Extension Bulletin No. 194

# Pole Frame Construction for Idaho Farm Buildings



by
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UNIVERSITY of IDAHO
College of Agriculture
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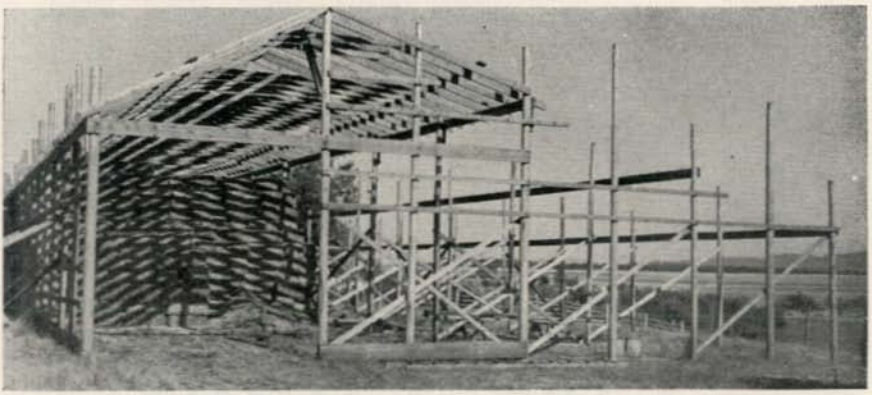


"Before and After" photos of a pole-frame barn. The owner did his own work, used local material. The structure is 52 by 104 feet and is used as a combination hay shelter and loafing shed. The barn was built in 1951 at a total cost of less than $2000 for material outlay. Note that the door and walls are high enough to allow use of a tractor inside for piling hay and removing manure. Site of the barn on a rise of ground makes for good drainage. A variation of this plan would leave the south side open for the open loafing shed on that side with hay storage in the taller section. Such storage is a necessity in the loafing shed if feeding is to be done with the least effort.

Today's farmer is looking for the building he can build with his own tools at a cost he can afford. He is demanding that such a building save him time, travel, and energy in his chores. Pole structures are often the answer to his needs. They require approximately half the labor and materials of the conventional structure. Treated poles solve the foundation problem.

# Pole Frame Construction for Idaho Farm Buildings

By

**Owen K. Brown, Extension Agricultural Engineer**
**Walter R. Friberg, Agricultural Engineer**

**A pole-frame building for half the cost of a similar one of conventional construction is entirely possible. This bulletin gives construction procedures, recommendations, and plans for such a building.**

## Location of Buildings

Locate the building on a nearly level, well drained site. Make it fit conveniently with other buildings in the farmstead plan. A ground slope of about 1 percent is good.

If the structure is to be used as a loafing shed or machine shed, locate it as much as possible so that the open side faces the sun and is protected from the prevailing wind.

## Layout

Once the site is decided upon, set up batter boards and string lines to represent the outline of the building as shown in Figure 1. Square the corners by laying out any right triangle whose sides are in the proportions of 3, 4, 5. This can be 3 feet on one side, 4 feet on the other, and 5 feet on the hypotenuse or long side of the triangle. Any multiple of these figures will do so long as the triangle is laid out the same way. It may be 6, 8, 10 as in Figure 1, Corner A. It could be 9, 12, 15; 12, 16, 20, etc.

Most builders space their poles 12 to 15 feet apart. Measurements are made from the outside of each corner pole to the center of the next pole as indicated in Figure 1. Spacings are then determined from the center of each pole to the center of the next. The proposed pole locations are marked by measuring in from the outside wall a distance equal to half the diameter of the large end of the pole and driving a stake as indicated by "b" in Figure 1. (See Plan No. .724-15 on page 9 of this bulletin for a typical plan layout using 15-foot pole spacings.)

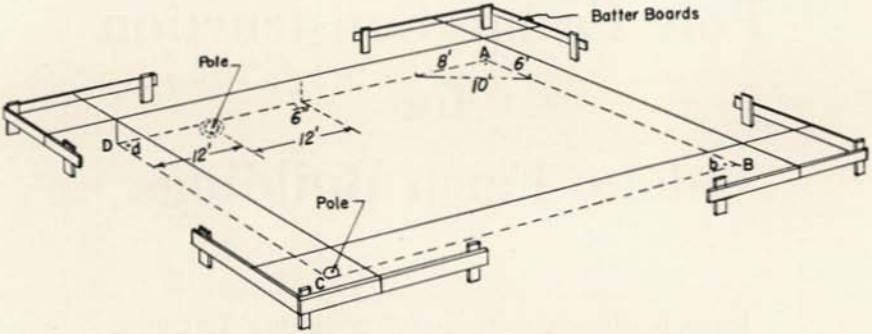



Figure 1. How to Lay Out the Site for a Pole Frame Building.

**Holes** The depth of the holes will depend on the bearing strength of the soil and the weight and height of the building. In soils with hardpan close to the surface or stiff clays throughout, a depth of 3 feet is enough for poles up to 20 feet in height. A depth of 4 feet is recommended for most average soils. A depth of 5 feet is good for sandy or soft soils.

