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# Choose comfortable stalls for your dairy cows

I. D. Porterfield

A. D. Longhouse

H. O. Henderson

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# Choose COMFORTABLE STALLS For YOUR Dairy Cows

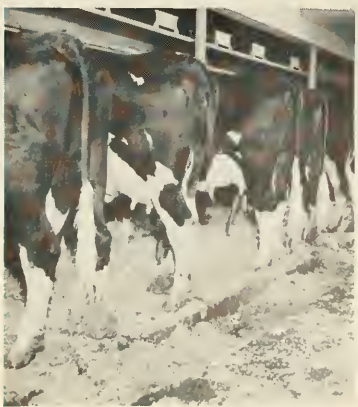
## CLEANLINESS TRIALS



Cows in comfort stall at the beginning of a seven-day cleanliness trial.



Cows in comfort stall at the end of a seven-day cleanliness trial.



Cows in tie-chain stall at the beginning of a seven-day cleanliness trial.



Cows in tie-chain stall at the end of a seven-day cleanliness trial.

COMFORTABLE STALLS  
Can MEAN--

- More Production
- Less Injuries
- Cleaner Cows
- More lying down time for your cows

### THE AUTHORS

Authors of *Choose Comfortable Stalls for Your Dairy Cows* are I. D. Porterfield, Professor and Head of Dairy Husbandry and Dairy Husbandman in the Agricultural Experiment Station; A. D. Longhouse, Professor and Head of Agricultural Engineering and Agricultural Engineer in the Agricultural Experiment Station; and H. O. Henderson, Professor of Dairy Husbandry and Dairy Husbandman in the Agricultural Experiment Station.

### ACKNOWLEDGMENT

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WEST VIRGINIA UNIVERSITY  
AGRICULTURAL EXPERIMENT STATION  
COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS  
A. H. VANLANDINGHAM, ACTING DIRECTOR  
MORGANTOWN

# Choose COMFORTABLE STALLS For YOUR Dairy Cows

I. D. PORTERFIELD, A. D. LONGHOUSE, and H. O. HENDERSON

## Part I. A COMPARISON OF COMFORT AND TIE-CHAIN STALLS

### Introduction

**D**AIRY cows in northern United States spend more time in the barn than on pasture, and so the stall that will give the most comfort to the cow and the most convenience to the dairyman is of great importance.

Some dairymen stable one of the larger breeds of dairy cattle in stalls that were designed for a smaller breed. The breed change was made without giving consideration to enlarging the stall. Other dairymen attempt to keep both large and small breeds in stalls designed for the small breeds. For example, the stanchion stall was installed when the barn at the West Virginia University Dairy Farm was built in 1921. This stall, which is 42 inches wide and 66 inches long, was the recommended size at that time, but it is now considered to be both too narrow and too short and is not comfortable for Holstein cows.

In such stalls the cow's rear feet are often in the gutter, when lying down a portion of her udder is in the gutter. Such cows are dirty, and there are often many conditions conducive to mastitis. In addition, narrow stalls often result in bruised flanks and smashed teats.

### Comparison of Comfort and Tie-Chain Stalls

The objective of this study was to determine if there were significant differences in milk production, cleanliness, incidences of mastitis, injuries, and in time spent lying down between Holstein cows kept in comfort stalls and those kept in tie-chain stalls. The differences in the amount of bedding used and in the time required for cleaning were also determined.

### Procedure

Data for this experiment were collected during the winter months for three years on the Holstein herd of the West Virginia University Agricultural Experiment Station. Cows in this herd were above average in size and have averaged more than 150 pounds of butterfat per year for the last ten years.

The so-called comfort stall was a Hoard-type stall. It was 84 inches long and 48 inches wide with a crossbar at the rear of the stall, adjustable to the size of the cow, as shown in Figure 1. When the cow was standing, she was forced by the pipes in the front of the stall to stand with her rear legs back of the crossbar so that the droppings and urine were always back of the crossbar. When lying down, the cow's head would go under the pipes enabling her to lie in front of the crossbar.

The tie-chain stall was 66 inches long and 42 inches wide, as shown in Figure 2.

