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# Two-Tier Partially Enclosed Air-Cure Tobacco Barn

*George A. Duncan, Extension Agricultural Engineer*

## Introduction

With the rising costs, scarcity of materials, and greater construction requirements for regular tobacco barns, the concept of a lower cost but functionally sound tobacco curing facility with partial or no sidewall closure has been developed into a blueprint plan shown in Figure 1. The plan can be built and used now with partial sidewalls and enclosed more completely later if desired.

Curing observations in past years have shown that this type structure provides curing results comparable to a conventional barn with considerable savings in labor and cost. The two-tier housing is the most efficient for workers, especially with two workers side by side on two adjacent tiers with a third worker on the wagon handling sticks of tobacco (576 sticks per hour or 7.2 wrk-hrs per acre).

This type of facility could be helpful for expanding present housing capacity or replacing barns. Likewise, any regular barn could have siding and doors omitted initially to speed construction time, reduce cost, and offset material shortages.

## Design Features

### Two-Tier Height

The efficiency of the two-tier two-worker housing concept has gained considerable attention and popularity. The greater length necessary to house the same amount of tobacco compared with a three-tier or higher design is offset by closer tobacco spacing and reduced construction costs.

Several studies have shown that tobacco can be spaced much closer on the tier rails of well-ventilated facilities than is the normal practice in conventional barns. This potential for placing more tobacco onto two tiers with greater ventilation areas, combined with the two- and three-worker housing feature, improves the feasibility of the two-tier reduced-cost facility. Three workers provide the most labor efficient method for manual housing methods. Economic comparisons show the two-tier partially enclosed design can provide tobacco housing space at a lower cost per pound than any three- and four-tier fully enclosed plan.

### Sidewall Closure

Sidewall closure is provided to protect the untreated wood and tobacco from sun, rain, and wind, thus helping ensure a good quality cure. For permanent protection, either of the two types of partial sidewall closure shown in Figure 2 can be used. One method is a straight vertical wood or metal sidewall construction from the top plate down to the lower tips of the tobacco. This protects all untreated wood and the tobacco. The six-inch space between the rafters is left open for ventilation.

Another method of partial sidewall closure is to slope the sidewall out at the bottom approximately two feet (a mansard design) so as to give added protection to the lower tier from blowing rain and enable better air movement up through the tobacco.

### Future Total Enclosure

The versatility and potential for total enclosure of the barn have also been considered in the basic design.

For the straight sidewall option, the closure could be continued down to a pressure-treated curb board or concrete curbing between the poles. However, for adequate ventilation, sidewall ventilator doors would have to be built into the sidewall during this process. An alternative is to enclose the barn tightly and install high-volume fans in accordance with a two-tier forced-air design.

For the sloping sidewall option, the closure could be continued from the lower tier rail to a pressure-treated or concrete curbing. The horizontal opening left by the sloping sidewall (approximately two feet, as shown in Figure 2) would then become a protected natural ventilation opening for curing. This two-foot wide opening, with the six-inch opening at the eave, would total approximately 17% (2.5' x 14') for the sidewall opening, which is considerably less than the 33-50% traditionally recommended. Thus, tobacco would have to be spaced farther apart on the rails, or possibly the two tiers and narrow barn width might not require this same amount of sidewall ventilation and the above openings would be adequate.

The gable ends are covered from the roof to the lower tier in the standard design. This arrangement provides

clearance for most farm equipment. Full closure would require entrance doors to be added at the ends.

## ***Tier Rail and Barn Height***

The overhead clearance for the tier rail support beam is a minimum of ten feet. This is the minimum to allow low tractors and wagons to pull underneath the hanging tobacco. Also, trucks or two-wheel rail wagons can be used in the barn for unloading.

Raising the height to 12 feet would permit a third tier to be “swung” underneath for 50% more capacity or for the entire barn to be converted to the cable-hoist method. Temporary plastic siding could then be stretched and attached to the posts after two to three weeks of curing to protect the hanging tobacco.

