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<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023	<b>Page</b>	1	<b>of</b> 10

# NSP/004/101 (OHI 1) - Guidance on Pole and Stay Holes

## 1. Purpose

The purpose of this document is to describe the approved techniques for setting out the position of pole or stay holes and their subsequent excavation and foundation and backfilling requirements for use on the Northern Powergrid Distribution System.

This document supersedes the following documents, all copies of which should be destroyed;

Document Reference	Document Title	Version	Published Date
NSP/004/101	Guidance on Pole and Stay Holes	3.1	July 2019

## 2. Scope

This document has been prepared to provide guidance on the foundation and excavation requirements for all wood pole design specifications used within Northern Powergrid.

<b>Document Reference:-</b>	NSP/004/101	<b>Document Type:-</b>	Code of Practice			
<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023	<b>Page</b>	2	<b>of</b> 10

## 2.1. Table of Contents

<b>1. Purpose .....</b>	<b>1</b>
<b>2. Scope .....</b>	<b>1</b>
2.1. Table of Contents .....	2
<b>3. Technical Requirements.....</b>	<b>3</b>
3.1. Setting out Pole Holes .....	3
3.1.1. Single Poles .....	3
3.2. "H" Poles .....	3
3.3. Excavations .....	4
3.3.1. General.....	4
3.3.2. Single Poles .....	4
3.3.3. H, A or Rutter Poles.....	5
3.4. Stay Hole Excavations .....	5
3.5. Backfilling .....	6
3.6. Pole Sinking Depths.....	6
3.6.1. LV Construction – NSP/004/041 .....	6
3.6.2. HV Construction – NSP/004/042.....	6
3.6.3. EHV Portal Construction (33 / 66kV) (OHL 4 and CE/C/37).....	6
3.6.4. EHV Construction (66 kV / 132kV) (OHL9/OHL10) .....	7
3.7. Pole Foundations .....	7
3.7.1. LV Construction – NSP/004/041 .....	7
3.7.2. HV Construction – NSP/004/042 & NSP/004/044.....	7
3.7.3. EHV Construction – (33/66kV) – OHL 4 or CE/C/37 .....	7
3.7.4. EHV Construction – (33/66/ 132kV Single Circuit) – OHL 9/OHL10 .....	8
<b>4. References.....</b>	<b>9</b>
4.1. External Documentation .....	9
4.2. Internal Documentation.....	9
4.3. Amendments from Previous Version .....	9
<b>5. Definitions .....</b>	<b>9</b>
<b>6. Authority for Issue .....</b>	<b>10</b>
6.1. CDS Assurance.....	10
6.2. Author .....	10
6.3. Technical Assurance.....	10
6.4. Authorisation .....	10

Document Reference:-		NSP/004/101	Document Type:-		Code of Practice			
Version:-	4.0	Date of Issue:-	October 2023	Page	3	of	10	

### 3. Technical Requirements

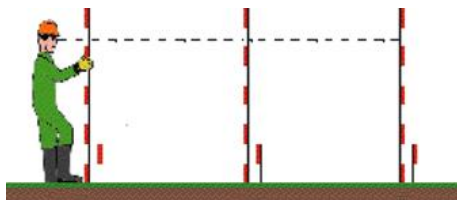
#### 3.1. Setting out Pole Holes

Checking the sighting of overhead line poles and associated stays prior to excavation is essential to make sure that poles are sited in the agreed line of travel and that stays are sited correctly to provide adequate stability of the pole to which they are attached.

The overhead line construction schedule will provide an initial guide to the route of the line and position of the poles however when surveyed the pole positions should be pegged. All terminal and angle pole positions shall be marked accurately with two white wooden pegs by the surveyor. Straight line poles are also normally marked with a single white peg and poles must be accurately aligned between terminal/terminal, terminal/angle or angle/angle positions. Before starting any excavations, check the peg position, if any positional adjustments are required in excess of 150mm contact the job supervisor for advice before proceeding.