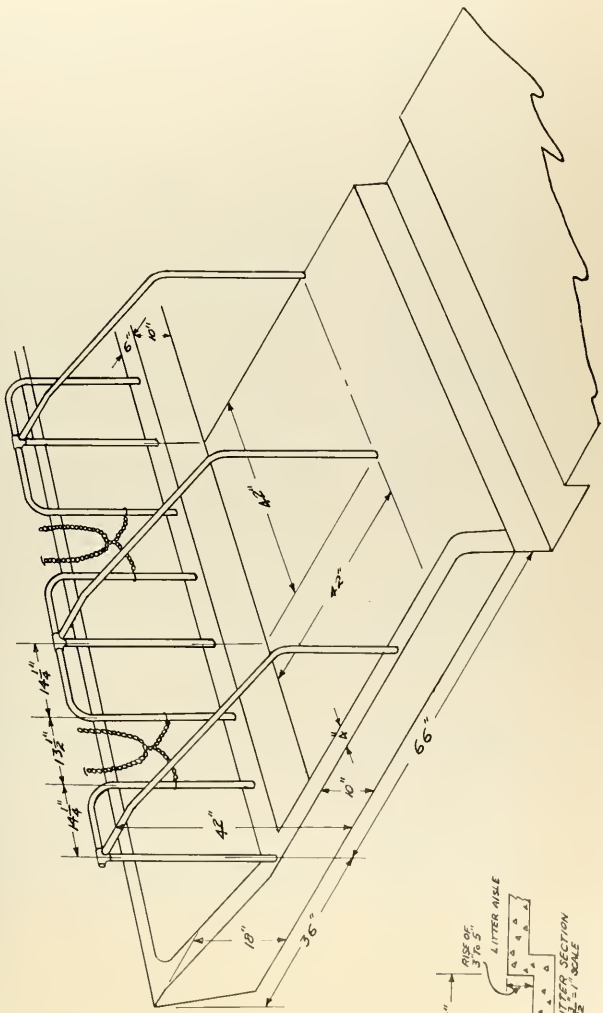
During the first year, two Holstein cows were placed in comfort stalls and production data were collected. Later, upon the addition of six more comfort stalls, the Holstein herd was divided, and eight cows, representative of the various ages, were placed in the comfort stalls and seven in tie-chain stalls. The following year, the cows in comfort stalls the previous year were placed in the tie-chain stalls and those that were in the tie-chain stalls were placed in comfort stalls. This procedure of reversing the cows each fall was followed throughout the experiment. Herd replacements, consisting of first-calf heifers, were equally divided between the two types of stalls.

Throughout the experiment, all cows were fed roughage similar in quality and all that they would consume. Each cow was given a 15 percent crude protein grain mixture fed according to the amount of milk produced, except that no cow received more than 16 pounds of grain per day. All cows were milked two times daily. Daily milk weights were kept and when totaled were corrected for age by factors used by the Bureau of Dairy Industry.

During the experiment 15 cows had one and in some cases two lactations in both the comfort and tie-chain stalls that could be compared. These records were made when the cows were in the same stage of lactation.

Before the cows were put on the experiment, they were observed for bruised hocks, skinned knees, swollen knots on sides, and their tendency to lie on the crossbar or in the gutter. Thereafter, each cow





WEST VIRGINIA UNIVERSITY  
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 MORGANTOWN, W. VA.

Drawn by EDWARD F. RANDOLPH JR.  
 Approved by \_\_\_\_\_

DAIRY (TIE-CHAIN) STALL

DRAWING NO. 2

NOTE: REDRAWN FROM EXISTING MANUFACTURING

FIGURE 2. THE TIE-CHAIN STALL.

was observed three time per week for injuries for which the stall might be considered to be the contributing cause.

Data were collected in the amount of bedding used in each type of stall for a seven-day period during one season and a fifteen-day period during a second season. Wood shavings were used for bedding. Time and motion studies were made on the amount of time necessary to clean the different types of stalls on nine different occasions.

Three, 7-14-day comparisons on the cleanliness of the cows in the comfort stalls with those in the tie-chain stalls were made. At the beginning of each trial all visible manure was removed from the bodies, flanks, tails, and legs of each cow and then the cows were not brushed or carried again until the trial had ended. During the trials the cows were scored daily on the following basis: 0—No visible signs of manure or stain; 1—Stained but no manure; 2—Stained and/or manure on hocks or tails; 3—Stained and/or manure on hocks and tail; 4—Stained and/or manure on hocks, tail, and one flank; 5—Stained and manure on hocks, tail, and both flanks.

