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Long Span Fences

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Long Span Fences



Agricultural Experiment Station
South Dakota State University, Brookings

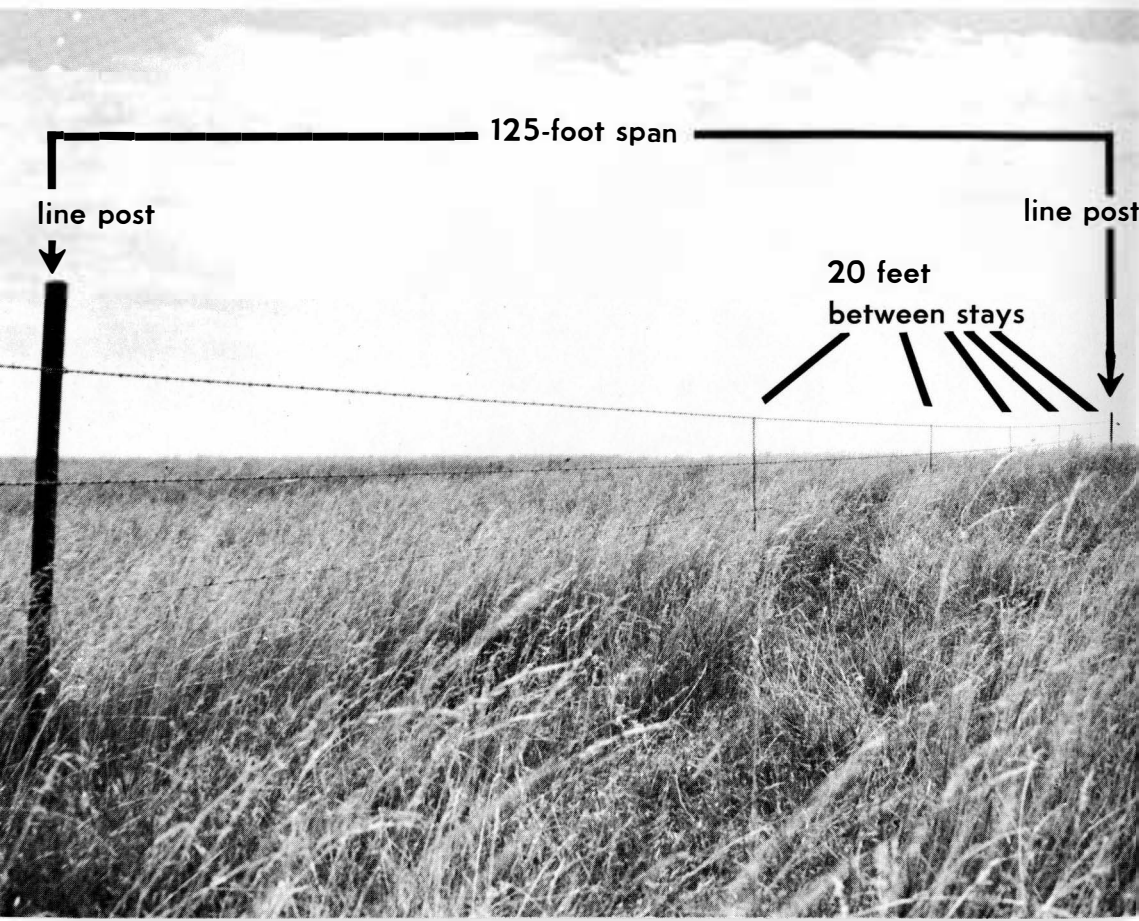
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Technical assistance from P. M. Wheel-
don, SDSU, E. A. Kinne and P. G.
Strom, U. S. Steel Corp., is acknowl-
edged.

COVER PICTURE—Long span fence
at Norbeck showing relative position of
twisted wire stays, steel posts and corner
post.

(Below) A four-wire, long span
fence with details indicated above.



Long Span Fences

FIGURE COSTS FOR YOUR PASTURES

By using information in this publication, you can get an idea of long span, suspension fence costs as compared with conventional fencing.

