the basic layout represented in alternative 1. Both men said the position of supporting posts in the existing barns required this type of layout.

The two service alleys run parallel to the long-axis of the existing barn in alternative 2. Equipment can be driven straight through, thus allowing more efficient handling of manure and bedding. The one wide end alley provides easy access to all stalls by the whole herd. Another six stalls could be added instead of the cross alley but would hamper herd movement at milking time. Alternative 2 will provide a much better traffic pattern at milking time because one service alley and the end alley can be used for the holding area. Twenty-four loose housing conversions followed the basic pattern shown in alternative 2. The potential for better maneuverability of cows and machines make this the superior alternative.

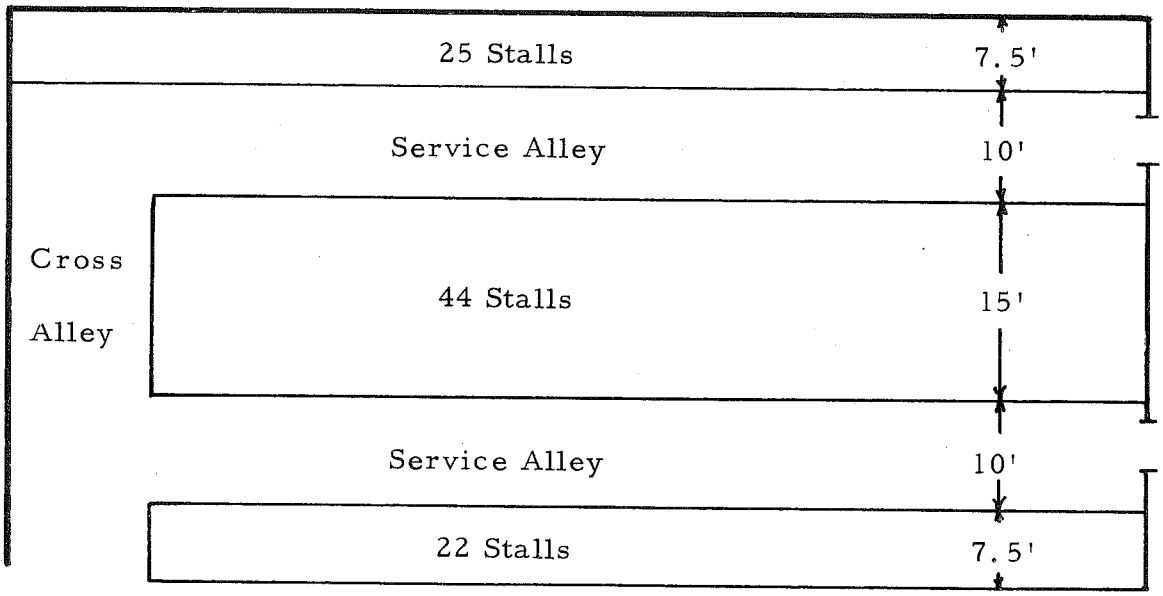
Illustration 5

ALTERNATIVE LAYOUTS FOR FREE STALLS IN EXISTING LOAFING BARN 50' X 100'



ALTERNATIVE 1

Total Stalls = 84 Each Stall = 48" X 7.5'



ALTERNATIVE 2

Total Stalls = 91 Each Stall = 48" X 7.5'

NEW HOUSING SYSTEMS WITH FREE STALLS

Any New York State dairyman considering building a new set of barns will find free stall housing one of his best alternatives. It is cheaper to build than a stanchion barn with a milking parlor, and is more efficient. Regular loose housing will cost as much per cow because free stalls require less square feet per animal.

New Free Stall Barns in New York

In the study of new free stall barns no part of the farmers' previous housing was included except where buildings were burned and portions of the milking parlor were saved.

Of the twelve farmers who built new barns four had operated loose housing systems before building. The remainder had used stanchion barns with no milking parlors. Milking parlors were a necessary part of all the new free stall operations.

Why New York Farmers Put Free Stalls in New Barns

Farmers building new barns today have three basic alternatives; they can build free stall housing, regular loose housing, or a conventional stanchion barn.

Eight of the farmers interviewed were building or had built new free stall barns to enable them to save bedding (Table 5). Several of these had to buy their total bedding requirements, and found both sawdust and straw to be increasingly scarce and expensive.

Seven men lost their previous barns to fire and replaced them with free stall barns. Some cited the cost of replacing conventional stall barns. Five others abandoned their existing stanchion barns which they said were inefficient and inadequate for their future plans, in favor of free stalls.

