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High-Tensile Wire or Cable Tobacco Field Curing Structure

George A. Duncan
University of Kentucky, gduncan@uky.edu

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY • COLLEGE OF AGRICULTURE

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George Duncan, with review by Linus Walton and Larry Swetnam

Producers are rapidly adopting field curing structures, and several variations in construction methods and materials exist to achieve low cost or low maintenance and long life. One of the construction methods, pioneered by a producer and now being used by others in the state, uses high-tensile wire strands or cable to support the tobacco sticks.

Figure 1. High-tensile wire or cable tobacco field curing structure.

Low-Cost Method

The high-tensile wire construction is a low-cost way to support the tobacco in a reasonably secure manner so it can be covered (Figures 1, 2, 3). For the supporting posts, farm-cut posts are the least expensive material to use, but commercially prepared posts can still be price competitive. When constructing an extensive amount of this type of structure, a tractor-powered post driver is a labor-saver for installing the small line posts when compared to the time involved in digging and tamping posts.

Table 1 shows the number of strands of high-tensile wire or the tensile strength of commercial cable required for different post spacings. It also shows the strength required for the common middle wires or cable when the tobacco sticks are lapped (twice the load) and for the outside support when they support only one end of the stick load.

Figure 2. End-post bracing (side view).

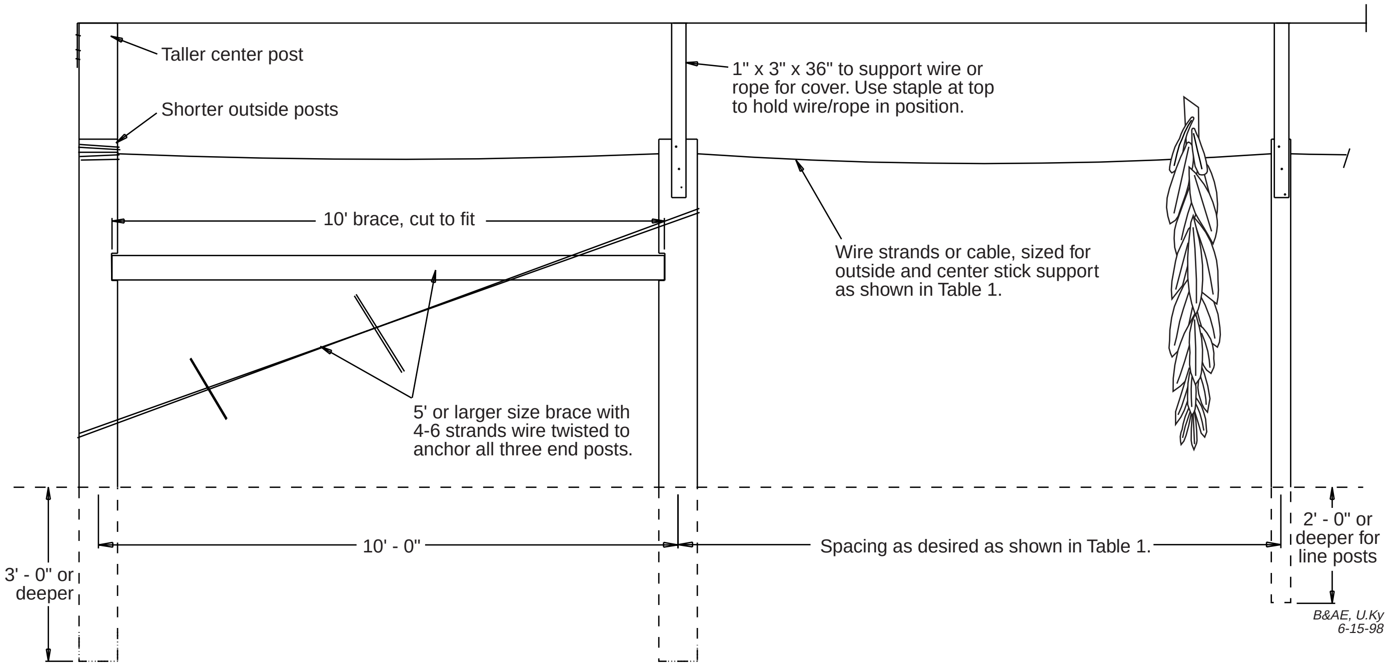


Table 1. High-tensile wire or cable requirements for hanging tobacco.*

Two-Sided, Double-Stick Loading (Middle Wires or Cable)