The vertical spacing between tier rails is 5'-0" in order to eliminate (or minimize) overlap, thus allowing closer spacing of tobacco without seriously restricting air movement through and around the tobacco. The narrower horizontal distance between rails (46.5") makes it easier for a worker to stand and hang the tobacco on the taller tiers. The tier rails at the

outside walls are on the inside of the post to allow for ventilation space and easier standing and to reduce stick overhang on the next rail.

## ***Barn Width and Length***

Blueprint Plan 735-34 shows 14-foot driveways and 12-foot bents with 3 x 4 x 12-foot tier rails. Plan 735-34A shows 16-foot driveways and 14-foot bents with 4 x 4 tier rails and 12-foot clearance to permit a “slip-rail” or “swing-tier” underneath for a third tier of capacity. Plastic could be used to protect this low tier by stretching and nailing to the posts with a supplemental 2 x 4 x 12' placed between posts to help support the plastic.

## ***Barn Capacity***

Tables 1 and 2 show the range of barn capacity for various stick spacings. The closer spacings are applicable to smaller tobacco with the sidewall open. The wider spacings are applicable for larger tobacco with sides open.

Tobacco inspection during the curing period will indicate any spacing adjustments necessary to alleviate any trouble spots.

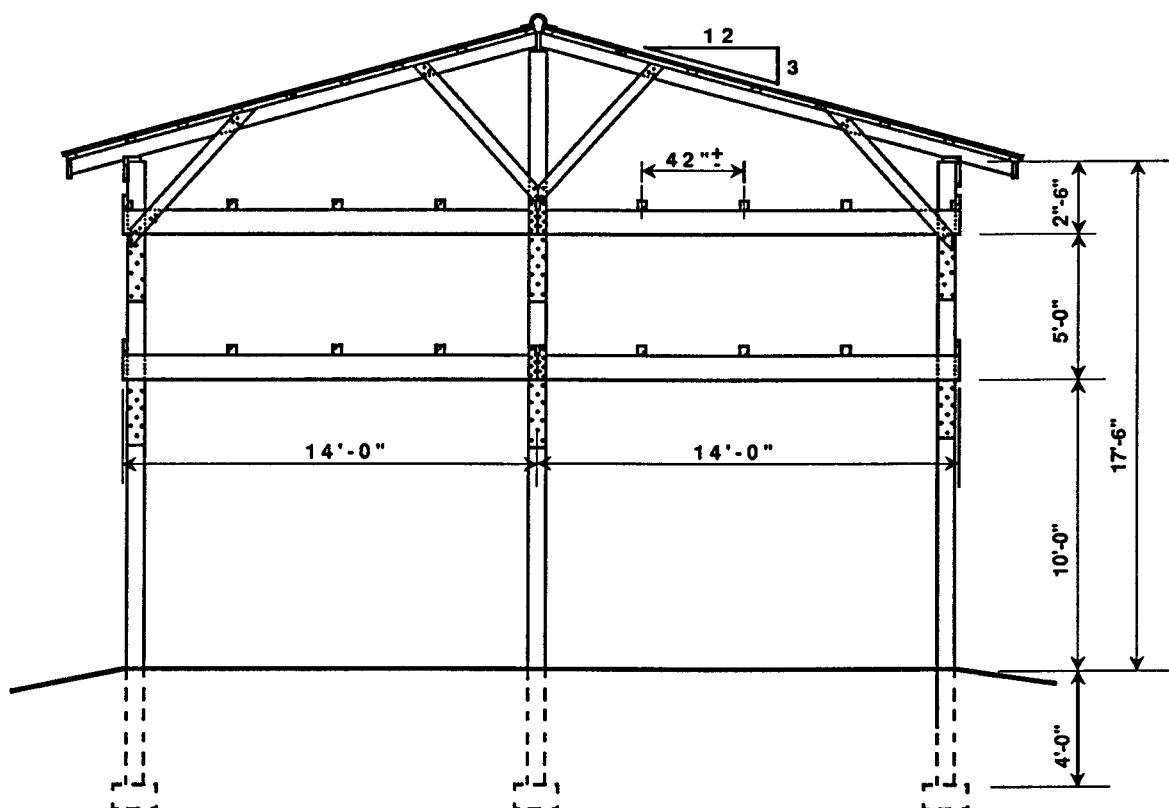


Figure 1. Cross section of 28-ft.-wide 2-tier partially enclosed air-cure tobacco barn (Plan 735-34)

