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Self-Supporting Aerial Cable

Erection and Recovery

About this document ...

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Content approval

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Issue 4	1-Nov-95	I R Jessey	Update
Issue 3	1-Dec-93	R Springett	Update
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Table of Content

1 Introduction

This ISIS Practice describes the methods and techniques used by the BT direct labour work force to erect and recover Metallic and Optical Fibre Self-supporting Aerial Cable in the BT overhead network.

It also describes the practice for attaching aerial cables to poles using the Telenco Aerial Cable Supporting system and is detailed in section 10.5- Full Terminations using Telenco Aerial Cabling Products. If you have not received official training on the use of Telenco aerial cabling products you must use the current method of attachment as shown in this document, section 10- Methods of Terminating Aerial cables at Poles.

For Specification details see ISIS EPT/ANS/A012.

2 Scope

Erection and recovery of self-supporting aerial cable to pole routes (including wooden, hollow and joint use poles) and attachment of aerial cable to buildings.

References are made to other ISIS, where appropriate, for supporting information that is outside the scope of this document such as information on pole staying, working on joint use poles, work in the vicinity of power lines, railway lines etc.

3 Safety

Refer to the SFY/HSH/D040 Working in the Overhead Network.

Specific safety issues relating to particular activities are covered in the sections of this document relating to those activities. In particular see Section Overhead Wiring and Cabling.

4 General

4.1 Working in the Vicinity of Power Lines

When working in the vicinity of Power Lines or on Joint User poles you must also follow the working practices laid down in ISIS EPT/PPS/B038 and ISIS EPT/PPS/B046. See EPT/PPS/B046 for details of power cable identification and details of when insulators shall be fitted in the vicinity of power.

4.2 Lightning Protection (All Self-supporting Aerial Cables)

Where lightning protection is required in a joint, ISIS EPT/ANS/A020 should be followed with the following additional operations:

- Separate the Suspension Wire from the cable leaving sufficient cable for jointing or termination in a Block Terminal or Box Connection
- At the pole where lightning protection is required, the incoming cables should be tensioned and fully terminated
- Cleat both the cables down the pole using Strip Aluminium 80, 120 or 160 and Nails Bonding with Galvanised Washers
- Provide the lightning protection as detailed in ISIS EPT/ANS/A020 and EPT/PPS/B055

4.3 Pole Safety

Inspect and test all poles before climbing (Refer to ISIS EPT/OHP/C022 and SFY/HSH/D040).

Warning: If a pole is found to be defective DO NOT CLIMB THE POLE

Check for adequate bracing of pole route (Staying, etc) in accordance with ISIS EPT/ANS/A014 and EPT/ANS/A015.

4.4 Road Works Guarding

Before you start working at the roadside refer to SFY/HSH/D040 section “Before you start work.”

4.5 Completion of Job

Ensure work site is clean, tidy and in a safe condition.

4.6 Minimum Clearances at Lowest Point of Span

On completion of all road crossings the Aerial Cable height must be checked. The document containing the clearances for Aerial Cables and dropwires including CAD 55M (dropwire 15) is contained in ISIS EPT/ANS/A013 **Minimum Heights and Carriageway Definitions.**

An appropriate A1024 should be submitted for any plant, which does not meet the standards detailed in ISIS EPT/ANS/A013.

> **Warning:** It is a mandatory requirement that the heights of all wires crossing the carriageway are checked, to ensure a minimum clearance of 5.2m. If there are any wires with a clearance below 5.2m, then it is not permitted to climb the pole, and other means of access will be required.

For the height standards required when overhead plant is provided over private land or privately maintained carriageways (See ISIS documents EPT/ANS/A013 and EPT/OAM/F027).

4.6.1 The Tools Used for Measuring Minimum Clearance Standards by Operational Functions

Operational function	Height measuring tool	Item code
Pole examination and clearance inspection	Rods Clearance Telescopic 7 metres Slide rule fixing height 1A+1B Slide rule fixing height 1C Tape measuring 20 metres	008874 127582 129168 116981
Planning and Survey	Rods Clearance Complete Wheel measuring Tape measuring 20 metres Slide rule fixing height 1A + 1B Slide rule fixing height 1C	116121 117652 116981 127582 129168
Field people	Rods clearance Telescopic 7 metres	008874
Ops Managers and Quality Inspection	Rods clearance Telescopic 7 metres	008874

Table 1

5 *Underground Cable Feeds to Poles*

5.1 General

This section describes the methods of leading cables from underground routes to serve overhead distribution points (DPs) or Aerial Cables. Cables serving DPs are normally terminated on terminal blocks as described in ISIS EPT/OHP/B073, where the cable serves an Aerial Cable, a joint may be provided in an adjacent underground jointing structure.

5.2 Serving Overhead DPs

The general arrangement for bringing buried underground cables up a pole is shown in Figure 1 below. Underground cables serving a DP should be brought up to the surface at the pole, through a suitable Bend Duct, from the duct to the pole. The bending radius of the cable should not be less than 12mm x D, where D is the cable diameter. A Connector Bend 1 should be secured to the pole to cover the cable exit from the Bend Duct at ground level.

Capping should be fitted to protect the bottom section of the cable from physical damage. For information on capping to be used see section 5.2.3. See also EPT/OHP/B073, EPT/OHP/B005 and EPT/ANS/A012. Ensure that the lower end is engaged into the Connector Bend 1.

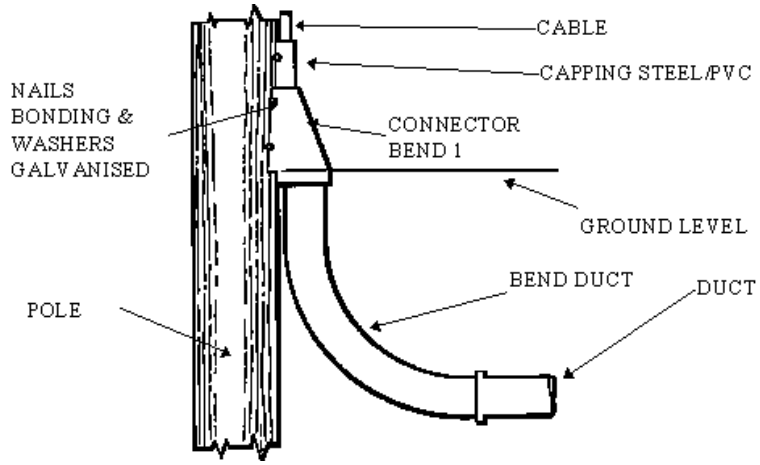


Figure 1

5.2.1 3 Metre Mark

When fixing the cable to the pole, do not obscure the 3-metre mark.

5.2.2 Fixing the Cable to a Pole

Cables should be secured to the pole, above the capping at intervals of 450 mm using cleats made from Strip Aluminium 80, 120 mm or 160 mm. Secure each side of the cleat with Nails Bonding with Washers Galvanised 19 under the heads of the nails or double over the strip aluminium and use only one Nails Bonding (pins steel must not be used).

5.2.3 Capping Steel and Capping PVC

Current range of capping for use on poles is listed below:

- Capping Steel 1 - For protecting cables not exceeding 19 mm in diameter - 2440 mm in length
- Capping Steel 4 - For protecting cables between 19 mm and 50 mm in diameter - 2440 mm in length.
- Capping Steel 5 - For protecting cables between 50 mm and 75 mm in diameter - 2440 mm in length.
- Capping Steel 8 - For enclosing cable joints up to a diameter of 89 mm - 610 mm in length.
- Capping 22 - Black PVC - 2440 mm in length
- Capping 23 - Black PVC - 380 mm in length
- Capping 26 - Black PVC - 2440 mm in length large enough in diameter to accommodate a 20 pair cable joint in a Kit Joint Closure 1A.

Capping Steel, Capping PVC and Connector Bend are secured to the pole through the pre-drilled holes using Nails Bonding.

Some earlier capping may be found on poles without pre-drilled holes. These are generally attached to the pole by using Nails Bonding with Washers Galvanised 19 overlapping the edges of the capping to secure them to the pole. If this type of capping needs to be removed for any reason and is in good condition it may be refitted in the same manner.

6 *Principles of Erection for Self-supporting Aerial Cable*

6.1 General

This section describes the principles of erection for Cable Aerial Self-supporting Combined (CASSC). CASSC can be divided into two categories:

Lightweight Aerial Cable - containing single stranded suspension wire (1/2.65 mm diameter suspension wire).

Heavyweight Aerial Cable - containing multi-stranded suspension wire (7x1.6 mm diameter suspension wire).

6.2 Safety

Specific safety issues relating to particular activities are covered in the sections of this document relating to those activities. In particular see SFY/HSH/D040 section 'Overhead wiring and Cabling.'

Also, for precautions when using Platform Elevating vehicles, see Section 8 of this document.

Warning: Hollow poles can only support ONE Lightweight Aerial Cable up to 20 pair 0.5. Heavyweight Aerial cables must not be cabled to a hollow pole.

Warning: Hollow poles must not be climbed. Work on hollow poles must be carried out from a Platform Elevating.

Warning: Two lengths of Self-supporting Aerial Cable Combined must never be joined together by splicing the suspension wire. See section 10.5 for Telenco products. Terminate each side of the fault and insert a new section.

Warning: On Joint User Poles, full terminations and terminations using Clamps Aerial Cable should only be used when following the guidance in ISIS EPT/ANS/A012. Hooks Aerial Cable 1 and Wire Lashing 2A must be used for securing aerial cable at intermediate poles where Clamps Aerial Cable cannot be used, see Section 10.4.

Warning: Do not tension Aerial Cable from a ladder.

Warning: Tension must not be applied to cables - except by hand - whilst anyone is on the pole.

6.3 Pole Route and Loading

The maximum loading capacity of the poles must not be exceeded, see ISIS EPT/ANS/A014 for details on pole loading limitations.

6.4 General Principles of Erection

- The maximum span length for new aerial cable routes is detailed in EPT/ANS/A012
- The cable should generally be mounted on the roadside of the pole. Where Pull on pole is greater than 1.5 m (see ISIS EPT/ANS/A014 for details of how

to determine pull on pole) the cable should be mounted on the inside angle of the route

> **Warning:** Never work inside the angle of a cable.

- Minimum clearances must be observed see Section 4.6
- There are 3 methods of erecting Aerial Cable detailed in Section 9
- Methods of termination are detailed in Section 10. At jointing positions sufficient cable should be left to enable the joint to be made at ground level and for future work. The cable should be coiled and secured to the pole with the cable ends sealed using Cap Sealing 16, see figure 2.

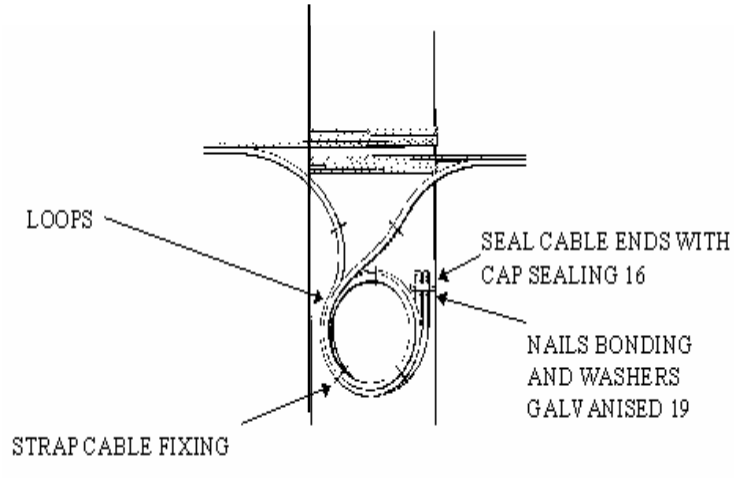


Figure 2

Note: Universal clip closure may be used to seal cable ends.

6.5 Tensioning

Lightweight aerial cable is tensioned by hand one span at a time.

Tensioning heavyweight aerial cable is covered in section 11 of this document.

6.6 Re-termination of Aerial Cable after Pole Changeover

Where the catenary wire is too short to reach the new pole position, it can be extended to facilitate a full termination using either a Grip Wire Suspension (See section 10.2.2.1 or by using the method used for power crossings (see section 10.2.3).

6.7 20/0.6mm and 50/0.5 Light-weight Aerial Cables

20/0.6mm and 50/0.5 copper Aerial Cables have been introduced into the network. These cables incorporate a single 2.65mm catenary and are classed as Lightweight.

For further information and standards required, see ISIS EPT/ANS/A012.

7 *Cabling to and Between Buildings*

7.1 General

This section describes the construction practices for cabling Cable Aerial Self-supporting Combined to and between buildings.

7.2 Safety

In addition to the general safety requirements detailed in SFY/HSH/D040

The following precautions and warnings apply:

Warning!

- Do not lean ladders against the cable
- Do not tension Aerial Cable from a ladder
- Hand tension should only be applied to cables attached to buildings INCLUDING HEAVYWEIGHT CABLES. Mechanically applied cabling tensions may cause damage

7.3 Type of Cable and Run

Both lightweight and heavyweight cable may be run from a pole to a building or from building to building. Cables should be supported by their Suspension Wire, i.e. a full termination should be made at each end.

7.4 Securing Lightweight Aerial Cable to Buildings

7.4.1 Safety

Carry out the normal on-site risk assessment of the installation area before starting work to confirm safe operation of equipment and tools. Check all equipment to be used including Personal Protection Equipment (PPE) is in safe working order.

- Wherever possible, a Platform Elevating should be used to undertake this work
- When fitting a Bolt Expanding 2A or Eyebolt Expanding 2A, an 8mm pilot hole must be drilled before attempting to drill a 16mm diameter hole (see Method)
- When using a drill aloft to install a Bolt Expanding 2A or Eyebolt Expanding 2A, it is mandatory that a Ladder Stability Device Top End (Item Code 129363) is used with the working ladder
- Where erecting between a Pole and a building it is recommended that the termination is performed on the Wall Plate first and then tension applied at the pole position prior to final termination
- Where erecting between buildings, terminate on one building using a Plate Wall 5 or 5A. At the other position fit a Wall Plate 5 or 5A and attach a Pulley 5 to the eye of the Wall Plate. See sections 10 and 11 for methods of tensioning and terminating.

7.4.2 Installation of Plate Wall

A Lightweight Aerial Cable (with a single strand suspension wire) may be secured to a brick or masonry structure using a Plate Wall No. 5A. The plate must be situated a minimum of 250mm below the roofline and at least 250mm away from the edge/corner of the wall or any window. Standard clearances from power supplies should also be observed.

Using the plate's base as a template, mark out the hole positions for the two Bolt Expanding 2As ensuring that only one bolt is fitted per brick. A position that straddles a mortar joint between two bricks is ideal. (See Figure 3)

WHEN FITTING A BOLT EXPANDING 2A or EYEBOLT EXPANDING 2A , A PILOT HOLE OF 8MM IN DIAMETER AND 95MM DEEP MUST BE DRILLED IN THE WALL BEFORE THE 16MM DIAMETER HOLE IS DRILLED.

Drill out the two holes, using an 8mm drill as a pilot hole, then bore out with a 16 mm drill, both to a depth of 95mm. Insert the bolts, fit the plate and washers. Finally, tighten the hexagon nuts using a 17 mm spanner until firm resistance is felt and then tighten an extra quarter of a turn for security.