Post Spacing (Ft)	Sag (In)	Total Tobacco Load (Lb)	Total Wire Tension (Lb)	Number of Wires Needed
8	1	840	10,089	8
8	2	840	5,057	4
8	3	840	3,386	3
8	4	840	2,555	2
8	5	840	2,059	2
8	6	840	1,732	2
10	1	1,050	15,759	13
10	2	1,050	7,892	7
10	3	1,050	5,276	5
10	4	1,050	3,972	4
10	5	1,050	3,193	3
10	6	1,050	2,677	3
12	1	1,260	22,689	18
12	2	1,260	11,357	9
12	3	1,260	7,586	6
12	4	1,260	5,705	5
12	5	1,260	4,580	4
12	6	1,260	3,832	4
14	1	1,470	30,879	25
14	2	1,470	15,452	13
14	3	1,470	10,316	9
14	4	1,470	7,752	7
14	5	1,470	6,174	5
14	6	1,470	5,197	5

One-Sided, Single-Stick Loading (Outer Wires or Cable)

Post Spacing (Ft)	Sag (In)	Total Tobacco Load (Lb)	Total Wire Tension (Lb)	Number of Wires Needed
8	1	420	5,044	4
8	2	420	2,529	2
8	3	420	1,693	2
8	4	420	1,277	2
8	5	420	1,030	1
8	6	420	866	1
10	1	525	7,879	7
10	2	525	3,946	4
10	3	525	2,638	3
10	4	525	1,986	2
10	5	525	1,597	2
10	6	525	1,338	2
12	1	630	11,344	9
12	2	630	5,679	5
12	3	630	3,793	3
12	4	630	2,852	3
12	5	630	2,290	2
12	6	630	1,916	2
14	1	735	15,435	13
14	2	735	7,726	7
14	3	735	5,158	5
14	4	735	3,876	4
14	5	735	3,109	3
14	6	735	2,599	3

**Stick weight = 35 lb; stick spacing = 4 in; uniform load = 105 lb/ft; wire diameter = 0.095 in; wire lb/sq in (psi) = 180,000; breaking strength = 1,276 lb*

The tensile strength of cable must equal or exceed the wire tension values shown. For example, if 3 to 4 inches of sag is allowed, a post spacing of 10 ft requires 2 to 3 strands of high-tensile wire when supporting two stick ends. Calculations use the formula: $H=wL^2/8h$ where: H = horizontal component of tension, w = uniform load, lb/ft; L = span, ft; H = sag, ft; and: $T_{max} = H(1+16(h/L)^2)^{1/2}$ lb where T_{max} is the maximum tension on the wire. The maximum tension occurs at the supports, with the horizontal component defined as above, and the vertical component = wL/2, or 1/2 the total load. For normal 12.5 gauge high-tensile wire, the typical diameter is 0.095 inches and tensile strength is 180,000 psi.

Use Table 1 to determine the number of strands of wire or strength of cable for the post spacing you intend to use. The farther apart the line posts, the stronger the wire or cable required, which means more strands of wire or larger cable will be needed. Likewise, the more sag allowed, the less strength required in the wires or cable.

Providing Support

It is important to understand the difference in the inner and outer strand loads and to provide adequate strength for the middle support (Figure 4).

Tightness in the strands or cable is maintained primarily by the end posts (Figure 5). Use your best fence bracing techniques to anchor the wires or cable and prevent severe sagging or complete loss of tightness. Or, use commercial screw-in or expanding guy-wire anchors (Figures 6, 7).

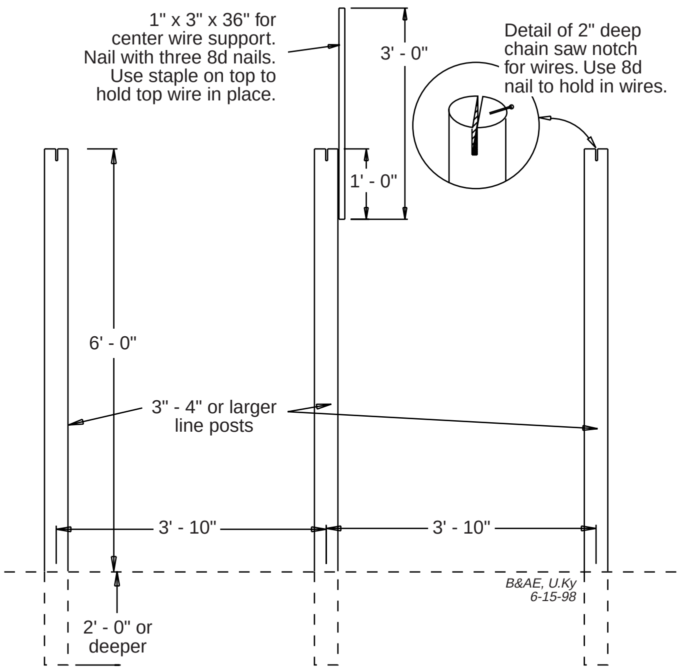
Special characteristics of high-tensile or cable structures for hanging and curing tobacco include:

- Sticks of wilted tobacco are supported at each end, just as on conventional tier rails. However, if the wires or cables sag excessively, any wind moving the sticks could cause them to slide down and bunch together, which would affect spacing and cure.