Make the holes 6 or 8 inches greater in diameter than the butt of the pole. The extra space around the pole is necessary to allow tamping of the soil **after the plates and rafters are fastened in place.**

Firm packing or tamping at final setting is essential for long-time stability of the building.

Where the soil has low bearing qualities such as in wet clay, it is advisable to widen the hole to three times the diameter of the pole and pour a foot of concrete in the bottom of the hole and around the pole. This will provide more bearing surface and prevent the pole from settling excessively.

To avoid extra settling, be sure the loose dirt is cleaned out of the bottom of the holes before the poles are placed.

**Poles** Pressure-treated poles are best for building construction. Power companies, construction firms, and pole-treating yards offer them for sale. Poles that come in contact with moist soil must be treated if they are to last. Black locust is probably the only exception in Idaho. On-the-site, cold-soak treatment of most woods will give good results if done right. The Idaho bulletin, COLD-SOAK WOOD PRESERVATION by Wohletz and Ravenscroft, gives full details of pole treatment.

Use poles that are 2 feet longer than the distance from the bottom of the hole to the roof. This allows for final trimming at the plate line. For most farm structures, pole with 5- or 6-inch top diameter are suitable.

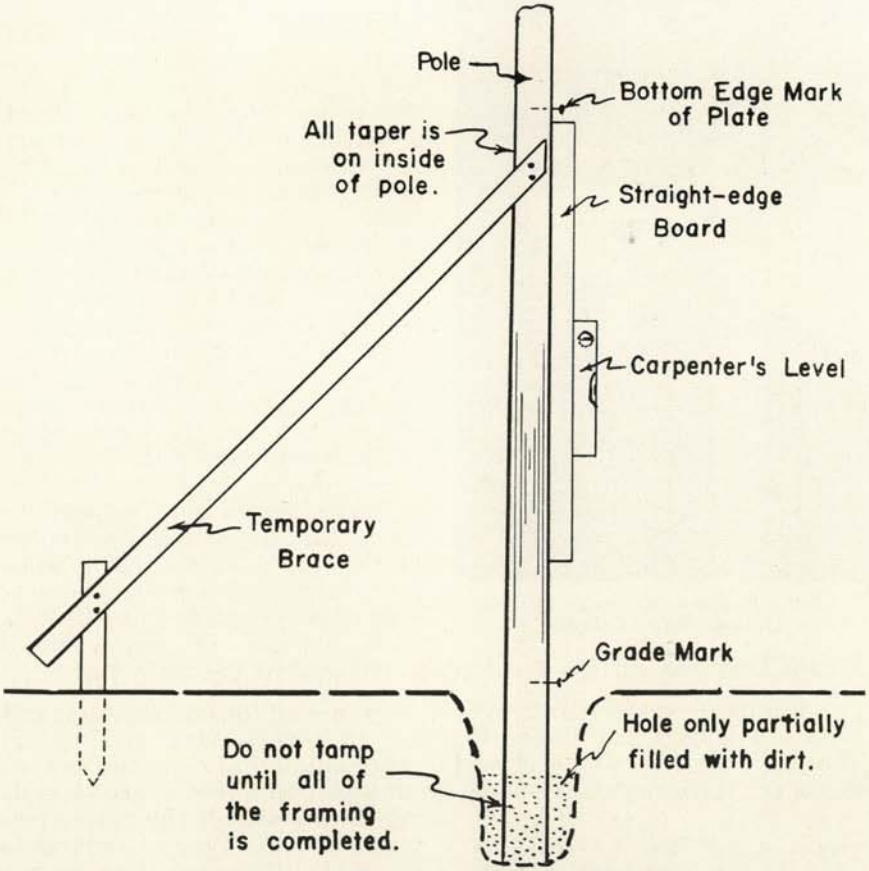



Figure 2. A Method of Aligning the Poles.

**Aligning Poles** Select the four straightest poles for the corners and carefully line them up on the outward side with the ground line as established in Figure 1. Put just enough dirt in the holes to hold the butt ends from shifting out of line. DO NOT TAMP AT THIS TIME.

Set the sidewall and endwall poles in place and line them up with the corner poles. Irregularities in sidewall poles must be taken care of as much as possible by rotating these poles so that any crookedness lies parallel to the siding. This will minimize distortion in the sidewall.

Poles are next aligned vertically on the outward side as shown in Figure 2. Braces from near the top of the poles to stakes hold the poles in place. Locate a grade-level mark on the outward side of each pole as shown in Figure 2. See that these marks are at the same level. Locate them by using a farm level or a carpenter's level and a straight edge. Check these grade marks to make sure they are all at the same elevation, then make them permanent with a nail or a level saw-cut.

