

## Portable Flag Poles

The following plan is for a set of three portable flagpoles of up to 29' tall, each of which telescopes into one ten-foot section that two of even the smallest Scouts can easily carry. With the addition of a moderately small box to contain the tackle, it becomes a system that is relatively simple to store, transport, and set up. My unit (Troop 575, Chaparral District, South Plains Council, Lubbock, Texas) has successfully used such a set for several years, and while we typically use all three poles--one each for the U.S., Texas, and troop flags--the design of the system is flexible, allowing the use of just one or two of the poles.

All of the materials required for this plan (see the parts list) should be readily available for purchase at virtually any full-line home improvement center such as Lowe's, Home Depot, Builder's Square, Payless Cashways, or the like. However, one could probably get at least some of the materials donated.

### Overview

Each pole consists of three ten-foot sections of electrical metal tubing (EMT): a lower section with an inside diameter (i.d.) of 1", a center section with an i.d. of 1", and an upper section with an i.d. of 1". For storing and transporting, the sections nest together--the upper section inside the center section inside the lower section--held together by one of the two wire-lock pins that are used to pin the sections together when set up. A 1" floor flange slides down over the upper section and rests atop the center section, with the four holes in the rim of the flange providing the necessary attachment points for four guy-ropes. The assembled pole sits atop a base plate to prevent the pole from sinking into the ground. The halyard is attached to the top of the upper section with an eye bolt, quick-link, and pulley arrangement, while a rope cleat clamped to the bottom section provides a tie-off point for the bottom of the halyard.

### Flag Arrangement Options

There are several possible flag arrangements using all three poles. The first arrangement is a symmetrical one with the U.S. flag in the center on a 29'-tall pole, flanked on either side by shorter poles flying the state and unit flags. Assuming a standard flag size of 3' x 5', a height of 26' is recommended for the two shorter poles. This will place the tops of the state and unit flags at the same height as the bottom edge of the U.S. flag. One could make the shorter poles 27' tall, placing the tops of the state and unit flags even with the middle of the U.S. flag. However, given the relative size of the entire set-up, this smaller difference in flag height is almost indiscernible, particularly to someone standing near the base of the poles.

A second option is to use poles of three different heights: the U.S. flag on a 29' pole, the state flag on a 26' pole, and the unit flag on a 23' pole. Again, although one could use an 18" difference in pole height rather than 36" (27' and 26' instead of 26' and 23', respectively), the greater difference is more obvious. In this arrangement, either the U.S. flag or the state flag should occupy the center position.

Consider making each pole adjustable to all heights needed for the selected arrangement. Doing so makes it unnecessary to keep track of which pole is which when preparing to raise them. However, it does require the drilling of more than one hole in the lower end of each upper section. Alternatively, mark the lower section of each pole with either an engraving tool or a ring of some unique color around one end (Marks-a-Lot® works well for this purpose) as an indication of how tall it will be when fully extended.

A third alternative--having all poles of equal height--requires drilling the fewest number of holes to make the poles interchangeable, but this is not really an appropriate arrangement for displaying the U.S. flag with that of any state except Texas. In general, the U.S. flag should be flown higher than state, community, or organizational flags. However, "When the Texas Flag and the Flag of the United States of America are displayed at the same time, they should be flown on separate flagpoles of equal length, and the Flags should be approximately the same size."<sup>1</sup>

## Construction

Construction of this pole set is relatively simple. The only tool required is a drill with a 5/16" bit, although a drill press would be helpful.

## POLES

Repeat the following steps for each pole to be constructed. NOTE: As used below, the phrase "drill a hole" means to drill through both walls of the EMT section, perpendicular to the length of the section, so that there are really two holes 180° apart around the circumference of the section. For the center and upper sections where more than one hole is required, drill all holes along the same longitudinal axis of the section. The holes should be 5/16" in diameter, to accommodate a 1/4" pin.

### Step 1: Upper (1" i.d.) section

#### A: Top end:

Drill a hole at a point centered 1" from one end of the upper section. This becomes the top end of the upper section when the pole is assembled and raised.

#### B. Bottom end:

Under this plan, all adjustment is built into the bottom end of the upper section of each pole. This is necessary in order to keep the guy-line attachment points between poles at the same level regardless of overall pole height.

