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Building A POLE BARN

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POLE BARNS are here to stay. And, there are good reasons for their popularity.

Designed for Alabama farmers by the Agricultural Experiment Station of the Alabama Polytechnic Institute, the multipurpose pole barn has these chief advantages: (1) low in cost, (2) simple to construct, (3) long lasting, (4) rough cut lumber is used throughout, (5) no masonry footing or foundation is required, and (6) no diagonal bracing is needed.

The only major disadvantage is the difficulty in handling and raising the long, heavy poles.

The barn's structural frame is designed so that it can be adjusted for a variety of purposes. Variation in pole spacing can be used to advantage for machine storage and farm shop, permitting bays of varying width for different size machinery. The barn can be a cattle shelter; by using taller poles, it can be used for hay and feed storage. Another use is for a poultry house; the pole spacing can be varied for different widths and arrangements.

Buildings have been constructed from this plan at the Station's Plant Breeding Unit at Tallassee and experiment fields at Alexandria, Tuskegee, and Brewton. These structures have proved satisfactory during more than 2 years of tests. Approved by the Experiment Station, plans are now available (plan Number BP-6) from the API Extension Service.

Regardless of how good a design or plan is, a good job of construction is necessary for a satisfactory building. This is especially true in the case of pole barns. Pole type buildings will not be structurally sound unless proper construction methods are used. Presented in this leaflet are detailed instructions, based on the Experiment Station's design research, on each step in pole construction.

MATERIALS

The plan specifies certain types and sizes of materials to be used. It is unwise to substitute other sizes, grades, or types without checking the advisability of each substitution. If inferior

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materials are used, the building may be unsatisfactory.

Poles

The poles are the most critical material used in this type of construction. As the main supporting members, they supply rigidity and strength to the structural frame, and the lower ends of the poles serve as footing and foundation.

The poles are in direct contact with the soil. Therefore, they must be properly treated to prevent damage by wood-destroying fungi, bacteria, and termites and to assure a long building life. A quick dip or paint treatment is not satisfactory because the wood preserving chemicals do not penetrate deep enough into the pole to serve any practical purpose. For a pole life of 35 to 50 years, a pressure treatment with No. 1 creosote or a 5 per cent solution of pentachlorophenol to a retention of 8 pounds per cubic foot of wood is required. Such treated poles can be purchased from most building supply dealers and lumber yards.

Poles having a small end diameter of about 5 inches are needed. Smaller poles do not provide sufficient area for holding the nails that fasten the rafters to the poles. Larger poles are too heavy and difficult to handle. Length of the poles will depend on their location in the building. They must be about 2 feet longer than the distance from the bottom of the hole to the roof to allow for low places and slope. This extra pole length is cut off after the roof framing is in place.

Framing Members

Side wall nailing girths that come in contact with the ground require the same pressure treatment as the poles. All other framing members, both roof and side wall, can be rough cut, yard dried, No. 2 yellow pine or equal. Dressed lumber may be used but it is more costly, and when used as rafters and purlins, it has only 70 to 75 per cent of the strength of rough cut lumber.

The commercial grade of yellow pine known as No. 2 Common is recommended. Rafters and purlins containing knots that appear objectionable can be rotated so that the knots are on top. The strength of these framing members is not appreciably affected when knots are located in this position.

Roofing

Metal roofing is nailed directly to the roof purlins, which are spaced 24 inches from center to center. Metal roofing material that requires closer purlin spacing can be used if the purlins are spaced according to the requirements of the manufacturer. For nonrigid roofing, a solid wood deck is nailed to purlins.

Side Walls

Exterior siding, such as vertical rough cut boards and battens, exterior grade building boards, or metal siding may be used. These materials are nailed directly to the horizontal nailing girths, which are spaced from 24 to 42 inches from center to center depending upon the siding used. Any of these materials will prove satisfactory. They should be selected on the basis of cost, durability, and ease of application.

LOCATION of BUILDING

The building is made part of a good farmstead plan and oriented to give maximum protection from prevailing winds and rains. A level, well drained building site is selected and any necessary grading completed before construction is started.