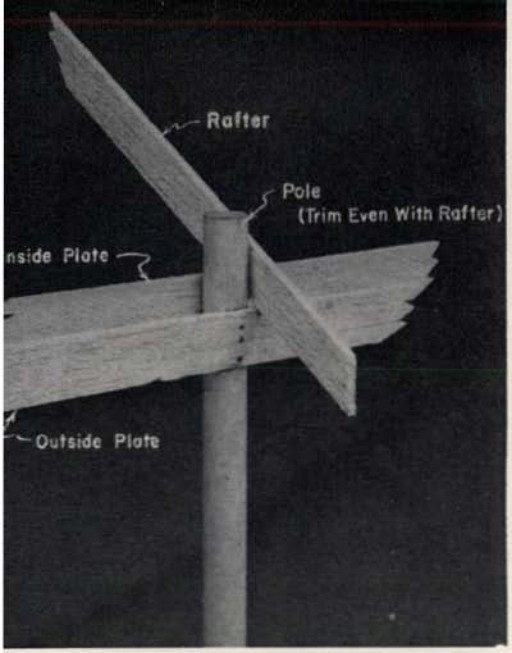


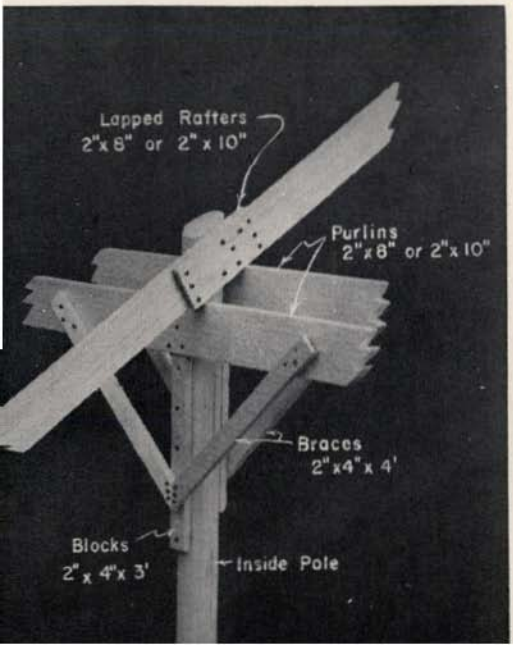

Figure 3. Framing Detail for the Outside Row of Poles.

**Framing** From the grade mark on each pole, measure up the required distance to locate the plate. Measure this height on each outside pole and drive a nail in each pole as a mark. The outside plate can then be set directly on the nails and spiked to the poles as shown in Figure 3. For stronger construction in windy and heavy snow areas, use bolts or notch the poles for the plates before nailing. To support rafters, the inside plate is placed higher than the outside one. (Figure 3.) Put the inside plate in place after the rafters are up.

Purlin plates are fastened to the poles supporting the center of the roof. These inside poles are spaced the same as the outside poles. Figures 4 and 5 show two methods of construction. Notice that the rafters are lapped and spiked to the poles.

Figure 6 shows construction at the roof peak. Rafters and girts are lapped and spiked together to save sawing and fitting. The pairs of rafters on each end of the building are cut and butted together. Rafters can be spaced from 2 feet to 6 feet apart depending on the size of the rafter material and the type of roofing to be used. When poles are spaced 12 to 15 feet apart, 2″ by 10″ rafters spaced 4 feet apart are satisfactory.

Figure 4. A Method of Framing for the Interior Poles Using Braces.




After the rafters are in place, the tops of the poles may be sawed off. The 2″ by 4″ girts are nailed on edge and spaced 2 feet apart when corrugated roofing is used. If 1-inch seating is used in place of 2″ by 4″ girts shown in Figure 6, the rafters are best spaced closer together.

**Siding** To hold the siding, 2″ by 6″ girts usually are nailed on the outside of the poles as shown in Figure 7. Vertical wood siding or metal roofing sheet is then nailed over the girts.