A comparison of the amount of time cows spent lying down in each type of stall was made by using thermocouples and a recording potentiometer. Each time a cow got up or laid down the device recorded the number of the cow and the time to the nearest five minutes. Data were obtained over a period of 19 days.

## Results

### PRODUCTION

The average weekly milk production (2x M.E.) for the 15 cows in the comparison is shown in Table 1. Each cow had at least one production record made in each type of stall. Nine of the 15 cows produced

TABLE 1. A COMPARISON OF THE AVERAGE WEEKLY MILK PRODUCTION OF COWS KEPT IN COMFORT AND TIE-CHAIN STALLS

COW NO.	WEEKS	MILK PRODUCTION WHILE IN		DIFFERENCE *
		TIE STALLS	COMFORT STALLS	
		<i>lbs.</i>	<i>lbs.</i>	<i>lbs.</i>
1	17	193	264	+71
2	17	162	239	+77
3	23	183	281	+98
4	19	205	224	+19
5	14	144	159	+15
6	25	238	296	+58
7	19	316	399	+83
8	16	362	374	+12
9	16	492	382	-20
10	30	360	348	-12
11	15	118	64	54
12	9	191	225	+34
13	22	407	288	-119
14	13	213	161	-52
15	23	231	104	-127

\*+ indicates that the cow produced more milk while in the comfort stall.

- indicates that the cow produced more milk while in the tie-chain stall.

between 12.0 and 98.0 pounds more milk per week while in comfort stall than while in the tie-chain stall. Six cows produced between 12.0 to 127.0 pounds more milk per week while in the tie-chain stall than while in the comfort stall.

### INJURIES

During the three years of this experiment 19 injuries were sustained by cows in the comfort stall as compared to 11 by those in the tie-chain stall. Five flank injuries were sustained by the cows in the tie-chain stalls and none by those in the comfort stalls. All other injuries were either bruised hocks or skinned knees.

### BEDDING

For a seven-day period the tie-chain stall required an average of 16.6 pounds of bedding (wood shavings) per stall per day as compared with 16.9 pounds for the comfort stall. During a period of 14 days the tie-chain stall required an average of 14.1 pounds of bedding per stall per day compared with 16.2 pounds for the comfort stall. The difference in the amount of bedding required for the tie-chain and comfort stalls for the 14-day period was analyzed by the analysis of variance and found to be not significant.

### TIME REQUIRED FOR CLEANING STALLS

Time and motion studies were made on the amount of time required to clean the tie-chain and comfort stalls. The average time required to clean one tie-chain stall was 28.64 seconds and to clean one comfort stall 35.12 seconds. This shows that the comfort stall required 6.48 seconds longer; however, this difference was not statistically significant.

### CLEANLINESS

The total score for cleanliness in each trial is shown in Table 2. In addition, before and after pictures of cows in each type of stall for one seven-day trial are shown on the cover. In each trial the cows in comfort stalls remained cleaner than the cows in the tie-chain stalls. The first trial was conducted shortly after the cows were moved into their stalls from pasture and they had not become properly adjusted to the stall; this probably accounts for the poorer cleanliness score during this trial.

### TIME SPENT LYING DOWN

During a 19-day period, cows in the comfort stalls spent an average of 10.2 hours per day lying down, whereas the cows in the tie-chain stalls spent an average of 8.8 hours per day lying down. This difference was found to be highly significant. During a second trial, after the cows had exchanged stalls, the difference was even greater. The cows in the comfort stalls spent an average of 10.6 hours per day lying down as compared to 7.5 hours for the cows in the tie-chain stalls.

TABLE 2. TOTAL SCORE FOR CLEANLINESS OF COWS IN COMFORT AND TIE-CHAIN STALLS\*

TRIAL	LENGTH OF TRIAL (DAYS)	COMFORT STALLS		TIE-CHAIN STALLS		SCORE DIFFERENCE
		NUMBER OF COWS USED	TOTAL SCORE	NUMBER OF COWS USED	TOTAL SCORE	
1	7	7	65.5	7	130.5	65.0
2	7	7	37.5	7	65.5	29.0
3	14	8	37.5	7	109.5	72.0

\*As indicated in the Procedure on page 3, cows with a low score remained cleaner than those with a high score.

## Discussion

The fact that the cows in the comfort stalls spent more time lying down than did those in the tie-chain stalls indicates that they were more comfortable. This may be one of the reasons why many of the cows in comfort stalls produced more milk than they did when in tie-chain stalls.

