Building a (very) strong Stand-alone dog trolley, More than sufficient for an animal Up to 200 lbs.

The following is my own unique design. I did not find the idea of using Back support posts in any document, nor on the Internet. The 45º offset spacing on the back support posts appears almost ideal, Providing full protection to the two main support posts, no matter in which Direction the animal lunges. It's not mere theory. This document was Composed after the trolley had been completed, and after it was severely Tested for at least 2 full weeks, including during freezing weather.

Hardware was chosen in such manner, that adjustments may be Made by loosening and re-tightening nuts, bolts, brace bands and rotating 5 turnbuckles. There are no permanently-drilled holes or eyebolts that can Cause weakened posts, inflexibility or difficult-to-accomplish changes.

This project is not one you will be able to complete from start-to-finish In 1 or 2 days! Don't try to hurry the installation, since the posts Have to set in concrete for 3-4 days, Before you put lateral (sideways) stress on them.

This IS a permanent installation, however. Once the posts are Set and the concrete has hardened, there is no moving them!!!

DISCLAIMER

I WILL NOT BE RESPONSIBLE IN ANY MANNER FOR ADVERSE RESULTS THE INSTALLATION YOU MAKE MAY CAUSE. THESE ARE MERELY CONSTRUCTION HINTS. IN NO WAY AM I ENDORSING A SPECIFIC PRODUCT OR BRAND, NOR AM I STATING THAT THIS IS THE BEST WAY THE JOB CAN BE DONE.

Safety tips have been included, please read them carefully!!!

This dog trolley can only be as good,
And only as safe,
As the quality of the materials
And the attention to workmanship and
Detail you put into it ! ! !

If you plan to use the
Information contained here,
It is my suggestion, that
You read <u>all the way</u> through
This 21-page document first!

<u>Daily</u> inspections, to check
For loose, worn or
Damaged hardware, and such,
Is a VITAL part
Of KEEPING
Your dog trolley safe
And fully-functional.

Jerry P. Mulder – January 2005

This document proceeds on the premise, that you do not yet have access to two strong trees, buildings, telephone poles or other existing tie points.

My situation is such, that I had to install or make two non-existing anchors to which I could attach the dog trolley. FYI, commercial dog trolleys (the aerial "clothesline" portion) are available for between $25.00 and $75.00, but none come anywhere close to the quality and strength as compared to the materials used here. All the commercial ones I've seen only come supplied with one tiny drawbar spring. To make the trolley fully functional, a drawbar spring needs to be installed at each end of the aerial cable, since the dog will invariably run toward either end of a main support post. The end that does not have a drawbar spring will take unnecessary stress when the animal comes to an abrupt stop at the end of its tether. Narrative-only descriptions sometimes don't do justice to a project like this, so I shall include as many illustrations and annotated photos to describe what was done. At the time this document was completed, all references to Internet web sites were active and valid.

For this project, I chose to use back-supported galvanized steel (fence) posts.

BILL OF MATERIALS

4ea **Galvanized structural steel posts**, 8 feet long, 2-3/8" outside diameter, available at just about any fence company. Depending on your locale, be prepared to pay about $37.00 each (new) for those. Schedule 40 posts, made of thicker wall material, are even more expensive. Use Schedule 40 posts if your run is going to be 50-75 feet or longer. Also consider using type SS-40, claimed to be 33% stronger and 20% lighter than Schedule 40, possibly even less expensive, made by Allied Tube & Conduit. Search for local supply vendors on the Internet. http://www/hooverfence.com/catalog/cpage23.htm. For runs longer than 75 feet, consider using 3" diameter Schedule 40 (or SS-40) posts and applicable hardware.

6ea **Aluminum dome caps.**

Enough bags of 60 lb. "QuikCrete" to set and fill the posts (more information about filling the posts later). I chose the 60 lb. bags since they're a bit easier (for me) to handle than the 80 lb., especially when one needs to lift them up and out of a deep automobile trunk.

At least 32 2-3/8" brace bands and hardware for use as anchor points and supports on the posts. Use 5/16"x1¼" galvanized carriage bolts and nuts.

1ea **½" Diameter 6' long hollow aluminum rod.**

¼" **Vinyl-covered stranded and braided steel cable** for the main aerial "clothes line," available at Lowe's Hardware.

3/16" **Bare stranded and braided steel cable** for use on the guy wires, available at Lowe's hardware.

2ea **Fender washers** with 5/16” holes.

2ea **Hard rubber bumpers** with 5/16” holes, or 2 golf balls or baseballs with 5/16” holes drilled through the centers.

18ea **Wire rope clips for use on ¼” steel cable** (this includes 2 on the tether).

16ea **Wire rope clips for use on 3/16” steel cable**

1ea **Bull swivel snap, 7/8”x4”**

5ea **All-steel turnbuckles**, GGS brand, WW Grainger Stock #4DV15. **DO NOT** use the type where the body of the turnbuckle is made of aluminum. The threads just won’t last, and the turnbuckle may even fail when the high amount of pounding torque used in this application is applied.

http://www.grainger.com/Grainger/productdetail.jsp?xi=xi&ItemId=1613545626

2ea **Drawbar Springs**, Century Spring, rated at 300 lbs., available at Lowe’s Hardware (comes in a set of two, sold as Drawbar Porch Swing Spring #4002, approx. $14.95/pair). On the Century website, the part number is listed as #DB7010, but you’ll pay about $15.00 **each** if you buy them from Century directly.