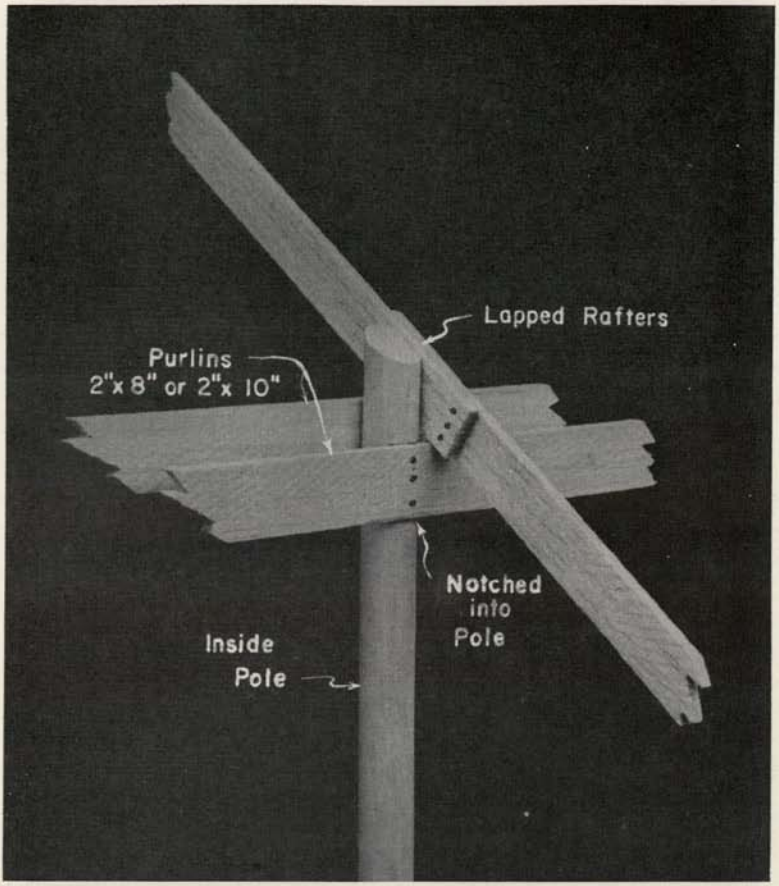



Figure 5. An Alternate Method of Framing the Interior Poles. Support for the Purlins is provided by notching the pole.

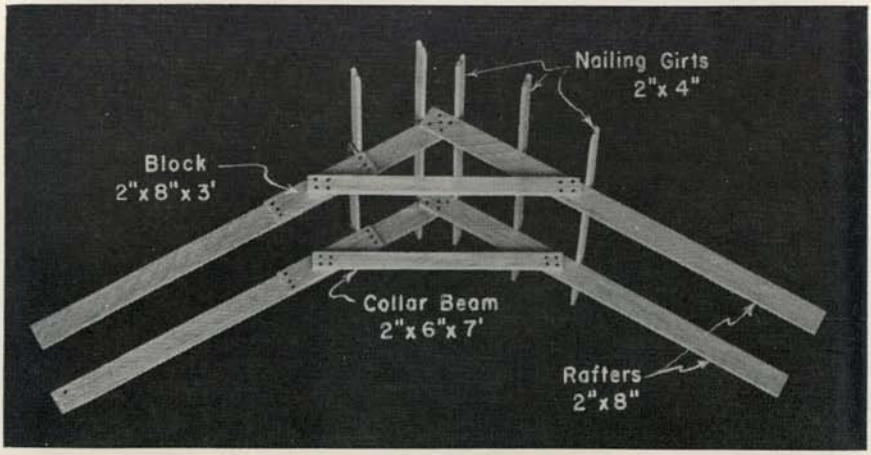



Figure 6. Ridge Framing Details.

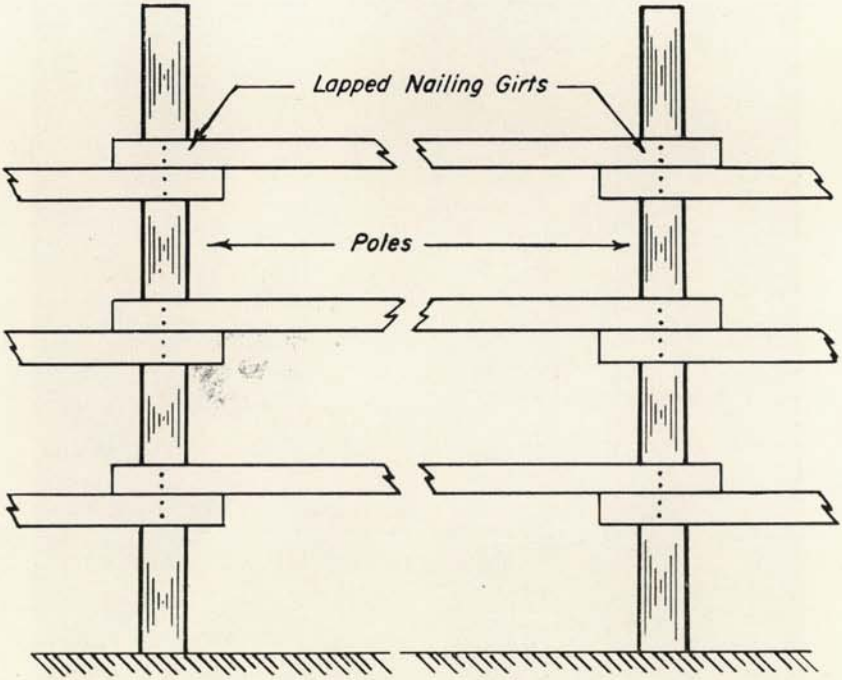
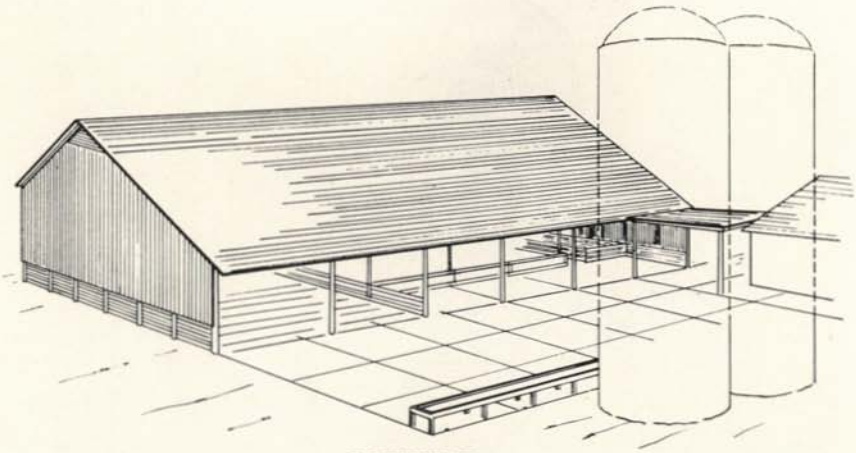