Six men planned to keep more cows in their new barns than they had in their previous housing. Some mentioned that a more efficient barn would provide time to care for more cows with the same labor input.

Five men, all former stanchion barn operators, selected free stall barns over regular loose housing because they did not like the manure pack and associated problems. They based their opinions on what they saw at neighboring farms.

Table 5. REASONS GIVEN FOR BUILDING NEW FREE STALL HOUSING SYSTEMS
12 Farmers, New York State, 1963

Reason	Number of farmers mentioning
Save bedding	8
Previous barns burned	7
Expanding herd	6
Dislike loose housing	5
Save labor	5
Cleaner cows	3
Encouraged by other people	3
Avoid handling manure pack in spring	2
Cheaper than building stanchion barns	2
Had visited successful free stall operations	2
Looked like a good idea	2

The five farmers who expected to save labor with free stall housing had been using stanchion barns previously. Although loose housing has about the same labor requirements as free stall housing, a conventional stanchion barn usually requires more labor. When comparing systems, it should be remembered that factors like a milking parlor and a good milking routine can contribute to improved labor efficiency with any type of housing.

Three operators expected that free stalls would keep their cows cleaner. Three others said they received substantial encouragement from outside interests. One farmer was convinced by a field representative of his milk buyer, another by the county extension agent, and the third had heard the milk inspector make favorable remarks about free stalls.

Cost of Building New Free Stall Housing

The cost of building the basic buildings for new free stall housing ranged from $247 to $400 per stall. To obtain this information, each operator was asked how many hours were supplied by regular farm labor, how much lumber was supplied from the farm woodlot, and how much cash outlay was required in addition. In the calculations, regular

farm labor was valued at $1.75 per hour and wood products from the farm woodlot at $50 per thousand board feet. The figures include the cost of structures associated with the feeding area and the free stall area, the cost of building the free stalls, the cost of built-in manure handling facilities like ramps or pits, and the cost of any paved areas. They do not include the construction of the milk house and milking parlor, the cost of feed bunks, the cost of any equipment in the milking facilities or feeding area, nor the cost of any equipment needed to handle manure.

The wide variation in cost per stall is to be expected due to the range in design and type of building materials used (Table 6). The number of stalls built was not the primary reason for variation in the cost per stall.

Table 6. COST OF BUILDING NEW FREE STALL HOUSING*
Seven Farms, New York State, 1963

Number of stalls	Cost per stall
55	$400
128	391
36	372
54	324
160	256
104	254
58	247

* Does not include milk room, milking parlor, and any equipment required in the milking area and the feeding area.

All but two of the farmers hired a contractor to help with the construction. One of these had the lowest cost per stall. A common practice was to have the contractor put up the building shells and the farmer build his own free stalls and feeding area. All the farmers provided some labor thus reducing their cash outlay.

The Decision to Build New Free Stall Housing

A man with regular loose housing who adds free stalls is likely to save bedding, have cleaner cows, and make better use of his labor

throughout the year. For these same reasons a farmer should consider building free stall housing instead of regular loose housing. A new building has an advantage in that it can be planned to insure adequate maneuverability and efficient construction methods. If free stalls are not built immediately, loose housing should be planned so that stalls can be added easily.

Designs of New Barns

The building plan used on two farms was similar in some respects to a conventional stanchion barn (Type A, Illustration 6). The main barn was a long, narrow, one-story structure with free stalls in one end and a feeding area in the other. In each the milking parlor was attached to one side of the barn on the same end as the feeding area. These buildings could be expanded by adding at either end or one side, thus providing more free stalls and a larger feeding area.

Three new systems had designs very similar to the "L" type of loose housing with free stalls located in the loafing barn (Type B, Illustration 6). The feeding and free stall areas were connected by the milk room and milking parlor. The "U" type design used in loose housing can also be modified for a new free stall housing system (Illustration 2). These operations may be expanded at the ends away from the milking facilities.