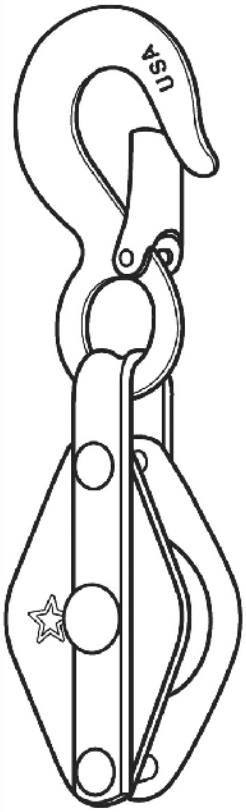
http://www.centuryspring.com/pdfs/338.pdf

1ea **5” Metal sheave** (heavy-duty pulley), Cooper Tools (Campbell) #3031F, available at Lowe’s Hardware. On the Cooper website, it’s listed as Stock #7230533.

http://www.cooperhandtools.com/brands/campbell/index.cfm?search_criteria=1

1ea **Johnson** Model 007 (or equivalent) 10” Magnetic Torpedo Level

http://www.johnsonlevel.com/levels_torp_007.html



This is the photo I took of my own sheave. I’m using it upside down, in other words the hook hangs down as shown here. Also take a look at other photo, where you’ll see the sheave hanging from the overhead cable.

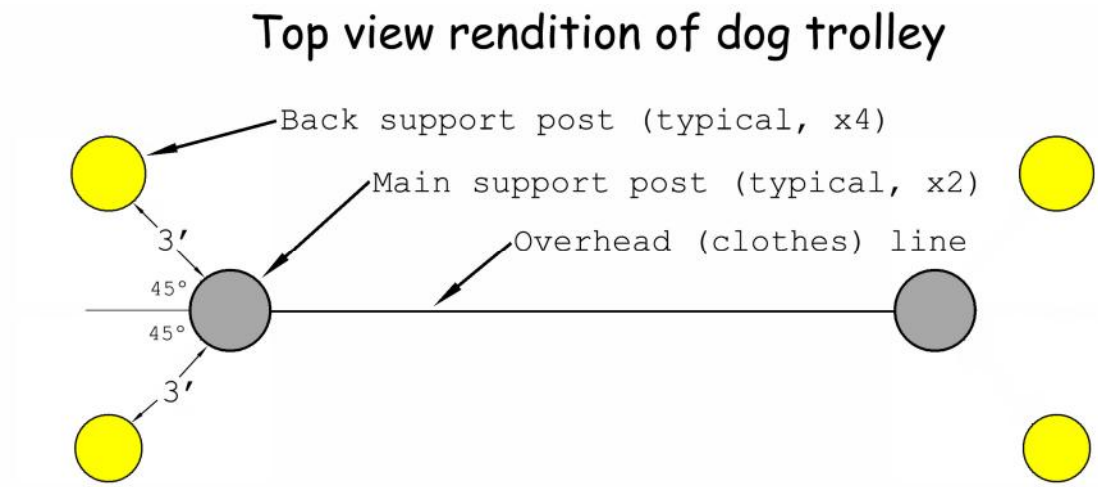
FYI, if you buy just the right kind of bolt cutter, it will do a very nice job of cutting the type of stranded steel cable described here---not all bolt cutters will work. Furthermore, not all bolt cutters that work, will work equally-well. I found one made by Pittsburgh, #450 Bolt Cutter, sold by Harbor Freight Tools, **Item #41148** (http://www.harborfreight.com), for $9.99. The Pittsburgh #450 has adjustable (that's an important feature) and replaceable jaws. The ¼" vinyl-covered cable may be cut very cleanly and easily. The 3/16" bare cable left a few minor jagged strands, but it still did a very nice job on that, as well. If you plan to buy another type or brand of bolt cutter, take some steel cable with you, to see if the bolt cutter cuts the cable cleanly and easily, without leaving too many jagged strands. While you're at it and testing bolt cutters to see if they work, try to cut off some 3" pieces, which you can then use later as "filler" cable, described on Page 12. When cutting stranded steel cable as described here, **use safety goggles eye protection at all times.**

An inexpensive standard manual post-hole digger is just about a "must." Model DG-60, Item No. 75624, is available at Ace Hardware for $16.79 http://www.acehardware.com/home/index.jsp. I set the two main support posts in concrete, 23" deep, 12" diameter holes. Each of the two main support posts requires between 100-120 lbs. of concrete. The easy way to do this is to dig the hole, place the post in the middle of the hole (centered, in other words). Have somebody available to assist you, if at all possible, to help keep the post centered and somewhat vertical. KEEP THE POST AT THE BOTTOM OF THE HOLE the entire time you're mixing the concrete and filling up the hole. I emphasize this, because if you pull the post partway out/up after you start mixing the concrete, you'll have a heck of a time getting the post all the way down again. It happened to me accidentally one time. I ended up quickly removing the hardening concrete from the center and bottom of the hole with my post-hole digger, re-inserted and centered the post at the bottom of the hole, then quickly putting back the hardening concrete mix and continued. By the time the hole is less than 1/3 full, the concrete will have started to set, and I already have my magnetic torpedo level stuck to the post, to allow checking for a true installation. All the while that I'm mixing a batch of dry concrete and water inside the hole, I check the trueness of the post with the level and adjust the post sideways one way or another as necessary. Checking two quadrants 90º out from each other is sufficient, and allows a good estimation of how vertical and true the post is.

To start off, place the post in the hole. Make sure it's bottomed out firmly, but do not pound the post into the soil. Pour about 1 gallon of water into the hole, then add 1/3 bag or less of concrete mix into the hole. Start mixing and stirring swiftly with a firm stick or thin stout plank, adding water if necessary/as necessary. Ascertain that all of the dry concrete gets totally mixed-in. The resultant mix should not be too watery, approximately the consistency of almost-dry mixed oatmeal. As mentioned,