##### 3.1.1. Single Poles

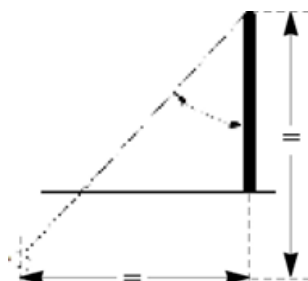
Using sighting rods, sight through from a terminal or an angle position to the next terminal or angle position. Check that all the pegs are in line with each other. On long sections of line, sections that run through land that varies in height or is interrupted with heavy vegetation it may be necessary to split the line to align intermediate poles in shorter sections.



#### 3.2. "H" Poles

Check the proposed stay positions. Make sure that terminal pole stays are in line with the conductors or splayed equally either side of this line and that angle pole stays are on the line of bisect or splayed equally either side of it. Where single or splayed stay excavations are required then measurements can be made from one of these lines. **Note** that tandem stays are no longer allowed other than existing arrangements.

Remember that were possible the stay wire should be at a slope of 45° to the pole. To achieve this angle on level ground, plant the stay block the same distance away from the pole as the pole top make off is from the pole butt.



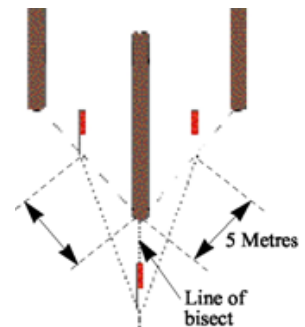
On sloping ground make allowances for the slope. In such cases use a 45° template and spirit level to check the stay angle.

Additional guidance on stay types and installation can be found in NSP/004/104.

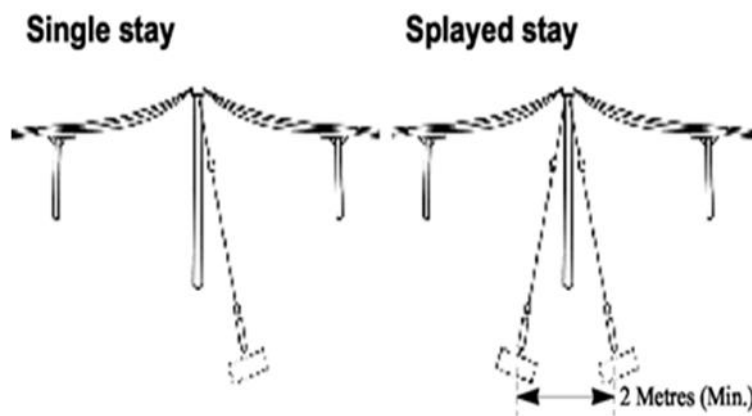
<b>Document Reference:-</b> NSP/004/101		<b>Document Type:-</b> Code of Practice	
<b>Version:-</b> 4.0	<b>Date of Issue:-</b> October 2023	<b>Page</b> 4	<b>of</b> 10

#### Finding the line of bisect:-

Knock a peg into the ground 5M from the angle pole centre and in line with the next pole centre. Repeat for the other side. Mark the centre of a 30M (approx.) length of rope. At equal distances from each end of the rope tie the rope to the peg. Holding the rope at the centre mark, pull it tight forming a "V". Lay the rope on the ground and drive a peg into the ground adjacent to the rope centre mark.



A rope stretched between the pole centre and the peg will show the line of bisect. The diagrams below show the staying arrangements and stay excavation outlines for terminal and angle positions. For single pole terminal and angle arrangements there shall be a minimum of 2m between multiple stay rods. This cannot be achieved on 'H' terminal poles therefore the rods shall be as far apart as practical depending on the pole centre dimension. Where more than one stay is used on a support it is important that each stay is equally tensioned. Further information on locating the correction position for different stay arrangements can be found on Drawing No [1091010273](#) sheet 1.



### 3.3. Excavations

#### 3.3.1. General

When carrying out excavations the guidance detailed in ENA G37 - Avoidance of Danger from Underground Electricity Cables shall be followed.

#### 3.3.2. Single Poles

Excavations for overhead lines poles and stays must be set out and excavated correctly to reduce the possibility of leaning or unbalanced poles.

Make sure that your excavations are to the correct depth and width as shown below. When using a mechanical excavator use a bucket with a width matched as near as possible to the size of the pole and follow the guidance given in GN 21-02 Using Mechanical Excavators.

