# Collapsible, Portable Hoist

## Construction Drawings and Notes by Dave Graham.

Operating and detail photos available on the "Projects" pages at
www.ledgewalkers.com/Astronomy

The portable hoist illustrated here is used for a 12" Meade LX200 telescope and Meade Giant Field Tripod (with or without a wedge). Other use(s) may require revision of overall and/or detail dimensions. Measure twice - be sure the hoist will clear your tripod legs, and will lift high enough for your particular equipment and configuration before cutting wood.

### The Lawyer Insists:

Any and all information presented here is without warranty of any kind, and nothing here is represented to be adequate or suitable for any intended purpose whatsoever. Read this and use (or do not use) the information contained herein entirely at your own risk. You will probably cut your fingers or other body parts off if you use a saw or any other sharp instrument or implement. You will probably smash your fingers beyond repair if you use a hammer or any other other blunt instrument. If you ingest screws or other small parts, you will undoubtedly suffer gastric distress, including but not limited to pain, suffering and possibly DEATH. You could hang yourself by becoming entangled in the winch line and DIE. Your telescope or other expensive property could be DAMAGED BEYOND REPAIR should it slip out of the support sling(s) or a knot comes untied or otherwise proves to be inadequate for the intended purpose and it crashes into the cold, hard concrete or other incompatible or uncomfortable surface to be found along the general gravity vector for your particular location. You might suffer a HEART ATTACK and DIE while looking at the results of such an unintended consequence. In fact, you should not ever even THINK about trying to build or use anything described herein for any purpose whatsoever. Failure to measure and calculate appropriate dimensions will probably result in the re-purchase of materials and possible humiliation by persons of some significant status in your personal life.

If you choose to disregard the above warning, and need help or have questions, or if you just want to communicate:

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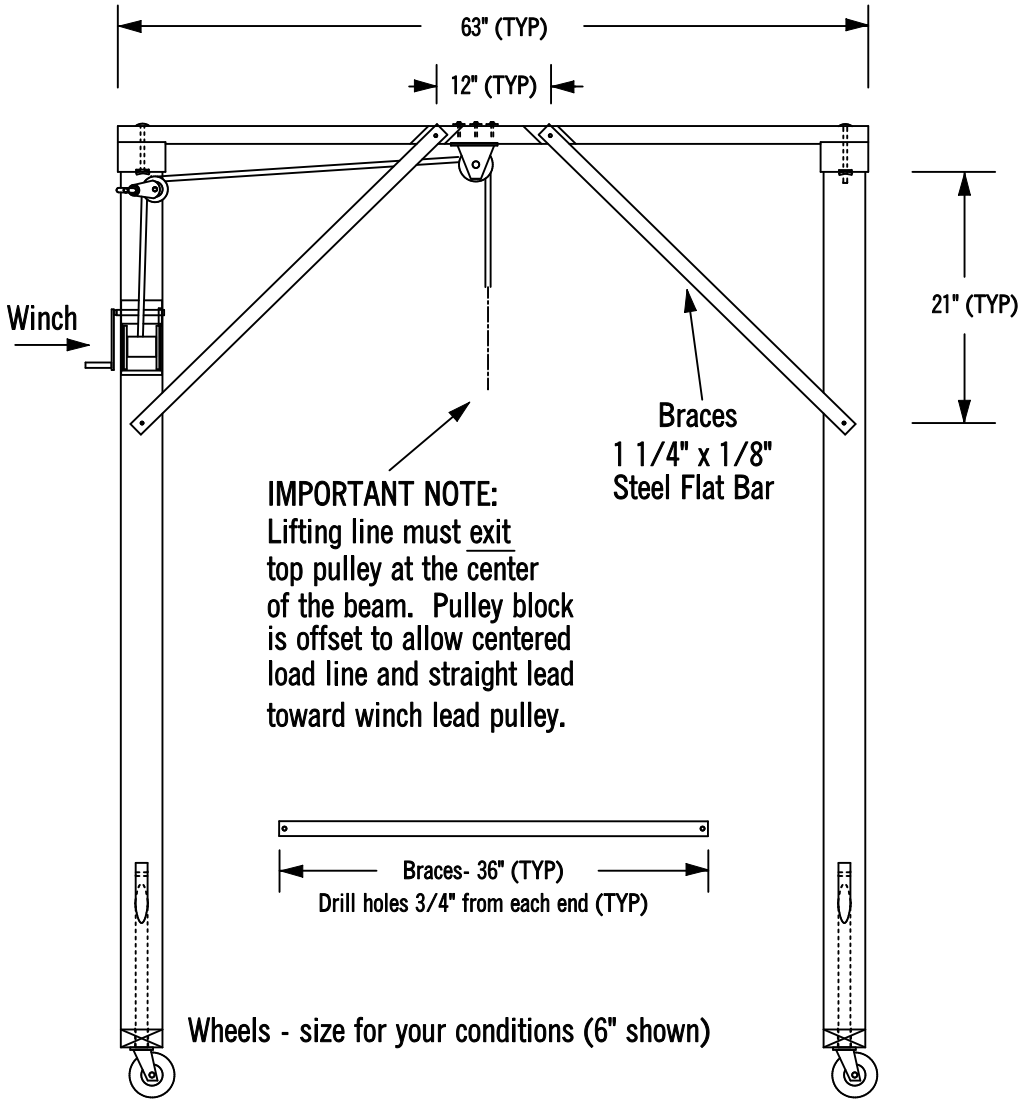