If Bolt Expanding 2As are unavailable, then Eyebolt Expanding 2A can be substituted in order to prevent unnecessary travel and wasted engineering time. The best solution is to use the Bolt Expanding 2A and sufficient stock should ideally be checked before the job commences. The dimensions of these two items are the same.

Figure 3 - Positioning a Plate Wall 5A on brickwork using Bolt Expanding 2A

Important:

- Where brickwork is visible, holes should not be drilled into mortar joints
- Only one lightweight cable can be fitted to a Plate Wall 5 and 5A
- It is now permitted to fix a Plate Wall 5A to rendered, pebble dashed or other surfaced walls using the larger Bolt Expanding 2A or Eyebolt Expanding 2A
- Do **NOT** use a Wall Plate 5 (four fixing holes) for masonry or pebbledash surfaces as the smaller fixings (e.g. Stud Expanding 1A) will be too weak
- Where Eyebolt Expanding 2A have been used instead of Bolt Expanding 2A, eyelets must not be removed or used as a dropwire/cable fixing

Note: For Plate Wall 5 (four fixing holes) brickwork installations, if Studs Expanding 1A are unavailable, Eyebolts Expanding 1A can be substituted, in order to prevent unnecessary travel and wasted engineering time. The Plate Wall 5 should continue to be used until all local stocks are exhausted.

7.4.3 Terminating of Aerial Cable

METHOD 1 Using Telenco BWC 25 (Barrel Clamp Single Strand Bare Wire 2.5mm) Item code 016973.

Normal installation practices apply to Telenco BWC 25 as documented in section 10.5.5.

Important:

- The metal 'thimble' must be left hanging downwards (See Figure 3 above)
- The Telenco AC7-200 Aerial Cable Terminating Clamp must NOT be used
- Bail wires must not foul (press) on the Eyebolts Expanding 2A were fitted (See Figure 4)

Figure 4 - Bail wires fouling the eyebolt

METHOD 2 Using Grip Wire Suspension 3.

Tension may be applied to the cable by hand, either from the cage of a Platform Elevating or from the ground using one or two Pulley No6's as follows:

Pass a length of Line Sash 2 or 15 through the Pulley No6 and attach a Grips Pulling Aerial Cable 2A using a bowline. Attach the grip to the suspension wire (sheath in place) and pull up the cable. Where necessary a second grip and pulley arrangement may be used attached to the same Wall Plate to pull the cable into position by positioning the second grip ahead of the first grip to take a further short bite of cable. If necessary, further bites may be taken by releasing the grip that no longer holds the tension and placing it ahead of the one holding tension to take a further bite of cable. This may be repeated until the correct clearances are obtained.

With the cable in the position the cable should be terminated.

Expose the suspension wire by removing its sheath (see Section 10.2.1). Pass the Grip Wire Suspension 3 around the bracket and wrap the legs of the clamp around the exposed steel. Bind the cable to the Grip Wire Suspension using Wire Lashing 2A see figure 5.

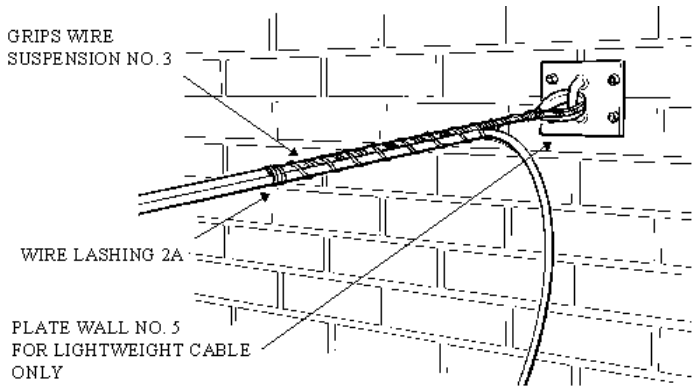


Figure 5

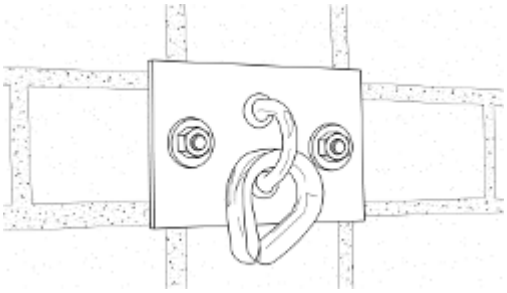


Figure 6 - Wall Plate 5A

7.5 Securing Heavyweight Aerial Cable to Buildings

Heavyweight Aerial Cable (7 strand suspension wire) may be secured to a brick or masonry structure using a Plate Wall No 4 see Figure 7. Use the plate as a template and mark hole positions for 4 Bolt Expanding 2A so that, when fitted, the plate is at an angle of 45° to the horizontal (a position that straddles a mortar joint between bricks is ideal) and has a minimum of 1 metre of bricks all around the plate wall No 4.

WHEN FITTING A BOLT EXPANDING 2A, A PILOT HOLE OF 8MM IN DIAMETER AND 95MM DEEP MUST BE DRILLED IN THE WALL BEFORE THE 16MM DIAMETER HOLE IS DRILLED.

Drill out the four holes, using an 8mm drill as a pilot hole, then bore out with a 16 mm drill, both to a depth of 95mm. Insert the bolts, fit the plate and washers. Finally, tighten the hexagon nuts using a 17 mm spanner until firm resistance is felt and then tighten an extra quarter of a turn for security.

7.5.1 Terminating of Aerial Cable

Method of termination for heavyweight aerial cable is by using a Grip Wire Suspension 4 or Telenco BWC 47.

- Only one aerial cable to be fitted per Plate Wall no 4
- lightweight aerial cable can be fitted to a Plate Wall no 4 using BWC 25
- AC7-200 or AC10-320 must not be used
- The metal ‘thimble’ must be left hanging downwards

Figure 7 - Plate Wall no 4

8 *Precautions when using Mobile Elevating Work Platform*

8.1 General

This section details the additional precautions necessary when working with elevating platforms. For further information on Platform Elevating vehicles see ISIS SFY/HSH/D039. For Generic Risk Assessments see ISIS SFY/GRA/A019.

Caution: Helmets safety must always be worn when working in the vicinity of Platform Elevating.

Caution: Belt Safety No 9 and a Helmet Safety must always be worn when in the cage.

Warning: Do NOT use ladders, steps or any item to gain height within the cage.

8.2 Operator Training

Any person operating a Platform Elevating must have previously attended the appropriate course (see ISIS SFY/GRA/A019).

8.3 Tensioning

Cables can be supported or tensioned from the cage of an Elevating Platform providing that:

- The wire is supported solely by the operator in the bucket, or in the case of the PE3 on the especially designed cable support arm

- Tension is not applied directly to any part of the bucket or boom structure. If the tension required is too high to be held manually, it must be held by other approved methods e.g. by using the winch on the PE3 or see Section 11 for tensioning methods
- Care is taken to ensure that the cable is not likely to be snatched from the hands of the operator by a passing vehicle

8.4 Mobile Working

Platform Elevating 3 and 4 may be driven with an operator in the cage.

DO check your route before commencing mobile work for sloping ground/type of surface/ obstructions both in line and overhead that may cause the vehicle to become unstable.

DO Keep the cage within the vehicle width.

DO Activate spring lockouts if fitted.

DO Use the intercom between cab and cage.

DO Remember that the person in the cage is in control.

DON'T Exceed 5 mph.

9 *Cabling Methods*

There are 3 methods:

- Direct placing method
- Threading method
- Winching method

These methods are described below.

9.1 General

9.1.1 Rope Selection & Usage

Rope	Uses referred to in this Document
Rope Cabling 1	Tensioning on PE winch - self tailing only As a tail for securing Grips Aerial Cable to the pole. (See section 11) Securing the pole to the ground anchor when tensioning. (See section 11)

Draw rope 1	Cabling by hand. Use on PE Winching Method.
Line Sash 2	Cabling between buildings with Pulley 6, Power Crossing.
Line Sash 15	Cabling between buildings with Pulley 6, Road Crossing
Wire Steel 7x1.6mm	Tensioning cable using a Tensioner 2B, Support line for road and Power Crossing

Table 2

9.1.2 Cable Drum Trailer Position

Cable should be drawn off the top of the drum with the tow bar pointing in the direction that the cable is to be paid out.

9.2 Direct Placing Method

The direct placing method may be used if the Aerial Cable can be placed on the ground roadside or field side or if the pole route has vehicular access for a Platform Elevating and Cable Drum Trailer.

9.2.1 Cable Positioning and Placing

9.2.1.1 GP Parties with or without a Platform Elevating

Perform a full termination of the cable on the first pole as in Section 10.

Progressing along the route, fit a Hooks Temporary Hold 2 to each intermediate pole at the height where the cable is to be terminated. Place the cable into the Hooks Temporary Hold 2 before moving to the next pole. The cable may be pulled up using a loop of Line Sash made off into a bowline so that the cable can run freely through it.

9.2.1.2 Parties with a Platform Elevating 3

Alternatively, if using a Platform Elevating with a Cable Drum Trailer 3A or Cable Drum 2A with drum brake fitted the cable may be placed as follows:

Apply the cable drum brake on the cable drum trailer to allow the cable to pay off without over run. Pass the cable through the vehicle quadrant. Perform a full termination of the cable suspension wire on the first pole as in Section 10.

> **Warning:** The cage must be slewed in line with the vehicle before driving between poles at a maximum speed of 5 mph.

Drive the vehicle to the next pole.

Progressing along the route, fit a Hooks Temporary Hold 2 to each intermediate pole at the height where the cable is to be terminated. Place the

cable into the Hooks Temporary Hold 2 before moving to the next pole. The cable may be raised into position on the cable support arm situated on the cage of the Platform Elevating.

9.2.2 Preparation at Termination Position

Fit a Block Snatch 1 to the pole at a convenient position above the position where a full termination will be made. To fit the Block Snatch to the pole, wrap a Chain Tensioning around the pole so that a link from each leg of the chain is available at the position where the Block Snatch is to be fitted. Attach the Block Snatch to the links of the chain using a suitable D Shackle**.** Place the cable in a Hooks Temporary Hold 2 fitted just below the Block Snatch.

Attach a Grip Pulling Aerial Cable 2A to the pole, on a short tail, above the position of the Block Snatch. This will be used to hold the cable in position after slack has been taken out, also during tensioning and to hold the cable in position whilst terminating the suspension wire.

The tail should be made up from Rope Cabling 1 tied off on the pole using a clove hitch locked off with a half hitch. The other end should be attached to the eye of the Grip Pulling Aerial Cable 2A using bowline knots or eyes spliced in the rope (see instructions supplied with the rope for splicing).

Note: A Sling Lifting 4A (i/c 126742) can be used as an alternative to the chain tensioning.

Fig 8 shows both the chain and the Sling

9.2.3 Taking up the Slack

The slack may be taken up by hand, or by use of a PE winch or a Tensioner 2B. Attach a Grip Pulling Aerial Cable to a length of rope (see figure 9 for

rope selection). Pass the rope through the Block Snatch and pull in excessive slack. Use the Grip Pulling Aerial Cable previously fitted to the pole to hold the cable in position See figure 10.

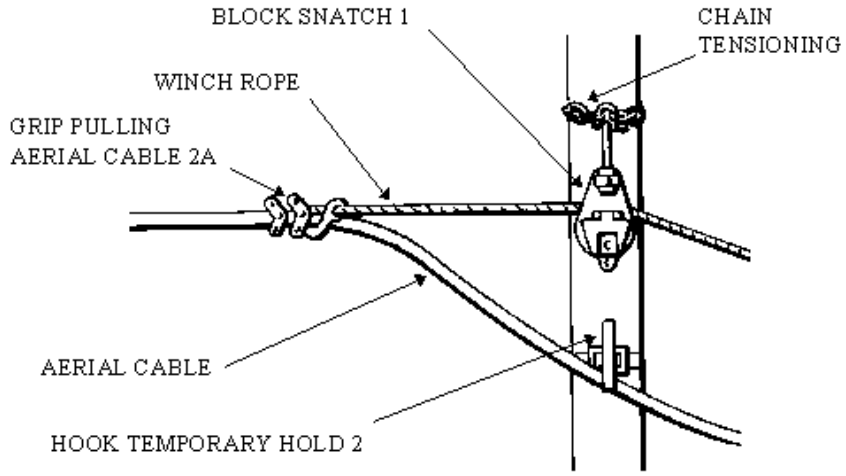


Figure 9

If there is a lot of slack cable, short bites may be taken (fleeting) using the Grip Pulling Aerial Cable previously positioned on the pole, see figure 10. Secure this grip to the cable and then move the pulling rope forward along the cable and attach it to the cable. Pull the cable again to take up a further bite of slack. The other grip is then moved to a position forward of the pulling grip, and the process is repeated until the slack is removed ready for tensioning.

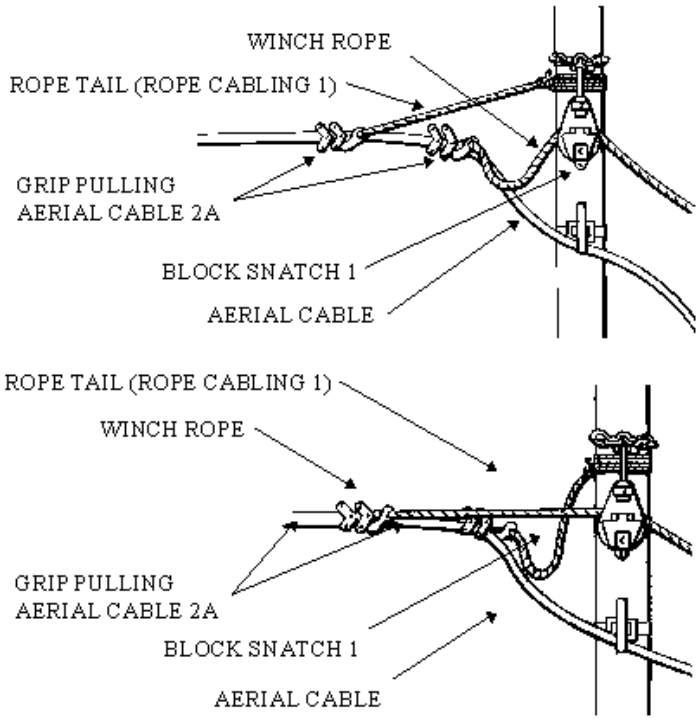


Figure 10

9.2.4 Anti-Galloping Twists

Anti-galloping twists must be inserted in each span, (see ISIS EPT/ANS/A012 for requirements).

9.2.5 Tensioning and Terminating the Cable

Lightweight cable must be tensioned by hand one span at a time.

Heavy weight cable may be tensioned using the PE winch or the Tensioner 2B, see Section 11.

The cable should be terminated at all poles using the appropriate technique described in Section 10.

9.2.6 Final Operations

Confirm correct clearance has been achieved using Rods Clearance Telescopic 7m described in EPT/OHP/B011.

9.2.7 Aerial Cable through Trees

The aerial cable should follow a free path to avoid chaffing and damage, it should not come into contact with structures such as buildings and lamp posts. Running aerial cables through trees should be avoided; if this is not possible, use of Protector Cable Abrasion or pruning of the branches should be considered.

