

NALLY TOWER RELOCATION NOTES by Ian Jackson VK3BUF

SMALL DISCLAIMER

These notes have not been compiled as a part of a commercial enterprise or tower installation service. It is simply a catalogue of notes representing some methods that have been used by private individuals for relocating Nally style towers. It makes no claims about the suitability of a tower for a given location, Council permissions, or structural integrity of this equipment.

There are elements of danger associated with tools and equipment for tower relocation that should not be lightly dismissed. Anyone working with heavy steel structures of this nature should take extreme care to ensure that children are kept away from the construction area and that all appropriate safety equipment is worn and used correctly.

REMOVING THE TOWER FROM THE OLD SITE

A **You-Tube** video by Clint **VK3CSJ** describes this process in excellent detail. Perform a search on the You-Tube site using his callsign to locate and view this video clip it is worth doing.

THE NEW TOWER SITE

First choose a site for the tower with care. Be aware that as the tower tilts over a full 3 metres of clearance is needed behind the tower as the tower base rises into the air.

Also leave space at the tiltover location for bulky antennas to clear trees and buildings, preferably so that the tower will be able to tilt over to full horizontal without fouling any antenna elements.

HOLE PREP

The hole has to be dug in an appropriate place. This is usually 250 or 300mm in diameter (depending upon available hole boring equipment) Hole depth should be 2.1 metres where the pole in-ground-length is 2 metres. (the end of the pole should not be sitting in the dirt, it should be encased entirely in concrete)

It does not matter much if there is water in the hole as this will be displaced as the concrete is added. As long as the hole does not begin to cave in.

If the hole does start to collapse, there are two choices. One is to sleeve the hole as it is drilled with a thin steel sheet. The other is to drill it quickly and get the pole into the ground before it collapses.

A square collar needs to be dug at the top of the hole. This needs to be about 600 x 600 mm and about 150mm below the surface. Work on the basis that the top of the concrete will be 50-100mm above the ground surface so that water and dirt cannot accumulate around the base of the pole.



POLE PREP

Where the pole needs to be repaired and extended (as many old towers are cut off at ground level) a sleeve will need to be inserted. Getting a close-fit pipe section to sleeve a 150mm waterpipe section is very difficult. A very good sleeve may be fabricated from a section of 150mm gal pipe approximately 800mm long that is placed inside the pole.

The pipe should be 150mm gal water pipe. Non-galvanised pipe is not recommended as over time water can build up inside the installed tower pole from condensation and this can cause the pipe within the ground to rust out.

Before the sleeve is inserted, four 20mm holes must be drilled through both halves of the pole so that the sleeve may be pin-welded to the outer section.



The pipe extension and the prepared sleeve

Ensure that both halves of the pipe are cut at exactly 90° across the pipe, with the outside edge bevelled slightly as there needs to be a uniform gap between the two halves for welding the join. A simple way to square-off the end is to wrap a single sheet of newspaper tightly around the pipe until the sheet overlaps, then mark around the pipe using the edge of the sheet as a reference line.

A longitudinal gap is cut in the pipe of about 40-45mm wide. Then using a press and clamp the pipe must be closed up so that it can be sleeved inside the two halves.

The pipe will spring open a little as the gap is cut out.

Closing the gap can be hard as it will take a lot of pressure to compress the pipe. Normally we use a bolt-together clamp arrangement, but it can be done in other ways, such as with a car jack and twitching the pipe with some fencing wire.



The joined & prepared pole

The inside of both halves of the pole have a welded seam that forms a prominent bump down the interior length of the pipe. It is best to align this seam with the gap in the inner sleeve as the sleeve is pushed into the pole in order to get a smoother fit.

Once one end of the sleeve has been inserted to the halfway point, it is ok to weld through the 20mm holes on that half to stop the sleeve from moving further when the remaining half of the pole is slid over the sleeve. Spraying the sleeve with WD40 or similar can make the pipe slide over the sleeve a little easier. A big hammer is useful here to tap the pole extension into its final position.