Figure 7. Side Framing Details Showing How Girts Are Lapped to Eliminate Sawing.

# Summary

When pole-frame buildings fail, they usually do so because of one or both of two reasons. Bottoms of the poles may rot off and allow the building to settle out of shape, or the lack of ample bearing area under the poles may cause uneven settling. This is always a possibility with pole-frame structures on clay, loam, or silt soils. Concrete footings beneath and around the pole butts are insurance against this trouble. Poles set in well drained sand usually do not need this extra precaution. Use poles not less than 8 inches in diameter at the butt. Larger poles give more bearing area and are less likely to allow uneven settling.

Rotting of poles at and below the ground line is not an unbeatable evil. Pressure treating makes it possible to extend the life of a pole to 30 or 40 years. Using untreated poles is inviting disaster at a saving of only a few cents per pole. USE ONLY WELL-TREATED POLES.

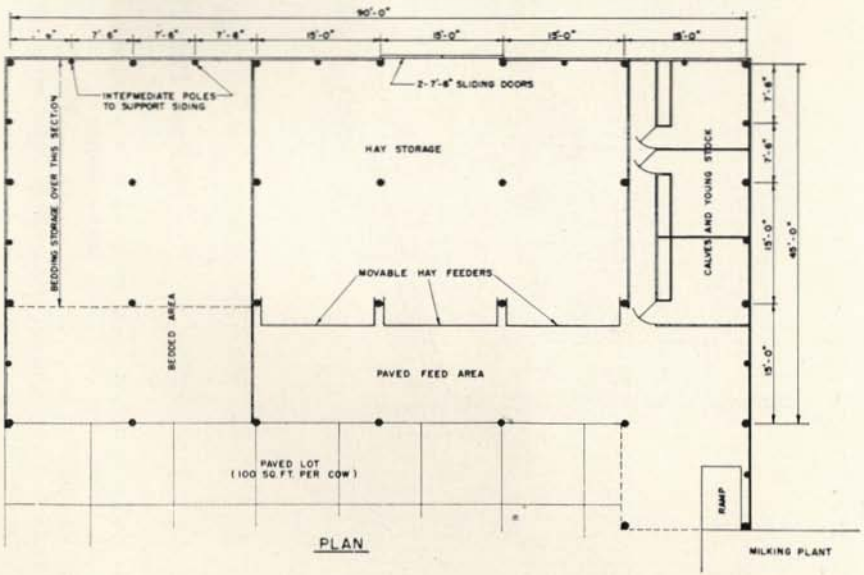


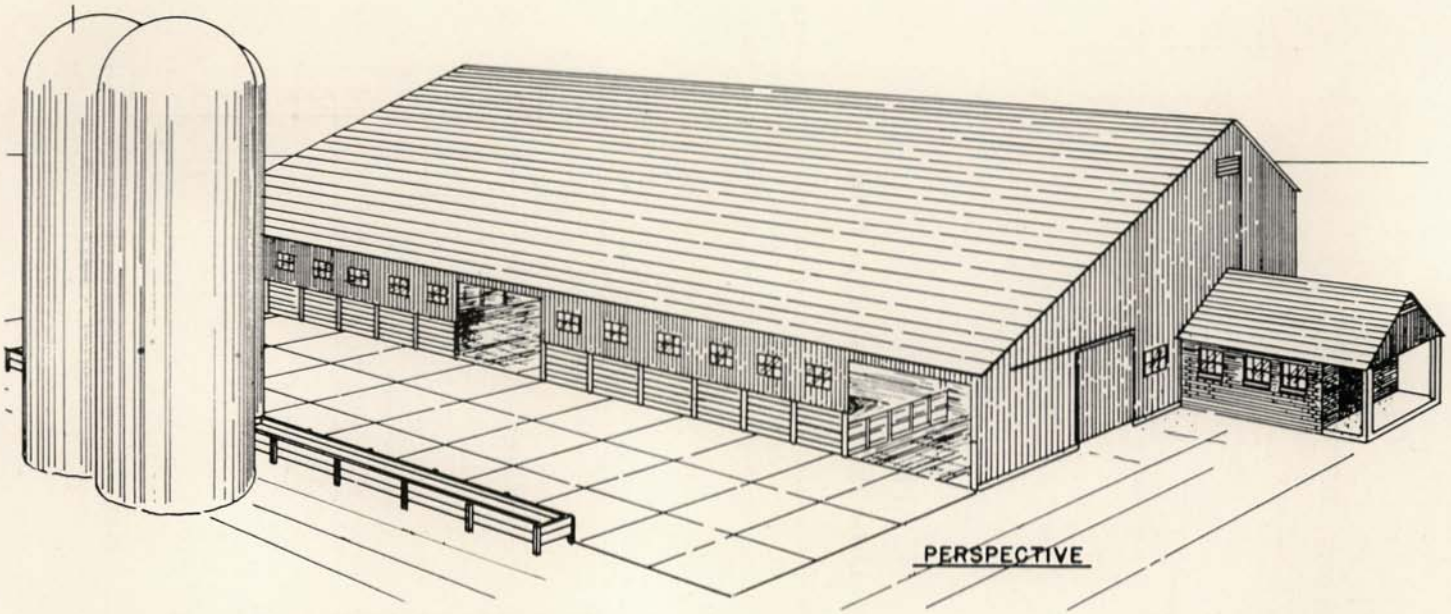
PERSPECTIVE

## APPENDIX I

### 45-Foot, Loose-Housing, Pole Type Barn

This is an open front combination hay-storage, loafing shed barn using pole-frame construction. If more detail plans are needed, order Plan No. 724-15 from the Agricultural Engineering Department, University of Idaho. Price $0.80 (3 sheets).

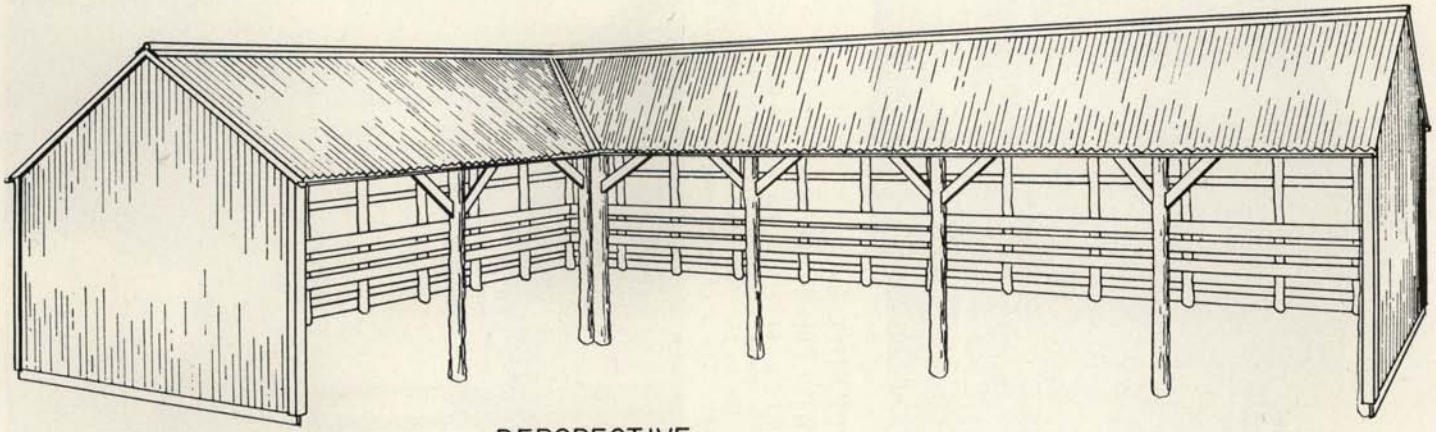





## APPENDIX II

### 60-Foot, Pole-Type, Loose Housing Barn

This typical dairy set-up is becoming quite popular in Idaho. It consists of a loafing shed-hay storage barn with the milking parlor-milk house attached. Many Idaho dairymen leave the entire front of the loafing area open. This barn is easily built and relatively inexpensive when the pole-frame method of construction is used. If more detailed plans are needed order Plan No. .724-16 from the Agricultural Engineering Department. Price: $0.60 (3 sheets).