It is important that wherever possible the excavation shall be in line with the line and as narrow as is practically possible. This will ensure that the pole will rest as near as possible against undisturbed ground and give maximum support against wind loading. The length of pole hole shall generally be equal to required depth. The excavation will be carried out in steps reaching full depth at the front of the hole. The ideal hole will therefore have a vertical front and side faces with a stepped rear. Any undercutting of the sides necessary to accommodate kicking blocks should be done with the removal of the minimum amount of soil from the faces of the hole.

<b>Document Reference:-</b>	NSP/004/101	<b>Document Type:-</b>	Code of Practice			
<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023	<b>Page</b>	5	<b>of</b> 10

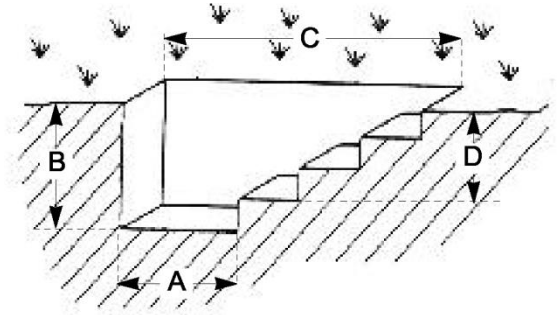
A = Diameter of butt + 150mm.

B = Planting depth.

C = Equal or greater than "B" dimension

D = 1200mm

At straight line positions the peg will be left in and the hole excavated up to it so that on erection of pole it can be placed with its centre against the peg in order to reduce 'lining in' to a minimum.

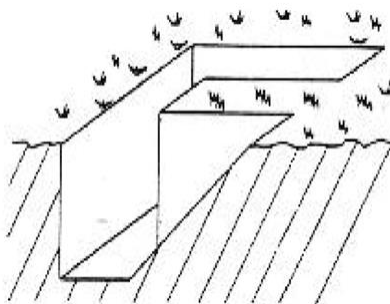


At angle positions the pit must be carefully marked out around the peg so that the pole can be placed in the centre of the pit. Where ground conditions make accurate digging difficult, additional pegs should be put in line both directions for ease of 'lining in' after erection.

### 3.3.3. H, A or Rutter Poles

The size and length dimensions of the pole pit are governed by pole centres and foundation block dimensions plus tolerance each side to give adequate clearance during erection.

*"H pole (with cross-member foundation baulks) mechanical excavation"*

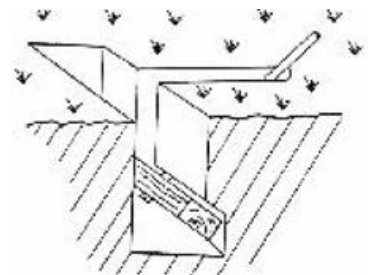


Where stability of ground will allow, pole erection will be easier if slotted trenches are cut and sloped into the pit in line with pole legs.

### 3.4. Stay Hole Excavations

Stay blocks shall be undercut into firm ground and set for angle and terminal positions, as indicated on the line schedule. The stay pit shall be square with the line of the stay.

The sinking depth (vertical) for stay blocks shall be 1.6 m for low voltage (LV) lines. High voltage (HV) line blocks shall be sunk to the depth specified on the appropriate drawing either [1000439108 sheet 1](#) or [5](#) or [1091231166](#) sheet 1. The bottom of the stay pit must be undercut to accommodate the stay block so that pressure is taken against virgin ground and the stay rod must be slotted into the ground so that it falls in line with the stay. The stay rod must not be bent, the slot must be deep enough to accommodate it.



The stay block must be held in a position in the undercut until sufficient soil has been placed and rammed in the bottom of the pit to hold it in position. The hole is then backfilled and reinstated in the manner described for pole holes.

Stay rods shall be in accordance with Drawing No [1000439101 sheet 2](#).

Stay blocks shall be as quoted on the appropriate material list.

<b>Document Reference:-</b>	NSP/004/101	<b>Document Type:-</b>	Code of Practice			
<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023	<b>Page</b>	6	<b>of</b> 10

### 3.5. Backfilling

Correctly backfilled excavations are necessary to ensure that ground settlement is kept to a minimum and additionally the poles remain in the position they were erected. Strong foundations are essential to prevent poles falling over during normal working conditions or following conductor breakage. This is a very important operation and great care must be taken to ensure that excavated spoil is thoroughly compacted in order to hold the pole securely and reduce to a minimum future settlement.