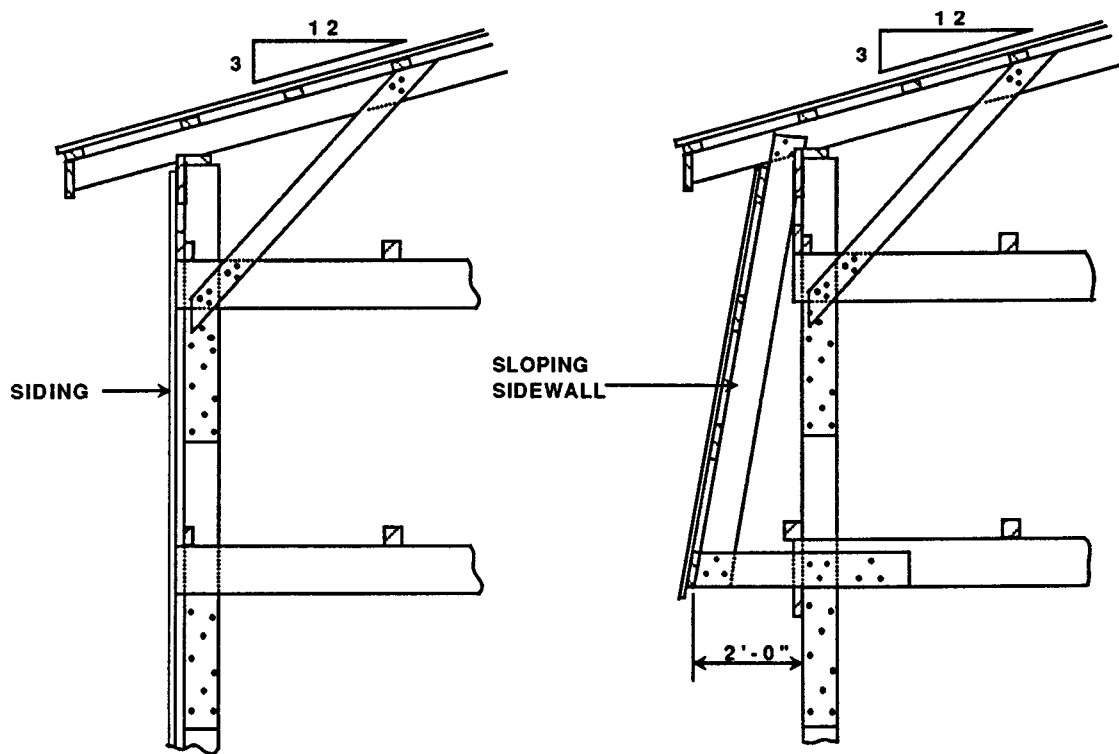


Figure 2. Details of two methods of partial sidewall closure

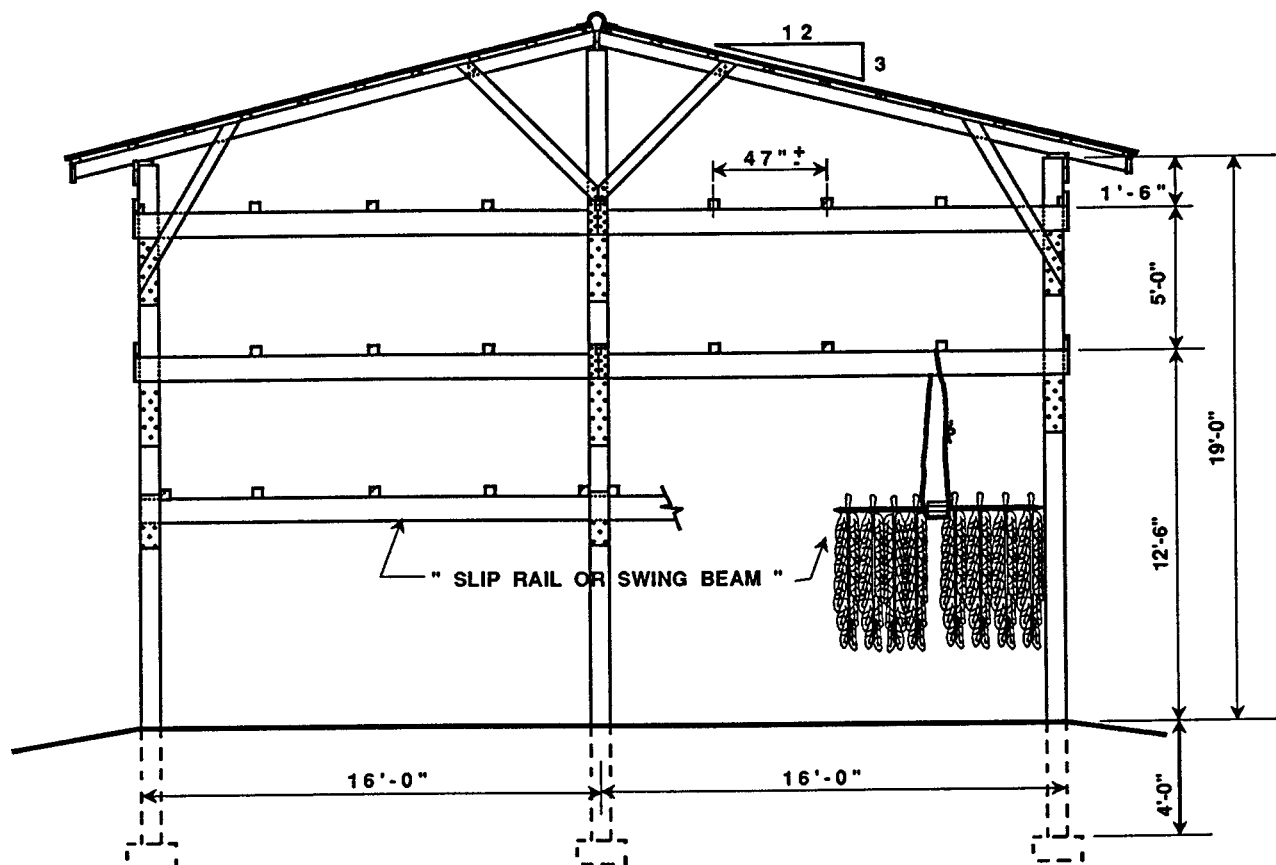


Figure 3. Cross section of 32-ft.-wide 2-tier partially enclosed air-cure tobacco barn with third rail (Plan 735-34A)

<b>Table 1. Approximate Barn Capacity per 12-foot Bent (28' Wide, 16-Tier Spaces per Bent)</b>				
STICK SPACING:  STICKS PER RAIL:		6 PLANTS/STICK		
		6"	5.5"	5"
		25	27	30
PLANTS/ 1 ACRE	STICKS/ 1 ACRE	ACRES PER 12-FOOT BENT		
8,000	1,333	.30	.33	.36
7,000	1,167	.34	.37	.41
		POUNDS QUOTA PER 12-FOOT BENT*		
8,000	1,333	750	810	900
7,000	1,167	857	925	1,028
		*Assuming 2,500 pounds yield for both plant populations.		

<b>Table 2. Approximate Barn Capacity per 14-foot Bent (32' Wide, 16-Tier Spaces per Bent)</b>				
STICK SPACING:  STICKS PER RAIL:		6 PLANTS/STICK		
		6"	5.5"	5"
		29	31	34
PLANTS/ 1 ACRE	STICKS/ 1 ACRE	ACRES PER 14-FOOT BENT		
8,000	1,333	.35	.37	.41
7,000	1,167	.40	.43	.47
		POUNDS QUOTA PER 14-FOOT BENT*		
8,000	1,333	870	930	1,020
7,000	1,167	994	1,062	1,165
		*Assuming 2,500 pounds yield for both plant populations.		

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