9.3 Threading Method

This method is used where the Direct Placing method cannot be used, but the field engineer is able to reach the cable fixing positions. A Platform Elevating fitted with a winch is required for this operation.

9.3.1 Preparation at the First Pole

Park the cable drum trailer at the start of the route and apply the cable drum brake so that the cable can be pulled off easily by hand without overrun.

Prepare the end, using Grips Wire Suspension 3 (for heavyweight cable) or 4 (for light weight cable) and Tape Plastic Adhesive 25 mm as shown in fig 11.

Strip the sheath from the suspension wire as described in section 10. Wrap both legs of the Grip Wire Suspension around the bare suspension wire intertwining the helixes so that they lay side by side. The whole of the helixes should be occupied by suspension wire. Tape over the top of the helixes with Tape Plastic Adhesive 25 mm. Item code 075995.

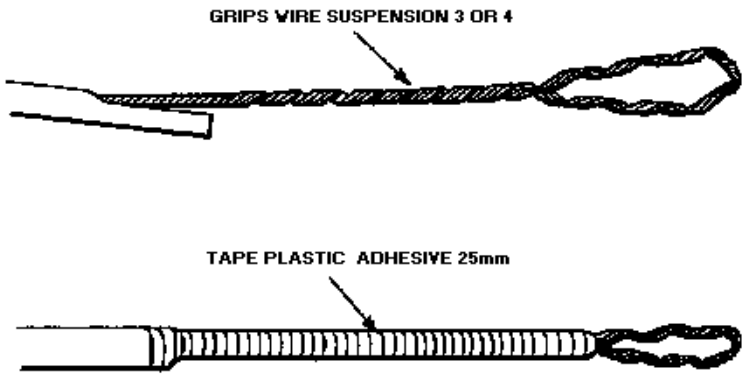


Figure 11

9.3.2 Winching at the First Pole

Fit a Block Snatch 1 on the first pole above the position where the termination is to be made. Thread the prepared cable end through the Block Snatch and attach to the winch rope using a Hook Pulling Aerial Cable. See Figure 12.

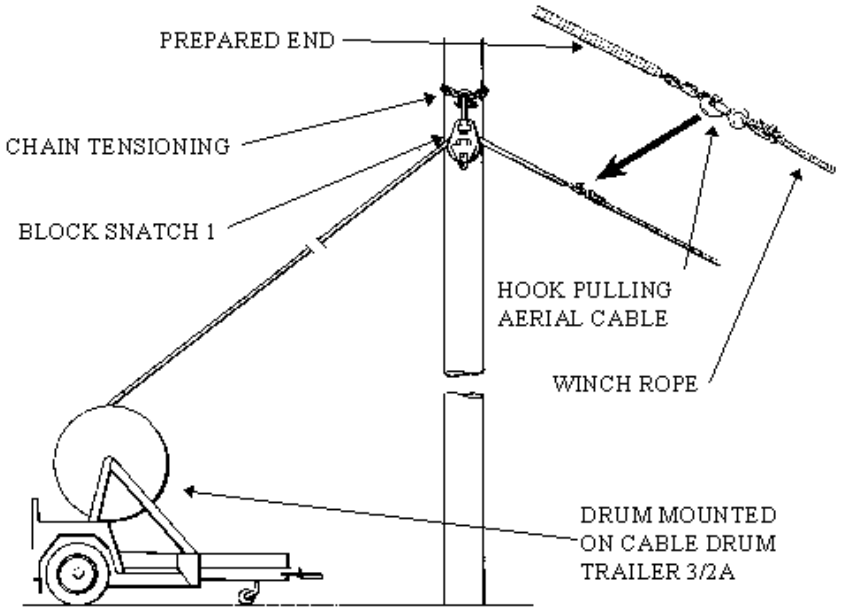


Figure 12

Ensure that the winch rope passes over the cable support arm on the PE. Winch in the winch rope until the cable is approximately 1 m from the first pulley on the vehicle.

9.3.3 Continuing Along the Route

With the cage in line with the vehicle and at a height such that adequate clearances are maintained over obstructions, drive the vehicle to the next pole.

> **Warning:** The cage must be slewed in line with the vehicle before driving between poles at a maximum speed of 5 mph.

Ensure that the cable does not become snagged and is free running from the drum at all times during this operation.

At the next pole slew the cage towards the pole and fix a Hook Temporary Hold 2 to the pole at the height where the termination will be made and place the cable in the hook. Restore the cage in line with the vehicle and winch in

the winch rope until the cable is approximately 1 m from the first pulley on the vehicle. Repeat 9.3.3 until the terminal pole is reached.

9.3.4 At the Terminal Pole

Terminate the cable as described in Section 10.

9.3.5 Taking up the Slack Cable and Tensioning

Take up the slack (see section 9.2.3), tension and terminate the cable.

Lightweight cable must be tensioned by hand one span at a time.

Heavy weight cable may be tensioned using the PE winch or the Tensioner 2B, see Section 11.

The cable should be terminated at all poles using the appropriate technique described in Section 10.

9.3.6 Final Operations

Confirm correct clearance has been achieved using Rods Clearance Telescopic 7m described in EPT/OHP/B011.

9.4 Winching Method

The winching method may be used where the cable fixing positions are not accessible with the cable. A PE is required for this method.

9.4.1 Preparation

Prepare the cable end as for the threading method see section 9.3.

Position the cable drum trailer at the first pole.

Thread Drawrope 1 through the Block Snatch and proceed down the route fitting Hooks Temporary Hold to each intermediate pole and threading the Drawrope 1 through them.

Position the Platform Elevating at the last pole.

Fit a Block Snatch No 1 at the top of the last pole above the position where the Full Terminations are to be made. Leave sufficient Drawrope 1 to pass through the Block Snatch and the final pulley on the PE, and to reach the winch.

At the first pole - attach the Drawrope 1 fitted to the eye prepared on the end of the aerial cable. Tape any loose ends using Tape Plastic Adhesive 25 mm to ensure smooth passage of the rope and cable through the hooks.

Return to the last pole.

Position the PE approximately 1m away from the last pole. Empty the winch drum on the Platform Elevating.

Fit a Block Snatch 1 to the leading eye provided on the PE. Thread the Drawrope 1 through the Block Snatch and pulley and attach the Drawrope 1 to the flange of the winch.

9.4.2 Winching

One of the crew should return to the drum end and establish communication with the winch operator. When confirmation is received from the far end that everything is ready, operate the winch and pull the cable through.

Maintain communication with another member of the working party who should watch the cable along the route. Any snags must be communicated to the winch person and winching must stop. Tension must be released and the snag freed before continuing.

9.4.3 Terminating at the Winch End

When the cable has been winched through, stop the winch, and secure the cable using a Grip Pulling Aerial Cable that is secured to the pole with a rope tail.

Release the drawrope, unwrap and discard the Grip Wire Suspension 3 or 4.

Expose sufficient Suspension Wire for termination and perform a full termination as detailed in Section 10 of this document.

Recover the Block Snatch and Grip Pulling Aerial Cable.

Go to the other end of the route.

9.4.4 Taking Up the Slack, Tensioning and Terminating

Take up the slack (see Section 9.2.3), tension and terminate the cable.

Lightweight cable must be tensioned by hand one span at a time.

Heavy weight cable may be tensioned using the PE winch or the Tensioner 2B, see Section 11.

The cable should be terminated at all poles using the appropriate technique described in Section 10.

9.5 Road Crossing

Note: Where road crossings occur in aerial cable routes a full termination must be made each side of the road crossing.

At road crossings traffic control may be necessary to use the methods described above.

9.5.1 Rings Method for Road Crossing

This section is provided for teams who hold the necessary equipment and are competent in its use.

> **Warning:** All pulling must be carried out at ground level and suitable Gloves must be worn.

1) Rig both poles either side of the crossing as shown in Fig 13.

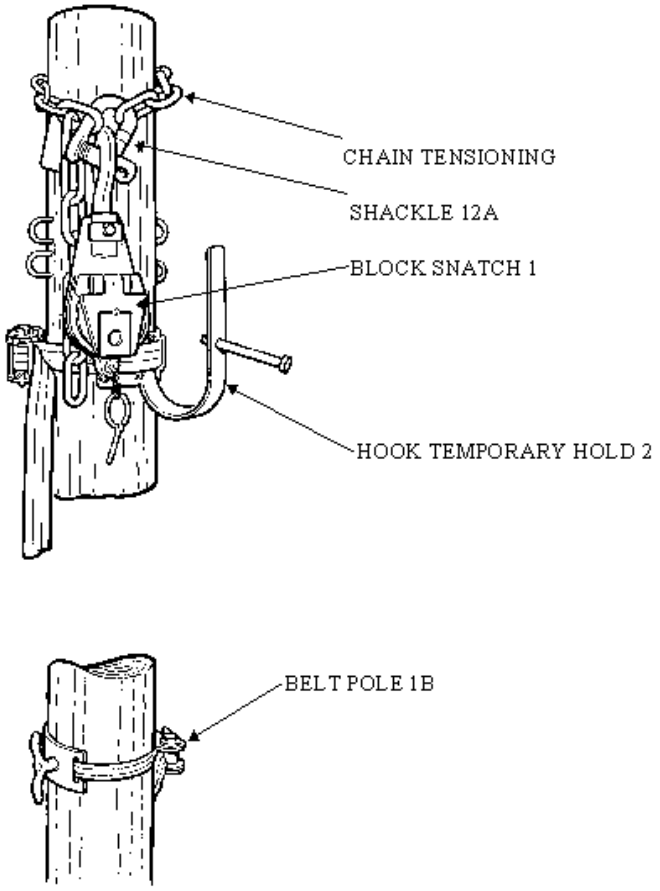


Figure 13

> **Caution:** When ropes, sash lines cables are above the road, tension must be maintained to ensure clearance across the road, or LV power unless contained within the rings.

2) Attach a Sash Line 15 to the pole belt at pole A. Feed it over the Block Snatch 1 and lay across the road when it is safe to do so. Use Weight Sandbag 2 (i/c 068971) at either side of the road to keep the Line Sash flat on

the road. The rope should be placed under the bag and approximately 100 mm from the bottom of the bag.

3) Pass the sash line over the Block Snatch 1 at Pole B. See Figure 14.

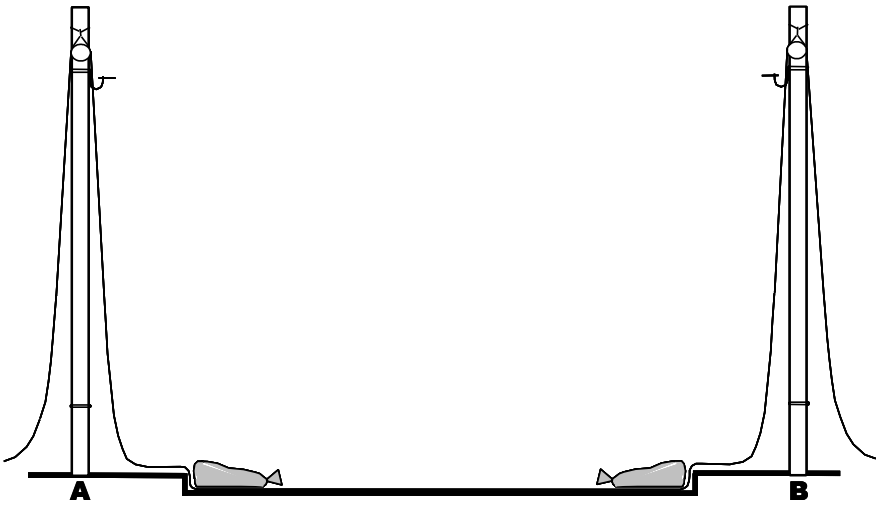


Figure 14

4) Make sure that the road is clear.

5) Pull the sash line up from Pole B. The Line Sash should pull from underneath the sandbag without the need to remove the sandbag. See Figure 15.

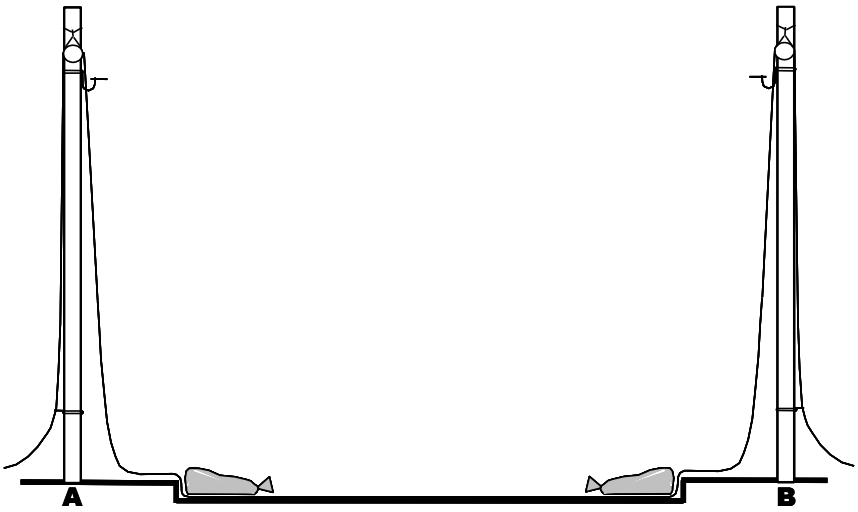


Figure 15

6) Apply hand tension and secure the Line Sash to both poles using a clove hitch and a half hitch. This is the preliminary support rope. See Figure 16.

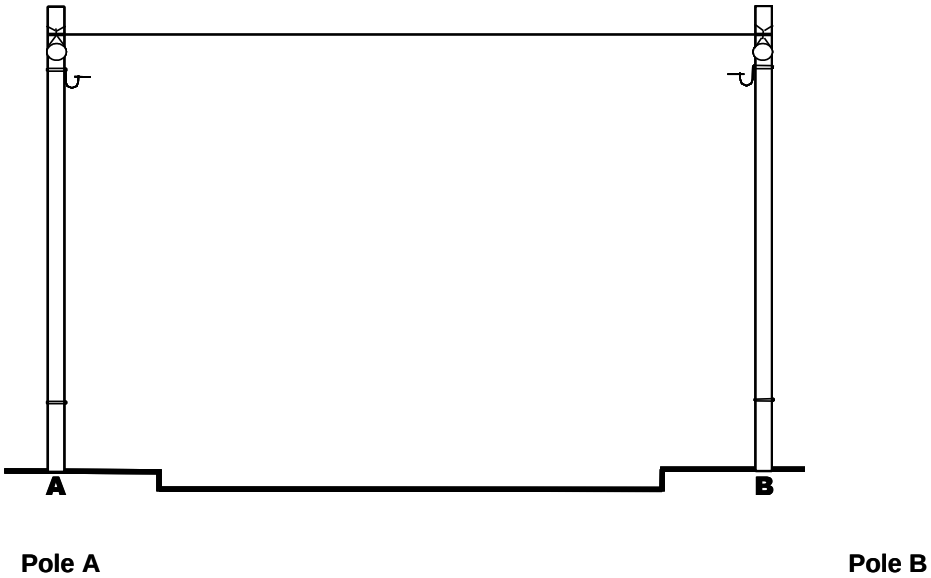


Figure 16

7) Provide a second Line Sash 15 as shown in Figure 17. This is a “pulling line”.