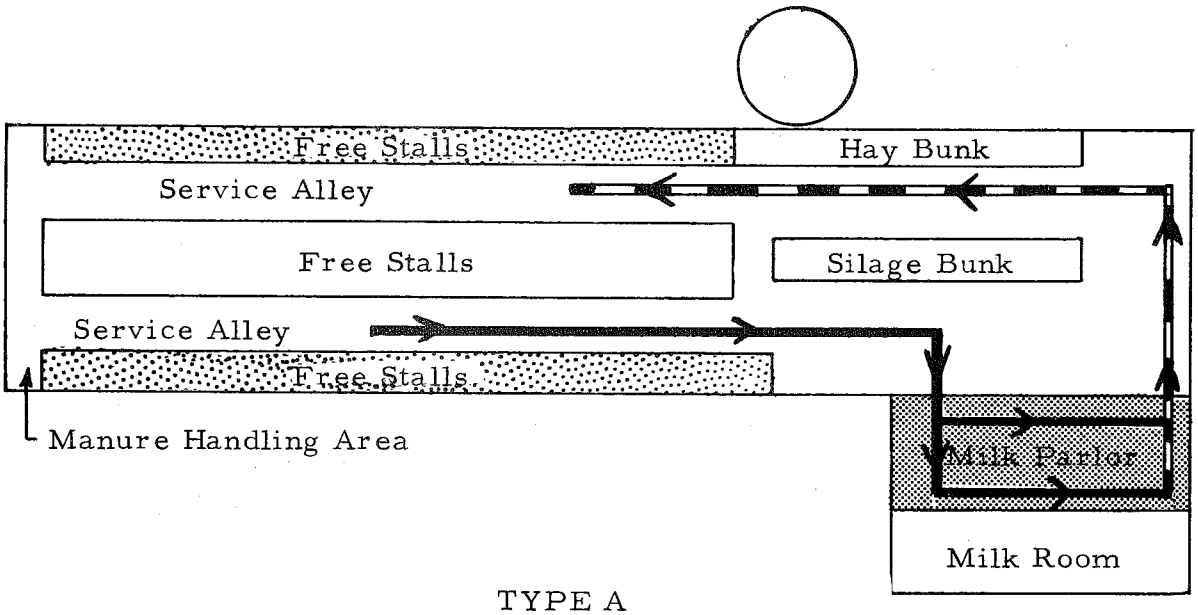
Four new barns had everything under one roof (Type C, Illustration 7). There was a double row of stalls along one side, and hay storage in the center. Hay was fed on the side opposite the stalls. A silage bunk could be included in the alley beside the hay rack or it could be put at one end. The milking parlor was built at one corner where it would not hamper future expansion.

Three new barns had two groups of free stalls, one at each end of a long structure (Type D, Illustration 7). The feeding area for each group of stalls was toward the center. The milk room and milking parlor complex were attached to one side in the middle. Two herds could be managed separately and still be milked in the same parlor.

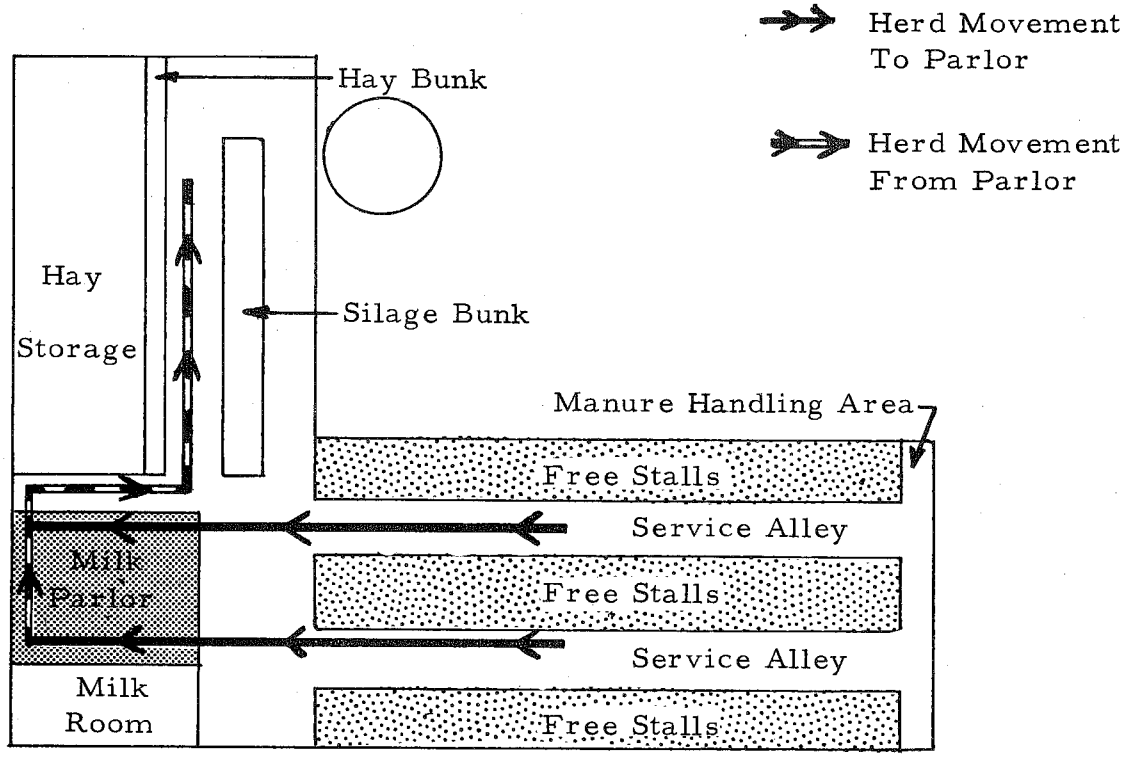
This design lends itself particularly to the housing needs of the expanding commercial dairy operations of today and the future. Buildings of this type can be built one unit at a time. A milking parlor, feeding area and free stalls would be the first unit. The second unit of feeding area and free stalls could be added later. The third and fourth units could be built parallel to the main barn on the side opposite the milking facilities. There is plenty of room for tower silos in this design, but no allowance for hay storage. If the trend towards more silage and less hay feeding continues, lack of hay storage would not be a problem.