Twenty-seven combinations involving distance between posts, number of wires, and distance between stays within spans have been observed through two seasons of use. All combinations have been successful in turning livestock. However, livestock have damaged three-wire fences more than the others. It is anticipated that a greater amount of maintenance will be required

with these fences in the future than with four and five-wire fences.

Total costs of construction range from \$335.52 to \$496.89 with long span fences, and up to \$685.46 for a conventional fence.

These lower costs do not necessarily mean long span fencing will always be suitable to use in place of conventional fencing. The information included in this publication is intended to provide a guide which may be used in making decisions on the best type of fencing for various situations.

Long Span Fences

By **R. A. Moore**, professor, Agronomy; **H. G. Young**, assistant professor, and **M. E. Larson**, associate professor, Agricultural Engineering; and **G. B. Haiwick**, superintendent, Pasture Research Center, Norbeck.

Fencing is important for good grassland management. It provides many opportunities to control grazing and thereby contributes to high producing pastures and ranges.

The cost of conventional fencing is often prohibitive for anything other than boundary or certain cross fences. Less material and labor are needed with long span (suspension) fences. In this type of construction, line posts are spaced much farther apart and "stays" keep each wire the desired distance from another wire. Corner and brace construction must be strong to support the longer spans and stays.

The conventional fence is a "barricade" type of enclosure. The long span fence can be considered as a series of panels with resilience and whip-like action to turn back livestock. When pressure is exerted against the top wire, the bottom

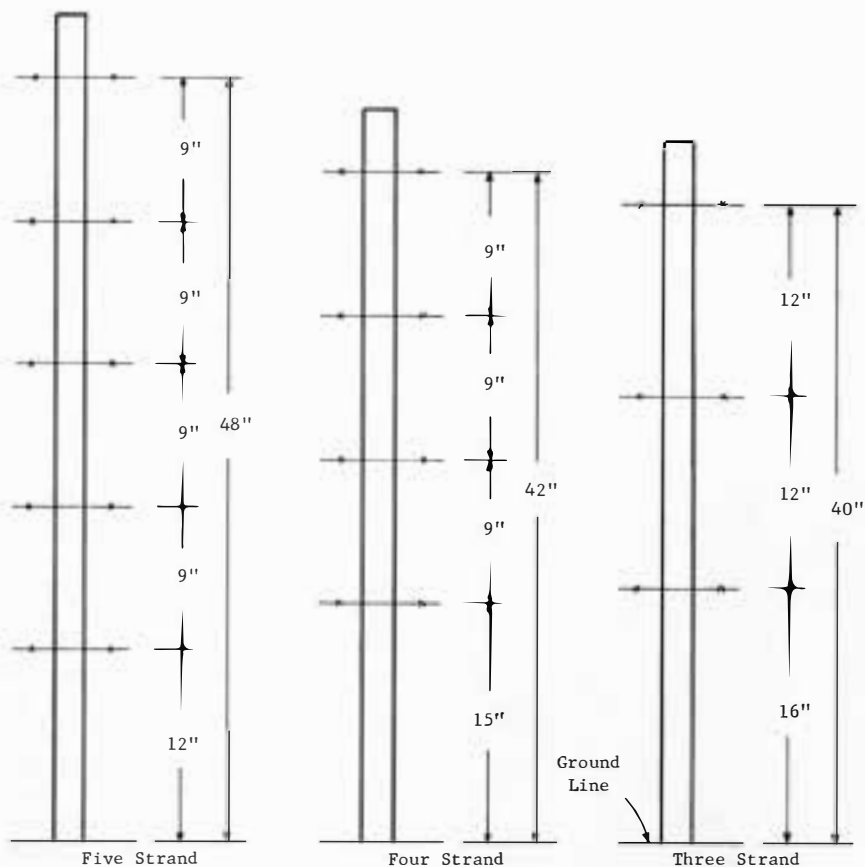
wire moves in the opposite direction—a cow attempting to reach over the top wire is struck in the knees by the bottom wire. The top wire similarly moves in the opposite direction if pressure is applied against the bottom wire. The fence panels frequently are set in a swaying motion by the wind. This action discourages animals from encountering the fence. It also gives less trouble from weeds piling against it because weeds tend to go over or under the moveable wires.