1. For a 29' pole, drill a hole at a point centered 5" from the bottom end of the upper section.

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<sup>1</sup>General Laws of Texas, Forty-Third Legislature, Regular Session, 1933, Chapter 87, Page 189, quoted in "The Texas Flag: Rules Governing the Use of the Texas Flag", a pamphlet published by the Adjutant General's Department of the State of Texas. Texas holds the singular distinction of having been a recognized sovereign nation prior to becoming a state. Under the terms by which Texas joined the Union, its Lone Star flag--symbol of the Republic of Texas from 1839 to 1845 and of the State of Texas since that time--retains its status as the symbol of a nation, with the right to be flown at the same height as that of the United States.

2. For a 27' pole, drill a hole at a point centered 23" from the bottom end of the upper section.
3. For a 26' pole, drill a hole at a point centered 41" from the bottom end of the upper section.
4. For a 23' pole, drill a hole at a point centered 77" from the bottom end of the upper section.

Step 2: Center (1" i.d.) section

A: Top end:

At a point centered 1" from one end of the center section, drill a hole. This becomes the top end of the center section when the pole is raised.

B: Bottom end:

At a point centered 5" from the opposite end of the center section, drill a hole.

Step 3: Lower (1" i.d.) section

At a point centered 1" from one end of the lower section, drill a hole. This becomes the top end of the lower section when the pole is raised, and is the only hole needed in the lower section of the pole.

Step 4: Using an indelible felt-tipped marker (such as a Marks-a-Lot<sup>®</sup> or a Sharpie<sup>®</sup>) or an engraving tool, mark or engrave a point 4' from the bottom of the lower section, in line with the hole at the other end. Then turn the section over and do the same thing on the other side (you only need one such point, but having one on either side of the pole makes it more convenient when assembling the poles). These marks indicate the position at which to center the rope cleat when assembling the poles in the field, and need to be aligned with the holes so that the halyard will hang straight down the length of the pole. While centering the cleat only 4' above the base of the pole may seem a bit low, bear in mind that it is probably about right for the more "vertically challenged" Scouts.

Step 5: Assemble the poles, mating one of the holes created in step 1B with the hole created in step 2A, and the hole created in step 2B with the hole created in 3A. Pin the sections together using a wire-lock pin at each joint. As an aid to re-assembling the poles in the field, draw or engrave a ring around the circumference of the smaller section at each joint, just at the point where it enters the larger section. Then, beginning at a point on the larger section approximately 1" below its rim and in line with the pin, draw or engrave a short, straight line at right angles to the ring, continuing across the rim and for approximately 1" beyond onto the smaller section. Turn the pole over and make a similar mark on the back side, in line with the other end of the pin. These marks provide visual

references for realigning the pin holes: from its nested position inside the larger section, slide the smaller section out until the ring around it becomes visible, then twist it until the perpendicular marks are aligned.

Step 6: Remove the pins and telescope the upper section into the center section, then the center section into the lower section. Line up the holes located 1" from the top of each section and insert one of the wire-lock pins. The poles are now ready to be stored or transported.

## GUY-ROPES

The size and type of rope used for the guy-ropes is a matter of choice. For this application, the primary considerations should be strength, the ability to take and hold a tight splice permanently, and a high degree of resistance to stretching. Twisted natural-fiber materials such as manila take and hold splices well. However, they are somewhat stretchy and will rot if stored wet. Some of the synthetics stretch less and are more rot-resistant, but do not generally splice well. One factor in favor of synthetics is the fact that they can be found in bright colors, so there is less need to tie flagging tape to the guy-ropes to reduce the risk that little Tommy Tenderfoot (or, for that matter, Sam Scoutmaster) will clothesline himself!

The three-pole setup requires two pole-to-pole guy-ropes and eight pole-to-ground guy-ropes. The two-pole setup requires one pole-to-pole guy-rope and six pole-to-ground guy-ropes, while the single-pole setup requires only four pole-to-ground guy-ropes.

Each pole-to-pole guy-rope has a swivel trigger snap attached to each end. The overall finished length should be 9'9" from the eye of the snap at one end to the eye of the snap at the other.<sup>2</sup>

Each pole-to-ground guy-rope has a swivel trigger snap in one end, with the other end secured in a manner that prevents it from unraveling.<sup>3</sup> The overall finished length should be approximately 32'.<sup>4</sup>

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<sup>2</sup>This length will result in the poles centered on approximately 10' spacing. For different spacing, finish the pole-to-pole guy-ropes to a length of 3" less than the desired distance. One may elect to construct sets of several lengths, in which case additional swivel trigger snaps beyond the quantities listed in the parts list are needed (4 more for a three-pole set, 2 more for a two-pole set).

