

Horizontal Manual Pole Assembly & Installation

For Base Plate Mounted Utility Poles

1.0 Purpose

The purpose of this technical instruction is to detail those actions necessary to ensure that steel power pole sections are joined, assembled and installed in compliance with the applicable design standards.

2.0 Scope

This procedure applies to the joining/ assembly and installation of base plate mounted steel power poles. Methods of horizontal pole assembly are detailed.

3.0 Procedure Details

Preparation of Pole Foundations

- 3.1 The pole foundation, supplied by others, must be designed and constructed in accordance with the applicable standards to ensure that the pole foundation is appropriate to the pole design parameters.
- 3.2 Assemble the foundation bolts and templates into a cage using the nuts and washers supplied in accordance with the relevant drawing.
- 3.3 Before pouring the foundation it is recommended that the steel templates be used to ensure that the bolts are correctly centred and vertical (For termination or angle poles which may be back raked, the foundation cage may be offset from vertical to achieve the back rake required). The longer full threaded portion of the bolts should protrude the required distance above the finished concrete level (as shown on the relevant foundation bolt assembly drawing) and should be coated with grease and protected by a cap.

Horizontal Pole Assembly

- 3.4 Each site should determine, document and train its personnel in safe work methods relevant to the site and to the pole assembly and installation.
- 3.5 Arrange the base section onto the packing and level so that the underside of the pole section will be horizontal. The height of the packing should be such that it clears the bottom of the base section, well above ground level.
- 3.6 Make sure that the pole base section is wedged to prevent rotation (refer figure 1).

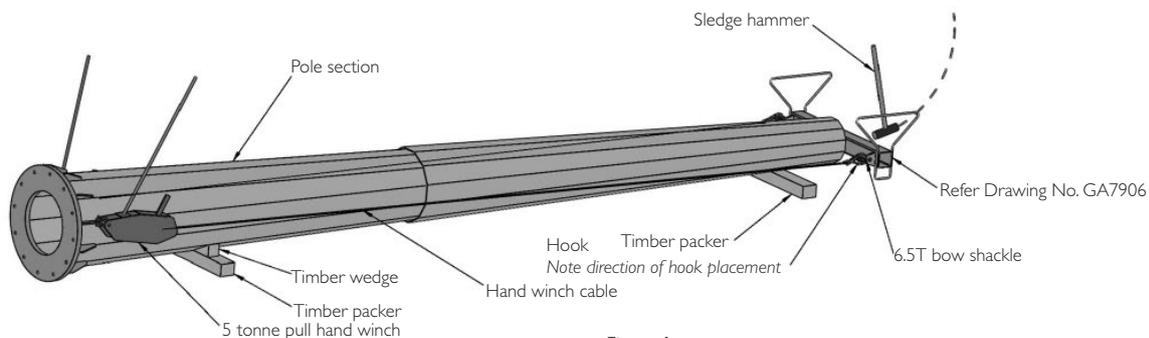


Figure 1.

- 3.7 Check that the design slip distance and minimum slip distance, are correctly marked near the top of the section. If the final slip length achieved is to be recorded then mark an additional spot 300mm past the design slip distance as a measuring reference.

- 3.8 Check that the packing is a minimum of 300mm clear of the slip joint length shown on the drawings to allow for any horizontal movement of the column during assembly.
- 3.9 Sling the next section for assembly at its centre of gravity and engage the section as far as easily possible, making sure that perfect alignment of the pole sections are maintained. Rotate the section being slung as necessary to maintain perfect alignment of the corner fold lines.
- 3.10 Pole sections must be aligned both horizontally, when viewed from the side (refer figure 2), and must also at the same time be in a straight line when viewed from the end of the section (refer figure 3).