Batter boards are next set in place about 3 feet beyond the proposed corners of the building and lines are strung between the batter boards to represent the outline of the structure. These lines can be squared by setting up a contractors transit over the corners or by measuring from one corner a dis-

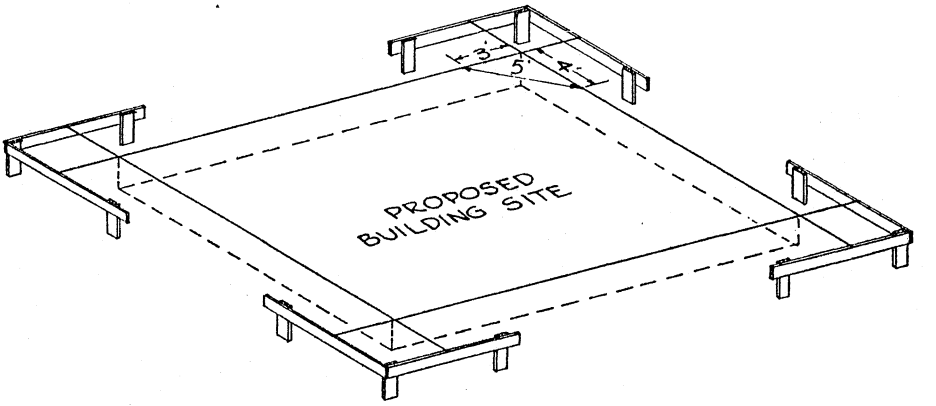

FIGURE 1. Lines outlining the building are strung between batter boards located about 3 feet beyond the proposed corners of the building. Corners are squared as shown in the diagram above.

tance of 3 feet along one line and 4 feet along the other, Figure 1. If the corner is square, the distance between these points will measure exactly 5 feet. If the distance between these points is not 5 feet, one string is moved until the correct measurement is obtained. This process is repeated on each adjacent corner until all four corners are square. One further check for squareness is then made by measuring the distance between the diagonal corners of the building. These distances will be equal if the corners are square. If the measurements are not the same, the foregoing process is repeated until the building outline is square.

Stakes are then driven into the ground to locate the center of each hole, Figure 2. The outside edge of each exterior wall pole should just touch the line forming the outline of

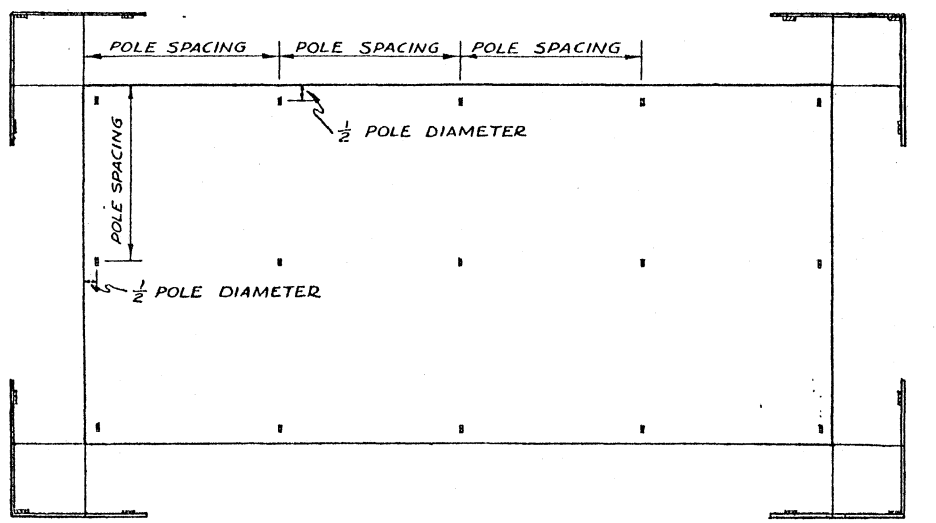

FIGURE 2. To locate the center of each hole, stakes are driven into the ground a distance of one-half the pole diameter from the line marking the side of building.