LONG SPAN NOT NEW

Long span fencing is not new. It has been used in grazing areas in the United States and in other countries for many years. Low cost of construction, minimum maintenance, and effectiveness in confining livestock are primary reasons for its use.

Suspension fences are used mainly for interior and cross fences,

Figure 1. Strand Spacing on Three, Four and Five Wire Fences



however, they have also been used for boundary fences. If cattle are crowded near the fence, calves may roll under the fence. Twenty-gauge wire plates have been used to fasten wire to wooden posts as a certain amount of "pull through" is necessary and staples frequently do not hold. Steel posts have enough "give" that the wires may be rigidly attached to them. Corner posts should be well anchored. Wires should be tight with no more than

3 inches of sag per span. Line posts should be sound.

Although several agencies make recommendations for the use and construction of long span fences, extensive research information on this method of fencing is limited.

RESEARCH IN SOUTH DAKOTA

The 2,665-acre Pasture Research Center near Norbeck in north central South Dakota includes an area where long span suspension fence-



Figure 2. Twisted wire stay on four-strand fence. Numbered metal tag is used for identifying measuring point for sag tests.

line posts spaced 100, 125, and 150 feet apart. Three, four and five wires of 12½-gauge steel are used with twisted steel stays, 36 inches long, to keep wires a given distance from each other (Figures 1 and 2). Stay spacings are 10, 15, and 20 feet apart. Corner construction is identical for each fence combination. A diagram of a corner is shown in Figure 3. Stretch stations (Figure 4) have been installed at 80-rod intervals. The material for corners and stretch stations per mile of fence is as follows: two 6"x8' wooden posts, ten 5"x8' wooden posts, and seven 4"x8' wooden posts and approximately 400 feet of No. 9 "tie" wire.

The terrain at Norbeck is flat to gently undulating. If a depression or abrupt rise was encountered, an additional line post was placed to keep the panel of wires a proper distance from the ground. Segments of a long span fence are shown on the cover and inside front cover pictures.

The value of each fence combination is measured in several ways: (1) effectiveness in turning livestock, (2) increase in sag of wires and (3) movement of corners. In addition, the cost of each combination has been compiled.

COSTS PER MILE DETAILED

Material, labor and total costs per mile of fence of each of the 27 different combinations are given in Table 1. The cost range is from a low of \$325.52 for a three-wire,

ing was constructed to permit close observation over a period of years under varying conditions.

Distance between posts, number of wires, and distance between stays within spans are the main factors being investigated. Studded T, steel fence posts, 6 feet long, are used as