Tie the pulling line off on both pole belts.

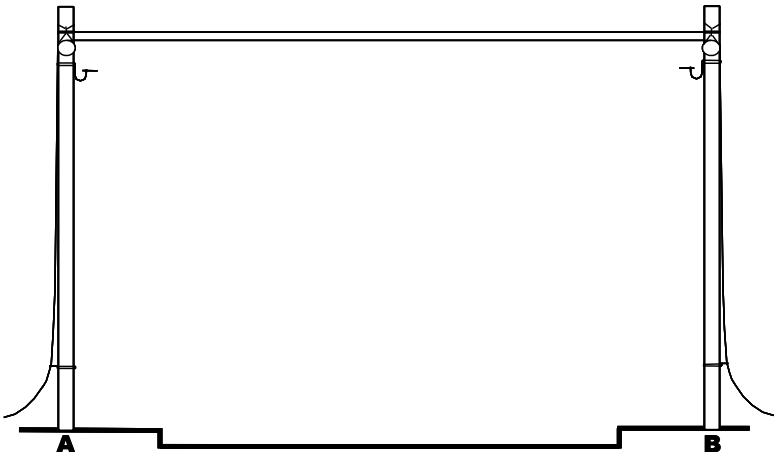


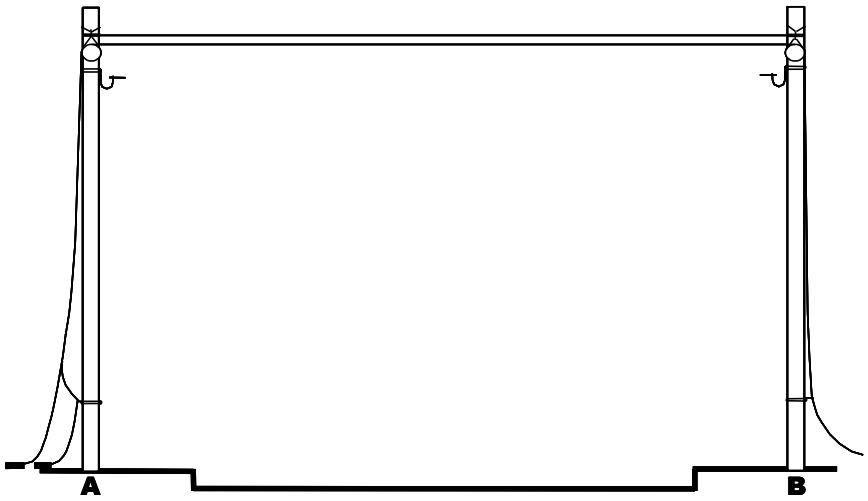
Figure 17

8) At Pole A, prepare the end of a length of Wire Steel 7x1.6 mm (HW Aerial Cable steel) using a Grip Wire Suspension 4 as shown in section 9.3.1.

9) At pole A attach the prepared end to the Line Sash 15 using a Bow-line knot and attach another length of Line Sash 15 using a Bow-line knot through the eye of the Grip Wire Suspension. The length of the additional sash line 15 needs to be 4X the height of the Pole plus the length of the span. This will be used to apply back tension to the pulling line during installation of the wire steel. See Figure 18

Caution: Wherever there is a risk, however slight, of accidental contact between Openreach plant and Power Conductors, Gloves IR must be worn.

10) Remove the Sash line 15 from the Pole Belt whilst maintaining the tension of the span



Pole A **Pole B**

Figure 18

11) Whilst back tension is being applied by hand at pole A, pull the wire steel by hand using the pulling line at Pole B. The wire steel should be pulled through the hook temporary hold at Pole A and past the pole to enable sufficient rings to be fitted around the steel and support rope (enough to be able to put the rings on).

Caution: Do not pull the wire across to Pole B at this point.

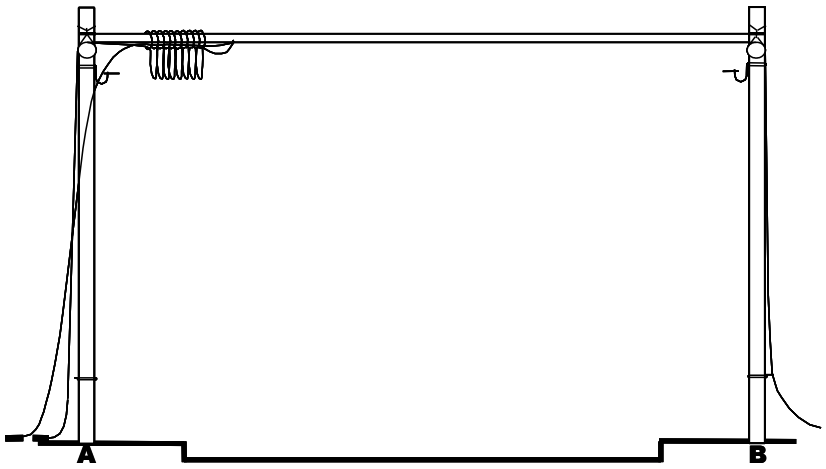
12) Tie off the sash line on both poles maintaining clearance across the road.

13) Prepare a length of sash line No.2 (approximately the span length plus 5 metres) with loops tied at 1 metre intervals. The Rings will feed through the prepared loops.

14) At pole A, make fast the rear Ring sash line to the pole or convenient attachment.

15) Attach the Rings through the pre-made loops. The Rings must be fitted around the preliminary support rope, the wire steel and the back tension rope.

16) Tie the lead Ring sash line using a bow line knot to the leading end of the wire steel.



Pole A **Pole B**

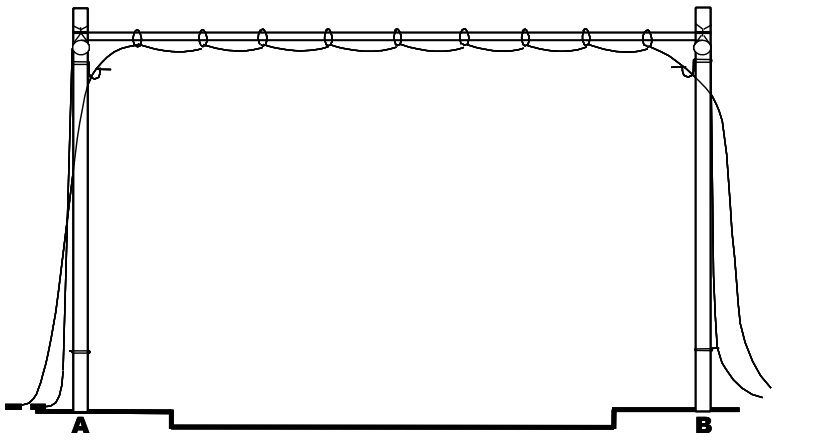
Figure 19

17) Descend Pole A and untie the Sashline 15 from the Pole Belt.

18) Apply back tension by hand at Pole A using the Line Sash and from Pole B pull the wire steel and rings across by hand. Ensure enough wire steel has been pulled through for termination.

Note: The Line Sash may be tied off at the pole belts at either side should difficulties be encountered at any time during the crossing. See Figure 20.

Note:



Pole A **Pole B**

Figure 20

19) Tie off the Sashlines at Pole A and Pole B on the ‘figure of 8s’ of the Pole Belts.

20) Starting at Pole B, tension and terminate the Wire Steel (see Figure 21) using a Bare Wire clamp 47. Cut the wire steel (approximately 25mm) from the end of the bullet of the BWC 47. Repeat at Pole A.

Note: Alternatively, the wire steel can be terminated using the wire wrap method. See sections 10 and 11.

21) At Pole B remove the Grip Wire Suspension.

Tie together the sash line No.2 with the Rings to the pulling rope and the preliminary support rope using a bow line knot. Ensure all the Rings are over the wire steel, the prelimary support rope and the pulling rope.

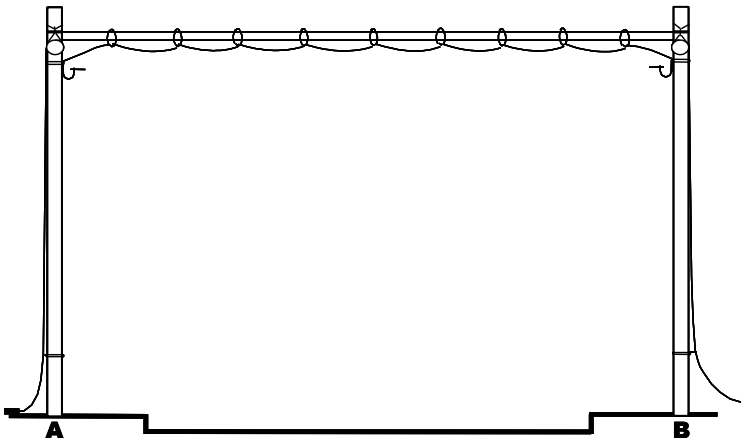


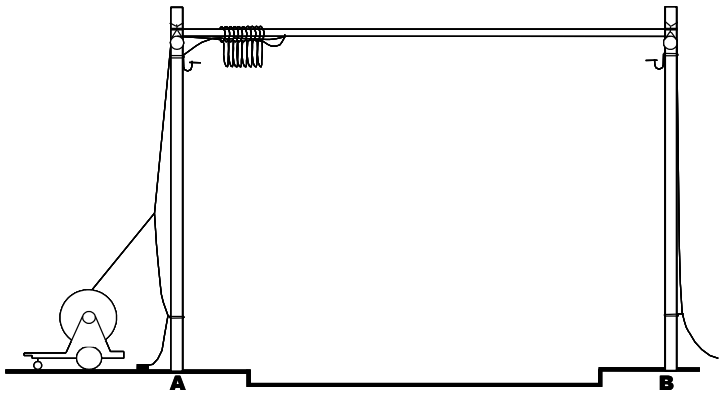
Figure 21

22) Pull all the rings back to pole A, maintaining tension at pole B (to prevent sagging). At pole B secure the sash line 15 to the figure of 8 on the pole belt. Ascend pole A and disconnect the sash line from the lead Ring from the pulling line. Secure to a suitable part on the pole. Bring the pulling sash line to ground level.

23) Prepare the end of the cable as shown in Section 9.3.1 and attach to the Pulling sash line using a bowline on the Pulling line.

24) Whilst maintaining tension pull the cable up using the pulling line at pole B until the cable reaches the top of Pole A. Tie off the back tension sashline to the pole belt. Ascend pole A, feed the cable through the temporary J hook and the rings. Tie the sash line of the lead Ring to the made end of the Aerial cable.

25) Descend pole A and untie the sashline from the pole belt maintaining hand tension.



Pole A **Pole B** Figure 22

26) Pull the cable across using the pulling Line Sash at Pole B.

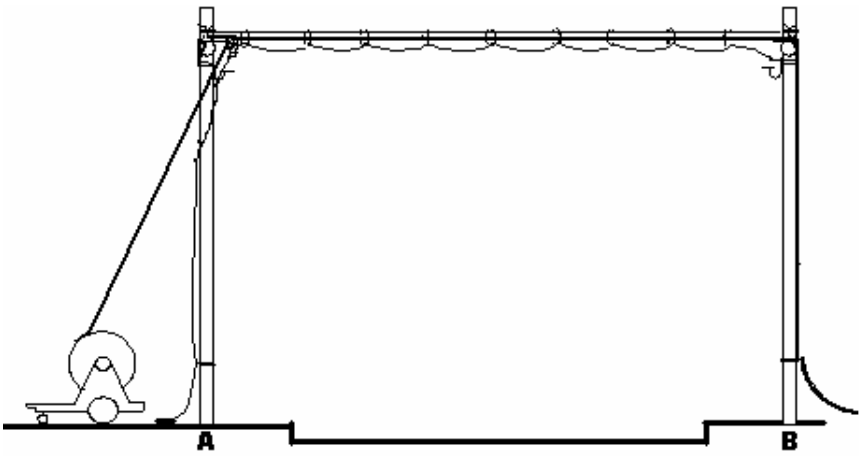
Note: If a Platform Elevating winch is used, then back tension must be applied using the cable drum brake on the cable drum trailer.

27) At pole B secure the pulling line in a pole belt. Ascend Pole B and disconnect the sashline lead ring securing it to the pole.

28) Pull enough cable through for termination and jointing purposes.

29) Make fast the pulling sash lines at both Poles.

30) Tension and terminate the cable as described in sections 10 and 11.



Pole A **Pole B**

Figure 23

31) At pole B wrap a Grip Wire Suspension onto the steel wire. Tie the lead ring sashline and the back tension sashline to the eye of the Grip Wire

Suspension. Cut the steel wire between the Grip Wire Suspension and the BWC 47.

Note: Some of the Rings may need to be disconnected in order for the Grip Wire Suspension to be attached.

32) Recover the BWC 47.

33) At pole A attach a Grip Wire Suspension 4 to the steel wire. Attach another sashline 15 through the eye using a bowline knot and attach to the pole belt. Place through the temporary J hook with the existing sashlines. Cut the steel wire between the Grip Wire Suspension and the BWC 47.

34) Recover the BWC 47.

35) Descend the pole and pull both sashlines together until the rings and the steel reach pole A.

Note: At pole B, tension must be maintained on the Wire Steel.

36) Recover the equipment and the sashlines from both poles following the dropwire recovery process detailed in EPT/OHP/B011.

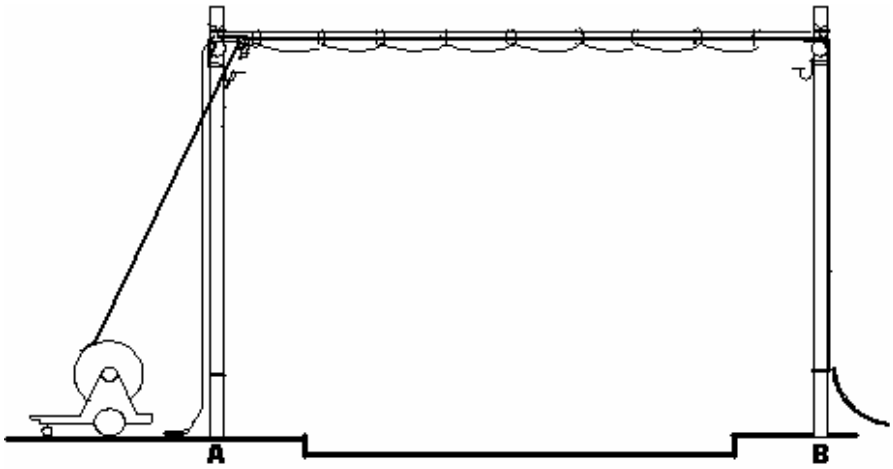


Figure 24

9.6 Power Crossings

This instruction details a change in practice for the provision or recovery of an aerial cable which crosses over a low voltage power line. Detailed below is the method to provide sash lines over the low voltage power conductors without any contact by the sash lines. Once the sash lines have been installed over the power lines, continue the installation practice as detailed in section 9.5.1 Road Crossing using rings method.

9.6.1 Description of Components Required

Note: It is MANDATORY to wear Gloves IR (BS EN) or Gauntlets as shown below when providing the sash line over the power conductors.