PERSPECTIVE
NOT TO SCALE

## APPENDIX III

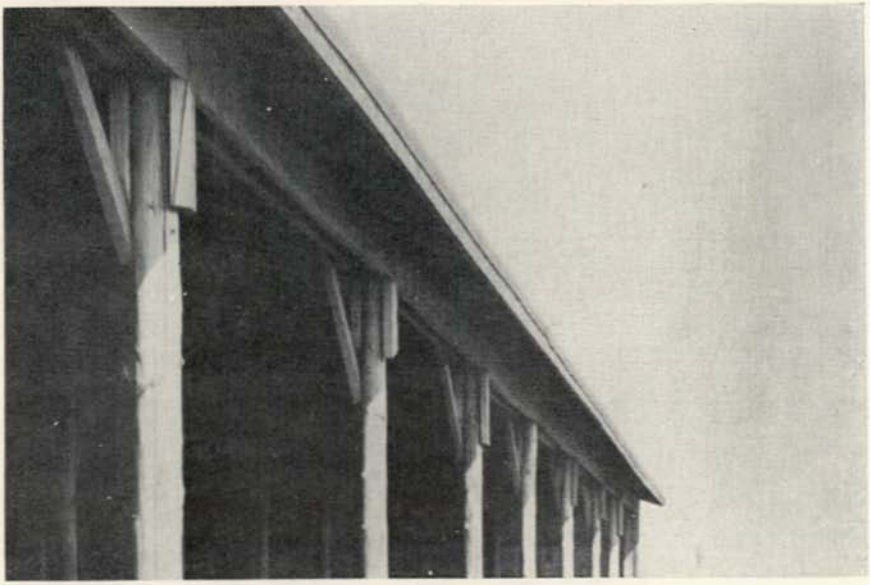
### Pole-Type Cattle Shed

This pole-frame, L-type loafing shed will provide good shelter for animals. It is flexible in regard to size and construction materials. You can easily change the design size and shape to fit your location and needs. Remember to build the front high enough to allow easy operation of the tractor manure-loader. Where the building is used extensively a concrete slab floor is desirable. If more detailed plans are needed order Plan No. .724-17 from the Agricultural Engineering Department. Price: $1.20 (4 sheets).

## APPENDIX IV

### Trench Silo With Pole-Frame Roof

This trench silo, built in 1948 on a ranch near Laclede in Bonner county, has plastered walls that are still in good condition. The owner says much of his success with trench silage is due to the fact that the shake-covered roof gave protection from rain and snow. The roof is supported by a pole frame.

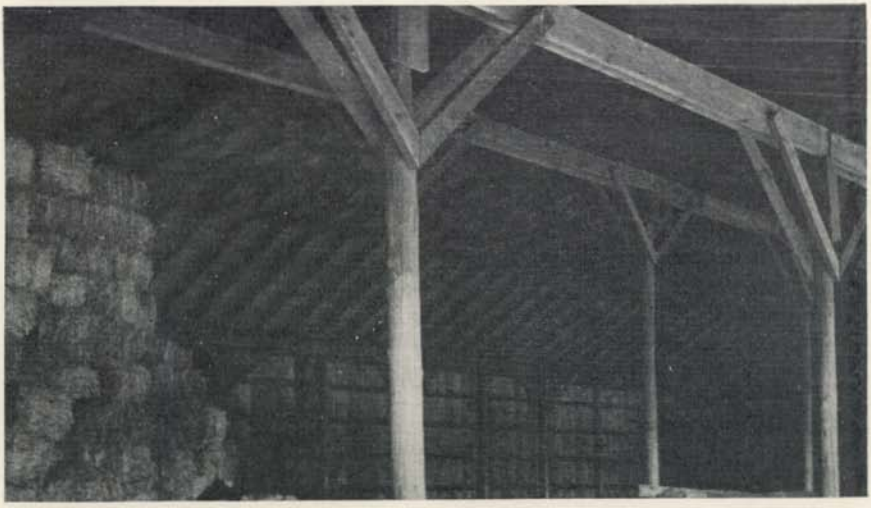


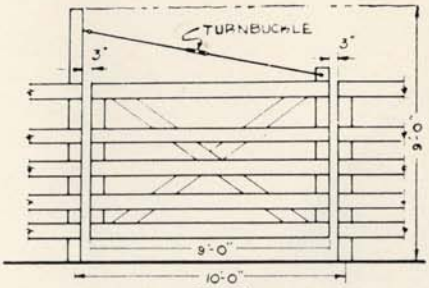
## APPENDIX V

### Pole Frame Barn

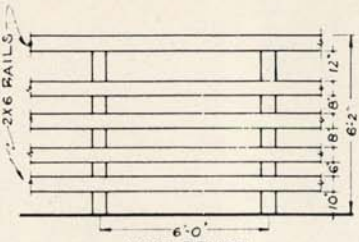
TOP—Details of eaves and the supporting structure of a pole-framed loafing shed. Construction of this kind will last for years under normal conditions.

BOTTOM—This loafing shed of pole construction provides hay storage, sheltered feed mangers, and protection to livestock when and if they want it.