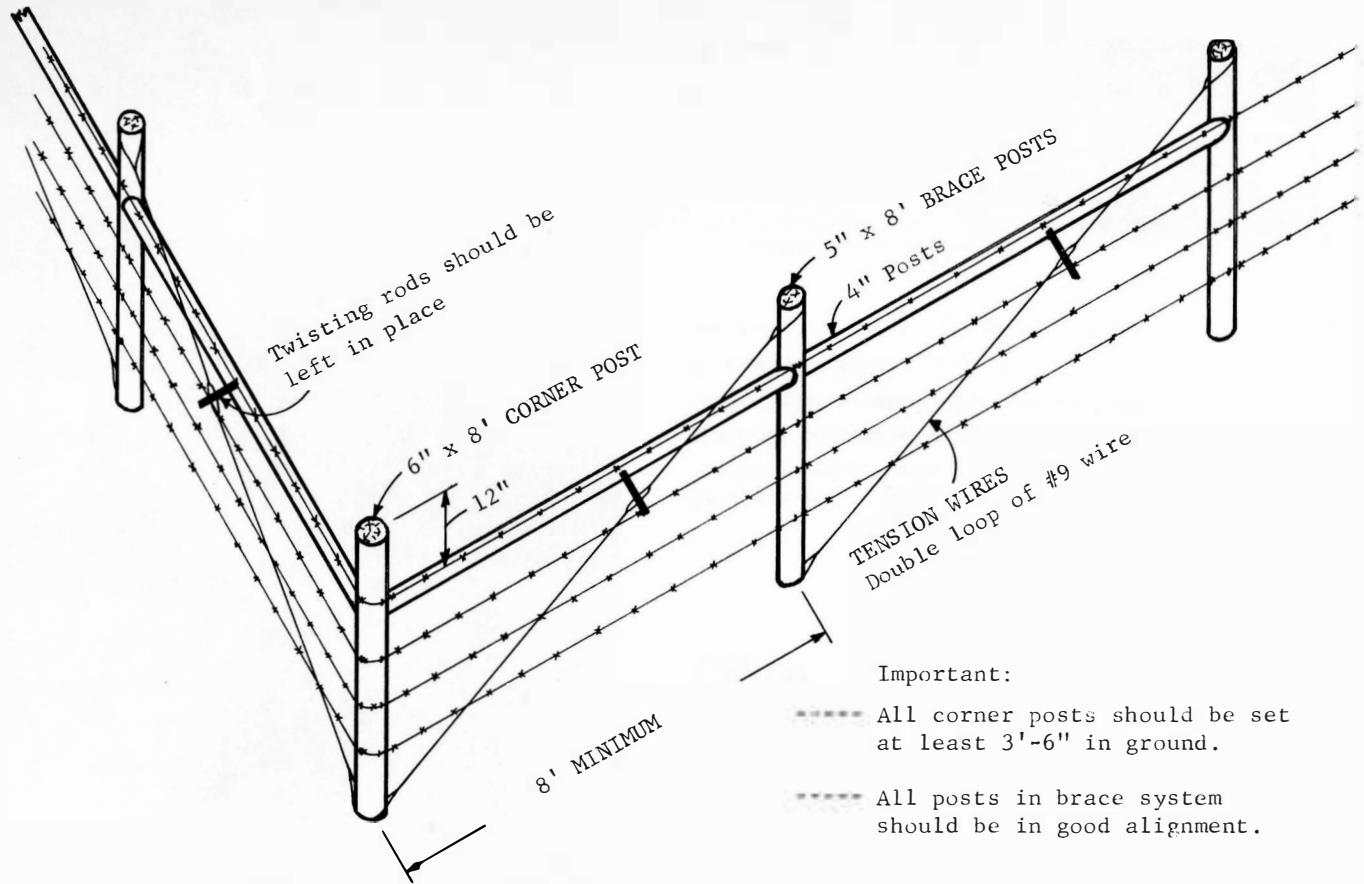


Figure 3. Corner Post Construction

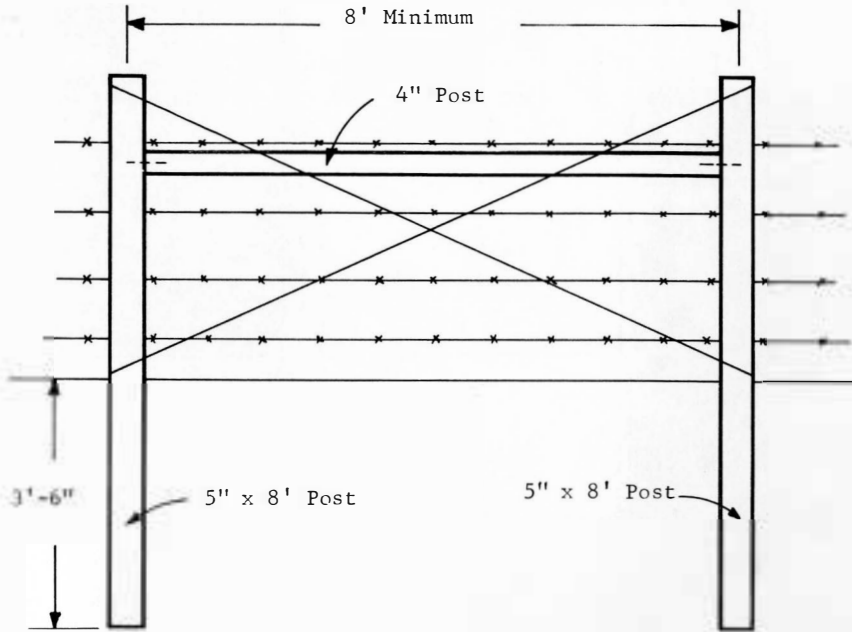
— x — x — x — x — Long span fences

(another 320 acres 7 miles west used for hay, small grain, and silage production)

HIGHWAY 20

NORBECK

Figure 4. Stretch Station Construction



150-foot span with 20-foot stay spacings to a high of \$496.89 for a five-wire, 100-foot span with stay spacings 10 feet apart. Labor is calculated at \$2.00 per hour throughout. Tables 2, 3, and 4 represent a more detailed breakdown of the fence construction costs. The number of posts and stays, and rods of wire are listed for each type of fence.

Steel posts retail locally (1968) at \$1.13 with fasteners. Twisted steel wire stays, 36 inches long, sell at 10½¢ each. The price of barbed wire is \$10.00 per 80-rod spool. Pressure treated cedar posts retail as follows: 6" x 8'—\$2.95; 5" x 8'—\$2.50; and 4" x 8'—\$2.00. Four hundred feet of No. 9 wire is valued at \$6.80. The total cost for corners, including stretch stations, for each long span fence is \$51.70 per mile. Corner construction was not a variable in the study,

therefore the costs are identical for all fences.

Labor for wire includes one wire stretched initially and used as a guide for putting in line posts and then stringing subsequent wires and clipping to posts. Spools mounted on the back of a pickup truck were used to effectively lay out three strands of wire at a time. However, when more than three wires were used considerable difficulty was encountered in keeping the wires separated. This is the primary reason for the increased cost of labor for five wires over the others.