Figure 3: End-post bracing and plastic covering for high-tensile structure.

- After taking the tobacco from workers in an adjacent wagon or transport trailer, two workers at ground level pass the tobacco under the 6-foot-high wire or cable and then hang the sticks on the wire or cable. With heavy tobacco, short workers will have to reach high.

Figure 4. Line posts (end view).



- Tobacco tip leaves may be very close to the sod and vegetation, so the chance for damage from moisture is possible.
- Because a tractor mower cannot get between the posts, you may need a line trimmer, push lawnmower, or small lawn tractor mower to trim vegetation before you hang the tobacco.

Figure 5. End posts (end view).

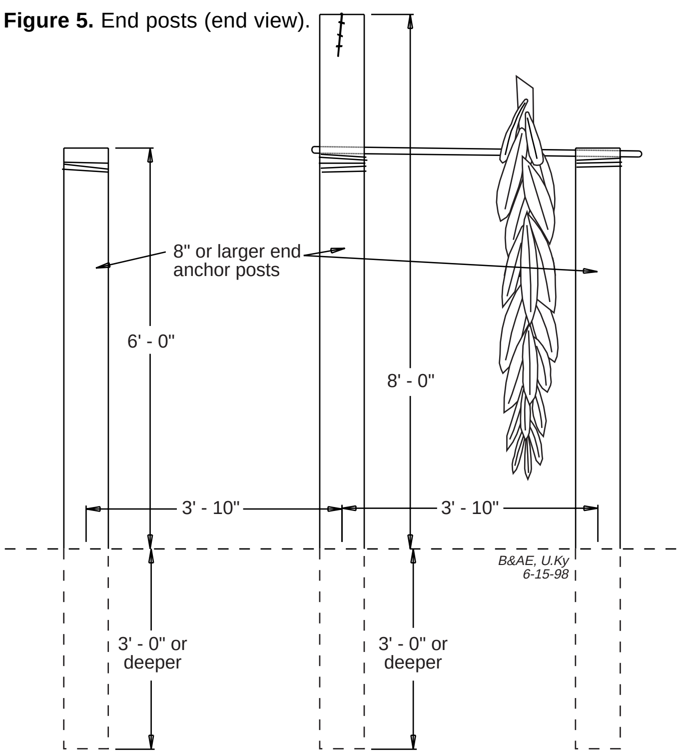
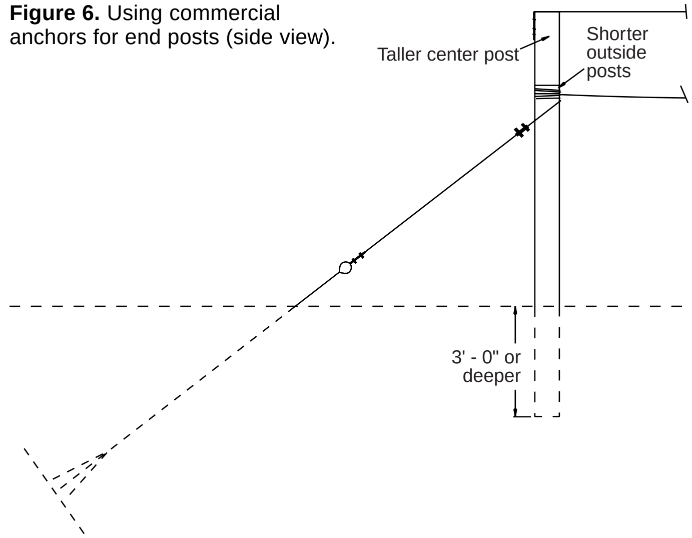