<sup>3</sup>If using a natural-fiber material such as manila, the swivel trigger snap should be attached using an eye-splice, with the other end back-spliced. Use of synthetic cordage may dictate another means of attaching the hardware and/or preventing unraveling. The pamphlet, "Knots and How to Tie Them" (B.S.A. publications no. 33170) contains instructions for all knots and splices mentioned herein.

<sup>4</sup>In order to provide the most stable structure with the least amount of material, the guy-rope should go from the ground to the pole at an angle of 45°. To achieve this optimum angle, the distance from the base of the pole to the guy-rope stake should be equal to the distance from the base of the pole to the guy-rope attachment point (the 1" floor flange) at the top of the center section of the pole. If the guy-rope stake is closer to the pole than this distance, the structure will be less stable than it would otherwise be; if the stake is further away, it takes more rope to reach it without any significant gain in stability. This distance--from the base of the pole to the top of the center section--is 19' (234"); therefore, the distance from the base of the pole to the guy-rope stake should also be 19'. The Pythagorean theorem ("the square of the hypotenuse is equal to the sum of the squares of the other two sides")

After creating the guy-ropes, permanently mark each pole-to-ground guy-rope at a point 19'6" from the eye of the trigger clip, using either an indelible marker or a tight whipping of string in a color that contrasts with the rope. This provides a built-in measurement of how far from the base of the pole to place the stakes (refer to "Assembling and Erecting the Pole Set" below).

## GUY STAKES

Because of the height of these poles, the guy-ropes supporting them must be firmly anchored; therefore, scrimping on the stakes used for this purpose is not advisable, and something on the order of 2' lengths of  $\frac{1}{2}$ " re-bar is recommended. To create an eye through which to run the guy-rope, bend the top of the stake into a 1" triangle and spot-weld the end back to the side of the stake. This not only prevents the rope from slipping off the top of the stake; it also reduces the potential for injury that exists if the rough end of the stake is left exposed. Spot-welding the end of the eye back to the side of the stake should make it strong enough to endure the punishment inflicted as the stake is driven into the ground.

## BASE PLATES

In order to prevent the poles from sinking into soft ground, it is advisable to provide some sort of base plate to support the pole. A piece of steel plate with a hole drilled in the center, through which a stake is driven, will work nicely--as will the wheels scavenged off an old, worn-out lawnmower or little red wagon. Wood plates work, too, but rain and ground moisture will do them in much more rapidly. While the shape of the base plate is really immaterial, a round plate may be preferable for aesthetic purposes (round pole, round base). Size is not too critical, although anything less than about 3" across might tend to bury up in really soft conditions, while anything over 6" would most likely be overkill. If using steel plate, thickness should probably not be less than  $\frac{1}{2}$ ", and more than  $\frac{1}{2}$ " would be unnecessarily heavy.

As for the length of stakes to use for the base plate, experience has shown that, while it really doesn't matter once the poles are up, short stakes can create problems by ripping out of the ground during the process of raising the poles. Therefore, stakes of at least 1' in length are recommended, and 18" probably would not be too long in most instances. Welding the stake and base plate together is not recommended because 1) it requires more work than is necessary, 2) it makes a piece that is harder to find space for in a box, and 3) it makes it harder to replace a bent or broken stake.

## HALYARDS

Each halyard consists of a length of rope which, after being passed through a pulley, is either spliced or tied together into a continuous loop. The type of rope used should be soft, flexible, and--most important--resistant to kinking. For this reason, braided cordage

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reveals that the length of rope necessary to span the distance from the attachment point to the stake is approximately 331", or roughly 27'  $\frac{1}{2}$ ". Adding 4'  $\frac{1}{2}$ " for tying and adjusting a taut-line hitch gives a total length of 32'.

generally works better than twisted, even though such cordage typically doesn't readily lend itself to splicing and, therefore, must be tied. For this application, a stretchy type of cordage may be desirable, as this tends to keep the halyard taut so it does not flap against the pole as much. The rope should be small enough in diameter to easily pass through the pulley being used, bearing in mind that natural-fiber cordage will swell in the event that it gets wet.