All stay and pole foundations shall have the backfill material supplemented with “Perma Soil” soil stabiliser. A 25kg bag of Perma-Soil shall be used per pole leg. The powder shall be thoroughly mixed with the excavated pole hole spoil, half of this amount shall be used when the pole hole is being augured. Reinstatement/Compaction should be completed in lifts on approximately 300mm of material at a time. The mixed material must be placed in the pit and thoroughly rammed. After the initial 300mm layer the pole shall be checked for alignment and plumb with any correction being made at this time.

The health, safety and environmental installation guidance is detailed on the packaging when using Perma Soil and must be followed.

25kg bucket, commodity code: 240777

Where stony ground is encountered backfill material may need to be imported. .

To accommodate kicking blocks, the pit should be backfilled to the lower level of the baulk; alignment, twist and plumb checked and necessary excavation carried out to accommodate the kicking block before completion of backfilling as previously described. Before leaving the pole or stay hole area, the surface must be reinstated, turf re-laid etc. and the whole area around the position cleared of all surplus spoil.

### 3.6. Pole Sinking Depths

#### 3.6.1. LV Construction – NSP/004/041

With the exception of unstayed angle poles, all support foundations shall be sunk without kicking blocks at the depths shown:

Pole Height	Pole Sinking Depth
9.0 - 11.0m	1.6m
12.0 – 14.0m	1.8m

#### 3.6.2. HV Construction – NSP/004/042

Pole Height	Pole Sinking Depth Standard Block Founds Medium / Stout Poles	Augured Pole Foundations Medium Grade Poles	Augured Pole Foundations Stout and E/Stout Grade Poles
9.0 - 11.5m	1900 mm	2100mm	2400mm
12.0 - 14.0	2100 mm	2400mm	2600mm
15.0 - 18.0	2400 mm	2400mm	2800mm
19.0 - 22.0	3000 mm	Not Allowed	Not Allowed

#### 3.6.3. EHV Portal Construction (33 / 66kV) (OHL 4 and CE/C/37)

Pole Height	Pole Sinking Depth
Up to 12.0m	2.0m
13.0 – 15.0m	2.2m
16.0 – 18.0m	2.4m
20.0 – 24.0m	3.0m

<b>Document Reference:-</b>	NSP/004/101	<b>Document Type:-</b>	Code of Practice			
<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023	<b>Page</b>	7	<b>of</b> 10

### 3.6.4. EHV Construction (66 kV / 132kV) (OHL9/OHL10)

Pole Height	Pole Sinking Depth		
	Single Pole	Rutter Pole	Inter H Pole
12.0 – 13.0m	2.6m	3.2m	2.6m
14.0 – 18.0m	2.6m	3.2m	2.6m
19.0 – 20.0m	3.0m	3.2m	2.6m

## 3.7. Pole Foundations

### 3.7.1. LV Construction – NSP/004/041

Unstayed angle supports shall be avoided wherever possible; however they are permitted when installed as follows:

- ABC 120mm Main – Medium grade poles with a max angle of deviation of 7°
- ABC 120mm Main – Stout grade poles with a max angle of deviation of 19°
- Extended service spans – medium grade poles with a max angle of deviation 30°

In all cases the max pole height is limited to 12m and the poles must be sunk to a depth of 1.8m and fitted with 2 x ENA TS 43-91 Type 2 (1300 x 250 x 125)mm blocks located 500mm below ground level and attached with an M20 bolt. See drawing 1090431216 or 1091193332 for details.

Tubular steel supports shall be erected on a concrete slab 50 mm thick by 600 mm square. The planted section of the pole shall be surrounded with 100-300 mm of concrete, depending upon the load on the pole and ground condition, as Drawing No 1091193502.

### 3.7.2. HV Construction – NSP/004/042 & NSP/004/044

#### Standard Pole Foundations

All poles shall be fitted with two wood foundation blocks (1300 x 250 x 125mm) as detailed in ENA TS 43-91 fig 3, Type 2 or Northern Powergrid drawing 1000439103 sht1. The blocks shall be placed as follows:

Ground line to Top Block Pole Bolt = 500mm

Ground line to Bottom Block Pole bolt = 880mm.