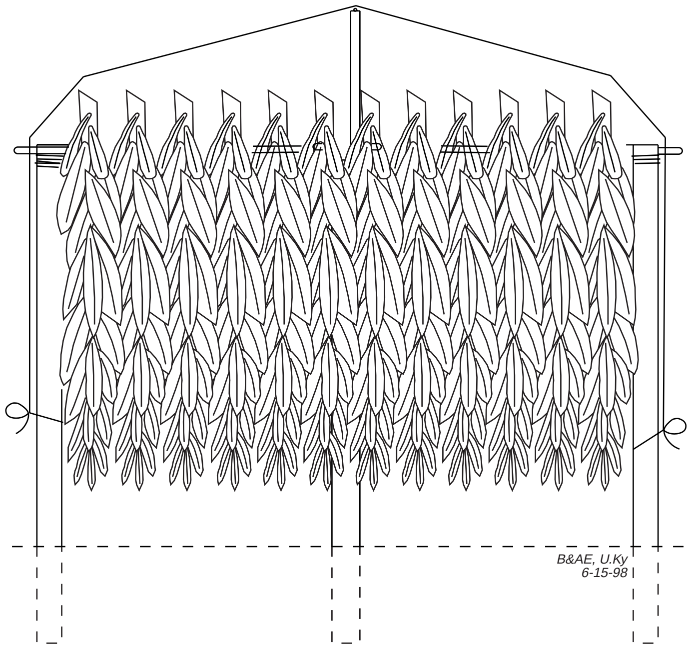
Figure 6. Using commercial anchors for end posts (side view).



- You should start hanging tobacco on the wires or cables with some tobacco placed at each end and at the center of a structure that should be approximately 100 to 200 feet in length. Experienced users of this method suggest working from the ends toward the center to even up the sag.
- If you want to protect the sides of the tobacco with plastic, you will have to tie the plastic down and under the tobacco, just as with the post-row structure (Figure 8). Use your best techniques for tying baler twine to keep plastic over this type of structure. This tying method will help hold the plastic in blowing wind and rain. When the tobacco needs to be ventilated, fold the plastic and raise it up under the ends of the sticks to create an opening.

Figure 7: Anchoring for cable tobacco field curing structure.

Figure 8. Covering with 6-mil black plastic (end view).



Use 14-ft wide roll to cover part of tobacco, 18- to 20-ft wide roll to cover all tobacco sides. Push plastic over stick end at 2- to 3-ft intervals. Use baler twine from post over top to other post to tie plastic down and twine from a post diagonally over top to a next post for more secure anchoring of plastic. Crisscross diagonal twines if maximum hold-down is desired.

Hanging Tobacco, Managing the Cure

Guidelines for hanging the tobacco and managing the cure in this type of structure are much the same as those for the low cost, post-row tobacco curing structure described in Cooperative Extension Service publication ID-116, *Low Cost Post-Row Field Tobacco Curing Framework.*

Specific instructions for spacing the tobacco, covering it, etc., are given in that publication, and it should be reviewed if you are not familiar with outside curing procedures. A commonly expressed viewpoint is "Just push the wilted tobacco as tight as you can, and it will cure fine!" Using such a method may get you by in some situations, but curing evaluation results over many seasons indicate using this approach is pushing your luck a little too far unless you have small, wilted tobacco in a very dry curing environment.

Year after year, a spacing of around 3.5 to 4.5 inches per stick seems to give better ventilation and curing.

The capacity of a curing structure for various stick spacings is shown in Tables 2 and 3.

The 4.5-inch spacing should be used for large, barely wilted tobacco with potential yields of more than 3,000 pounds per acre. The 3.5-inch and any closer spacings should be used *only* for smaller, well-wilted tobacco that may yield less than 2,500 pounds per acre. With any spacing, weather conditions and management of the plastic covering during the cure greatly affect cure quality.

References

Norris, Charles Head, and John Benson Wilbur, *Elementary Structural Analysis*, 2nd ed. (New York: McGraw-Hill Book Co., 1960), pp. 278-280.

Data for Table 1 provided by Larry Turner, Extension Agricultural Engineer, Biosystems and Agricultural Engineering, College of Agriculture, University of Kentucky.

Table 2. Sticks per 14-ft of length, two rails wide.

Spacing (In)	Number
4.5	74
4.0	84
3.5	96

Notes: *The 14-ft length is comparable with other lengths of field curing structure. Post spacings for the high-tensile wire would work at about 10 ft for both strength and minimum sag between posts. (See Table 3.) That spacing would require 4 to 5 strands of high-tensile wire when supporting two stick ends if 3 to 4 inches of sag were allowed. See Table 1.*

Table 3. Capacity of 96-ft framework.

Stick Spacing (In)	Sticks	Acreage
4.5	256	.36
4.0	288	.41
3.5	329	.46

Notes: *The 96-ft length is a convenient length that permits a 100-ft roll of plastic to cover the framework. Acreage capacity is based on about 7,100 plants/ac (40 in x 22 in with 97% stand) and 6 plants/stick.*

Acknowledgement

Early work and cooperation by Mark Mahan of Fayette County, assisted by Maner Ferguson, county Extension agent, was provided on the high-tensile wire field curing structure shown in Figure 3, and by Arnold Goode of Casey County, assisted by Tommy Yankey, county Extension agent, on the cable field curing structure shown in Figure 7.