Construction costs for a conventional fence are listed in Table 5. Data are shown for a four-wire fence with steel posts one rod apart. Corner construction is the same as discussed for the long span fences except that there is only one stretch station or brace per mile. Two 6" x

Table 1. Material and Labor Costs of 27 Long Span Fence Combinations

	Cost Per Mile	100 Ft. Span			125 Ft. Span			150 Ft. Span		
		Distance Between Stays			Distance Between Stays			Distance Between Stays		
		10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.
Three Wires	Material	\$280.55	263.85	252.72	268.83	250.77	241.74	262.70	244.33	236.98
	Labor	\$105.26	96.10	90.00	103.02	93.12	88.16	97.86	92.56	88.54
	Total	\$385.81	359.95	342.72	371.85	343.89	329.90	360.56	336.89	325.52
Four Wires	Material	\$320.55	303.85	292.72	308.83	290.77	281.74	302.70	284.33	276.98
	Labor	\$114.66	103.16	95.50	112.36	99.92	93.72	112.24	99.56	94.54
	Total	\$435.21	407.01	388.22	421.19	390.69	375.46	414.94	383.89	371.52
Five Wires	Material	\$360.55	343.85	332.72	348.83	330.77	321.74	342.70	324.33	316.98
	Labor	\$136.34	119.24	113.36	134.00	119.10	111.64	134.10	118.94	112.88
	Total	\$496.89	463.09	446.08	482.83	449.87	433.38	476.80	443.27	429.86

Prices quoted are for 1968

8", seven 5" x 8", and six 4" x 8" posts and 1,280 rods of wire were wooden posts are used per mile in building the construction of the corners and conventional fence. The steel posts brace. Three hundred twenty steel for this fence were installed by a

Table 2. Itemized Material and Labor Cost Per Mile of Three Wire, Long Span Fence