Gloves IR (BS-EN) (for use with voltages up to 500 volts)	Small Item code: 005678	Medium Item code:005679	Large Item code:005680
Gauntlet (for use with voltages up to 7500 volts)	Small Item code: 008519 IR-HV9 EN	Medium Item code: 129403 IR-HV10 EN	Large Item code: 008517 IR-HV 11 EN
Stay Guard High Visibility item code:013612		Line Sash 2 item code: 127429	
Dispenser Dropwire 2B item code: 127548		Pulley Dropwire 4 item code: 127580	
Pulley Dropwire 6 item code: 047036		Belt Pole 1B item code: 126966	
Straps Lashing item code:127545		A suitable weight such as 3 rolls of insulation tape e.g. Tape Plastic Adhesive item code :075995 Or: Stay Insulator 2 item code: 105240	

Table 3

A Mobile Elevating Work Platform is required to perform this operation.

9.6.2 Definition of LV Power & Clearances

Low voltage lines are those not exceeding 1000V ac. In virtually all cases the low voltage power lines normally encountered are single phase lines, 230V ac to a neutral (referred to as Phase Voltage), and three phase lines, 400V ac between phases (referred to as Line Voltage). These are supplies to residential properties and generally smaller commercial properties.

A **conductor** is a conductor of electricity, including earth and neutral wires.

High voltage (HV) power lines are those carrying a voltage in excess of 1000V ac.

Further information is available in EPT/PPS/B026 and the Glove box guide.

Power lines other than those described above should be treated as high voltage.

The clearance that must be kept between Openreach (BT) plant and Low Voltage (LV) lines is dependent upon the type of DNO cable, and whether the BT cable is above or below the DNO line, according to the table below.

Cable Type	Clearance from BT cables When BT cables are **below**	Clearance from BT cables When BT cables are **above**
Concentric Neutral service cable	200mm	200mm
ABC	600mm	400mm
Single wires	900mm	900mm

Table 4

See ISIS EPT/PPS/B026, EPT/PPS/B038, EPT/PPS/B046, SFY/HSH/D039 and SFY/HSH/D043 for further information.

9.6.3 General Principles

This allows work to proceed with the following provisions

- This work should only be carried out by an individual who has had the method demonstrated to them by a suitably qualified experienced person
- The insulated plastic tube shall be a Stay Guard High Visibility item code: 013612

Note: Before use, the Stay Guard High Visibility must be clean, dry and undamaged.

- Insulated tools and equipment as described shall be visually inspected before use
- Work shall be organised in such a way that the 1 metre Exclusion Zone cannot be breached by any tools or any part of the body
- Insulated tools shall not be allowed to touch any power conductors or steelwork
- Gloves IR shall be worn at all times by all operatives when using this procedure
- Glover IR shall be stored, inspected and replaced in accordance with Openreach test policy ie, ESI testing
- ***Members of the working party shall not stand under or near the power conductors***
- A Ground Support person shall be observing operations at all times and must be in a position to stop the work if necessary

- Only MEWPS (Mobile Elevating Work Platforms) with fibreglass buckets and insulated handrails are to be used
- The MEWP must be positioned such that in the event of any operator error or machine malfunction, the 1 metre Exclusion Zone must not be breached
- Generally, the bucket should be positioned adjacent to lines and never directly above conductors
- All parts of the MEWP, personnel and tools shall be kept out of the 1 metre exclusion zone at all times
- If there is a carriageway crossing Traffic Management must be used

9.6.4 Power Crossing using the Rings Method

9.6.4.1 This section is provided for teams who hold the necessary equipment and are competent in its use.

> **Warning:** All pulling must be carried out at ground level and suitable Gloves must be worn.

Only one Platform Elevating vehicle available, or site conditions only allow one Platform Elevating to be in position on one side of the LV power lines:-

> **Warning:** Make sure the sash line/s are kept under control in windy conditions.

INSTALLATION PROCEDURE

3 persons will be required as a minimum for this activity, (not including those present for traffic control). A MEWP operator, GSP and at least one other suitably skilled engineer.

Wherever there is a risk, however slight, of accidental contact between Openreach plant and power conductors, gloves IR must be worn. They must also be worn whenever ropes or sash lines which may come into contact with power lines are handled. This is essential, the sash line may become wet with rain and so lose its insulating properties.

> **Warning:** This activity must only be carried out in dry conditions.

Under NO circumstances must any attempt be made to throw a cable or sash line over power cables.

Note: This process is only applicable for pole-to-pole distribution. For scenarios out of scope, an underground solution must be sought.

1. Fit a Pole belt 1B to Pole A and Pole B at ground level.
2. At Pole A secure the cable dispenser to the pole using Straps Lashing and wind a sufficient length of sash line 15 onto the cable dispenser to go up and down the pole and across the span length to Pole B. Use a double sheet bend knot to attach the sashline No.15 to the dropwire on the drum.
3. Tape the free ends.
4. Take a length of sash line No.2 (2 x pole height) and a Pulley No.4 and ascend Pole A. Fit a Pulley No.4 to the pole ring. Open the side of the pulley and insert the sash line. Descend the pole and attach the free ends of the sash line to the pole belt.
5. At Pole B fit a Pulley No.4. Install a length of sash line No.2 through the pulley so that sufficient sash line can go up the pole and down to the ground. Secure the sash line to the Pole belt (one end through the cleat and the other end around the figure of 8).

Note: At both poles the crossing side of the sash line must be placed in the cleat of the pole belt.

6. Using a reef knot secure a length of sash line No.2 (long enough to reach the two poles plus an additional 5 metres) to the sash line No.2 at Pole A to the span side.
7. Using traffic control, pay the sashline out towards Pole B. Pass the sashline to the platform operator whilst managing the coil. The sashline then needs to be pushed through a length of Stay Guard High Visibility. Tie a suitable weight (non power conducting) such as 3 x Tape Plastic Adhesive or an Insulator Stay 2 to the sashline and lock off the sash line by drawing it into the split in the stay guard.
8. Position the platform bucket maintaining the clearances detailed in the Overhead Power Glove Box Guide. Making sure that Gloves IR are being worn, position the Stay Guard containing the sashline over the power cable making sure it does not come into contact with the power cables. Carefully unlock the sash line from the split and hold the weighted line. See figure 25 below.

Note: When manoeuvring or positioning the MEWP bucket it must never be closer than 1 metre (in any plane) from any Live conductor/s. Also, the bucket controls must be switched to OFF or the emergency stop activated.

9. Feed the sashline through the Stay guard until the weight touches the ground. See figure 26 below.

10. The third person wearing gloves IR, can then take hold of the sashline at ground level and carefully pull the sashline through the stay guard. Continue to lay the sashline out until it can be attached using a reef knot to the sashline installed through the Pulley No.4 at Pole B (to the end that is positioned in the cleat of the pole belt).

Note: A Pulley No.4 is required as the sash line knot will not pass through the jaws of a Pulley No.6.

11. When safe to do so, and while still wearing gloves IR, pull the sashline up at Pole B until the sashline is taught between Pole A and Pole B. The platform operative may need to feed the knots through the stay guard. Ensure the sashline is attached to the figure of 8 on the pole belt.
12. Using a double sheet bend knot, tie the sashline No.15 previously wound onto the dropwire dispenser to the end of the sash line No.2 which is attached to the figure of 8 on Pole A. Remove the sashline from the pole belt, while maintaining tension wind any slack back onto the drum. Adjust the back tension on the dispenser if necessary.
13. Check the separation distances can be maintained before going further.
14. At pole B, wearing Gloves IR, continue to pull the sash line No.2 until the sash line No.15 is pulled across. Secure the sash line 15 in the figure of 8 in the Pole Belt.
15. Return to the Dropwire Dispenser and lock off the drum.
16. At pole B, fit a ‘Come Along’ (Grip pulling Aerial cable 2A) to the sashline 15 (span side) and secure to the pole using a clove hitch and a half hitch knot.

Note: Attach a suitable length of rope cabling to the ‘Come Along’. One side attached to the ‘Come Along’ and the other secured to the pole.

17. Descend the Pole and untie the sashline 15 from the figure of 8 in the Pole Belt. Also untie the sashline no.2 from the sashline no.15.
18. Ascend Pole B and remove the Pulley No.4. Secure the sash line No.15 using a clove hitch and a half hitch to the pole. This should be positioned as close as possible to the pole ring or UPB. Manage any lose ends.

Note: This is the preliminary support rope.

19. Remove the Come Along from the sashline 15.
20. At Pole A unlock the Dispenser, ascend the Pole and fit a Come Along to the Sashline 15 and secure to the pole using a clove hitch and a half hitch knot.
21. Descend the Pole and remove the Sashline 15 from the dispenser.
22. Ascend Pole A and remove the Pulley No.4. Secure the sash line No.15 using a clove hitch and a half hitch. Manage any lose ends
23. Remove the Come Along from the sashline 15.

24. When the sash line is tensioned the platform operator can open the split in the stay guard and carefully slide it off the sash line.
25. Repeat steps 1 to 15 to provide a second sash line No.15

Note: This is the “pulling line”.

26. When the sash line is tensioned the platform operator can open the split in the stay guard and carefully slide it off the sash line. Once the two sash lines are secured at both poles and there is no risk of the sash lines falling, the MEWP Operator is no longer required, and Traffic Management can be removed.
27. Remove the Sashline 15 form the dispenser at Pole A and attach the free end to the figure of 8 on the Pole Belt.
28. Dress Poles A and B with temporary J hooks.
29. Remove the sash line 15 from the pulleys and feed the sash line through the temporary J Hooks at both poles, two persons will be required to maintain height/tension of the sashline.

Note: Position the sashline no.15 over the J hook prior to removing the Pulley No.4.

30. Continue from step 8 of the Rings Method described in section 9.5.1.

Figure 25

Figure 26

Figure 27

9.6.5 On Site Risk Assessment

9.6.5.1 Justification

Before any work starts with the electricity network live, a thorough justification process must take place.

Consideration must be given as to whether the works can be carried out safely in accordance with this document. It must still be reasonable to continue with the work taking in to account the following factors:

- proximity of other people / traffic, etc.
- complexity of the task.

- likely duration of the works.
- weather conditions.
- terrain (area of land with respect to its physical features).
- Condition of the electricity and Openreach networks (see 6.2 below).

If suitable control measures cannot be put in place to ensure that there is no possibility of the people or equipment infringing the **Power Vicinity Zone**, the work must not proceed.

For further information see Risk Assessment (bt.com)

9.6.5.2 Condition of the Network

A visual inspection shall cover at least a span length either side of the site.

If there is any doubt as to the condition of the network, then advice and authorisation must be sought from the electricity company.

If works continue when there is a doubt over the condition of the network, then the findings of this inspection must be noted in a written Risk Assessment.

9.6.6 Emergency Procedures

In the event of an incident then the emergency procedures detailed below shall be followed.

- Stop all work and make site safe
- Keep everyone away of live conductors, fences or equipment
- Call emergency services if necessary, give exact location and access details
- Carry out First Aid if necessary or A&E
- Contact the electricity company
- Do nothing else until instructed by an investigator

10 *Methods of Terminating Aerial Cable at Poles*

10.1 General

This section details the use of Clamps Aerial Cable for terminating aerial cable at poles and the methods of performing full termination of the suspension wire at the pole. It also details the methods of using insulators at termination points and methods of attaching to Joint Use Poles. Information is also detailed on the use of Telenco products for use with overhead cable terminations.

10.2 Full Termination

10.2.1 Separating the Suspension Wire from the Cable

Gloves and eye shields must be worn.

Note: Gloves Kevlar should be used when knife pocket.

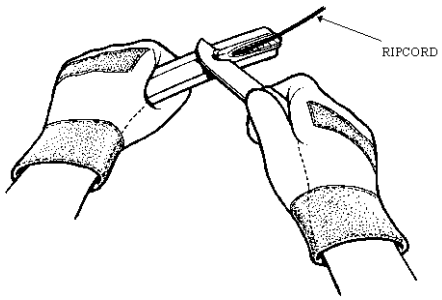


Figure 28

Remove the polythene sheath from the suspension wire using a Knife Pocket 2 see Figure 28.

Caution: When using knives always direct the cutting action away from yourself

Lift and expose approximately 100 mm of suspension wire.

Note: Tape the end of multi-stranded suspension wire to prevent unlaying.

Continue exposing the Suspension Wire until sufficient has been exposed for termination. Where a ripcord is present this may be used to assist in the splitting of the sheath to expose the strength member.

10.2.2 Wire Wrap Method for Terminating Aerial Cables on Wooden Poles

Note: This method is not suitable for use with Cable Optical Fibre (COF)204.

The two lashed areas circled are critical to the integrity of the termination

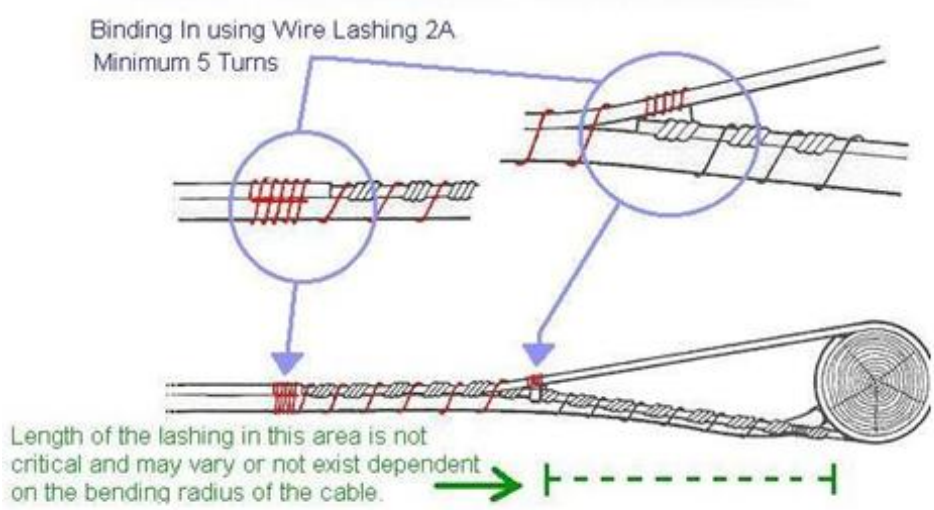


Figure 29

Note: Use Grips Wire Suspension No 1 (GWS No 1) for fully terminating lightweight aerial cable and Grips Wire Suspension 2 for heavyweight cable.

Strip enough sheath from the suspension wire to allow a minimum of three wraps around the pole plus an allowance for one and a half times the length of a Grip Wire Suspension plus approximately 100 mm.

Note: The minimum number of wraps around the pole on new work is three.

(This will provide spare suspension wire to accommodate a possible future pole change over when the number of turns of suspension wire may be reduced to two times around the pole.)

Hammer a Staple 45 mm (for lightweight) or Staple 65 mm (for heavyweight) halfway home in line with the direction of the cable but on the opposite side of the pole to the cable being terminated.

Pass the suspension wire three times around the pole, through the staple in a clockwise direction.

Hammer the staple home to prevent the suspension wire crossing over. Do not crush the suspension wire with the staple.