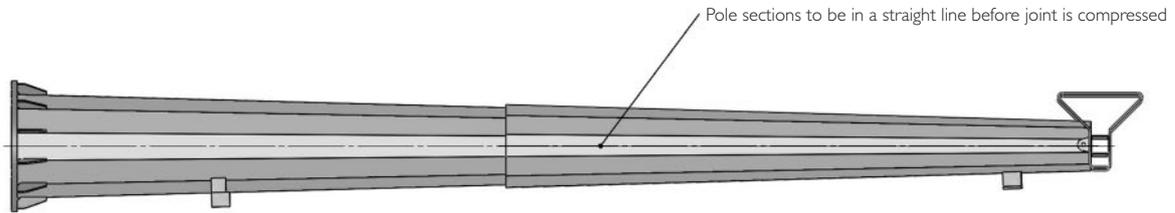


Figure 2.

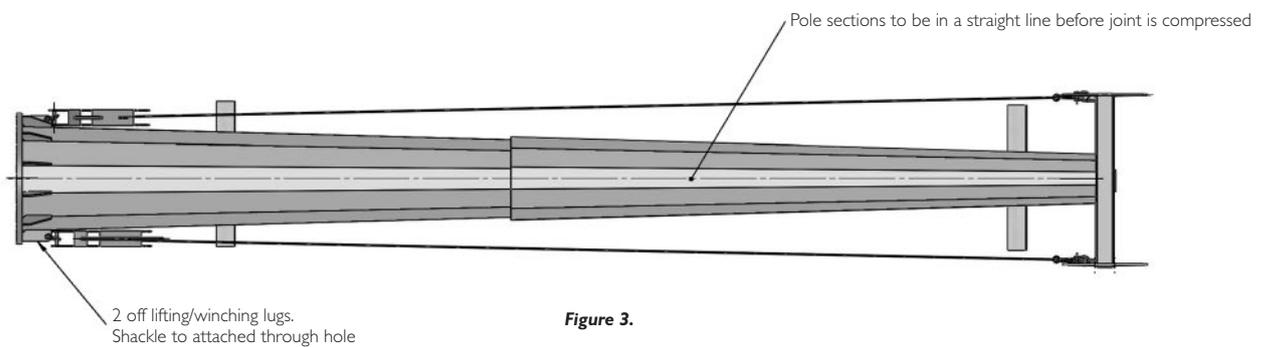


Figure 3.

- 3.11 Pole sections and climbing rung clips, if applicable, must be aligned along the length of the pole in accordance with the relevant pole drawings.
- 3.12 Assemble two 3 tonne lift, 5 tonne pull hand winches (this may vary for larger transmission poles to 20 tonne total compression), one each side of the pole. Anchor the hand winches to the two lifting/winching base plate gussets provided (refer Figure 3). Position an SHS cross beam at the top end being joined and attach the wire rope to the lugs on the SHS cross beam.
- 3.13 Raise up the cross beam as necessary, so that the cross beam is on the pole centre line. When viewed from the top end it is important that the cross beam at the top end is parallel with the plane of the two winching lugs at the base on to which the hand winches have been attached (refer figure 4). If welded winching lugs have been provided on the upper sections, these may be used in place of the cross beam.
- 3.14 Noting only one section of the pole is to be assembled at a time starting from the base section.

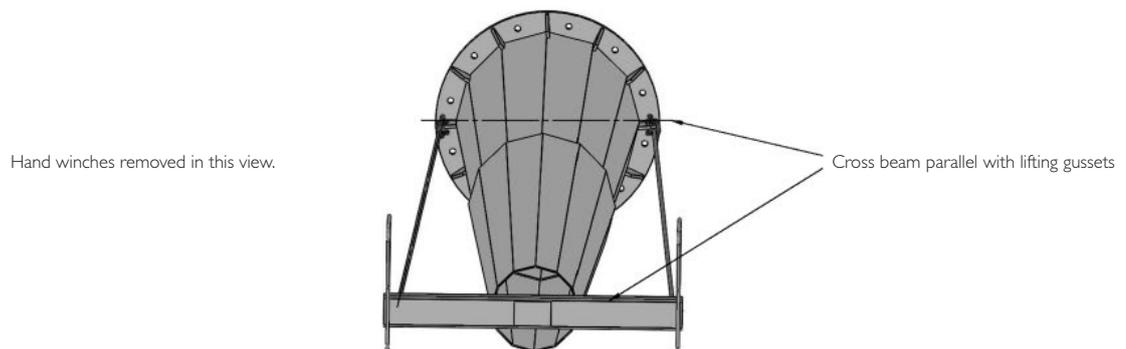


Figure 4.