Span Length			100 Ft.			125 Ft.			150 Ft.			
Stay Spacing			10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.	
Materials	Steel Line Posts	No.	52	52	52	42	42	42	35	35	35	
		\$	58.76	58.76	58.76	47.46	47.46	47.46	39.55	39.55	39.55	
	Wood Corner Posts	No.	19	19	19	19	19	19	19	19	19	
		\$	51.70	51.70	51.70	51.70	51.70	51.70	51.70	51.70	51.70	
	Wire	Rds.	960	960	960	960	960	960	960	960	960	
		\$	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	
	Stays	No.	477	318	212	473	301	215	490	315	245	
		\$	50.09	33.39	22.26	49.67	31.61	22.58	51.45	33.08	25.71	
	Total		\$	280.55	263.85	252.72	268.83	250.77	241.74	262.70	244.33	236.98
	Man Hours	Line Posts	Hrs.	6.5	6.5	6.5	5.5	5.5	5.5	4.82	4.82	4.82
\$			13.00	13.00	13.00	11.00	11.00	11.00	9.64	9.64	9.64	
Corners		Hrs.	19	19	19	19	19	19	19	19	19	
		\$	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	
Wire		Hrs.	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	13.38	
		\$	26.76	26.76	26.76	26.76	26.76	26.76	26.76	26.76	26.76	
Stays		Hrs.	13.75	9.17	6.12	13.63	8.68	6.2	11.73	9.08	7.07	
		\$	27.50	18.34	12.24	27.26	17.36	12.40	23.46	18.16	14.14	
Total		Hrs.	52.63	48.05	45.00	51.51	46.56	44.08	48.93	46.28	44.27	
		\$	105.26	96.10	90.00	103.02	93.12	88.16	97.86	92.56	88.54	
Total Cost		\$	385.81	359.95	342.72	371.85	343.89	329.90	360.56	336.89	325.52	

Prices quoted are for 1968

Table 3. Itemized Material and Labor Cost Per Mile of Four Wire, Long Span Fence

Span Length			100 Ft.			125 Ft.			150 Ft.		
Stay Spacing			10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.
Materials	Steel Line Posts	No.	52	52	52	42	42	42	35	35	35
		\$	58.76	58.76	58.76	47.46	47.46	47.46	39.55	39.55	39.55
	Wood Corner Posts	No.	19	19	19	19	19	19	19	19	19
		\$	51.70	51.70	51.70	51.70	51.70	51.70	51.70	51.70	51.70
	Wire	Rds.	1280	1280	1280	1280	1280	1280	1280	1280	1280
		\$	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00
	Stays	No.	477	318	212	473	301	215	490	315	245
		\$	50.09	33.39	22.26	49.67	31.61	22.58	51.45	33.08	25.73
	Total	\$	320.55	303.85	292.72	308.83	290.77	281.74	302.70	284.33	276.98
	Man Hours	Line Posts	Hrs.	6.5	6.5	6.5	5.5	5.5	5.5	4.82	4.82
\$			13.00	13.00	13.00	11.00	11.00	11.00	9.64	9.64	9.64
Corners		Hrs.	19	19	19	19	19	19	19	19	19
		\$	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
Wire		Hrs.	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58
		\$	29.16	29.16	29.16	29.16	29.16	29.16	29.16	29.16	29.16
Stays		Hrs.	17.25	11.5	7.67	17.1	10.88	7.78	17.72	11.38	8.87
		\$	34.50	23.00	15.34	34.20	21.76	15.56	35.44	22.76	17.74
Total		Hrs.	57.33	51.58	47.75	56.18	49.96	46.86	56.12	49.78	47.27
		\$	114.66	103.16	95.50	112.36	99.92	93.72	112.24	99.56	94.54
Total Cost		\$	435.21	407.01	388.22	421.19	390.69	375.46	414.94	383.89	371.52