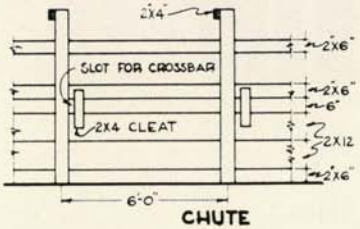




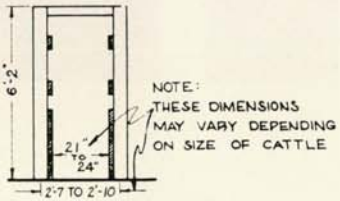

GATE



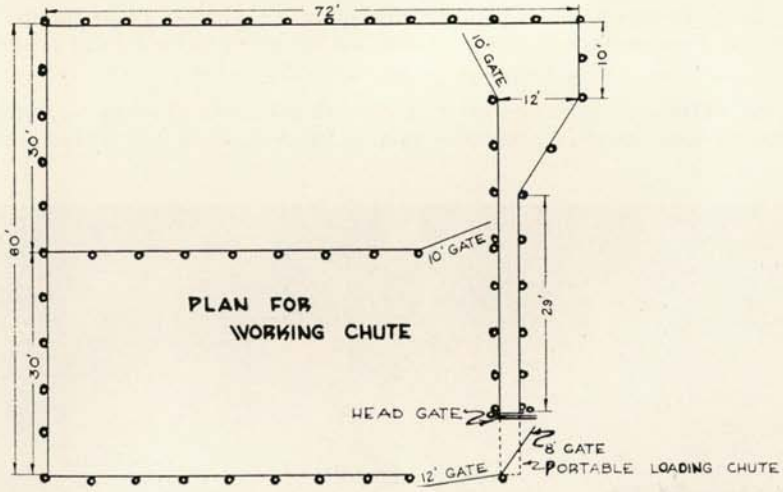

LINE FENCE




CHUTE



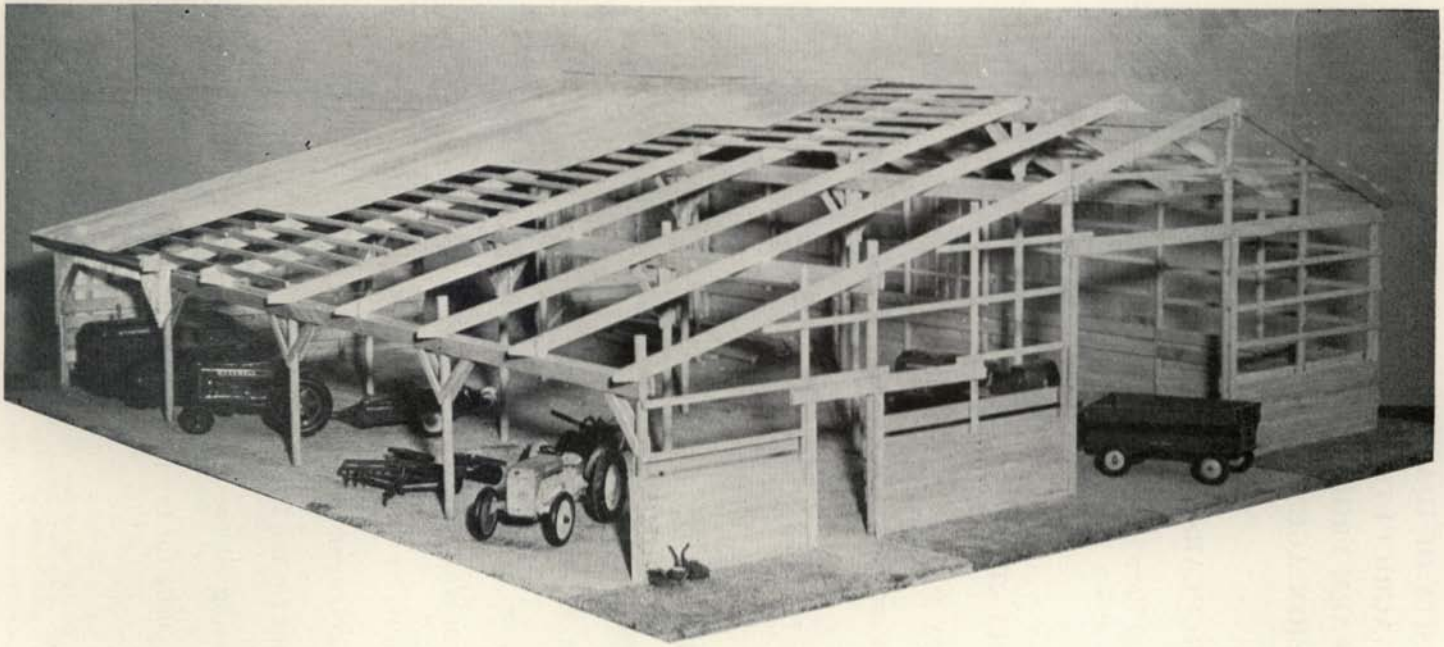

CROSS SECTION




## APPENDIX—VI

### Pole-Frame Corral and Chute

A suggested plan for a pole-frame corral and working chute to fit into a corner of the field. The pole-frame method of construction makes it strong, durable, and easily built.



## APPENDIX VII

### Utility Pole-Frame Building

This utility, pole-frame building model was made at the Agricultural Engineering farm structures shop, University of Idaho, to show construction details. The building is flexible in that it can be used as a machine storage shed, a loafing shed, or a crop storage shed. The design is similar to the plans shown in this bulletin.

**THESE UNIVERSITY OF IDAHO BULLETINS FROM THE DEPARTMENT OF AGRICULTURE ENGINEERING MAY HELP YOU SOLVE A FARM PROBLEM. YOUR COUNTY AGRICULTURAL EXTENSION AGENT HAS A COPY FOR YOU.**

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