- 3.15 Under strict supervision, operate the hand winches in unison to ensure that telescoping of the sections proceeds evenly about the column axis. During this operation the cross beam can be hammered on the striking plate (see figure 1), and the external surface of the slip joint can also be hammered via wooden block to assist in achieving a sound joint.
- 3.16 Misalignment of the sections for any reason may lead to jamming, which will prevent good telescoping of the joint and may be difficult to rectify.
- 3.17 Continue to apply pressure as described in 3.14 above **until no further movement can be achieved** under the application of the required force (refer to pole drawings). Check the design slip joint length with respect to the actual slip joint length achieved. If the slip joint length achieved is less than the design slip length, check that the minimum slip length has been achieved (refer to pole drawings) and that the joint appears to be tight all round. Contact INGAL EPS if the slip distance achieved is less than the minimum.

- 3.18** Before removing the crane sling, pack up the newly assembled section to the required level ensuring that the packing is at least 300mm clear of the next joint to be made. Proceed in the above manner until the pole is fully assembled, keeping a careful check on alignment.

Pole Installation

- 3.19** Safety considerations should be reviewed prior to any pole lift.
- 3.20** After the concrete has sufficiently cured, remove the top template leaving the bottom anchor bolt nuts and washers in position. These will end up under the pole base plate.
- 3.21** Adjust two pairs of nuts diametrically opposed at 90 degrees so that they are 10mm higher than the remainder and level with each other. These four nuts will provide a means of obtaining vertical plumbing of the pole (refer figure 5). Limit the space between the top of concrete and the raised nuts to a maximum of 1.5 x foundation bolt diameter. If the pole is required to be back raked on installation, allow the height of one of these pair of nuts to be adjusted to achieve the desired back rake. The pair of nuts at 90 degrees will need to be adjusted to half of the back rate height difference.

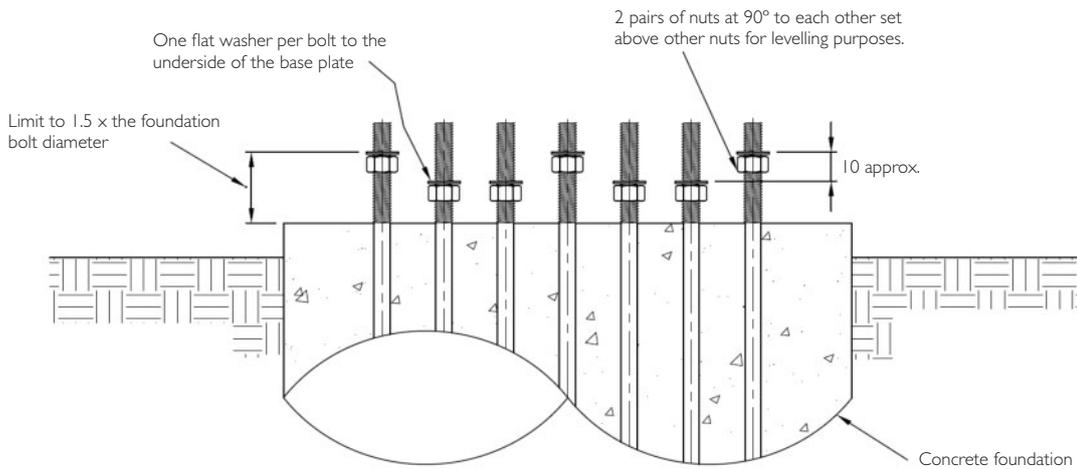


Figure 5.