Attach the Grip Wire Suspension to the free end of the suspension wire by wrapping the helical coils around the suspension wire. Ensure that the crossover paint mark is aligned with the end of the suspension wire and the end of the grip is approximately 75 mm from the line of pole centre.

Note: Use the Clips "O" supplied with the grips to ensure that the correct size is used.

Pass a Clip "O" over the end of the Grip Wire Suspension and crimp the Clip "O" using Pincers within 25 mm of the end of the suspension wire.

Wrap the second half of the grip around the suspension wire to leave approximately 100 mm of suspension wire exposed between the grip and the point where it enters the sheath.

- Bind the cable to the grip using Lashing Wire 2A. Bind in wire starting before the point where the steel separates from the webbing so that none of the minimum 5 turns locking the binding wire at this point are wound over bare steel. Fold approximately 25 mm of the end of the lashing wire so that it faces the pole and place it on top of the cable. Tightly wrap between 5 and 10 turns over the top in a direction working along the grip so that the spiral of the grip can be followed. Continue wrapping in the same direction but following the spiral of the grip.
- The length of the binding should be such that it supports the cable and enables a suitable bend radius to be maintained.
- At the "V" of the grip, tightly wrap 5 to 10 turns then continue wrapping the binding at a similar pitch to the spiral of the grip.
- At the end of the binding, bind around the cable and/or the wire to the suspension wire using a minimum of 5 tight turns.

  Flatten off any sharp edges.

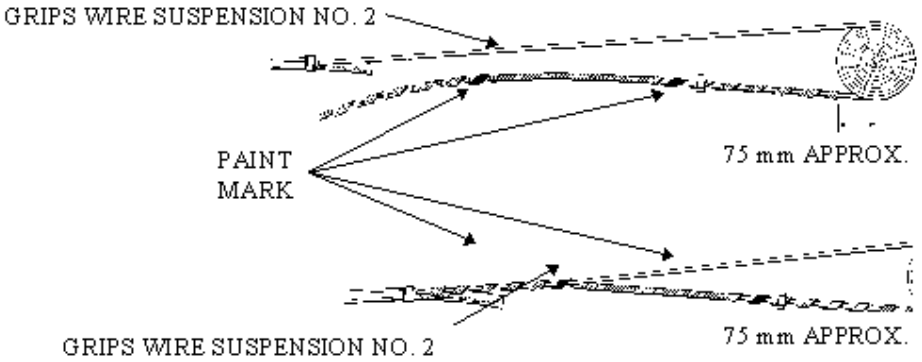


Figure 30

10.2.2.1 Extending Catenary wire using Grips Wire Suspension

Where Aerial cable catenary wire is too short to enable termination, it can be extended using a Grip Wire Suspension (GWS), using the following method.

Stores required:

- Use GWS 1 (016444) for Lightweight and GWS 2 (016227) for Heavyweight cables
- 2 x Clips “O” are required, to prevent the Catenary wire unwinding from the grip under severe tension. Use CLIPS 'O' 5-7mm (016448) for Lightweight Cables and CLIPS 'O' 9-11mm (016449) for Heavyweight cables.

Installation steps:

1. Tension the Aerial cable using Grip Pulling Aerial Cable 2A (Come Along) and prepare catenary wire ready to accept Grips Wire Suspension.

Figure 31

2. Wind one half of the grip onto the catenary steel of the aerial cable. The steel end should be just short of centre position indicated by the black paint mark on the GWS.

Figure 32

3. Cut a length of new catenary, which is sufficient to reach from the inside of the Barrel Clamp to the mid-point of the Grip

4. Slide 2 x Clips “O” onto the Grip

5. Wind the “new” Catenary onto the other half of the grip, leaving a gap of approximately 5mm between the two ends of the suspension wires.

6. Locate the Clips “O” 20mm back from each butt end of the catenary and nip them up

Figure 33

7. At the pole head, insert the other end of the catenary piece into the Barrel Clamp.

8. Cut and cap any excess catenary at the bare wire Clamp

Figure 34

9. Complete the installation by binding in sheath and catenary wire with wire lashing 1B and remove Grip Pulling Aerial Cable 2A.

Figure 35- Cable and catenary bound in

10.2.2.2 Back-to-Back in line Full Terminations

Where back-to-back in line Full Terminations are required see ISIS EPT/ANS/A012.

10.2.3 Method of Full Termination for Routes with Power Crossings

Note: Insulators are not always required at power crossings see ISIS EPT/PPS/B046 for details. Where insulators are not required then the standard method of termination may be used see section 10.2.2.

Note: This method may also be used on maintenance work where the suspension wire is too short to achieve a full termination using the method described in 10.2.2.

Fitting an Insulator to a Pole

Fit an Insulator Stay No 2 into a Suspension Wire using Grips Insulator Pole and Grips Wire Suspension No 3 (for lightweight aerial cable) or 4 (for heavyweight aerial cable), and a length of Wire Steel 7/2.00 mm. See Figure 36 for items and general arrangement.

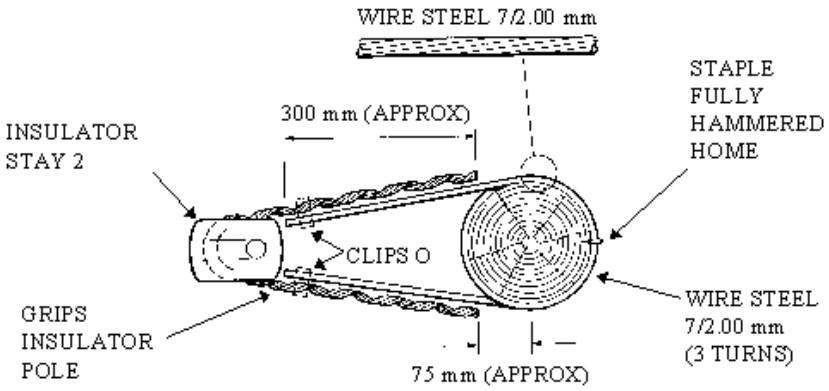


Figure 36

Hammer a Staple 65 mm halfway home in line with the direction of the cable but on the opposite side of the pole to the cable being terminated.

Wrap the Wire Steel 7/2.00 mm three times around the pole through the staple. Trim the length so that the two legs of the steel are equal in length and a minimum of 300 mm from the pole. This will provide sufficient length to attach a Grip Insulator Pole.

Hammer the staple home to prevent the Wire Steel from crossing over. Do not crush the suspension wire with the staple.

Wrap the helix of the Grip Insulator Pole around the Wire Steel for approximately 300 mm of one of its legs so that the end of the grip finishes approximately 75 mm from the line of pole centre.

Pass a Clip “O” over the end of the Grip Wire Suspension and crimp the Clip “O” using Pincers within 25 mm of the end of the suspension wire.

Thread the free end of the grip through an Insulator Stay as shown in figure 10.6

Thread a second Clip “O” over the end of the grip.

Wrap the helix of the grip around the other leg of Wire Steel for approximately 300 mm of one of its legs so that the end of the grip finishes approximately 75 mm from the line of pole centre. Crimp the grip to the suspension wire within 25 mm of its end using Pincers.

Attaching the Insulator to the Suspension Wire

Strip enough sheath from the suspension wire to enable the helix of one leg to be fitted plus approximately 100 mm.

Wrap the complete helix of first leg of the Grip Wire Suspension No 3 or 4 around the Suspension Wire for 3 turns.

Pass the free end of the Grip Wire Suspension No 3 or 4 through the insulator so that the insulator is in compression - not in tension.

> **Caution:** Insulator Stay 2 is designed to take compressive loads between its two eyes tensile failure will occur if fitted in tension rather than compression. See figure 10.5

Wrap the second leg of the Grip Wire Suspension No 3 or 4 around the suspension wire intertwining it with the first leg.

Continue to wrap both legs around the Suspension Wire. See figure 38

Bind the cable to the grip using Wire Lashing 1B such that it supports the cable and enables a suitable bend radius to be maintained. At the start of the binding fold approximately 25 mm of the end of the lashing wire so that it faces the pole and place it on top of the cable. Tightly wrap between 5 and 10 turns over the top in a clockwise direction working along the grip. At the end

of the binding bind around the cable and/or the wire to the suspension wire using a minimum of 5 tight turns.

Caution: The Wire Lashing 2A must not bridge the insulator!

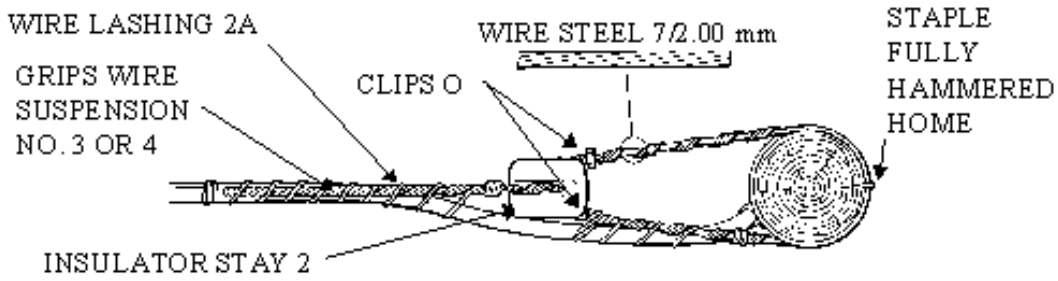


Figure 37

10.2.4 Full Termination on Joint Use Poles by use of an Eye bolt Through the Pole

The 'wire wrapping' method detailed above in sections 10.2.3 may be rejected by DNO's where their poles have electricity cables fed down the pole.

Note: Historically an eyebolt 250mm was used for such situations, however the current method is to use a UPB which can be attached using through bolting or stainless-steel banding. Where an eyebolt 250mm is encountered, Aerial cables can still be attached as shown in illustration below.

Note: The UPB method is dependent upon approval by the relevant DNO. The Openreach works originator must obtain such permission before installing the UPB.

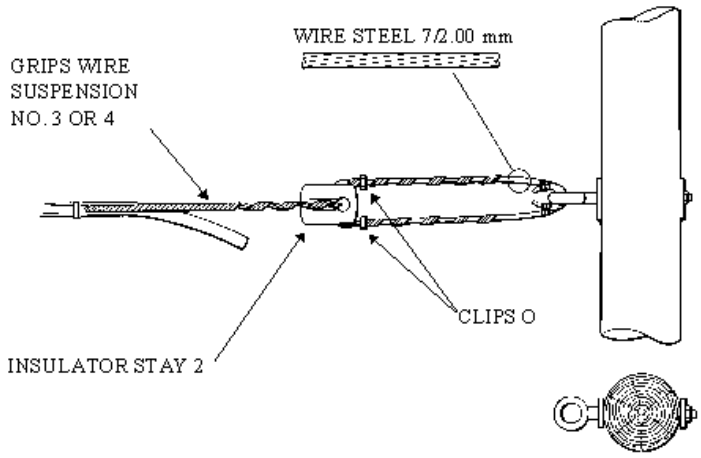


Figure 38

10.2.5 Full Termination at Hollow Poles

Caution: Heavyweight cable must NOT be terminated at Hollow poles. Do NOT terminate more than 1 lightweight aerial cable at hollow poles.

Caution: When using Barrel Clamp on hollow poles, the pre-formed eye loops must not be used.

Full Termination is performed on hollow poles in the same manner as for wooden poles except that staples are **NOT** used**.** Where rings are not an integral part of the pole a Collar Hollow Pole must be fitted to provide location rings, for the suspension wire to be looped through. There are two types of Collar Hollow Pole, both are described below:

10.2.5.1 Collar Hollow Pole 1

Collar Hollow Pole 1 (Discontinued in favour of Telenco UPB see section 10.6) is for use on Glass Reinforced Plastic Poles only. It is fitted before the pole is erected, and will accommodate a Stay and Lightweight Aerial Cable. See figure 39.

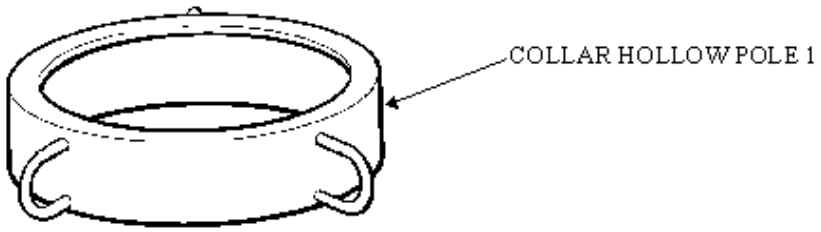


Figure 39

For Aerial Cable and Stay Terminations the collar should be fitted as below (figure 40).

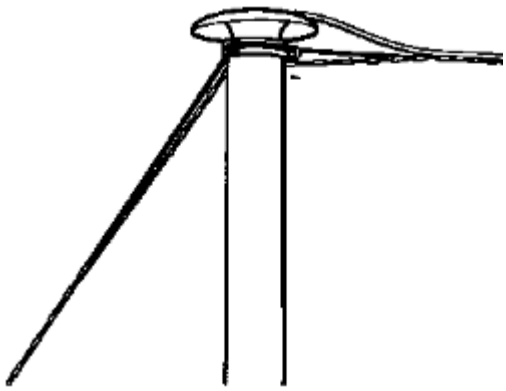


Figure 40

10.2.5.2 Collar Hollow Pole 2

A Collar Hollow Pole 2 (Discontinued in favour of Telenco UPB see section 10.6) can be fitted to all hollow poles, before or after erection. The collar is fitted 50 mm below the cap with the hinge uppermost. See figure 41

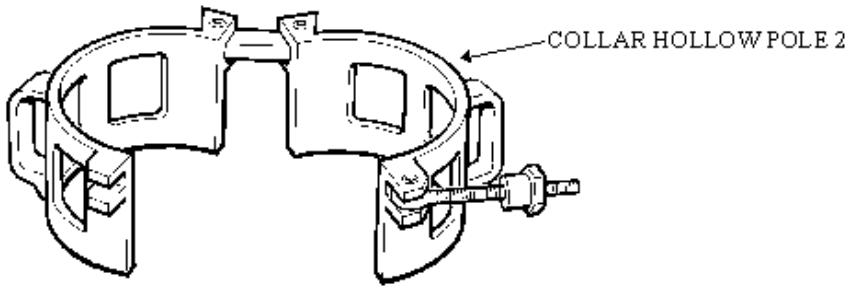


Figure 41

Orientation for full termination

The orientation of the collar should be as below. See figure 42

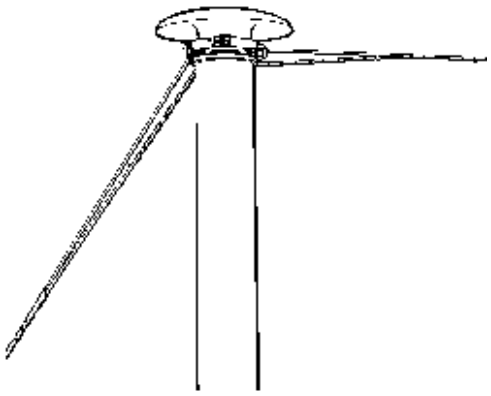


Figure 42

10.2.5.3 Fitting UPB on hollow poles

For the fitting of UPB on hollow poles using steel banding see section 10.6

10.3 Terminating using Clamps Aerial Cable (CAC)

Note: **Use of Clamps Aerial Cable does not constitute a Full Termination.**

Note: **Current clamps are not compatible with COF 204.**

10.3.1 Hooks Temporary Hold 2

In order to terminate using Clamps Aerial Cable a Hooks Temporary Hold 2 are used to temporarily support the cable aloft during erection. They are removed once the Clamp Aerial Cable is fitted.