Illustration 6

BASIC DESIGNS FOUND IN 5 NEW FREE STALL HOUSING SYSTEMS



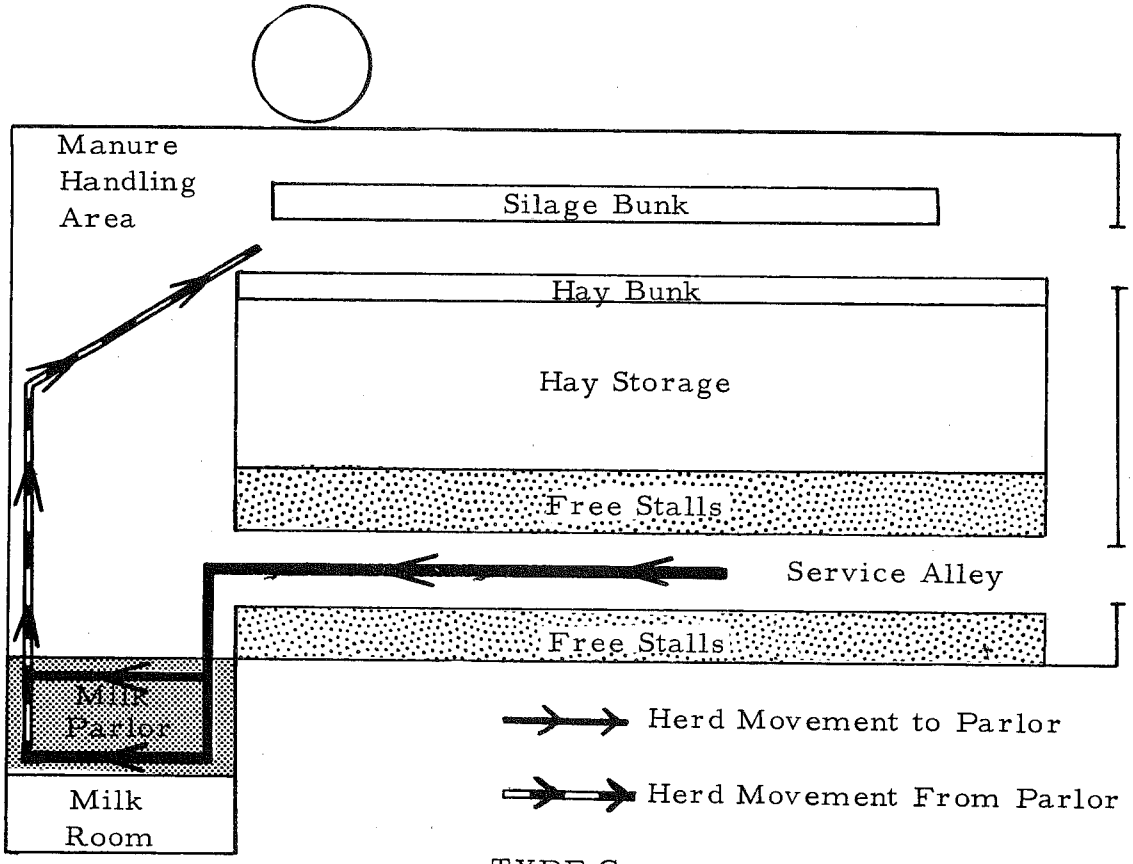
TYPE A



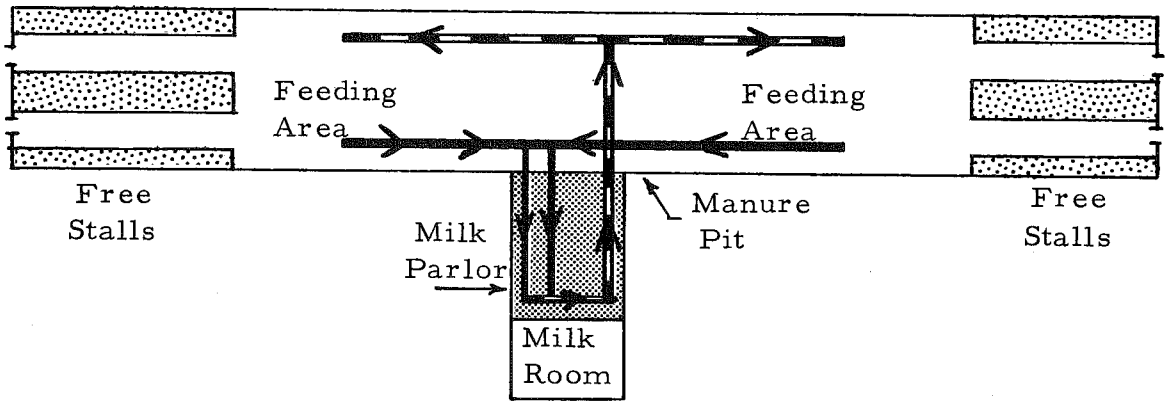
TYPE B

Illustration 7

BASIC DESIGNS FOUND IN 7 NEW FREE STALL HOUSING SYSTEMS



TYPE C



TYPE D

The housing system pictured at the top of Illustration 8 has a design similar to Type A in Illustration 6. An automatic silage bunk runs between the silo and the new free stall barn. The new barn in the bottom picture is similar to Type C in Illustration 7. The hay and straw are stored beside two rows of free stalls.

SUMMARY AND CONCLUSIONS

Summary