- 3.22** Before lifting the pole, ensure the pole orientation is correct with respect to any cross arms and direction of the power line. If necessary, rotate the pole on the packing prior to lifting to facilitate the orientation.
- 3.23** Centre the lifting crane (A) as shown in figure 6. Attach a sling formed into a cradle arrangement (see figure 6) at approximately two thirds of the pole height from the base. Attach shackles to the lifting sling and fix them to the link ring. Attach a lifting sling around the link ring and to the hook of the crane. Attach a wire rope, chain or hand winch between the base plate lifting lugs and link ring. Use appropriate shackles as required. The wire rope or chain should be made relatively tight prior to commencing to lift the assembled pole (refer figure 7). The purpose of the above arrangement is to ensure that the wire rope is taut as the pole is lifted, and to stop the cradle sling from slipping up the column while also transferring the lifting force back to the pole base. All lifting tackle must be checked for its capacity and adequacy for the mass of pole being lifted.
- 3.24** Figure 6 shows the sling around the pole as not choked and the method described ensures that the safety wire rope or chain will be taut and will prevent any pole sections separating in the unlikely event that a pole section joint has not been correctly assembled. A correctly assembled joint will not separate on lifting.
- 3.25** Alternatively, a choked sling arrangement can be used. If this arrangement is used it is very important that the wire rope or chain between the base winching lugs and the lifting link ring or uppermost pole section winching lugs is taut.
- 3.26** The INGAL EPS supplied lifting kit is only suitable for baseplate mounted poles up to 3 tonnes total weight (the INGAL EPS standard lifting kit M24 RUD Starpoint eye bolt, WLL 3.2 tonnes, is for use with in-ground mounted poles only).
- 3.27** For some larger poles it may be necessary to use a small mobile crane (B) to "tail in" the base end of the column as the main crane (A) is lifting. This will avoid the base dragging on the ground and maintain control of the base until the pole is held vertical by the lifting crane (see figure 6).
- 3.28** Following the above, the pole may now be lifted onto the foundation bolts.
- 3.29** With the pole now resting on the levelling nuts on the foundation, place washers and nuts loosely on all bolt threads.
- 3.30** Plumb or back rake the pole using the adjusting nuts tightening the adjusting top nuts down. If the pole is back raked start tightening the lowest back raked adjusting nut first. Also tighten the four nuts on the underside of the four adjusting nuts.
- 3.31** With the four adjusting nuts tightened check the verticality or back rake on the pole. Replumb if necessary.

3.32 Now tighten all nuts to snug tight in a diametrically opposite sequence, tightening the nuts to the underside of the base plate and then the corresponding nuts above the base plate in a similar sequence. An approximation only of the assembly torque to achieve the snug tight condition is as follows:

- M24 = 248Nm or 183lbf.
- M30 = 491Nm or 362lbf.
- M36 = 864Nm or 637lbf.
- M39 = 1115Nm or 820lbf.
- M42 = 1378Nm or 1020lbf.

3.33 Recheck tensions commencing with the bolts first tightened to ensure all bolts have similar final tensions. If lock nuts have been supplied these can then be threaded on and snug tightened in a similar sequence to the first ring of top nuts.

3.34 Release the load from lifting crane (A). If the lifting sling has not been choked, the lifting sling cradle and wire rope should easily slide down the pole as the lifting cable is run down.

3.35 Remove the lifting tackle and wire safety rope.

3.36 Fill the space between the base plate and the concrete foundation with a non-shrink grout (50MPa minimum). The grout must be at least in contact with the full underside of the base flange.