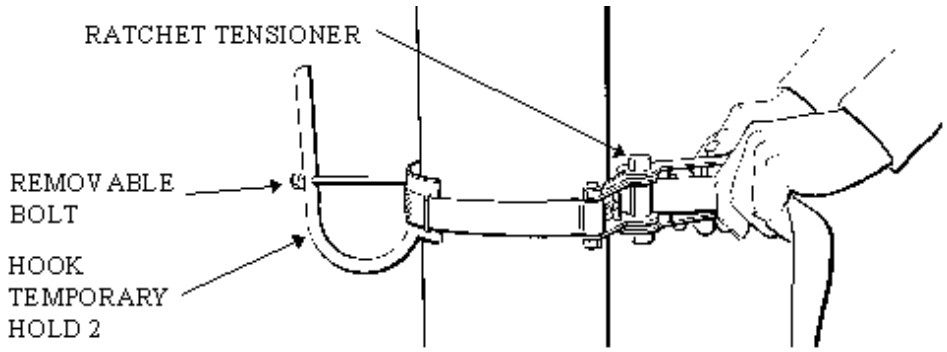


Figure 43

The hook is fitted to the pole as shown above in figure 43. The ratchet mechanism is used to tighten the webbing strap until the hook is secure.

There is a release lever within the ratchet mechanism that enables the tension to be removed from the strap for removal.

10.3.2 Clamps Aerial Cable

These clamps are used to secure lightweight and heavyweight aerial cable at intermediate poles where a full termination is NOT required. For details of Clamps Aerial Cable and their application see Table 4.

Cable	**Suspension Wire**	**Nominal Overall**	**Colour Code**	**CAC Number**
		Dimension		
Cable PET				
Aerial				
10/0.5	1/2.65 mm	16.5 mm	Purple	2*

20/0.5	1/2.65 mm	19.0 mm	Purple	2*
50/0.5	7/1.6 mm	26.0 mm	Blue	4
100/0.5	7/1.6 mm	31.6 mm	Green	5
Cable PET				
Aerial				
10/0.6	1/2.65 mm	20.0 mm	Purple	2*
20/0.6	7/1.6 mm	25.5 mm	Blue	4
50/0.6	7/1.6 mm	33.5 mm	Red	6
100/0.6	7/1.6 mm	42.0 mm	Black	7
Cable				
PEQ 6				
Aerial				
14/0.63	7/1.6 mm	23.5 mm	Yellow	3
28/0.63	7/1.6 mm	27.0 mm	Blue	4
60/0.63	7/1.6 mm	31.0 mm	Green	5
104/0.63	7/1.6 mm	37.5 mm	Red	6
14/0.9	7/1.6 mm	27.5 mm	Blue	4
28/0.9	7/1.6 mm	32.0 mm	Red	6
60/0.9	7/1.6 mm	39.5 mm	Black	7
104/0.9	7/1.6 mm	46.8 mm	Black	7
Cable PEUT				
TS FF				
Aerial				
20/0.6	7/1.6 mm	27.0 mm	Blue	4
40/0.6	7/1.6 mm	32.2 mm	Red	6
80/0.6	7/1.6 mm	39.0 mm	Black	7
Cable Fibre				
Optic				
COF 26	7/1.6 mm	25.5 mm	Yellow	3
COF 204	N/A	N/A	**	
COF 209	N/A	N/A	**	

Table 4 Maximum Diameter of Aerial Cable and Clamps Aerial Cable Numbers

* On Hollow Poles use CAC No 1 with 10/0.5, 20/0.5, 5/0.6 or 10/0.6 cable PET.

** For COF 204 & COF 209 The Barrel Clamp should be used.

10.3.2.1 Fitting of Clamps Aerial Cable Where Pull on Pole is Less than 5 metres

Note: The suspension wire is NOT exposed when fitting Clamps Aerial Cable

Only one Clamp Aerial Cable should be used where pull-on pole is less than 5. See below.

Fit a Hooks Temporary Hold 2 to the pole in order to support the cable at the appropriate height. Place the cable in the hook and refit the removable bolt see figure 44 step 1.

Position the Clamp Aerial Cable at the appropriate height and hammer 3 staples halfway in at the positions shown in figure 10.12 steps 2 and 3 to support the clamp at a downwards angle.

Cross the two legs of the clamp around the pole. See figure 10.12 step 2

Wrap the helix of the legs around the cable so that all the available loops of the helix are occupied by the cable.

Drive the staples fully home.

Remove Hook Temporary Hold when Clamp Aerial Cable has been fitted.

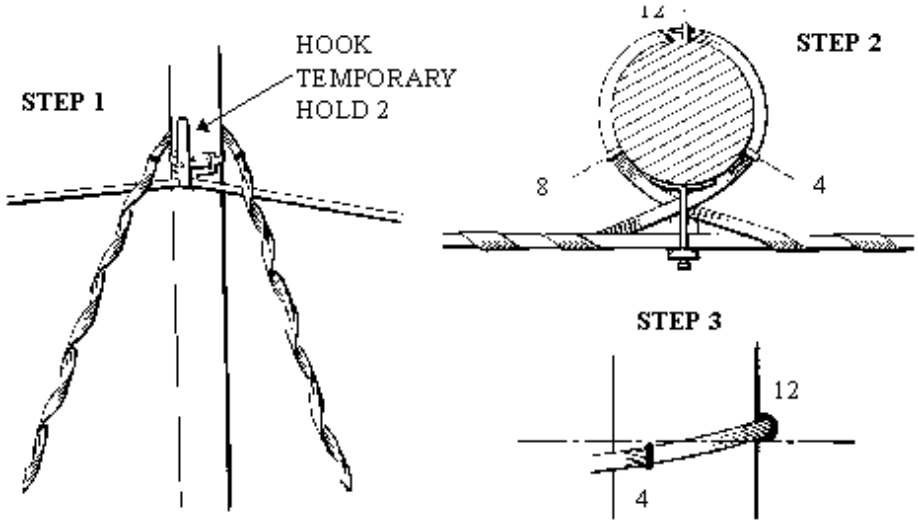


Figure 44

Note: In step 3 the cable line must be at least 300mm from the top of the pole

10.3.2.2 Fitting of Clamps Aerial Cable Where Pull on Pole is between 5 and 9 metres

Where the pull-on pole is greater than 5 metres but less than 9 metres, 2 Clamps Aerial Cable are used back-to-back, one clamp on each leg of the Aerial Cable see figure 45. The procedure is similar to fitting one clamp

except both legs of the clamp are fitted to the same leg of the cable. Intertwine both legs of the grip so that both are in contact with the cable sheath.

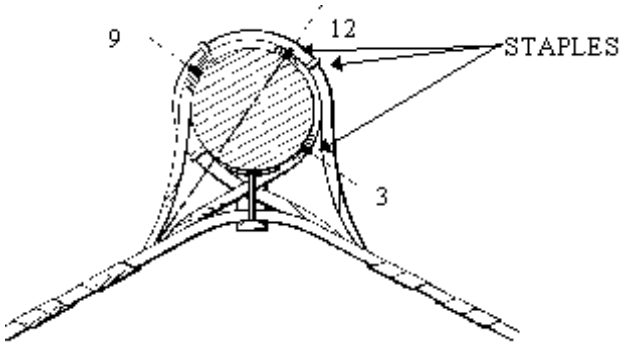


Figure 45

10.3.2.3 Pull on Pole Greater Than 9 Metres - Copper Cables

For copper cables where pull on pole is greater than 9 metres a Full Termination is required see section 10.2

10.3.2.4 Pull on Pole Greater Than 9 Metres - Optical Cables only

Where the pull-on pole is greater than 9 metres, 2 Clamps Aerial Cable should be fitted back-to-back using Filler Rod 1. The method is the same as described above for cables with pull on pole between 5 and 9 metres except for the addition of Filler Rod 1 along the length of the helix in the position shown in Figure 46. See also ISIS EPT/ANS/A012

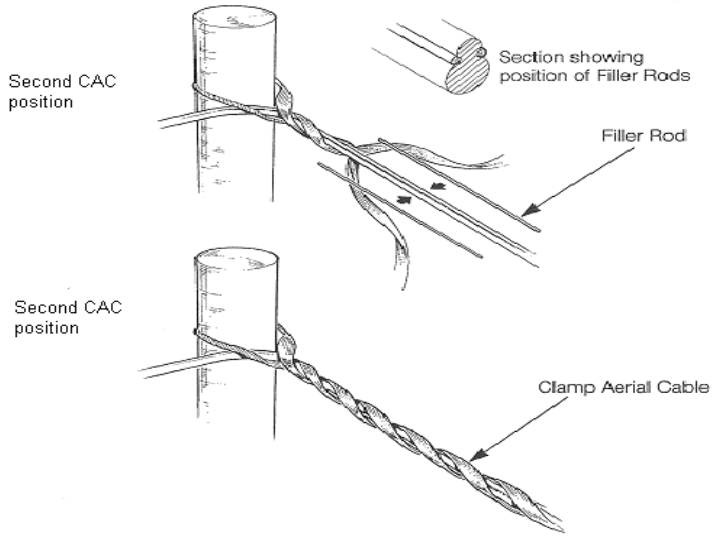


Figure 46

10.4 Terminating on Intermediate Joint User Poles where Clamps Aerial Cable cannot be used

10.4.1 Hook Aerial Cable 1 &1A

These are more commonly known as “J” hooks.

Note: For guidance on the use of full terminations and Clamps Aerial Cable on Joint Use Poles, see ISIS EPT/ANS/A012. Where Clamps Aerial Cable cannot be used at intermediate poles, use a Hook Aerial Cable and bind the cable into position using Wire Lashing 2.

Hook Aerial Cable (HAC) has been extensively used in the network for permanent cable support on both BT and Electric intermediate poles. In recent years, use has been restricted to electric intermediate poles only.

Hook 1

Hook 1A

Figure 47

(Above) **Hook Aerial Cable 1** (item code 016240) For Lightweight Aerial Cable

Used for supporting aerial cable at through positions. Manufactured from a 'D' section steel bar and is coated with nylon containing a molybdenum additive to reduce surface friction.

(Above) **Hook Aerial Cable 1A** (item code 016990) For Heavy Weight Aerial Cable This hook is used in place of the Hook Aerial Cable 1 for heavy weight aerial cables (over 30pr 0.5).

Note: Maximum pull-on pole for both HAC 1 and 1A is 9 metres

10.4.2 Fitting of Hook Aerial Cable 1

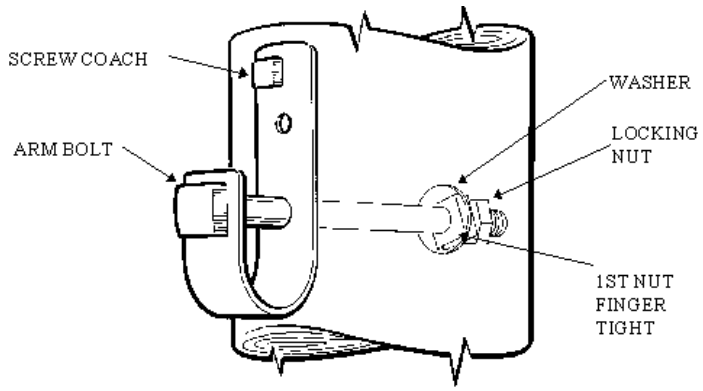


Figure 48

Position the hook as shown in Figure 48 and drill a 19mm hole through the centre of the pole perpendicular to its axis using an Auger Screw ¾ inch X 18 inch or equivalent item. Push the Bolt Arm through the hook and the pole and secure the first nut finger tight.

Hammer a Screw Coach through the top hole to secure the hook in its upright position.

Tighten the locknut to secure the arm bolt.

10.4.2.1 Binding in Aerial Cable

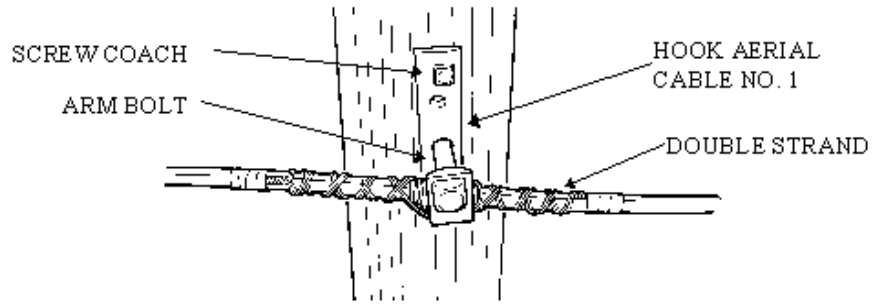


Figure 49

Fold a 1.5 m length of Wire Lashing 2A in half. Place the centre of the doubled length of wire across the cable, to one side of the hook. Take 3 turns round the cable, push them close to the hook and pull them tightly round the cable.

Repeat with a second, similar, length of Lashing Wire on the other side of the hook.

Now take each of the 2 pairs of ends of Lashing Wire, pass them under the hook and bind the cable in an overlapping plait.

Make off each pair of ends by twisting them together. See Figure 49.

Trim the ends and tape over any sharp ends using Tape Plastic Adhesive.

10.4.3 Aerial Cable Termination at Intermediate Hollow Poles

For Aerial Cable Termination at intermediate hollow poles the Clamp Aerial Cable is fitted as shown below in figure 50.

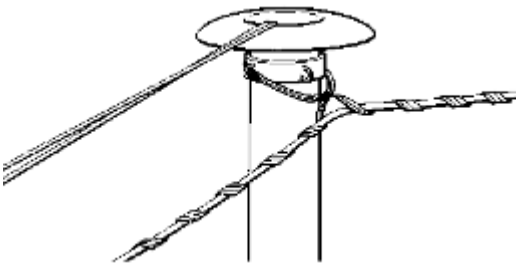


Figure 50

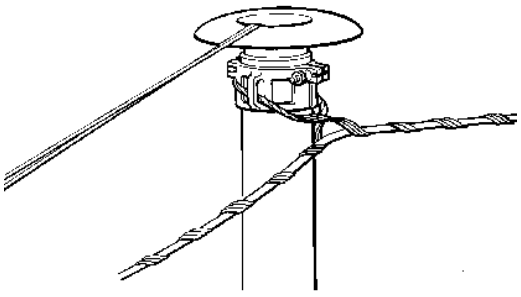


Figure 51

10.5 Full Terminations using TELENCO Aerial Cabling Products

This section details an alternative system for attaching aerial cables to poles where full termination of figure of 8 Aerial Cables are required. It lists a number of fixings that can be used to perform full termination of the catenary wire of the aerial cable without stripping the sheathing. This section also details a "cone clamp" system that allows the reuse of cables that have been bound to the catenary wire and a Back stay clamp for staying of poles.