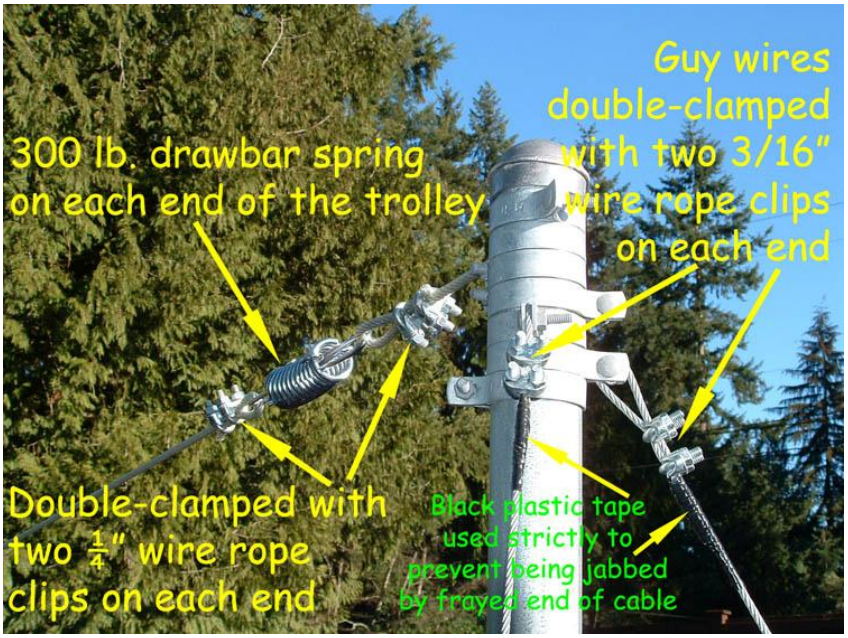
use a magnetic “torpedo” level so that the posts will be installed vertical and true. Keep doing this until the hole is full and concrete is flush with ground level.

Using a standard hacksaw with 12”, 32t metal-cutting blade, I cut the two remaining 8-foot posts in half to obtain four 4-foot sections for use as back support posts. At about 36” distance from the base off each main support post, I set the 4-foot back support posts 24” deep in concrete, 12” diameter holes, dug at 45° angles offset. Consult illustration to see what I mean by offset.



Some early photos, when I first started setting and filling the posts.

Due to the angles from which the 2 above photos were taken, it may not look like the back support posts are straight and true, nor at 45º offset, yet in fact they all are.



Pardon the basic information for those already-well-informed pet owners who have gone this route before. I specifically provide this information for those new pet owners, who may be looking for just this type of data.

Due to the relatively short lengths of the back support posts, I tried to place the brace bands on the 4 back support posts approximately 6" above ground level, give or take a couple of inches. This way, there's some axial (upward) and lateral (sideways) torque applied to the stubby back support posts. If you have the space (I did not), and if you can set the back support posts at 6 feet distance from the main posts (I could not), that much the better, since the back support posts will provide even more lateral support that way. If that had been my situation, I would have placed the brace bands very close to ground level, that way most of the torque would be applied laterally. Furthermore, since a turnbuckle is bolted to the brace band, I also ended up using an additional brace band above and below the turnbuckle support brace band.

The reason for the additional brace bands is that the turnbuckle eye, which is bolted to the brace band, is thick enough so that the brace band, by itself, will not tighten snugly-enough around the support post. If you do not add the extra brace bands, a single turnbuckle support brace band, by itself, will fit loosely, and will not provide a good anchor point for the turnbuckle. Consequently, the brace band will slip upward on the post as the turnbuckle is tightened, eventually causing the guy wire to lose tension. Buy the extra brace bands --- when factored into the over-all cost of this project, they're relatively inexpensive. At Lowe's, the brace bands were about 67¢ each.

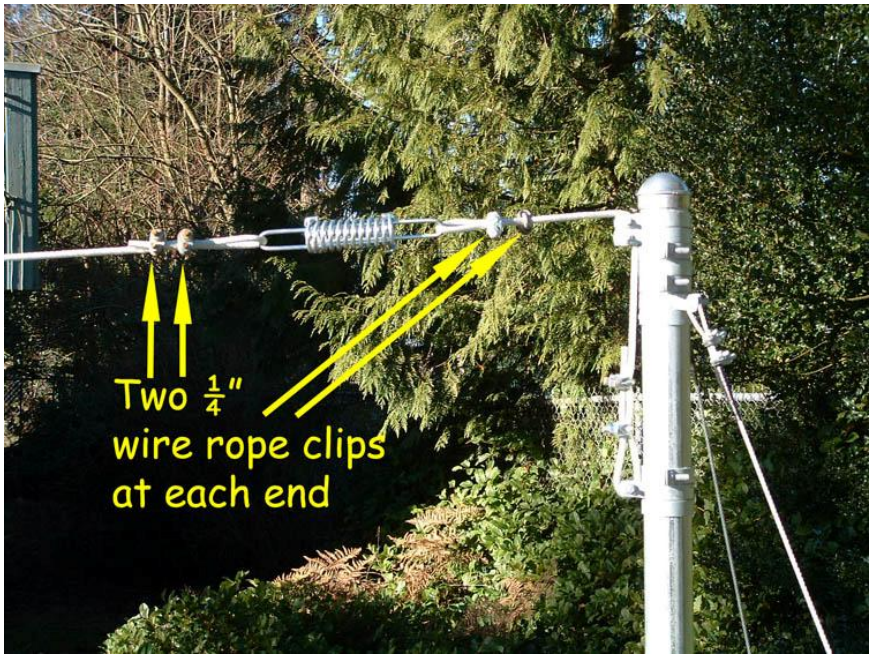
After several weeks of having been "hammered" constantly and incessantly, neither the 2 main support posts, nor any of the 4 back support posts on my installation, show any visual indication whatever that they have buckled or moved to even the slightest degree, neither laterally nor upward. It is my firm belief, that filling the posts with concrete has made a big difference here. Not having moved is a very good sign that all 6 posts are extremely well-established in the soil and are performing their jobs as intended. **That's why I previously emphasized letting all posts set for 3-4 days before you put lateral stress on them.** The soil in my back yard is very "dense" brown/yellow sand and appears to have some clay content. If your earth is "loose" or is made up of rich black soil 24" deep or more, or has a water table that is not far below ground, then you may very well have an entirely different experience than what I described here. In that case, you may need to purchase taller posts (9 feet custom-size), and set them in the ground considerably deeper than what I did.