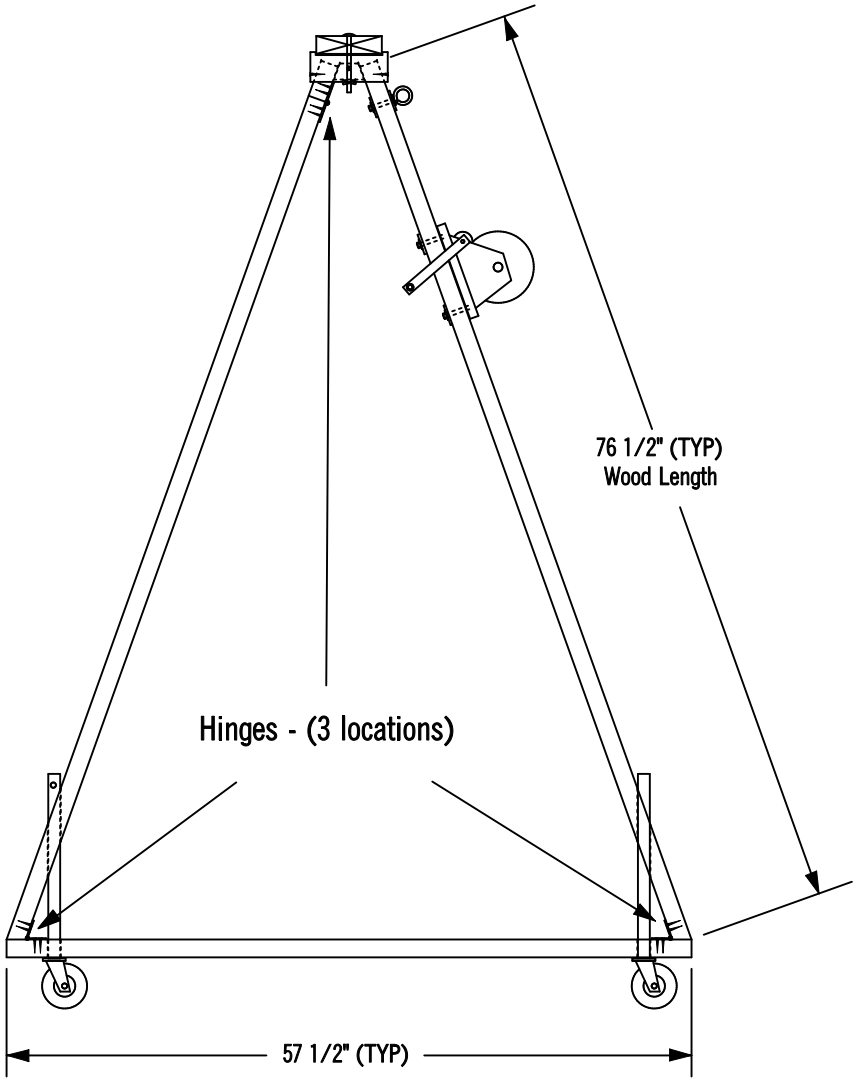
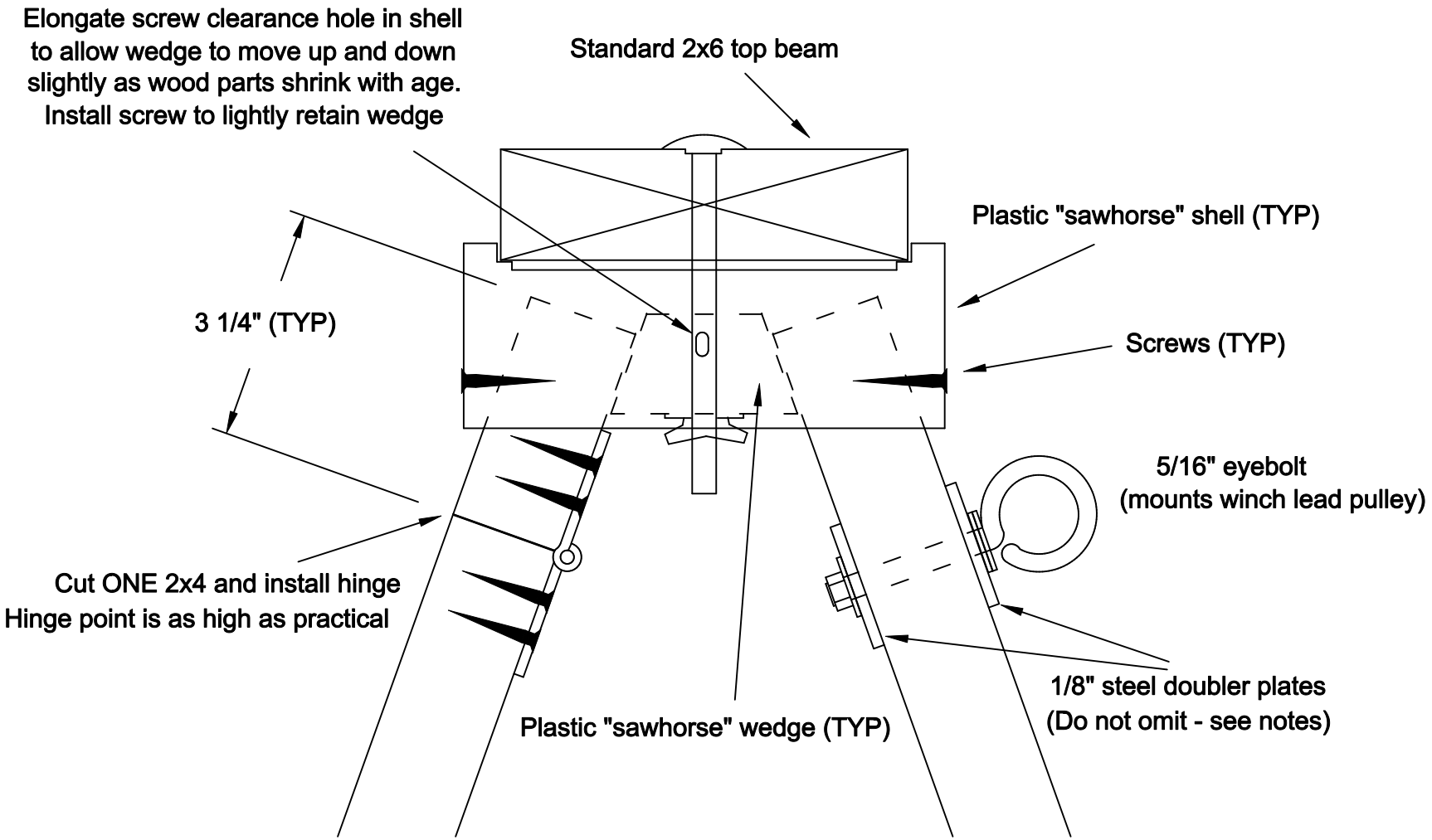
# Portable Hoist - General Layout