1. The purpose of this study was to determine the situations in New York State where free stall housing was being used and what management practices were required to make them successful. Two basic situations were studied: (1) Converting loose housing to free stall housing and, (2) Building a new set of barns designed for free stalls.

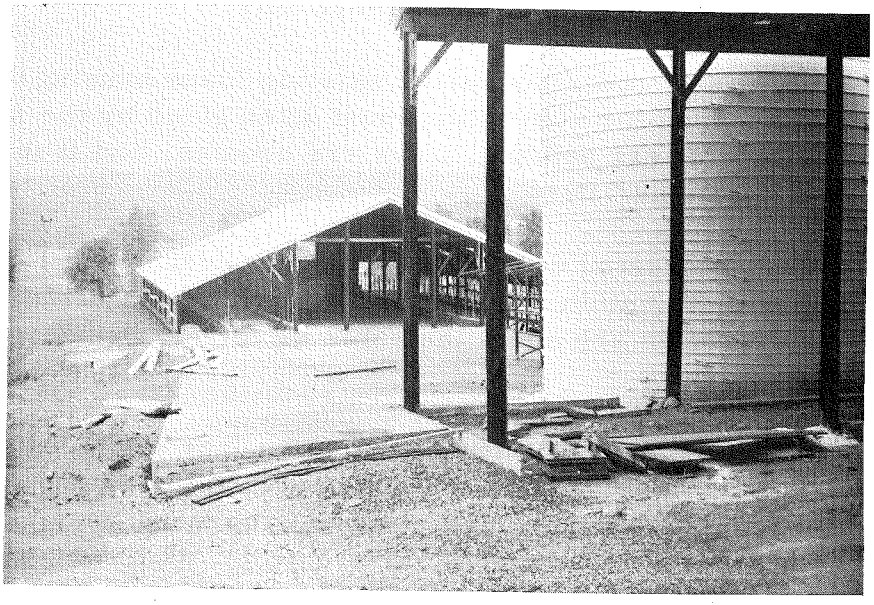
2. The first free stall housing system built in New York was used in November, 1961. When the field work for this study was completed on June 11, 1963, there were 45 free stall barns in the state. Thirty-four owners had experience with free stalls under winter conditions. The other 11 had their free stall barns in construction.