The comfort stalls were wider than the tie-chain stalls, which eliminated flank injuries caused by the pipe partitions of the stalls, and longer with a crossbar in the rear, which helped retain the bedding beneath the cows, thus keeping them cleaner. The combination of added length and more bedding beneath the front and rear legs largely prevented knee and hock injuries.

Fewer cows can be kept in a given space in comfort stalls than in tie-chain stalls since six comfort stalls occupied the same space in width as did seven tie-chain stalls. The comfort stall is 18 inches longer than the tie-chain. When two rows of comfort stalls are installed, the additional 18 inches requirement for length per cow will require a stable 3 feet wider than the conventional stable. This could mean that planners of dairy stables may need to consider a change in designs.

Most manufacturers of barn equipment sell more

stanchion stalls than either the tie-chain or comfort stall. A criticism of the experiment described herewith was that the comparisons should have been made between the stanchion and the comfort stall, but in this stable the tie-chain stalls were being used for several years prior to the beginning of this experiment, and since the tie-chain stall offers the cow more freedom of movement than does the stanchion, it would be expected that the difference in performance of cows would be even greater if stanchion stalls had been used. A question that remained unanswered is: Would there have been any difference in performance of the cows if the two types of stalls had been equal in platform width and length?

## Summary

A comparison of Holstein cows kept in comfort and tie-chain stalls was made. Based on 15 comparisons, 9 cows produced from 12 to 98 pounds more milk per week while in the comfort stalls.

Cows kept in comfort stalls sustained fewer injuries, remained cleaner, and spent significantly more time lying down.

The difference in the amount of bedding used and cleaning time for each type of stall was not statistically significant.

# Part II. A Comparison of Comfort, Modified Comfort, and Stanchion Stalls

## Introduction

THE study reported in Part I has been criticized by dairy barn equipment manufacturers because it did not include the stanchion stall. The reason for this criticism was that the stanchion stall represented a large portion of stall sales. There was also one unanswered question from the previous study: namely, would there have been any difference in the results if the two types of stalls had been equal in platform width and length?

The objectives of this study were to determine if there are significant differences in milk production, cleanliness, injuries, time spent lying down, and amount of bedding used between Holstein cows kept in comfort, modified comfort, and stanchion stalls.

## Procedure

Data for this experiment were collected during the winter months in five different years from the Holstein herd of the West Virginia University Agricultural Experiment Station.

The comfort stall was the same as described in Part I of this study. A drawing showing the design and dimensions are given in Figure 1 (48" wide and 81" long).

The modified comfort stall, (Figure 3) resembles the comfort stall in design. However, the platform is 14 inches shorter and does not have the 2x1 crossbar at the rear of the platform. In addition, the three pipes across the front of the stall were moved forward 14 to 16 inches further than those on the front of the







comfort stall. The bottom of the feed trough was 5 inches above the platform level. The platform was 48 inches in width and 70 inches in length.

The stanchion stall (Figure 1) was essentially the same design as those manufactured for the last 25 years. The platform in these experimental stalls was 48 inches wide and 70 inches long.

The Holstein herd was divided so that there were six cows in the comfort stalls, six in the modified comfort stalls, and five in the stanchion stalls. Cows representative of various ages were placed in each type of stall and the groups were kept as uniform as possible. The second year and each year thereafter the cows were assigned a different type of stall in order that their performance could be studied for three successive years, each year in a different type of stall.

Feeding and management of the cows in this study were similar to that described in the first part of this bulletin (page 3).

The procedure in this study was the same as that followed in Part I with the following exceptions:

(1) Results of the cleanliness trials were determined by taking photographs at the beginning and end of each trial. No attempt was made to score each animal, and (2) the amount of time spent lying down was determined by an electric eye and a recording potentiometer.

## Results

### PRODUCTION

The average weekly milk production (2x M.E.) for 13 cows for which production records were obtained in all three types of stalls is shown in Table 3. Seven of the cows produced more milk while in the stanchion stall than while in the other stalls. Four produced more milk while in the comfort stall and two produced more while in the modified comfort stall. One cow (No. 8) produced essentially the same amount of milk while in both the comfort and stanchion stalls.