All dimensions shown are typical (TYP)
for original hoist constructed to lift a
Meade 12" LX200 onto a Giant Field Tripod.
Adjust all dimensions to suit your needs.

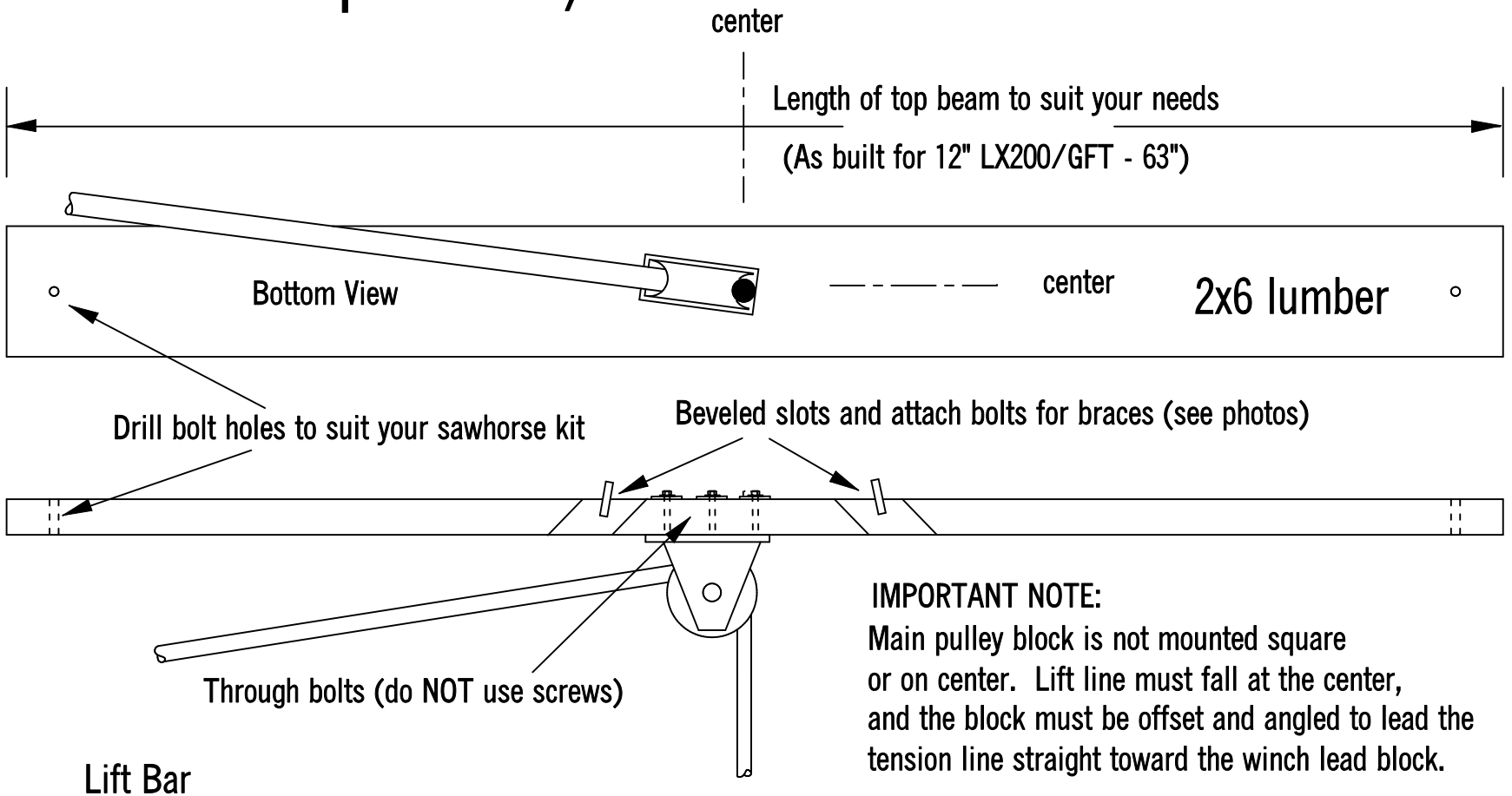


# Side Support Top Detail



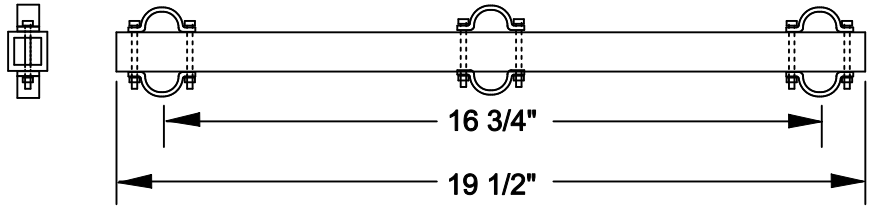
# Top Beam, Lift Bar & Harness Detail




**IMPORTANT NOTE:**
Main pulley block is not mounted square or on center. Lift line must fall at the center, and the block must be offset and angled to lead the tension line straight toward the winch lead block.