3. With a little time and effort, any dairy herd can be trained to use a free stall barn. If stalls are the only acceptable alternative, cows will accept them readily. A few cows may need to be tied in for a short time.

4. Most operators cleaned their stalls out by hand once or twice a day and their service alleys once a day. All but one farmer used a tractor blade or scoop to clean the service alleys. A ramp, loader, or elevator was used to load the manure spreader.

5. Manure handling should be carefully considered. Liquid manure should be expected. A scoop or blade with wings have been used successfully to meet this problem. Frozen manure should also be expected for short periods during the winter.

6. The floor of a free stall can be stone and gravel fill or solid concrete. Long straw or hay, chopped straw or hay, and sawdust or shavings are the most common types of bedding. Several operators said free stalls require between a quarter and a third as much bedding as do other types of dairy housing. The average free stall requires the equivalent of about 0.4 ton of straw per year or 3.5 pounds per stall per day when in heavy use.



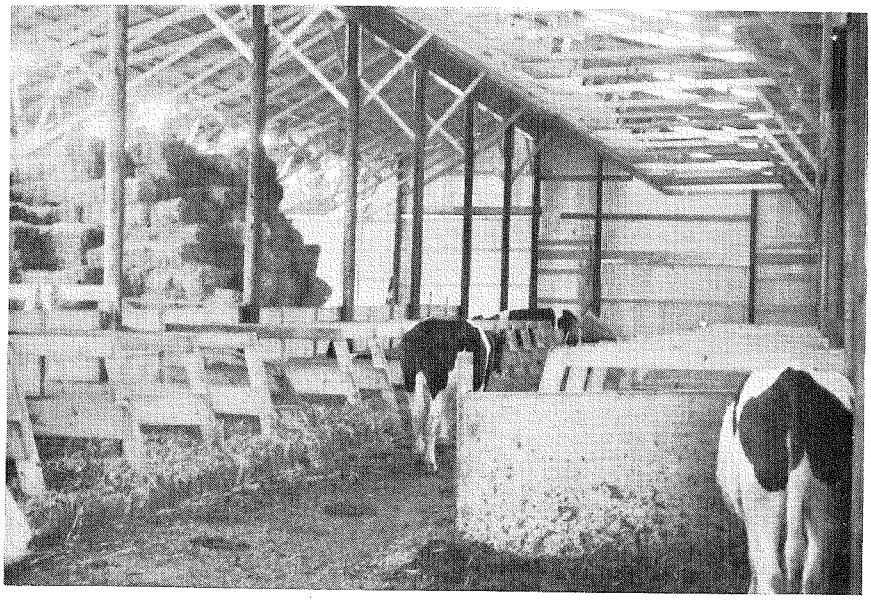


Illustration 8. NEW BARNS WITH FREE STALL HOUSING

7. Every farmer used a specialized feeding area. The free stalls are used by the cows as a resting area only.

8. Twenty-six farmers converted existing loose housing to free stall housing. Reasons for converting most often given by the farmers were: free stalls use less bedding, cows are cleaner, and free stall barns need less space per cow.

9. Most loose housing conversions cost between $10 and $30 per stall. Labor distribution is more desirable in free stall housing; total labor requirements are about the same as for regular loose housing.

10. Twelve farmers built new barns using free stalls. Most barns had designs similar to existing loose housing. Reasons most often given for constructing new free stall housing were: use less bedding, previous barns burned, wanted to expand, disliked loose housing, and wanted to save labor. The new barns, excluding milk room and milking parlor, cost from $247 to $400 per stall.

Conclusions

1. Handling liquid or frozen manure are the two biggest problems a farmer will face with free stalls. Low ceilings and narrow service alleys that hamper tractor maneuverability are disadvantages to avoid.

2. Problems can be minimized by good planning. Any farmer considering free stall housing should know the complete chore routine he will follow, decide what equipment he will use in and around the barn, and then draw up his building plan.

3. Farmers with loose housing should be encouraged to convert to free stall housing. Savings in bedding, better labor distribution, and cleaner cows will make it worthwhile.

4. From an economic point of view, a commercial dairyman building a new set of barns should consider seriously the construction of a free stall housing system. It is more efficient than a stanchion barn and requires less bedding than loose housing.

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