After the concrete of all 6 posts has set for several hours, go ahead and also fill the posts themselves with concrete, all the way level with the top. Filling the posts with concrete allows for additional strength, especially important for the 4 back support posts, to help prevent them from buckling caused by lateral stress. For that task, I used a 2-gallon plastic pail and a small/narrow garden trowel, yet not quite narrow enough to fall into the open end of the post. Mix only enough concrete, in small batches, and use up before it starts to harden. I also made a "packing rod," to allow pushing the concrete mix all the way to the bottom of the post. The packing rod is made of 6 feet of ¼ x 20 steel all-thread. At the time, I was only able to find a 6' length of all-thread at Lowe's Hardware. At one end of the all-thread, I fastened a 2-1/16" diameter round steel disc (slightly smaller diameter if you're using Schedule 40 pipe), a round disc cut from plywood will work just fine. On the other end (since I was packing an 8' long post with a 6' rod), I attached a long piece of stiff 14-gauge electrical wire, so that the packing rod would not fall into the post beyond reach. I loaded only the tip of the trowel with the concrete mix, to help prevent spilling outside the post too much, then dropped the mix into the top of the post, one little scoop at a time. It's somewhat tedious, but definitely worth the effort. After each 5-6 trowels-full, I packed the concrete. Fill the posts all the way up to the very top. **Let the concrete set for at least 3-4 days** (you'll be **very** glad you waited that long), before you put lateral torque on them. If you do not wait the stated amount of time, you may have a botched job.

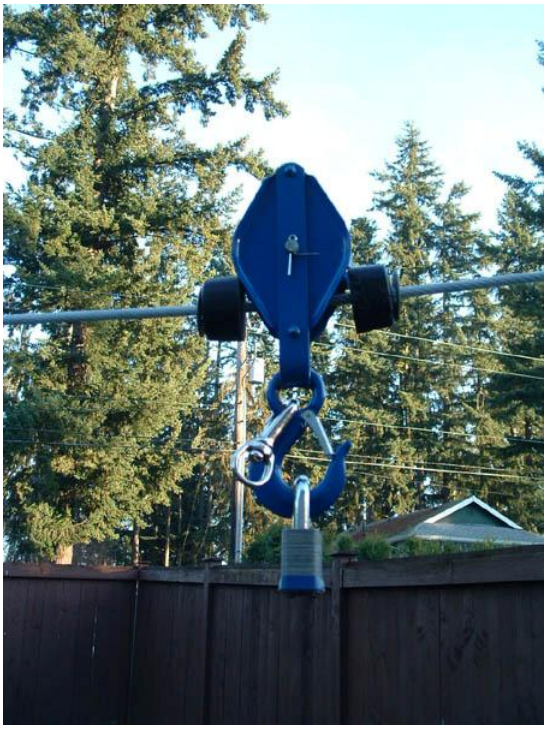
At one end of the main post, near the top (always leave enough room for the dome cap), I used two brace bands to allow a 3-foot section of ¼" cable to fit through. From the 6' aluminum rod, using a tubing cutter, I fashioned appropriate-thickness spacers for use as "washers," see detail photo on the next page. All four (2 at the top of each post) of these washers should be thick enough, so

that the ¼" cable will not be pinched between the "arms" of the brace bands. That is to say, when the 5th turnbuckle is tightened, it will allow the cable to slide over and past those washers easily. For another angle, also see the top left photo on Page 13.

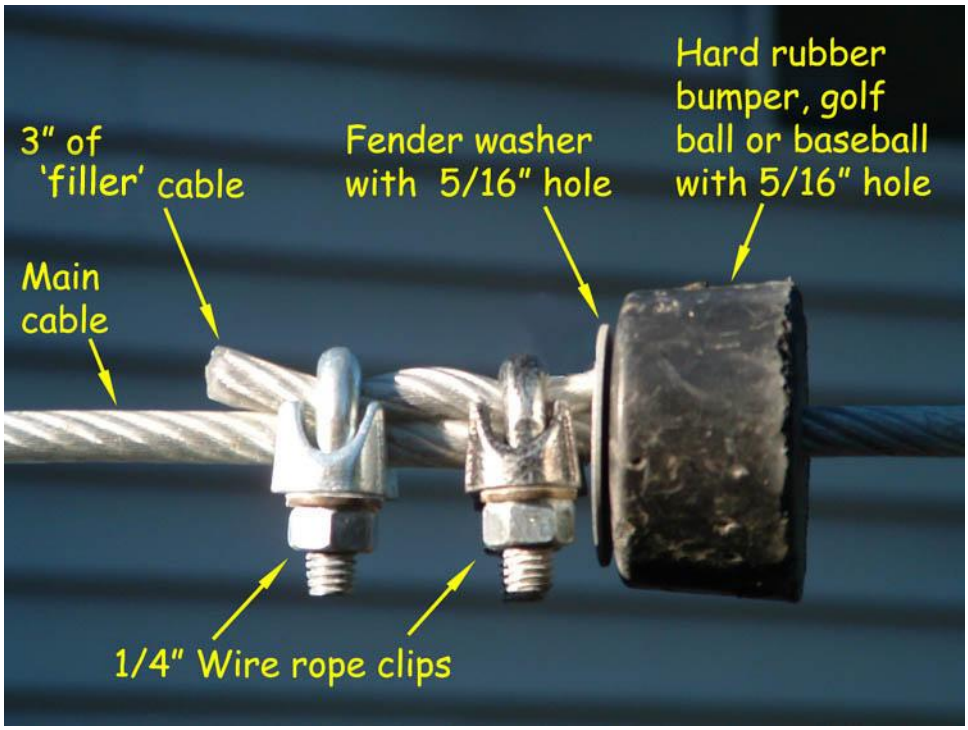
The other end of the 3-foot section of cable is secured to the support loop on either end on one of the drawbar springs with two ¼" wire rope clips. Below that are another two brace bands, one for each back support post guy wire, with an additional brace band between each guy wire brace band. Below that, I attached one final brace band for additional support, to help prevent the cable brace bands from being pulled down caused by downward torque applied by the turnbuckles. Finally, lowest on the post, I attached 3 more brace bands to support the other end of the 3-foot section of cable.