#### Augured pole foundations

May be utilised as an alternative to standard wood block foundations detailed above. Care shall be taken during the installation of these poles to ensure that the auger sizes match as close as possible to the pole base diameter.

### 3.7.3. EHV Construction – (33/66kV) – OHL 4 or CE/C/37

Two Kicking blocks 1300 mm long to Drawing No 1000439103, Type 2 shall be fitted to single straight line and angle supports, except in the case of poles to Drawing No 1091231193, where a foundation baulk as specified on the drawing shall be fitted. Where conditions warrant it, additional foundation argumentation to Drawing No 1091231187, Sheet 2, is available for 'H' pole supports with 2.9 m centres. The latter will always be fitted to 'H' poles to Drawing No 1091231173 and 1174. Where necessary, all pole legs shall be erected on two 250 x 125 x 850 mm long creosoted wood baulks laid together to form a 500 x 850 mm footing.

Where existing CE/C/37 supports require replacement they shall be replaced with the equivalent OHL4 portal support. See NSP/004/045 for further details.

<b>Document Reference:-</b>		NSP/004/101	<b>Document Type:-</b>		Code of Practice			
<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023		<b>Page</b>	8	<b>of</b>	10

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#### **3.7.4. EHV Construction – (33/66/ 132kV Single Circuit) – OHL 9/OHL10**

Specific guidance on the number and type of foundation blocks fitted to OHL 9/10 circuits is detailed in NSP/004/045.



<b>Document Reference:-</b>	NSP/004/101	<b>Document Type:-</b>	Code of Practice			
<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023	<b>Page</b>	9	<b>of</b> 10

## 4. References

### 4.1. External Documentation

Reference	Title
ENA TS 43-91	Stay Strands & Stay Fittings for Overhead lines

### 4.2. Internal Documentation

Reference	Title
ENA G37	Avoidance of Danger from Underground Electricity Cables
GN 21-02	Using Mechanical Excavators
NSP/004/041	Code of Practice for the Construction of LV ABC Overhead Lines
NSP/004/042	Specification for HV Wood Pole Lines up to and including 33kV
NSP/004/044	Specification for HV Wood Pole Lines of Compact Covered Construction up to and including 33kV
NSP/004/045	Code of Practice for EHV Wood Pole Lines operating up to 132kV with span lengths up to 220m
NSP/004/104	(OHL 4) Guidance on the Types and Installation Requirements for Stays
OHL 4	Specification For 66kV Overhead Lines on Wood Poles

### 4.3. Amendments from Previous Version

Reference	Description
Whole Document	Document reviewed no changes required – Paul McAdoo 03/10/2023 Doc approved by email Paul Black 05/10/2023 Doc republished to grid and externally - LB 19/10/2023

## 5. Definitions

Reference	Title
None	

<b>Document Reference:-</b>	NSP/004/101	<b>Document Type:-</b>	Code of Practice			
<b>Version:-</b>	4.0	<b>Date of Issue:-</b>	October 2023	<b>Page</b>	10	<b>of</b> 10

## 6. Authority for Issue

### 6.1. CDS Assurance

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

		<b>Date</b>
Liz Beat	Governance Administrator	19/10/2023

### 6.2. Author

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

**Review Period** - This document should be reviewed within the following time period;

Standard CDS review of 3 years?	Non Standard Review Period & Reason	
Yes	Period: n/a	Reason: n/a
Should this document be displayed on the Northern Powergrid external website?		Yes
		<b>Date</b>
Steven Salkeld	Policy and Standards Engineer	12/08/2016

### 6.3. Technical Assurance

I sign to confirm that I am satisfied with all aspects of the content and preparation of this document and submit it for approval and authorisation.

		<b>Date</b>
Ged Hammel	Senior Policy and Standards Engineer	12/08/2016
Paul McAdoo	Lead Policy and Standards Engineer	03/10/2023

### 6.4. Authorisation

Authorisation is granted for publication of this document.

		<b>Date</b>
Paul Black	Head of System Engineering	05/10/2023