TABLE 3. A COMPARISON OF THE AVERAGE WEEKLY MILK PRODUCTION OF COWS KEPT IN COMFORT, MODIFIED COMFORT AND STANCHION STALLS

COW NO.	WEEKS	MILK PRODUCTION WHILE IN		
		COMFORT STALLS	MODIFIED COMFORT STALLS	STANCHION STALLS
		<i>lbs.</i>	<i>lbs.</i>	<i>lbs.</i>
1	15	318	332	354
2	25	412	330	304
3	27	336	330	304
4	12	318	423	460
5	27	363	369	383
6	23	345	406	361
7	27	310	247	259
8	29	346	290	347
9	28	398	403	395
10	26	398	376	346
11	27	383	395	429
12	27	353	361	384
13	28	360	350	423

### INJURIES

During two years of this study, 12 cows in comfort stalls sustained 16 injuries, 12 in modified comfort stalls sustained 22 injuries, and 10 cows in stanchions sustained 20 injuries. All of the injuries were either skinned hocks or skinned knees except for one badly swollen hock which developed on one cow in a stanchion stall. In addition, three first-cal heifers persisted in lying on the crossbar of the comfort stall until the 2x4 crossbar was replaced with a 2x6 crossbar.

### BEDDING

The amount of bedding (wood shavings) required per stall per day was determined for each type of stall for a period of three years. The comfort stall required 13.9 pounds of bedding per day, the modified comfort 11.0 pounds per day, and the stanchion 14.0 pounds per day.

### CLEANLINESS

During this study two cleanliness trials were conducted. Photographs were taken before and after on seven-day trial and are shown in Figures 5-10. In each trial the cows in comfort stalls remained the cleanest; however, those in the modified comfort stall were a close second. Those in stanchions were rated a poor third in comparison to cows in the other stalls.

### TIME SPENT LYING DOWN

Over a three-year period cows while in the comfort stalls spent an average of 10 hours 36 minutes lying down per day. The same cows spent 9 hours 20 minutes lying down in the modified comfort stall and 9 hours 30 minutes lying down in the stanchion stall.

## Discussion

When Holstein cows were kept in stalls of equal size, whether comfort, modified comfort, or stanchion very little difference in cow performance was noted. This is particularly true in regard to production, injuries, and time spent lying down.

The modified comfort stall required almost three pounds less bedding per day than the other two stalls.

Cows in comfort and modified comfort stalls remained much cleaner than those kept in stanchion stalls. A partial explanation for this may be that the cows in stanchion stalls were more restricted in their movement.

In Part I of this study it will be noted that the cows kept in the larger stalls out-milked the kept in smaller stalls. This, coupled with the fact obtained from Part II of this study, has led the authors to revise recommended cow stall dimensions. These recommendations are shown in Table 4. The type of stall that a dairyman selects would be a matter of individual preference; however, he should keep



FIGURE 5. Cows in Comfort Stalls at beginning of one-week cleanliness trial.



FIGURE 6. Cows in Comfort Stalls at the end of a one-week cleanliness trial.



FIGURE 7. Cows in Modified Comfort Stalls at beginning of one-week cleanliness trial.



FIGURE 8. Cows in Modified Comfort Stalls at the end of a one-week cleanliness trial.



FIGURE 9. Cows in Stanchion Stalls at beginning of one-week cleanliness trial.



FIGURE 10. Cows in Stanchion Stalls at the end of a one-week cleanliness trial.

TABLE 1. SUGGESTED STALL SIZES

BREED	PLATFORM LENGTH		PLATFORM WIDTH
	COMFORT	MODIFIED COMFORT AND STANCHION	
Ayrshire and Guernsey	64	64	46-48
Holstein and Brown Swiss	74	72	48-52
Jersey	72	63	43-46

mind when comparing prices that the water and vacuum lines are included with both the comfort and modified comfort stalls.

## Summary

A comparison of Holstein cows kept in comfort, modified comfort, and stanchion stalls was made.

Based on 13 comparisons, 7 cows produced more milk while in stanchion stalls than while in either of the other types of stalls. Four produced more milk while in comfort stalls and two produced more milk while in modified comfort stalls.

There was essentially no difference between cows kept in the three types of stalls in regard to injuries and time spent lying down.

The comfort stall required 13.9 pounds bedding per day, modified comfort 11.0 pounds, and the stanchion stall 11.0 pounds of bedding per day.

Cows kept in the comfort and modified comfort stalls remained cleaner than those kept in stanchions.