Slide your hardware onto the aerial cable that needs to be done now, like the large fender washer, the rubber bumper, the pulley, the other bumper, then another fender washer. Secure the aerial cable to the remaining support loop of the drawbar spring with two ¼" wire rope clips.

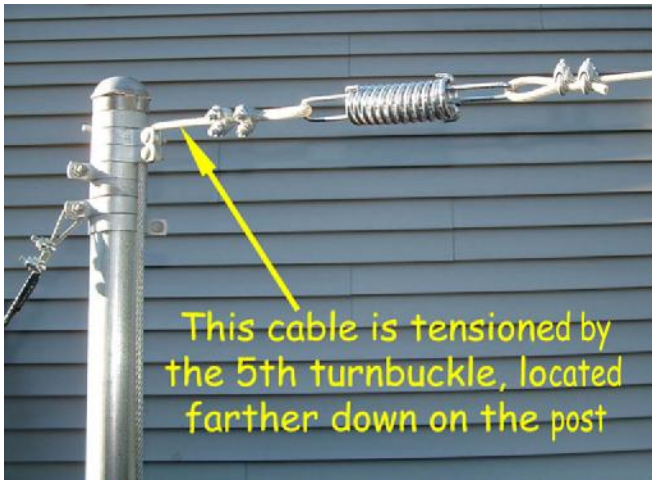


After you've mounted the aerial cable, determine where the aerial cable end-stops need to be. You can then go ahead and fasten 2 wire rope clips for each end-stop at the appropriate locations. First, cut off two 3" sections of vinyl-covered ¼" steel cable, and use them as "fillers" on the end-stop wire rope clips. Those two extra pieces of short "filler" cable make for a much better and secure installation, and help prevent the end stops from "sliding" when the dog lunges hard.



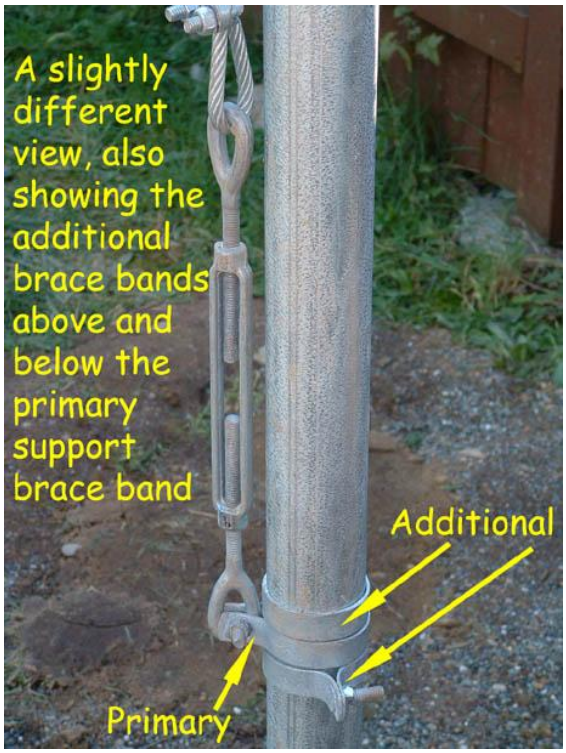
Make sure your “moving” hardware (pulley, 2 bumpers and 2 fender washers) are positioned in-between the end-stops. My aerial cable is now just about 6 feet above ground level. Tighten all wire rope clips and the end-stops wire rope clips before putting final torque on the aerial cable.

On the other main post, I attached another two brace bands to allow the ¼” aerial cable to pass through, identical to the way it was done on the first post.



On the primary support post that has the 5th turnbuckle, I provided several feet of additional length of ¼” cable, as you can see in the photo at right. This will allow you to give the amount of slack needed later to make adjustments and repairs very easily.

Some distance down the post, I attached a brace band to secure the 5th and final turnbuckle, to which I fastened the other end of the ¼" aerial steel cable using two ¼" wire rope clips. Another 2 support brace bands were used above and below the 5th turnbuckle brace band, see annotated right photo below.



Before stringing the aerial cable, I hand-tightened the 4 back support post turnbuckles until there was "a bit" of equal tension on all guy wires, also making sure that the 2 main support posts are not pulled "backward" or sideways by initial tensioning of the back support post guy wires, so don't overdo it! I then strung the aerial cable, pushing downward as much as I was able to on the 5th turnbuckle brace band to provide initial tensioning, then tightened the brace bands for the main 5th turnbuckle and started rotating the 5th turnbuckle until the aerial cable was horizontal and tight. I visually observed that the drawbar springs were compressed by about 30%-40%.