After several solid fillets of weld have joined the two halves and filled the 8 pin-welds through the 20mm holes, a grinder can be used to clean up excess weld before some cold-gal spray is added to the weld areas to protect them from rust.

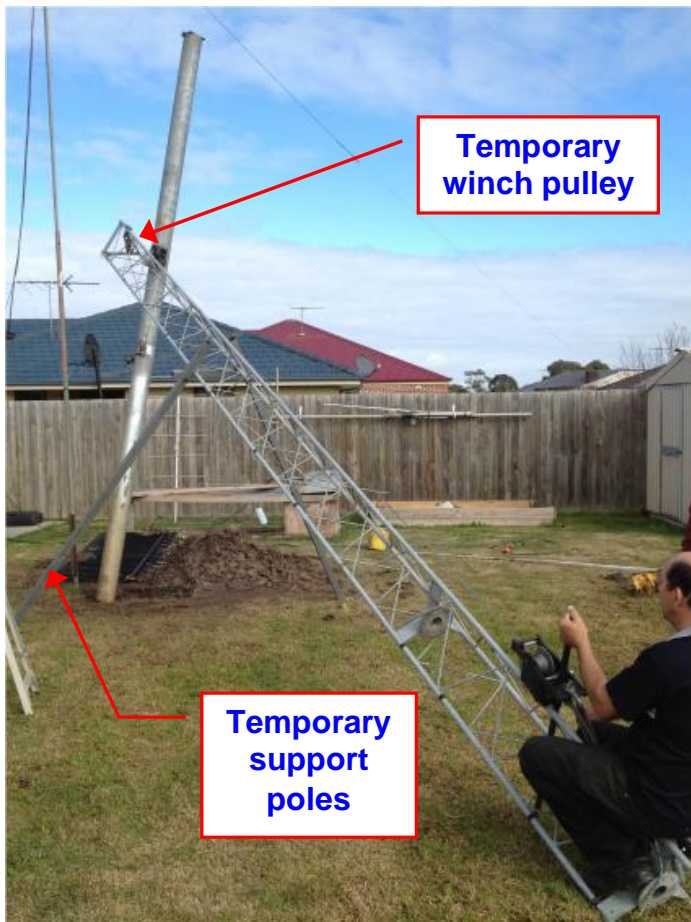


The sleeve clamped & inserted

PLACING THE COMPLETED POLE INTO THE GROUND

Unless this is done right, it can be a difficult and dangerous process. Just standing the pole up and dropping it down is a poor method, as it can snag on the side of the hole, causing partial cave-ins and fill up the base of the hole with soil. A correctly installed pole should have concrete around the end of the pole, which means it needs to be suspended slightly before the concrete is added.

If there is access to a small truck crane or earthmoving equipment with a hydraulic bucket to do the lifting, it is a simple matter to attach a chain and lower the pipe into the hole safely. Often this equipment is unavailable, or it cannot reach a sealed backyard location, so the insertion must be done manually.



Creating a large tripod from the top stage

To complete concreting preparation, bolt a section of scrap steel across the face of the pole base-plate, so that it may rest the weight of the pole on some old bricks, (shown right) while leaving clear access around the pole for trowelling off the concrete. A wood box-section 600 x 600mm with the top just above ground level makes a neat finish.

The top of the concrete needs to slope away from the pole so that rain water does not accumulate.

It usually takes 10 or 11 bags of 20kg pre-mix concrete to complete the job. Adding water with a hose as each bag is added to the hole.

One effective method is to simply use the top stage of the Nally tower on its own as a temporary lifting crane. By placing one end of the tower on the ground and by adding two support poles two-thirds along its length, a large tripod base is formed, with the end of the tower positioned over the hole.

A hand winch at the base has its cable extended the length of the top stage, over a temporary pulley, then down to the mid-point of the pole. The winch operator can then easily lift the pole into the air while a second person slowly guides it down the hole. This is a safe and stable method to use. If there is a problem, and the pole needs to be removed, perhaps to deepen the hole, then it is a simple matter to winch it back up again.