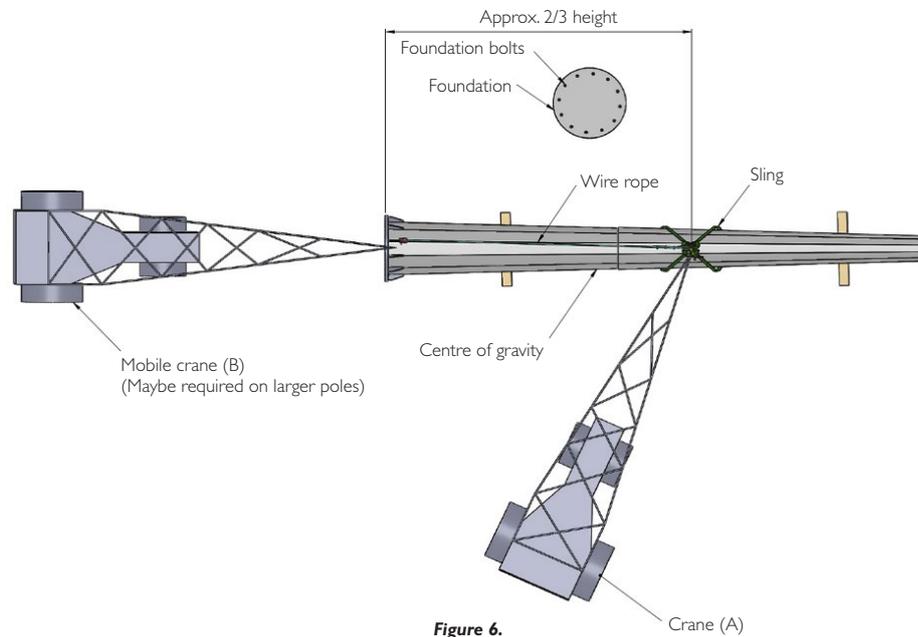


Figure 6.

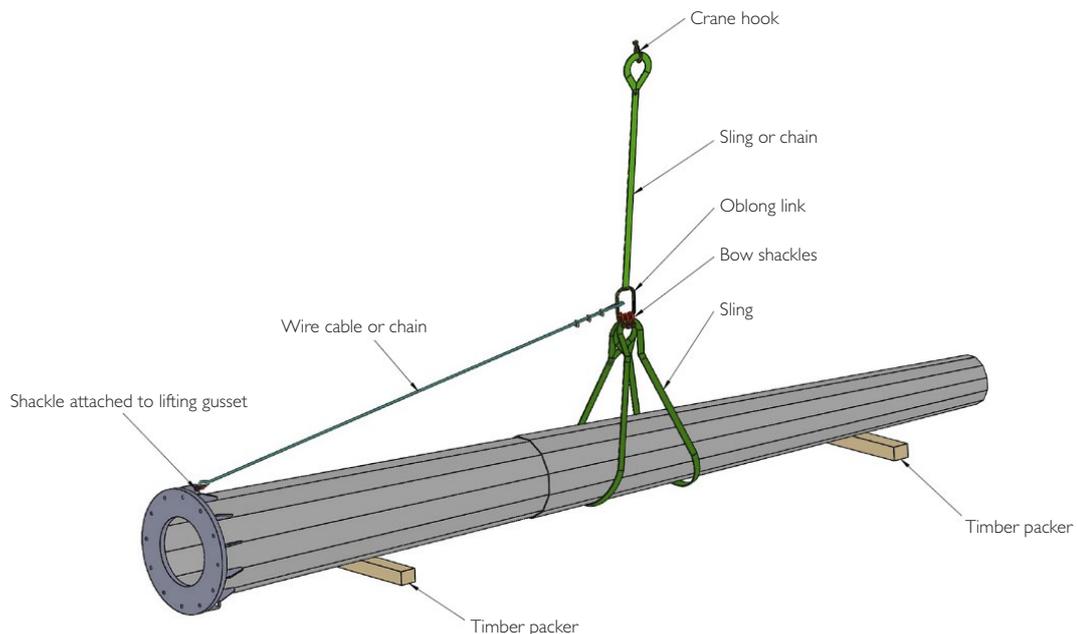


Figure 7.



4.0 Bill of Materials

Description	Qty
1 Soft Sling 6.0T 3.0m	2
2 Hand Winch 3.2T Lift 5.0T Pull capacity with Wire Rope 16mm diameter x 20.0m	2
3 Wire Rope 15.0m 3.0T WLL minimum with Thimble Eye one end, Brazed at other	1
4 Wire Rope 23.0m 3.0T WLL minimum with Thimble Eye one end, Brazed at other	1
5 Wire Rope Grip AS2076 to suit 15.0m 3.0T WLL minimum Wire Rope	3
6 Oblong Link 5.5T WLL minimum	1
7 Eye Bolt M24 3.2T WLL (in all directions) minimum	1
8 Bow Shackle 6.5T WLL minimum	5
9 Hand Winch Pulling Frame 10.0T, GA7906	2

Note: The 15m wire rope is for installation use on up to 26m length poles. The 23m wire rope is for taller standard in-ground mounted poles up to 34m length.