If possible, do not allow the drawbar springs to be compressed by more than about 50% **during static conditions**. In this case, "static" meaning no dog tethered and no other additional stress applied to the aerial cable. You'll have to do some experimenting, to see just how tight the aerial cable needs to be, taking into account the total weight of the sheave/pulley and end-stop bumpers. Finally, after I thought the set-up was approximately right, I got out my torpedo level one more time and checked 2 quadrants on each main post, to see if they were still true and vertical. At this point, I adjusted the 4 guy wire turnbuckles slightly to accomplish that. You may

also need to adjust the 5th turnbuckle again to make everything just right. Keep in mind, not to over-tighten the set-up during hot weather, since all the hardware, including the steel cables, will contract during cold/freezing weather. That's also the beauty of having **two (2)** drawbar springs, rather than one. They not only help cushion the shock when your dog lunges toward either end-stop or sideways on the aerial cable, but they also help prevent (to some extent) the aerial cable supports from becoming so stressed during cold weather that something may eventually snap. Over time, and after the initial tightening during installation, the cables will stretch a bit. Eventually, the drawbar springs will also fatigue, so keep an eye on the sag of the aerial cable and adjust the turnbuckles as necessary to remove only excessive sagging. After a few years of heavy use, or as needed sooner after a visual inspection, the drawbar springs may also need to be replaced. You can tighten the 5th turnbuckle sufficiently to take just about all sag/slack out of the aerial cable, but by that time you'll also have bottomed-out both drawbar springs, which totally defeats the intended function of the drawbar springs. Furthermore, having the aerial cable that tight may even present a dangerous condition, since there is no more "give" nor cushioning.

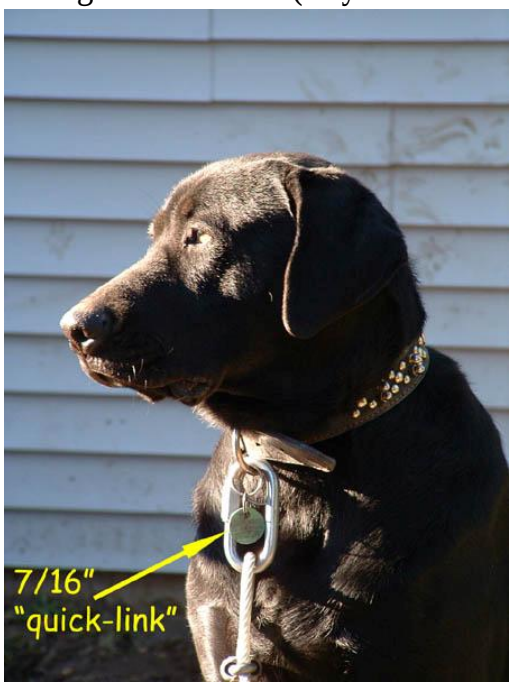
Everything on this dog trolley is several times stronger than it needs to be, except for the bull swivel snap, which is attached to the eye on the pulley. That snap is conservatively rated at 250 lbs. At this writing, I was unable to find a stronger one. Even though Drake has lunged on both end-stops extremely hard on numerous occasions, the set-up seems to be holding up very well. The trolley itself (aerial cable, guy wires, primary posts, back support posts, brace bands, pulley, turnbuckles and all associated hardware) is extremely strong and able to endure any stress that our dog can dish out. The fact that this trolley uses two drawbar springs really helps cushion the intense torque that is eventually placed on the bull swivel snap after both drawbar springs have bottomed-out after a lunging episode. When everything is nice and tight, each of the 4 guy wires on the back support posts have between 200-250 lbs. of tension on them. The 3/16" guy wires are rated at about 1,000 lbs. The ¼" aerial cable has about 150 lbs. of tension on it. It is rated at about 4,000 lbs.

Under no circumstances should your dog be tethered to the trolley when you're attempting to make adjustments or repairs, that's just inviting trouble!!! If the dog lunges unexpectedly, you could break or lose a finger, or get hit in the head with the 3 lb. pulley. The pulley may travel level along the aerial cable at between 25-30 MPH when the dog is in a full stride, running from one end of the trolley to the other.

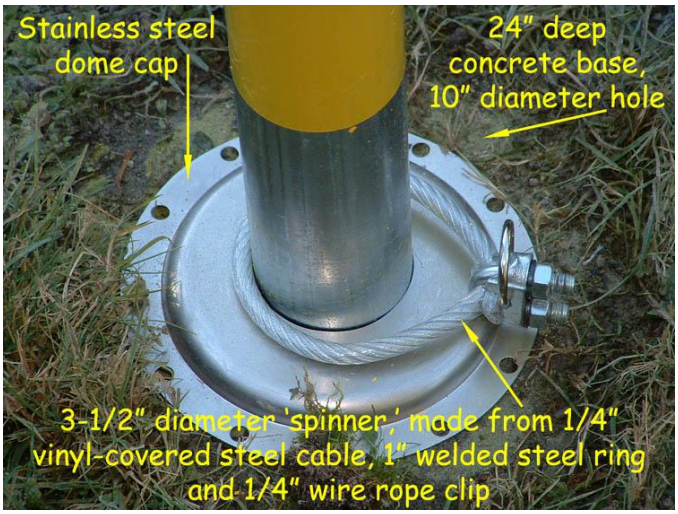
For your own safety, when making adjustments, first take all torque off the aerial cable. Give it enough slack so that the two drawbar springs are totally unloaded and the cable is actually sagging with an exaggerated 12-inch or more dip. This way, if something comes loose before you intend it to, the pulley won't be catapulted in your direction and possibly injure you, or worse!

If you need to service the trolley, when all lines are tight and under stress, it is important to release tension on the 5th (aerial cable) turnbuckle first, until you notice some sagging on the "clothesline." Rotate that 5th turnbuckle in the opposite direction which initially tightened the aerial cable. You can then loosen the top two brace bands for that 5th turnbuckle and slide them up on the post, which should totally unload the two drawbar springs, as well as provide the necessary slack on the aerial cable to replace any worn or damaged components.