Allowing too little rope for the loop will make it difficult to tie off the halyard securely, while too much will result in more rope than the cleat will hold, making it difficult to finish off the halyard neatly. The rule of thumb for determining the length of rope needed for the halyard is to subtract the height above ground of the cleat from the height of the pole, double the result, then add 4'. This will give you a halyard that is long enough to allow approximately 18" for tying off (2', less the 6" or so needed to splice or tie it into a loop), yet short enough so that it does not drag the ground. Be aware that different pole heights will require halyards of different lengths, and engraving or marking the length on the side of the pulley will help to prevent attaching the shortest halyard to the tallest pole, and vice versa.

To create the loop, first lay the rope out on the floor in a long oval and work out any kinks or twists (this is especially necessary when using manila or any other type of twisted cordage). Then pass the pulley onto the rope before attaching one end of the rope to the other, being careful not to re-introduce any unwanted twist to the rope. For twisted cordage, splicing (using either the short or the long splice) is the preferred way to join the ends, at least from the perspective of aesthetics; types of rope that won't take a splice can be joined with a fisherman's knot or, better yet, the Hunter's bend.

Next, attach the swivel snap hooks, one approximately 18" on either side of the splice or knot.<sup>5</sup> To easily attach the swivel snap hooks, create a lark's head by folding a bight into the rope, passing the bight through the swivel, then bringing the bight up and over the hook end and snugging it down against itself on the other side. This means of attaching the hooks allows the hook placement to be adjusted as necessary for flags of different sizes. After attaching the hooks to the halyard, attach the flag to the hooks and adjust the spacing between hooks by slacking the lark's head, working the rope through the swivel, then snugging the lark's head again. The hooks are properly spaced when pulling the halyard taut results in the spine of the flag being straight, but not under strain.

For "stacking" multiple flags on the same pole, simply attach additional hooks using the same procedure.

Finally, using a quick link, attach the swivel of the pulley to the eye of an eye-bolt. Alternatively, one could "spring" the eye of the eye-bolt open enough to attach the pulley swivel directly; however, this is difficult to do with good steel eye-bolts, and makes it harder to replace the pulley if it should break.

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<sup>5</sup>Placing the splice or knot between the hooks will prevent it from getting into the pulley regardless of which side of the halyard is pulled. Therefore, the thicker short splice can be used, rather than the thinner long splice, which is weaker and more difficult to tie.

## Assembling and Erecting the Pole Set

Assembling and erecting this set is simple, provided sufficient man- or boy-power is available for the job.

### Step 1: Site selection

Select a site that allows ample room for the set-up. From stake to stake, the three-pole set (on 10' centers) is 39' x 59', the two-pole variation takes 39' x 49', and a single pole requires 39' x 39'. The setup does not necessarily require that the space be absolutely clear--the guy-ropes can go over brush or between trees--but be aware that there is more than just the poles involved here. Avoid locations where the guy-ropes will block trails, etc., and do not place the poles near electrical lines or where people might congregate during thunderstorms.

### Step 2: Positioning and assembly

NOTE: the compass directions given below are for purposes of illustration and clarity only and assume that the poles are to be raised on a line running due east and west..

- A. Clip one end of a pole-to-pole guy-rope to a 1" floor flanges, then clip the other end of the guy-rope to a second floor flange. On the opposite side of the second floor flange, clip one end of the second pole-to-pole guy-rope, then clip its other end to the remaining floor flange, so that you have a string consisting of flange-rope-flange-rope-flange. For the sake of uniformity, I prefer to clip all lines to the flanges so that all triggers are the same way, either all up or all down.
- B. Anchor one of the three base plates to the ground in the position where the base of the western-most pole is to be. Leave approximately 1" of the stake sticking up above the base plate.
- C. Hook the floor flange on one end of the string over the stake at the west end of the pole line, flat-side-down. Taking the flange on the other end of the string, extend the string eastward along the pole line. Pull the string taut and, using the flanges as a template, position and anchor the center and eastern-most base plates, again leaving approximately 1" of the stakes sticking up above the plates. Be aware that because the line is pulled taut, the flange on the west end will be off-center on its stake, and adjust the positioning of the remaining two stakes accordingly. Hook each of the floor flanges over its corresponding stake top, flat side down.
- D. Clip one pole-to-ground guy-rope to each of the remaining holes in the flanges (three in each end flange and two in the center flange).
- E. Arrange the pole-to-ground guy ropes out from the pole line. From each flange, one rope should extend due north and one due south. The

remaining rope on the western-most flange should extend due west, while the remaining rope on the eastern-most flange should extend due east. Pull all guy-ropes taut and place a stake along each one at a point 19'6" from the flange (hence the reason for marking the pole-to-ground guy-ropes as recommended previously). Angle the tops of the stakes away from the base plates 45° and drive them in all the way up to the eye, if possible.