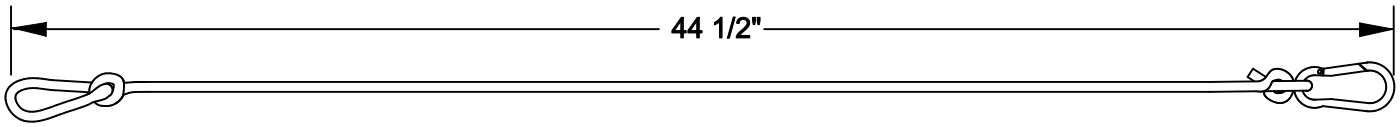
## Lift Bar

1" Square aluminum tube
"EMT" clips for line guides
See Notes

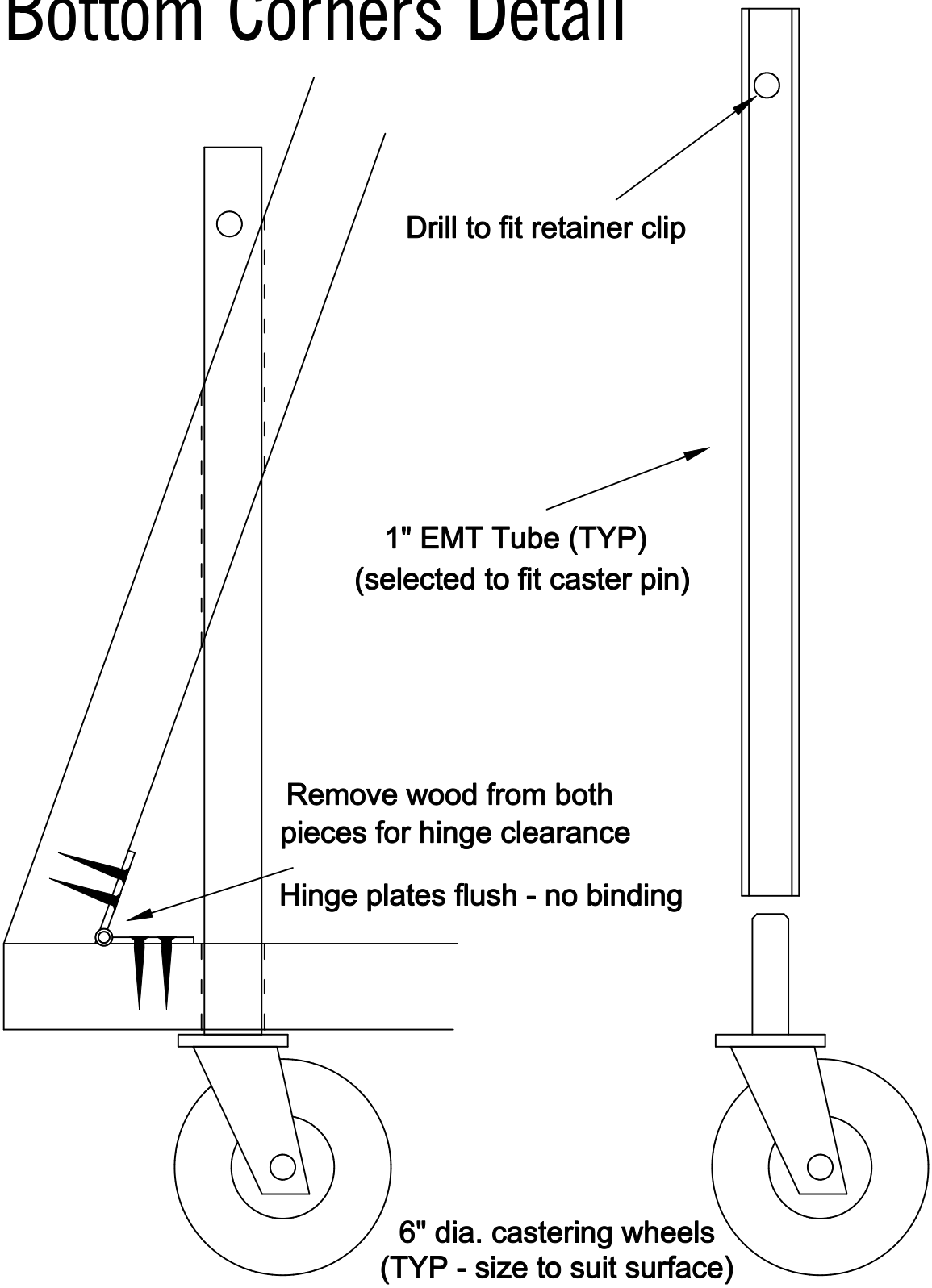



All dimensions shown are for a 12" Meade LX200ACF
Modify to suit your equipment

Harness Lines - 3/8" Nylon double-braided line - End clip has spring-loaded gate



# Bottom Corners Detail



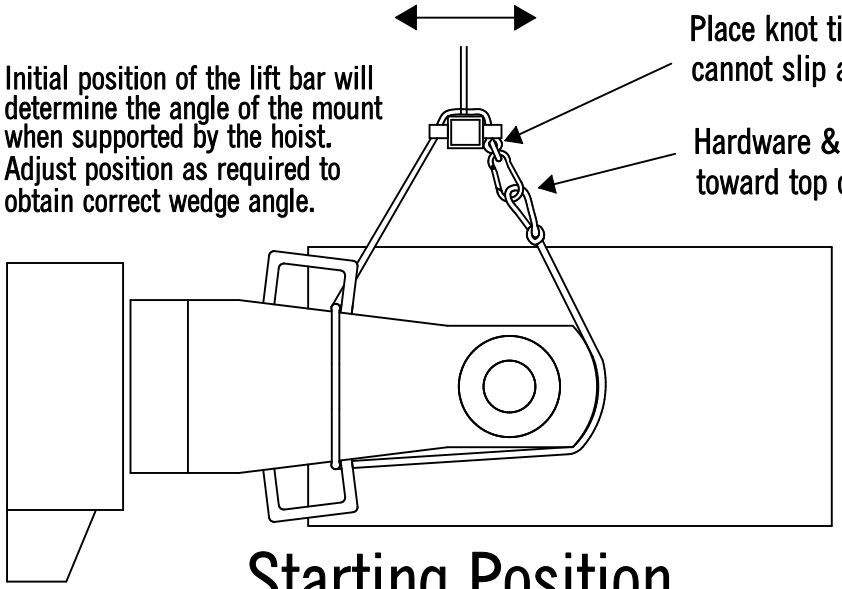
# Lift Harness Rigging for Polar Mount

Lift Bar Roughly Centered
Between Handle and End of Forks

Initial position of the lift bar will determine the angle of the mount when supported by the hoist. Adjust position as required to obtain correct wedge angle.