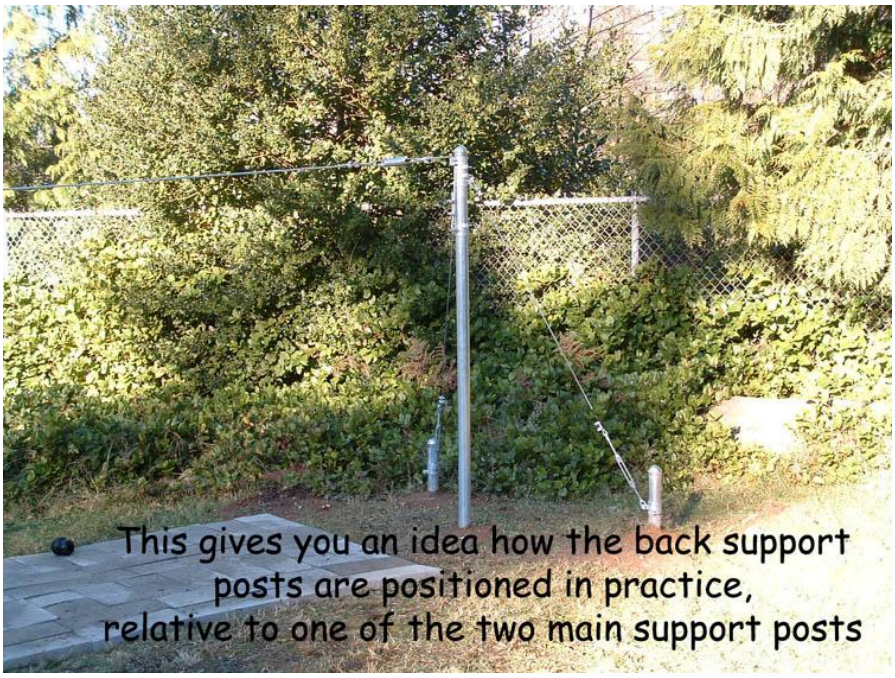
The safe way to transfer the animal to a "service post" (see narrative on Page 17) or some other secure holding area, is to first grab hold firmly of the dog's collar before you try to unhook from the trolley. Unless you have the dog by your side, secured by the collar, when you attempt to unhook it from the trolley, you **do not** have control of the animal! The animal can still lunge unexpectedly before you can unhook, and cause the kind of injury mentioned above. The other thing you may safely do, is to unhook the tether from the dog at the collar (stay out of the way of the pulley), and you may then control the dog with a separate leash or let it run loose, depending on your individual situation. If you can make a spare tether, hook it to the service post, hook the other end of that tether to your dog's collar, then unhook the trolley tether from the dog's collar, that would be even better. That's the way I have to do it with Drake for the time being, since he may get loose and escape from the back yard. He is not aware of dangers on the road and may get hit by a car. Drake's tether is made of the same heavy-duty ¼" vinyl-covered steel cable (see photos on Page 19) that I use for the aerial cable. Drake is so smart, that he can get out of just about anything spring-loaded attached to his collar. That's the reason I use a 7/16" "quick-link" on his collar, see photo. It takes about 10 rotations of the thumb nut to open the gap wide enough to allow the collar ring to pass through. The bull swivel snap at the pulley provides the actual swivel function (see photo on Page 11), so that the tether does not get twisted.



For your reference and interest, I also decided to install a stand-alone "service post" all by itself. It consists of a 6-foot galvanized steel post set 24" deep in concrete, 10" diameter hole, strategically placed/spaced so that the dog, while it is attached to the trolley, cannot get wrapped around that post. Since my yard space is limited, I also had to ascertain that once I tethered the dog to the "service post" while I was inspecting, adjusting or repairing the trolley, the dog cannot reach the trolley area, nor the wooden fence, nor the house, nor any other building structure. In other words, it was an additional matter of careful measurement before I installed the "service post." I dropped a 3½" diameter "spinner" onto the finished and painted post, to which I can now attach the bull swivel snap. This way, the dog can still move in an 8-foot radius while I work on the trolley. Since just about all of the torque is at the bottom of that post, I decided to use a less-expensive 17-gauge post and also filled it with concrete all the way to the top. Be sure to add a dome cap. That "service post" works <u>really well</u>! Additionally, after returning from a walk with Drake, I can also go into the back yard and drop the leash loop onto the post for a short while, if I need to do a quick inspection of the trolley. By the way, our dog Drake is a Labrador Retriever with a bit of Rotweiler---extremely gentle and smart like a Lab, but with the extra strength of the Rot. Here are a few pix showing location and some detail.

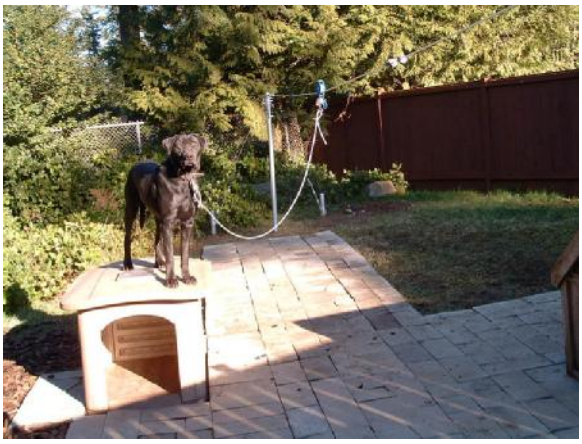


01/09/2005 Note: During our "fetch" session in 6 inches of snow this morning for about 30 minutes (temperature hovered around freezing), as he was chasing his kong, Drake absolutely **"hammered"** both end stops, as well as severely tasking the entire trolley system. Everything seemed to work just as intended, and the trolley did not appear to be adversely affected by all that pounding. Both drawbar springs still bottomed-out (which I expected to happen), as Drake lunged against the end-stops and sideways on the aerial cable constantly, at least 100 times in all. I inspected all connections and anchor points very carefully. None of the hardware seemed to be loosening, even during this cold-weather play session.



When your dog is on the trolley, **as an extra precaution**, it would also be very prudent to stay away from the midline underneath the aerial cable. That is to say, **stay away from any area directly underneath the travel path of the pulley**, and a safe distance either side of the aerial cable. You'll know what that safe distance is, by observing your dog and watching it lunge on the cable sideways, and seeing how far sideways the pulley moves as the drawbar springs bottom-out fully. A word to the wise (better safe than sorry, as they say) --- for safety margin, increase that distance by another few feet, in case something comes loose when your dog lunges sideways, since that entire cable and the pulley may come flying in your direction.