- F. Lift the floor flanges from the base-plate stake and set them off to the south side. Place the nested poles on the north side of the pole line, one pole per base plate, with the bottom end of the pole at the stake. If the poles are not interchangeable, be sure to have the correct pole at each base plate. Extend and pin the pole sections together and butt the bottom end of the pole against the stake, with the pole extending due north.
- G. Clamp a rope cleat to each lower section at the point previously marked, using two hose clamps side-by-side to prevent the cleat from twisting. The clamps should be turned so that their worm-gear mechanisms are on the side of the pole opposite the cleat, rather than in the valley of the cleat, to help prevent scraping the knuckles as the halyard is tied off.
- H. Slide the corresponding floor flange, with guy-ropes attached, over the upper section of each pole and down to the top of the center section.
- I. Attach the appropriate halyard to each pole by securing its eye-bolt through the hole at the top of the upper section. Using a wing nut instead of a hex nut to secure the eye-bolt will make it easier to attach and unattach the halyard in the field. The eye of each bolt should be aligned with the length of the pole and on the same side of the pole as the cleat, with the open side of the eye toward the top of the pole. Twist each pole as necessary to place all three cleats in the same relative position, then string the halyard down the length of the pole to its cleat and tie it off, being careful to keep the halyard between guy-ropes rather than across them.
- J. Station at least one member of the crew at each of the pole-to-ground guy-ropes. They provide balance and control as other crewmen slowly "walk" the poles up from the top end, bringing the whole set up as a unit and using the stakes protruding from the base plates to prevent the bottom ends of the poles from sliding. Upon reaching the vertical, the "walkers" hold the poles as nearly vertical as possible while the crewmen on the guy-ropes tie them off using good taut-line hitches. At this point, the ropes should be tightened just enough to remove all slack.
- K. While the crew remains in place, step back from the pole line to the north or south of the center pole and "eyeball" the poles to vertical in the east-west plane, calling upon the crewmen manning the west- and east-end guy-lines to slide their hitches up or down as necessary. When the poles



are vertical in this plane, have the west- and east-end guy-lines tightened equally, making the lines as taut as possible.

- L. Step to the west or east end of the pole line and align each pole to vertical in the north-south plane using the same give-and-take procedure between the guy-ropes on opposite sides of the pole. Again finish up by tightening the guy-ropes as much as possible.
- M. Raise the flags and enjoy the sight!

#### Other Ideas

If storage or transportation of a 10' pole is a problem, cut the EMT sections down to 8' before drilling the holes. This will result in flagpoles of up to 23' in height, with the guy-rope attachment height at 15\_'. Further reducing the section length to 6' produces poles of up to 17', with the attachment height at 11\_'.

If weight is a problem, try using just the center and upper sections in a 10' length. The poles will rise to 19\_', and the attachment point will be 10' above the ground.

Welding the cleat to the pole is not a good idea, because one or both arms of the cleat will eventually be broken off.

#### A Final Word

The source of the original idea for these poles is uncertain. Troop 567 here in Lubbock was using a two-pole version many years ago, and the idea may have originated with that troop's Scoutmaster at the time, John Agnew. Expanding the set to include a third pole was my idea, as were some minor adjustments in materials and construction technique.

Please feel free to modify this plan as the need arises and to copy and distribute it to other units in your council. I would appreciate knowing of any modifications or improvements made to the plan.

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## Parts List

Part	Number required to make		
	1 pole	2 poles	3 poles
Electrical metal tubing (EMT), 1" x 10'	1	2	3
Electrical metal tubing (EMT), 1_ " x 10'	1	2	3
Electrical metal tubing (EMT), 1_ " x 10'	1	2	3
Floor flange, galvanized, 1"	1	2	3
4_ " rope cleat	1	2	3
Hose clamp, worm-gear type, 1"-2" range	2	4	6
1" swivel pulley	1	2	3
_ " quick link	1	2	3
Eye bolt, _ " x 2_ "	1	2	3
Rope, _ " or similar, continuous (approximate)	190'	325'	455'
_ " swivel trigger snap	4	8	12
_ " swivel snap hook	2	4	6
Base plate, _ " steel plate or similar, 3"-6" (round or square)	1	2	3
Stakes, re-bar, _ " x 24"	4	6	8
Stakes, re-bar, _ " x 12"-18"	1	2	3
Wire lock pin, _ " x 2_ "	2	4	6