the building. To obtain this pole position, the center of the hole is positioned in from the line one-half the diameter of the pole. This point on the ground is found by dropping a plumb bob from the desired position on the guide line and measuring the required distance. At this point a short stake is driven into the ground to mark the center of the hole. The same procedure is used for locating the other stakes. Interior poles are located by stretching lines from a stake on one wall to the corresponding stake on the opposite wall and measuring in from the guide lines. When all of the stakes are driven, their positions are checked by sighting along each line of stakes to make certain no erroneous measurements were made. Special care in laying out pole positions will prevent having to redig holes and relocate poles.

STEPS *in* CONSTRUCTION

Holes

Depth of the holes depends on type of soil and height and weight of the building. The holes generally are dug 4 feet deep in soil of compact sand and gravel, shale, or dense sandy silt. If the soil type is sand, clay, silt, or muck, the holes are dug 5 feet deep for extra rigidity and strength. In either case the holes must be dug to undisturbed subsoil and all loose dirt removed from the bottom of the holes.

The diameter of the holes is dug 6 to 8 inches wider than the butt diameter of the poles. This allows room for raising and positioning of the pole, and for tamping the backfill soil. If the building is located on muck, clay, silt, or sand, the diameter of the holes must be increased and the hole backfilled with bank or stream-run gravel. If the soil is compact sand and gravel, shale, or dense sandy silt, it may be used as the backfill material.

To obtain straight building lines, the straightest poles are used at the corners and end walls of the building. The poles are placed butt down and positioned so that their straightest side just touches the lines that form the exterior edges of the building. The poles can be plumbed with either a builder's transit, a carpenter's level held against a straight edge, or a plumb bob. They are held temporarily in position with two diagonal braces, Figure 3, that have been fastened to stakes. The butt of the pole is secured by backfilling the hole with two 4-inch layers of soil, each layer uniformly spread and well tamped. The hole must not be completely backfilled until after the roof framing is in place so that minor alignments can be made.

The side wall and interior poles are placed and aligned next. To compensate for a lack of straightness, these poles are rotated in the holes so that the straightest surface faces the side of the building. The poles are then aligned with the corner and end wall poles, and the bottoms secured with two 4-inch layers of soil, each layer well tamped.

A level grade mark is made on each

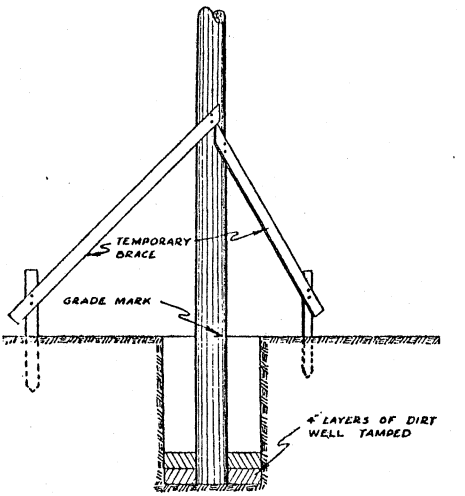

FIGURE 3. Poles are held temporarily in an upright position with diagonal braces fastened to stakes. Butt of the pole is secured by backfilling with two 4-inch layers of well tamped soil.

pole. It can be made with a string level or a farm level. From this line, the height of each rafter is marked on each pole. Rafters are then cut according to the plan and fastened into position. For greater strength, the rafters are fastened to the sides of the poles rather than on top of the poles.

Fastening the rafters is of utmost importance. The joint must support the downward force caused by the roof and snow load and the upward force caused by wind. To support these loads satisfactorily, the rafters must be firmly fastened to the poles with 40d nails or spikes.

After rafters are in place, the purlins are added. To prevent wind damage, the roof purlins must be securely anchored to the rafters. Framing anchors, shown in Figure 4, are a satisfactory fastening device. With this type of connection, the full strength of the roof framing can be utilized.

Purlins can be fastened in place by two men working on adjacent rafters, each starting at the eave and working to the ridge. Tops of the poles are cut off as purlins are fastened in position.