It is worthwhile adding four ropes and star pickets to keep the pole vertical during the levelling process with a spirit level. This method allows for small adjustments to be made by tightening and releasing the ropes in small increments. It will also keep the pole steady while waiting for the concrete to dry for the necessary 24-48 hours,



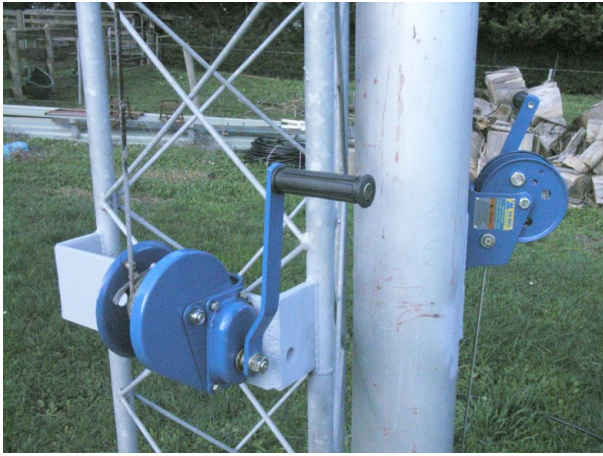
The pegged out pole, waiting for the concrete to set.

THE LIFTING JIB

One of the scarier parts of the process is placing the tower onto the top of the support pole. The bottom stage section is very heavy.



The lifting jib shown here was tailor made for this task. It clamps to the pole, with its base resting on a house brick or block, just above the tiltover winch. (as seen on the VK3CSJ tower removal video) It is capable of lifting both stages at the same time. This unit has been made available to local amateurs East of Melbourne so that they may work with their tower safely.



Inspect the tower winch cables for rust or damage. The tiltover winch cable is usually about 7.5 metres long. Replacing the cable with stainless Steel winch cable is a good option if you wish to pay a bit more. A good supplier for this cable at a reasonable price is **A. Noble & Son**, located on the south Gippsland Highway, near Dandenong Vic. (see www.nobles.com.au)

If your tower has the older style pawl & ratchet winch, it is worth considering replacing both winches with 'brake winches'. These newer winches won't run away if you let go of the handle during a tiltover operation. A separate article titled "**The Wicked Winch of the East**" is located on the GGREC web site that describes this upgrade process separately. These winches are also available from A.Noble & son.

For convenience, telescope the top stage of the tower inside the bottom stage while it is still on the ground, so that winch cables etc can be threaded through more easily than when it is in the air. Add a D-shackle or bind with rope between top and bottom stage to prevent any unwanted movement.

Tie a 4-5 metre length of rope to each end of the tower while it is on the ground. These ropes can then be manipulated by a couple of helpers when the tower is winched up, to keep it level and in position, while another person inserts the hinge pin from a step-ladder.

Before it is fully clamped to the pole, ensure that the lifting jib vertical section is not in-line with the pole pivot point, as this can prevent the easy insertion of the hinge pin when the tower is in the air.

It is also useful to hook up the tiltover winch cable to the base of the tower before it is lifted into the air. This avoids trying to add the cable to the tower base when it is a long way in the air. It can also be useful to use the pole tiltover winch to take some weight while manoeuvring the tower into position over the pivot point. The hinge pin should be well-greased before sliding it into its resting place. This helps to prevent future rust and corrosion.



Lifting the tower into position onto the pole

The inserted pivot pins should also have a cotter pin pushed through it to ensure that the pin would not wriggle out over time, although with the final weight on it, the pin will seldom move very far.

The base of the tower is fastened to the base of the pole. For convenience and easy insertion/removal for tower maintenance work, these bolts and nuts are nicer to work with if they are also stainless steel.