A picture of Drake, tethered to the trolley. The right photo shows the wooden dog house which we re-roofed. We also applied the roofing material to both sides and back of the dog house. That dog house is now quite a bit more wind-resistant.



If your dog likes to, or is able to, jump on top of its doghouse (as ours loves to do), make sure that the doghouse is far enough away from the aerial cable, so that the dog does not try to jump across the cable from the top of the doghouse. While standing on top of the dog house, if the dog cannot touch the aerial cable with the tip of its front paw (I saw ours try to do exactly that), it most likely will not try to jump across the cable, but no guarantees that it won't! If you have a rather tall dog house that the dog can jump onto, though, make sure that the roof of the dog house is not level with the top of the aerial cable, otherwise the dog may still try to jump across the cable and injure itself. The tether should be just long enough to allow your dog to get into the dog house and lie down comfortably all the way in the back without tugging on the aerial cable. When the dog is standing flat on all 4's directly underneath the aerial cable with its head upright, the dip of the tether should NOT be touching the ground. If it does, it's too long, and may cause problems, like wrapping around the dog's neck. Furthermore, when Drake is eating immediately underneath the aerial cable, head pointed down, and his nose touches the bottom of the food bowl, the dip of the tether barely reaches the ground. Drake likes his wooden doghouse to sleep in, and uses the plastic doghouse as a vantage point to stand on, but he occasionally does jump onto the roof of the wooden doghouse, as well.

If you decided to use the plans and eventually ended up building your own trolley, let me know if you have some suggestions for improvements. I'm definitely interested to read about your personal experience and would very much enjoy hearing from you.

Jerry
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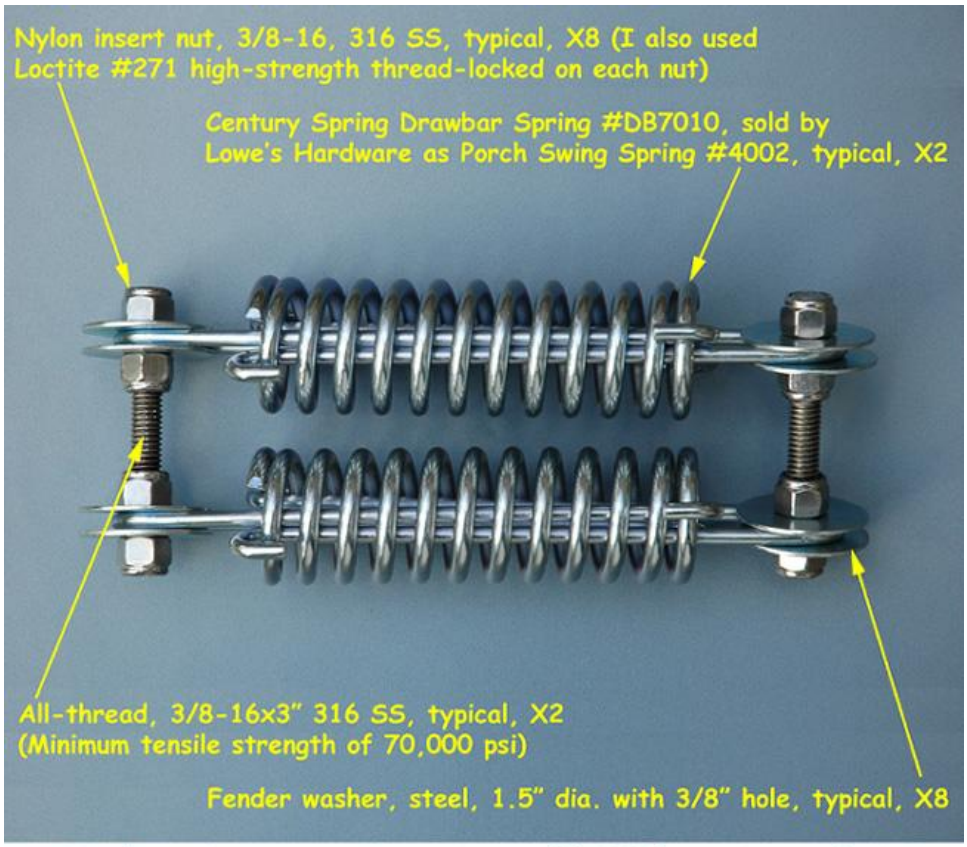
January 18, 2006 update

After only 6 months of heavy use and daily pounding, Drake has already worn out the original single set of springs. The first set of springs (both springs) are basically almost totally compressed, and no longer provide any shock "cushioning" nor "buffering". In their places, I designed dual-spring setups which appear to work much better and hopefully will last considerably longer. I'll dispense with the extra narrative, and just include some photos which should explain the improvement rather well. In other words, instead of a single spring at each end of the overhead "clothesline," I now use a dual-spring setup at each end, which is the only change. At this writing, the dual-spring design has been used for well over 6 months now, and there appears to be no sign of metal fatigue on the springs, nor sag on the overhead line. I still inspect the entire setup regularly, and everything is holding up <u>much better</u> than I expected! I haven't had to tighten the 5th turnbuckle since I installed it, but I have tightened each of the 4 guy wire turnbuckles between 1 and 2 turns each, not bad! During the past six months, the overhead clothesline has sagged a <u>very slight</u> amount, barely enough to notice. Tightening those 4 guy wire turnbuckles has taken care of the referenced small amount of sag. The 4 back support poles still work fantastically well, are totally stationary and tight in the ground. They simply **<u>do not</u>** budge, nor have they buckled even the slightest amount from the tremendous amount of torque that is applied in this application.



Tandem spring construction, using two (2) 300 lb. springs to obtain Capacity of 600 lbs. Set of 2 300 lb. springs at Lowe's is $15.00, equal To the cost of a single spring from the manufacturer or other jobber.