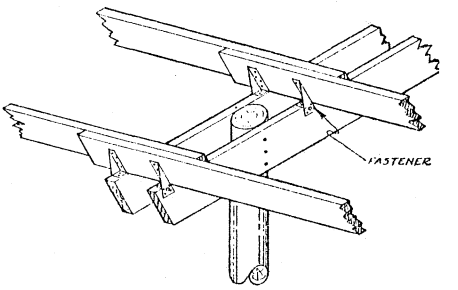

FIGURE 4. Fasteners shown above securely anchor roof purlins to rafters. Thus, full strength of the roof framing is utilized to prevent wind damage.

Backfilling the Holes

After enough purlins have been fastened in place to tie the rafters together, the holes are completely backfilled. The slightly moistened soil is evenly distributed around the pole in 4-inch layers. Each layer is thoroughly tamped before the next layer is added.

Finishing the Roof

After the remaining roof purlins are fastened in place, Figure 5, 2×6 nail-

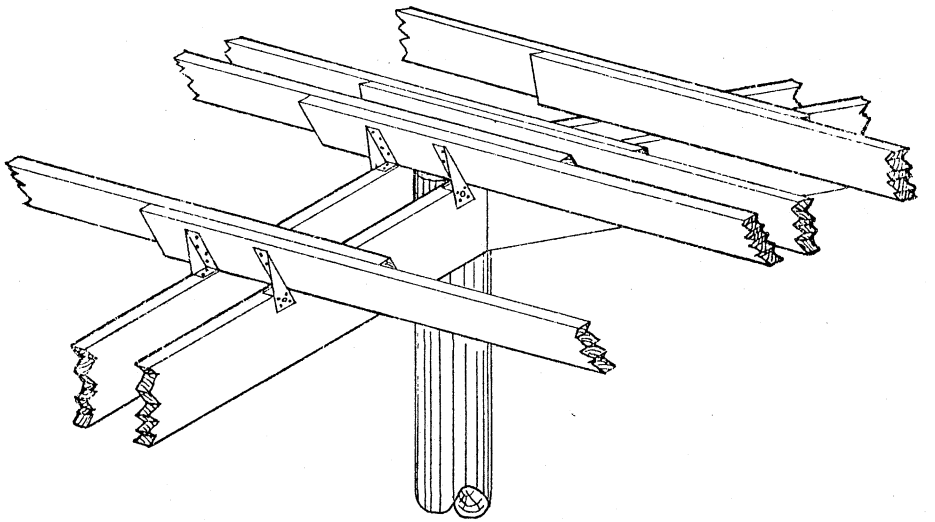

FIGURE 5. Two purlins are placed at the roof ridge with lower sides touching to provide nailing surface for end of roofing sheets and for ridge roll. A solid deck roof can be nailed to the purlins if non-rigid roofing material is to be used.

ers are fastened to the ends of the purlins on each gable end of the roof. The building is now ready for the sheets of metal roofing, which should be applied according to the manufacturer's specifications. If a roofing material requiring a solid roof deck is used, 1-inch tongue and groove boards or ⅜ inch exterior grade plywood is nailed directly to the purlins.

Siding

The side wall framing consists of 2×6 members nailed directly to the outside of the poles. Girths are nailed in a horizontal position, lapped at the poles, and spaced from 24 to 42 inches from center to center depending upon the siding material used. The girths that are placed in contact with the ground are pressure treated with wood preserving material. No untreated wood framing or siding material should be placed any closer than 8 inches from the ground. Metal siding, vertical rough cut board and battens, or exterior grade building boards can be nailed directly to the side wall girths.

Roof Pitch

The roof pitch can be varied without any major changes in the structural design. However, it should conform to the minimum pitch recommended by the roofing material manufacturer.

SUMMARY

Pole frame buildings are structurally sound, low in cost, easy to construct, and suitable for erection by farm labor using locally available building materials. Because of the importance of proper construction, care must be taken to follow the plan carefully. Competent advice should be sought before substituting building materials not specified on the plans.