COUNTERWEIGHT OPTION



A counterweight makes tilting the tower easy

Note that in this picture a larger base pad was used, with an earth stake and coax conduits protruding from the concrete. This made it less likely that cable would be damaged during grass cutting and trimming around the tower.

THE COMPLETED INSTALLATION

It is a lot of work, but the completed tower is a much tidier option than steel poles with multiple guy ropes littering the yard.

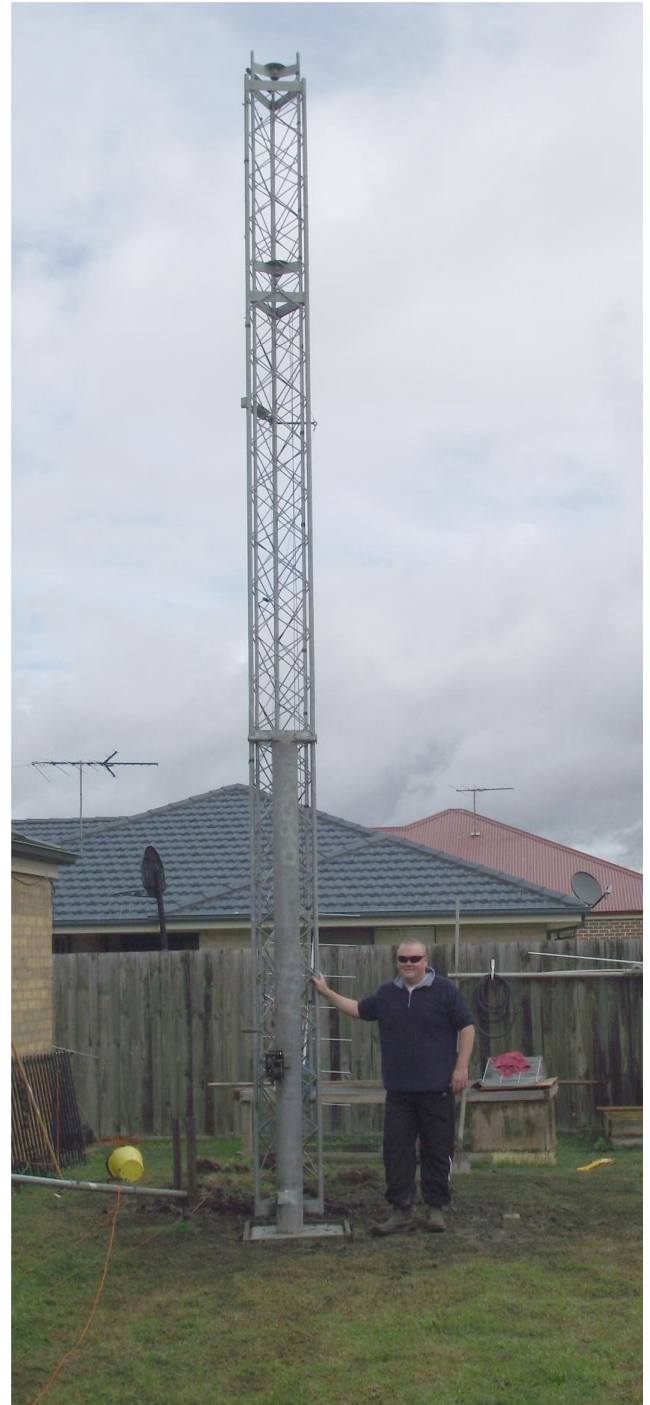
Coax cables may be run outside the tower, looping down when the tower tilts, or inside the tower. Inside is neater, but the cables do tend to bunch and catch when the top stage is going up and down.

When the job is done, it is important to stand back and look at it for a while, preferably with a beer in one hand.

If the antenna collection is large and heavy, it is worthwhile adding a counterweight to the base of the tower to assist the tiltover process. You need about 70-80kg to make this worthwhile.

A collection of scrap steel or blocks on a short chain is a good option for this

The adjacent picture shows a slab of steel that is simply hooked on or off when the tower approaches vertical.



The completed installation