Prices quoted are for 1968

Table 4. Itemized Material and Labor Cost Per Mile of Five Wire, Long Span Fence

Span Length			100 Ft.			125 Ft.			150 Ft.		
Stay Spacing			10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.	10 ft.	15 ft.	20 ft.
Materials	Steel Line Posts	No.	52	52	52	42	42	42	35	35	35
		\$	58.76	58.76	58.76	47.46	47.46	47.46	39.55	39.55	39.55
	Wood Corner Posts	No.	19	19	19	19	19	19	19	19	19
		\$	51.70	51.70	51.70	51.70	51.70	51.70	51.70	51.70	51.70
	Wire	Rds.	1600	1600	1600	1600	1600	1600	1600	1600	1600
		\$	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
	Stays	No.	477	318	212	473	301	215	490	315	245
		\$	50.09	33.39	22.26	49.67	31.61	22.58	51.45	33.08	25.73
	Total	\$	360.55	343.85	332.72	348.83	330.77	321.74	342.70	324.33	316.98
Man Hours	Line Posts	Hrs.	6.50	6.50	6.50	5.50	5.50	5.50	4.82	4.82	4.82
		\$	13.00	13.00	13.00	11.00	11.00	11.00	9.64	9.64	9.64
	Corners	Hrs.	19	19	19	19	19	19	19	19	19
		\$	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
	Wire	Hrs.	22	22	22	22	22	22	22	22	22
		\$	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00
	Stays	Hrs.	20.67	12.12	9.18	20.50	13.05	9.32	21.23	13.65	10.62
		\$	41.34	24.24	18.36	41.00	26.10	18.64	42.46	27.30	21.24
	Total	Hrs.	68.17	59.62	56.68	67.00	59.55	55.82	67.05	59.47	56.44
		\$	136.34	119.24	113.36	134.00	119.10	111.64	134.10	118.94	112.88
Total Cost		\$	496.89	463.09	446.08	482.83	449.87	433.38	476.80	443.27	429.86

Prices quoted are for 1968

Table 5. Per Mile Construction Costs - Conventional Four-Strand Fence

Item	Material Cost	Labor Cost	Total
Corner Posts	42.20	28.50	70.70
Line Posts	361.60	64.00	425.60
Wire	160.00	29.16	189.16
Totals	563.80	121.66	685.46

Prices quoted are for 1968

commercial fencer at a cost of 19c per post. A cost of 20c per post is used in Table 5. This figure will vary according to the method of installation. Several comparisons can be made between Table 5 and the others. It is apparent that line posts contribute greatly to fencing costs.

Several types of stays are available and vary in cost, ease of installation and longevity. The twisted steel stays are performing satisfactorily but other types might be just as successful.

OBSERVATIONS AT NORBECK

The effect of various fence combinations on corner construction is being evaluated by measuring movement of corners and brace posts. The measurements are taken each spring and fall. Slight changes have been noted in some corners, but these changes occurred soon after construction and do not appear to have been caused by any particular type of fence.

Each span of fence between two line posts is identified with a permanent marker (Figure 2) for experimental use. The distance from this point to the ground serves as a measurement of sag and is taken in the spring and fall at a time when

temperatures are approximately the same. Observations so far indicate a greater increase in sag with four and five wires than with three wires. However, this sag is quite small and all fences have been effective in keeping livestock within the pastures. Although 6-foot steel line posts were used in this study, it is possible that 5½-foot steel posts would be satisfactory for 3- and 4-wire fences. Good grazing management is being followed and bulls are not present in the pastures. Different levels of grazing between pastures (for instance, near maximum use or beyond) and presence of bulls could reduce effectiveness of fences. While three-wire fences have kept livestock confined to a given pasture, they have also been abused more because of cows putting their heads between the wider-spaced wires causing some stays to bend. It appears that maintenance will be greater on the three-wire fences.

Corners were constructed in the fall of 1965. Soil conditions were extremely dry and digging post holes took more time than expected. Rocks were frequently encountered and caused an increase in labor.

Pasture Research Center

1 mile north of Norbeck on Highway 20 (16 miles northwest of Faulkton or 50 miles southwest of Aberdeen)