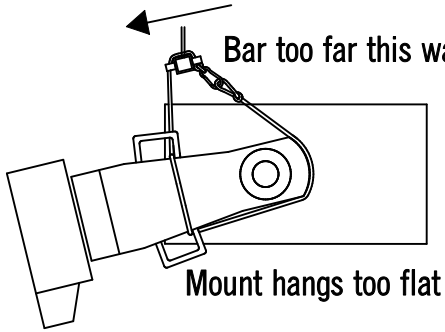
Place knot tight against line guide so line cannot slip and change the wedge angle

Hardware &knots placed toward top of mount



Starting Position

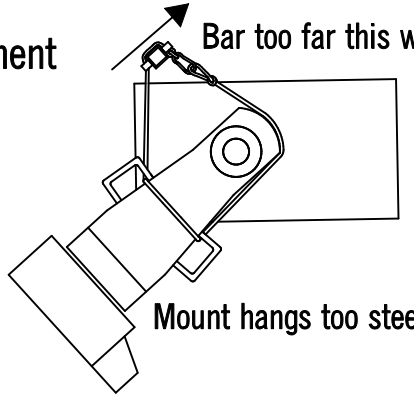
Bar too far this way



Mount hangs too flat

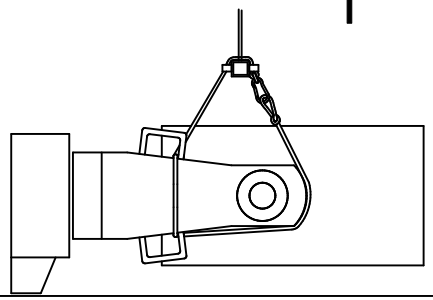
Bar Placement Examples

Bar too far this way



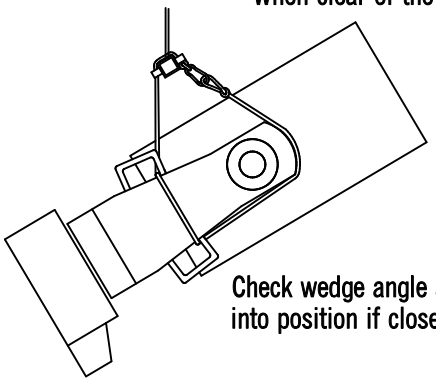
Mount hangs too steep

1



When clear of the case

2

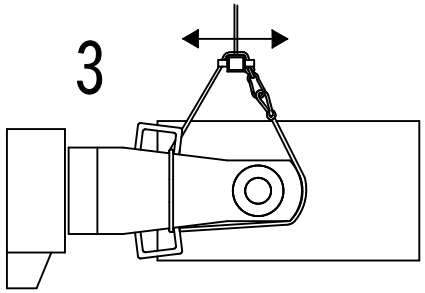


Check wedge angle and hoist into position if close enough.

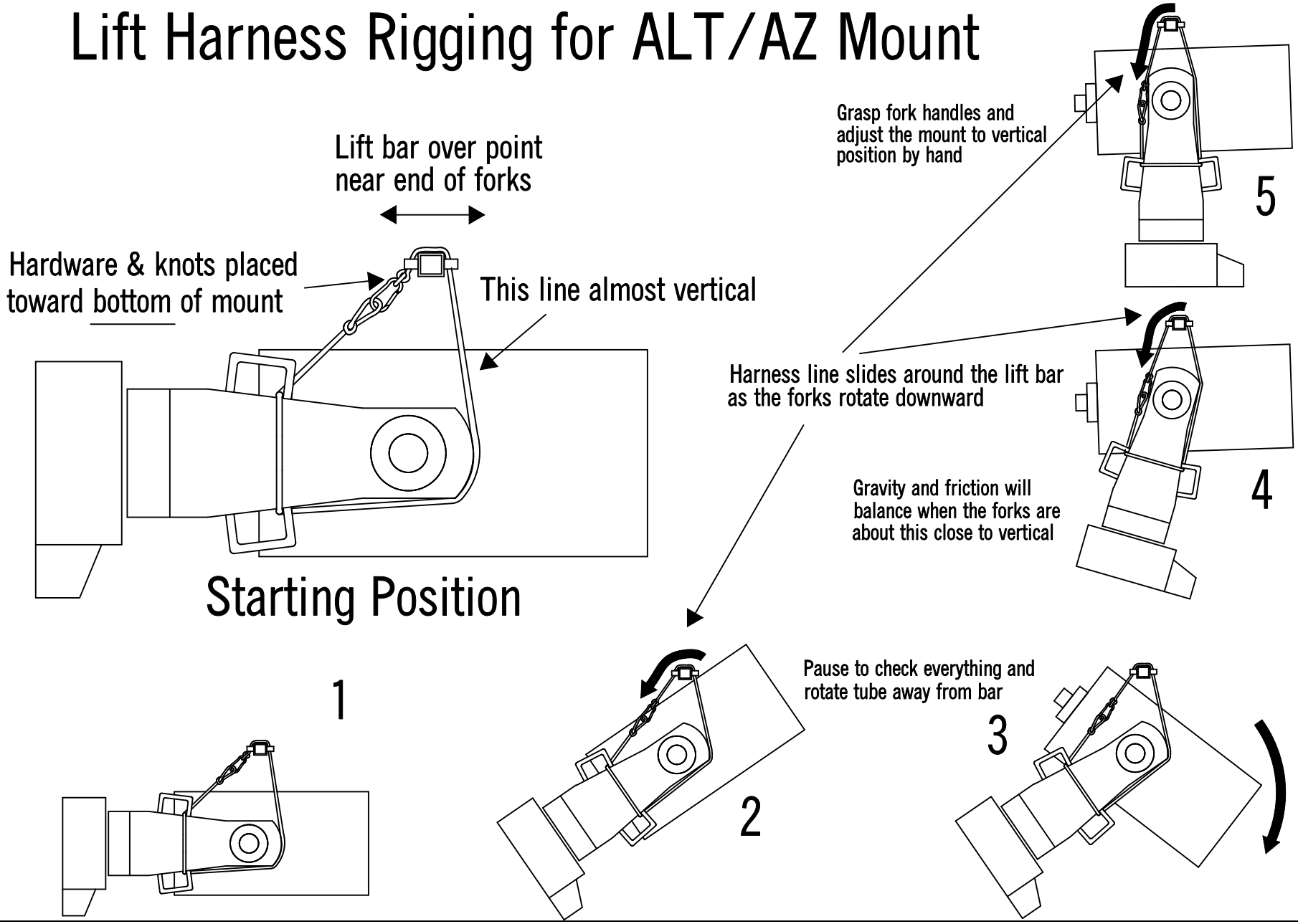
To adjust the angle of the mount:

Relieve the tension on the hoist, and slide harness lines to change bar position

3



# Lift Harness Rigging for ALT/AZ Mount



# General Notes

## Materials:

**Construction lumber:** Six 8-foot 2x4s for the end triangles, and one 8-foot 2x6 for the top beam. Kiln-dried lumber would be nice, but it's expensive and not readily available at many retail home-improvement stores. Most wood available at retail outlets these days has not been well dried at all, and if left to its own devices it will quickly warp and twist - sometimes to an amazing degree.

So… If you buy green (wet) wood, be prepared to somehow hold it straight while it dries. I stacked my wood tightly on the floor and put heavy weights on top of the stack. Then I waited about a week before starting construction. Every day or so, I would check the floor under the stack. If it was still wet from the lumber, I rotated the stack and waited.

Once the primary structure is complete, leave it standing (assembled and braced) for a while if you can. Wood held in position by the structure will warp a LOT less than if it's free to move while the wood finishes drying.

Or just spring for some nice, straight, kiln-dried stuff if you can find and afford it.

**"Sawhorse" kit:** Available at most home improvement and hardware stores. Get one made of fiber filled (it may say fiber-reinforced) plastic, and if you have choices, go for the heavier duty model. It needs to accommodate 2x4 legs and a 2x6 on top.

**Hinges:** Heavy-duty but otherwise standard door hinges (with removable pins, check the package). You'll need three pair, 3½" wide (tall if they were on a door).

**Pulleys and Eyebolt:** Look at the photos, and buy something similar. The pulleys need to have easily removable axle pins, and be rated for at least twice the load you expect to put on them. Mine are sized for 3/8" line. The one that goes at top center MUST be capable of being through-bolted into place. Don't even THINK of mounting it with the screws that may come with it. You will have to disassemble the unit to bolt it in place, but that's OK, you will have to disassemble it routinely anyway as you set up and tear down the hoist. I found mine at a name-brand hardware store. I used a 5/16 (rod diameter) eyebolt to mount the lead pulley above the winch. You'll need to clamp it in a vice and use your "bigger hammer" to open it up a bit to mount the pulley and then close it back up.

**Winch and Line:** My winch is standard boat trailer winch. Mine is a lot stronger than needed, but it was on sale cheap the day I went shopping. I found it at a discount hardware store for less than $30, and it's rated at 2,000 lb. I would have preferred something a bit lighter in weight, but money and immediate availability won out. The line is 3/8" nylon "double braid". Find it at a boat store. Again a lot more strength than required, but I wouldn't go with less. This size and type of line has about the ideal amount of "sliding friction", which will become important when we use that friction to regulate how the forks line up with the wedge (or the top of the tripod for Alt/Az mounting).

**Load Bar and Line Retainers:** Again see the photos. A 1" square aluminum tube with 1/16" walls is adequate for a load up to 200 lb. You'll need a piece 19 1/2" long for a 12" LX200. Other scopes will probably require something different. The line retainers are made of the clips used to hold 1/2" EMT electrical conduit in place on a wall. Find them in the electrical department of the home improvement or hardware store.

**Braces:** 1 1/4" x 1/8" mild steel flat bar. Hardware, home improvement, or farm & ranch store. You'll need 4 pieces about 3' long. I found 6' lengths at a big box home improvement store at a very reasonable price, and cut each in half.

**Brace Mounts:** These are 1/4" dia. studs that have a lag screw for wood on one end, and the other end threaded standard 1/4 x 20. Lag screw end about 1 1/4" long. The other end will probably be the same length, but you'll cut off the excess. You'll end up using about 5/8" of this end - see photos.

**Other Stuff:** Wheels and mounts according to your preference and scrounging ability, 1" wide nylon web strapping, 1" sew-on Velcro is nice (see photos), mounting bolts and washers for the top pulley, retainer clips for the wheels, 1/4" wing nuts for the braces, some 3/4" PVC pipe scraps for the carrying handles, convenient screws for retaining the plastic bits on the top end of the supports so everything doesn't flop apart when the hoist is folded up, odd bits of wood scrap, etc. Again, look through the photos and you'll come up with your own shopping and scrounging list.

# Construction Notes

**End Frames (Triangles):** Pretty straight-forward stuff. Since different sawhorse kits may have different angles for the legs, your dimensions for the wood pieces may vary. Mock up one set lying flat on the floor using full-length (8') legs, and start measuring. You'll need a minimum of 8" clearance between the bottom of the top beam and the top of whatever you're lifting to allow room for the pulley, knots, lift bar, sling connections, etc.

Decide the placement of the top hinge, cut the leg at the appropriate place, and fit the hinge before marking and cutting the bottom. The saw cut will take about 1'8" out of the leg, and the two pieces of the leg should to meet at the hinge line as if the wood was a solid, continuous piece. I neglected to do this, and you'll see the shims that "put back" my saw cuts in the photos.

Once you're sure of what your final height should be, miter cut the legs, cut and fit the bottom pieces and install the hinges. It may be helpful to use temporary screws to hold parts in place while you test the structure and complete the fitting. You'll have to relieve a bit of wood to achieve a good fit around each hinge pin unless you bought truly flat (piano-style) hinges.

Make sure the bottom hinge pin on the leg opposite the one with the cut/hinge drives in and out easily.

Try folding up the triangle. You'll have to pull (twist) the bottom piece out-of-line slightly to get it to swing up and fold, but there's ample flexibility in the wood so you won't harm anything.

**Top Beam:** The length of this will determine whether or not the hoist can straddle your tripod. Remember that the tripod legs present different widths at ground level depending on the angle at which you approach. Make your decision accordingly. Hold off on mounting the center lift pulley until the lift line is installed so you can install the pulley at the correct lead angle.

**Braces:** Stand the basic structure (no wheels yet) up on a flat floor. Push/pull/twist/shove as necessary to get everything square. Loosen the top bolts, twist, shove, pry, and try again. A little wood warping goes a long way here, so be prepared to use a bigger… or try an "X" of rope tied flat to the bottom corners, and adjust.

When you get close, make up some temporary braces out of wood scrap, and install them lightly with nails. Work your way around and keep fiddling with everything until you have everything as square as it's going to get. Drill pilot holes (snug on a nail) in the ends of the braces (about 3/4") from the ends, and trial-fit. Mark the locations for the relief slots in the top beam, and cut out the relief slots so the braces can lie flat in the slots. Nail the braces in what you think will be their final positions, and mark each brace (and the structure) so you can put each brace back where your trial fit worked. One brace at a time, drill pilot holes in the wood where the nail holes are, drill out the braces, install the lag/machine screw studs in the wood, and mount the brace with wing nuts.

**Winch, Lead Pulley and Eyebolt:** Your winch mounting will depend on which winch you buy. 3/8" double braid line, please. See the photos. For the top pulley to lead the winch somewhere near center, the eyebolt has to go through the leg close to the edge. Too close to trust it to hold under a heavy (twisting) load without some help. Install 1/8" steel or aluminum doubler plates on both sides of the leg and bolt solid with the eyebolt shaft and 1 or two smaller bolts on the other side. Again, refer to the photos. DO NOT OMIT THIS. Sleep well thereafter.

**Top Center Pulley:** Figure out the lead angle by threading the lift line in place. Remember that the exit (down) line is what's on center, mark and drill the mounting holes in the top beam, and bolt in place.

**Wheels:** This will depend on what you decide to use for wheels. I used 6" casters that had post mounts that slipped neatly into a 1" EMT section.

**Other Stuff:** Small details can make a big difference. Go through the photos and use what you think worthwhile. The most time-consuming part of the project for me was drilling/cutting/rasping/sanding… the long, angled holes in the legs where the wheel mounting tubes go through. I have no quick solution to this. It took me over an hour per hole. Profanity did not seem to help.