See also ISIS EPT/ANS/A012 for the list of items and their use. For staying see EPT/OHP/B035

The range of Telenco clamps are primarily an alternative for 'Full Terminations' of aerial cables. The main benefit is the time saving for installation, compared to a standard full termination, where it is necessary to strip out the steel suspension wire, wrap it around the pole and fit Grips Wire Suspension and staples.

The Telenco clamps are designed to be used where previously a full termination would have been used.

Clamps Aerial Cable (CACs) shall be used on straight through routes, where the same cable is just passing from pole to pole.

TERMINATION CLAMP AERIAL CABLE AC 7 and AC 10 clamps with a Universal Pole Bracket SHOULD NOT be used in these circumstances; otherwise the benefits of their introduction are lost because of the considerable increased cost.

The only situations where Telenco clamps should be used for through routes are where:

- Aerial cables are installed running in parallel (Tram lining)
- Hook Aerial Cable 1 supported a bound-in (lashed) cable and has been replaced with an Aerial Cable Relief Clamp (ARC)
- The cable requires to be extended due to pole change-out.
- Installing COF204

10.5.1 ITEM LIST for CAC's

The Clamps Aerial Cable (CACs) are to be used to secure lightweight and heavyweight aerial cable at intermediate poles where a full termination is NOT required. For details of Clamps Aerial Cable and their application see Table 4 in section 10.3.2. Also see ISIS EPT/ANS/A012.

10.5.2 Below is a List Showing the Products and a Brief Description

- Termination Clamp Aerial Cable Lightweight (AC 7 -200) Item Code 016962

  This clamp to be used for supporting light weight aerial cable (single strand of 2.65mm steel) where the catenary wire is fully covered by the sheathing of the figure of 8 cable. See Fig 52

- Termination Clamp Aerial Cable Heavyweight (AC 10-320) Item Code 016970

  This clamp to be used for supporting heavy weight aerial cable (7 strands of 1.6mm steel and 7 strands of 1.0mm steel COF 204) where the catenary wire is fully covered by the sheathing of the figure of 8 cable. See Fig 53

Figure 52 AC 7

Figure 53 AC 10

The illustrations above show the clamps upside down in order to show the jaws. When installing, the jaws MUST NOT be facing upwards.

- Universal Pole Bracket (UPB) Item Code 016988

  This bracket is used to secure and support dropwires, aerial cables using Termination Clamp Aerial Cable Lightweight (AC 7), Termination Clamp Aerial Cable Heavyweight (AC 10) or Barrel Clamp Terminating Stay Wire (SWC 63)

  See Fig 54

The bracket is secured to the pole using either Bolt Hex Head 16mm x 300mm Item code 016977 or Bolt Hex Head 16mm x 350mm. Item code 016978

When fitting back-to-back UPBs on stout poles, Bolt 14 i/c 010558 which is 375mm long may be used or steel banding.

Figure 54 UPB

- Aerial Cable Relief Clamp (ARC) Item Code 016971

  This product is used with Hook Aerial Cable 1, item code 016240 to secure light weight figure of 8 aerial cable to a pole instead of binding in using Wire Lashing 2A. See Fig 55. For heavy weight aerial cable use Hook Aerial Cable 1A item code 016990.

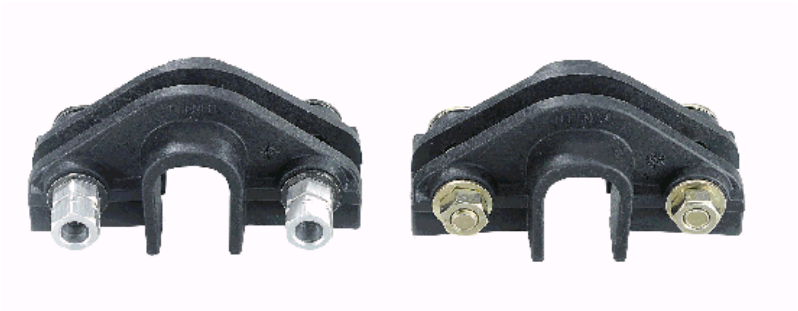


Figure 55 ARC

- Barrel Clamp Single Strand Bare Wire 2.5mm (BWC 25) Item Code 016973

  For use for terminating 1 strand of 2.63mm bare steel catenary wire of light weight figure of eight aerial cables. It can also be used with the In-Line Barrel Clamp Single Strand 2.5mm (ILC 25) Item Code 016975. See Fig 56

- Barrel Clamp Multi Strand Bare Wire 7 x 1.6mm (BWC 47) Item Code 016974
- For use for terminating 7 strands of 1.6mm bare steel catenary wire of heavy weight figure of eight aerial cables. It can also be used with the In-Line Barrel Clamp Multi Strand 4.7mm (ILC 47) Item Code 016989. See Fig 57

Figure 56 BWC 25

Figure 57 BWC 47

- In-Line Barrel Clamp Single Strand 2.5mm (ILC 25) Obsolete.

  These clamps are for joining two pieces of single strand x 2.63mm bare catenary wires together. See Fig 10.26
- In-Line Barrel Clamp Multi Strand 4.7mm (ILC 47) Obsolete
- Barrel Clamp Terminating Stay Wire (SWC 63) Item Code 016980

  Used for terminating one 7 strand x 2mm stay wire to a Universal Pole Bracket (UPB) Item Code 016988. For attaching the other end of the stay wire to the ground anchor, use Grip Stay Anchor, Item Code 016229. See Fig 58

Figure 58 SWC 63

Illustration of SWC 63 with NO PROTECTIVE Cap fitted (demo only)

- Earthing and Bonding Clamp (EC 13) Item Code 016979

  This clamp is used to attach an earthing wire to the catenary wire of a figure of eight aerial cable.

  It is designed to cut through the sheathing of the cable and grip the catenary wire forming a continuous circuit between the catenary wire and the earth wire. See Fig 59

Figure 59 EC 13

- Hook Aerial Cable 1A (HAC 1A) Item Code 016990

  This hook is a larger version of the Hook Aerial Cable 1 Item Code 016240 and is used where a heavy weight aerial cable (over 30pr 0.5) is supported using an Aerial Cable Relief Clamp (ARC) Item Code 016971

10.5.2.1 Attachment of AC7-200 & BWC25 to Ring Pole Head

- The Ring Pole Head Dropwire can be used to attach a single lightweight aerial cable.
- The ring may be used for one light weight aerial cable in and one light weight aerial cable out.
- Only Telenco AC7-200 and Telenco Bare Wire Clamp 25 (BWC 25) may be used
- The maximum dropwires that can be attached when an Aerial Cable is hung on the ring is 10 Dropwires per half ring
- Figure 60 (Below) shows an example of the AC7-200 and a Dropwire attached to the pole ring
- Figure 61 (Below) shows attachment using a Bare Wire Clamp.
- On terminal poles where the cable is jointed or run into a Box Connection, the cable must pass over the Ring and be strapped to the pole using Strips Aluminium.
- On intermediate poles (straight through route) the cable is attached on both sides of the Ring. The cable should not pass over the Ring but should be formed into a loop and strapped to the pole using Strips Aluminium.

Note: In all situations cables must not rub on any Dropwire Clamps, CAC, bail wire steels of clamp or any part of the ring or pole.

Figure 60 Attachment to Ring using Telenco AC7-200

Figure 61 Attachment to Ring using Telenco BWC 25

10.5.3 Universal Pole Bracket

The UPB bracket is designed to be installed on all types of poles.

The UPB bracket has been developed to cover all the following installation parameters:

Terminating and Staying

For staying requirements see ISIS EPT/ANS/A014

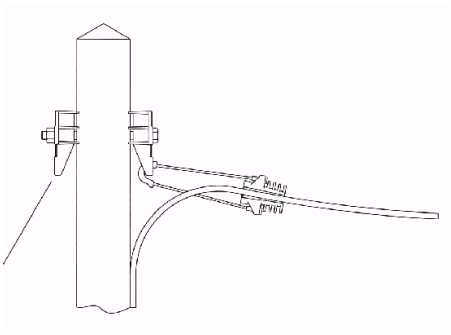


Figure 62

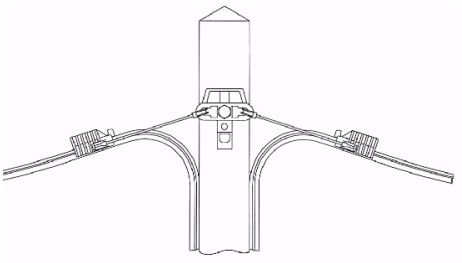


Figure 63 Jointing/Double terminating

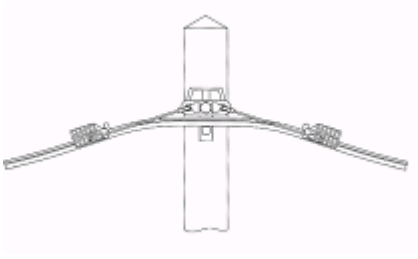


Figure 64 *Double anchoring*

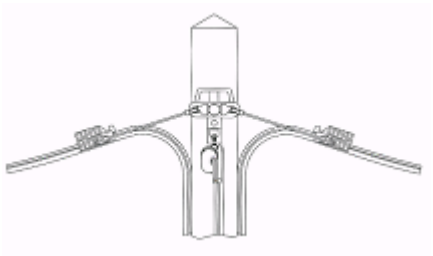


Figure 65 *Distribution points*

Cable Fixing Positions on a UPB see Fig 66

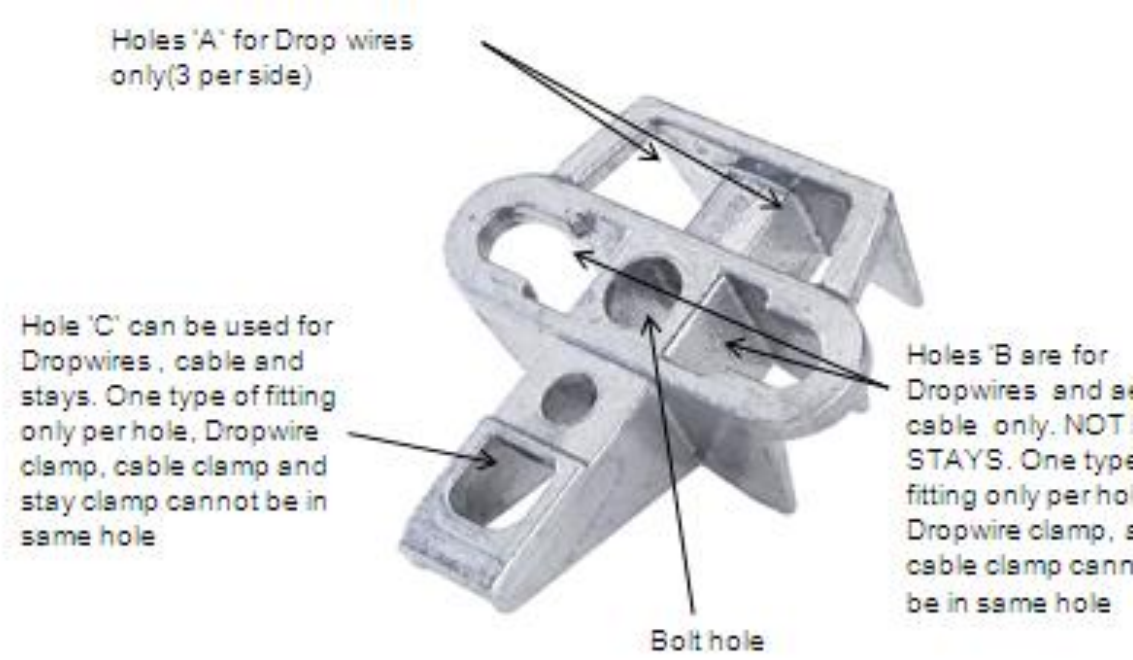


Figure 66

Note: It is important to note the following regarding cable installation on the UPB Bracket:

- The top two apertures (‘A’) are solely for use with dropwires. Under no circumstances can aerial cables be attached to these two apertures
- The central apertures (‘B’) can be used for dropwires or aerial cable clamps, but not in the same aperture
- The bottom single aperture (‘C’) can be used for Dropwire and cables but is the only aperture that can be used for Stay Clamps SWC63

- Exceptionally, this aperture ('C') may be used for V stays to replace single stays where obstructions prohibit the fitting of a single stay anchor (2 stay wires)
- The UPB, when used on a DNO pole must only be used for aerial cable. No dropwires to be attached, use stand-off ring as shown in SFY/HSH/D043 Low Voltage Joint Construction

10.5.3.1 Installation Procedure

- Using the existing hole 200mm down from the top of the pole, insert the Bolt 16mm x 300mm or Bolt 16mm x 350mm through the central hole of the UPB Bracket and run it through the pole. Secure the bolt at the rear of the pole with one of the washers and nut supplied
- If the existing hole (200mm) down from the top of the pole is already in use with either a Ring Pole Head Dropwire or Hook Aerial Cable 1, ascertain if it is possible to change the existing plant onto the UPB

  If not, then drill the pole 300mm down from the existing hole at 90° to the cable run, using a suitable 18mm auger giving clearance for a 16mm bolt.

Note: Bolt 16mm x 300mm and Bolt 16mm x 350mm are supplied with two washers. Use only one of the washers at the back of the pole, between the nut and the pole: washer dependant on pole size. WASHERS MUST NOT BE FITTED EITHER ONTO THE FACE OF THE UPB BRACKET OR BETWEEN THE UPB BRACKET AND THE POLE.

If a parallel aerial cable (tramline) or a stay are required in the future, then add another UPB Bracket to the back of the pole instead of the washer.

When terminating an end of route, the hole should be drilled inline to the pull-on pole. Install two UPB Brackets, one to the front and the second at the rear of the pole to enable a stay or stays to be fitted.

10.5.4 AC7-200 & AC 10-350 Aerial Cable Terminating Clamp

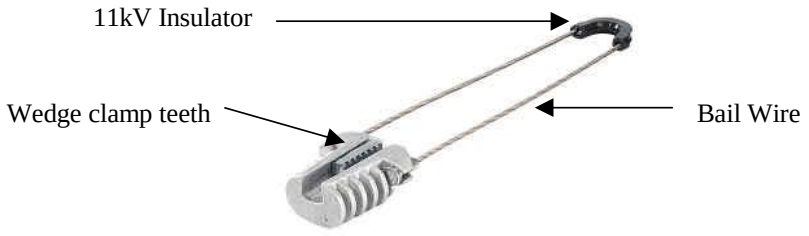


Figure 67

Note: The clamp is shown upside down for demo only to show the jaws. When installing the clamp, the jaws **must not** be facing upwards.

The AC7–200 Aerial Cable Terminating Clamp is suitable for use with 2mm single strand catenary Wire. (Plastic Retaining Clip coloured Black)

The AC10-320 is suitable for use with 7 x 1.6mm and 7 x 1mm (COF 204) multi-strand catenary wire. (Plastic Retaining Clip coloured Blue)

The AC7–200 & AC10–320 Aerial Cable Terminating Clamps are designed to be installed directly onto the outer sheath of the catenary wire without having to strip off the insulation material.

They should be used in the following situations:

As a full termination system:

- Where jointing/DP points occur
- Full terminations for road crossings
- Full terminations for field & gate openings (only needed where the pull-on pole exceeds the limit for using a clamp aerial cable)
- As an intermediate termination for COF 204 only

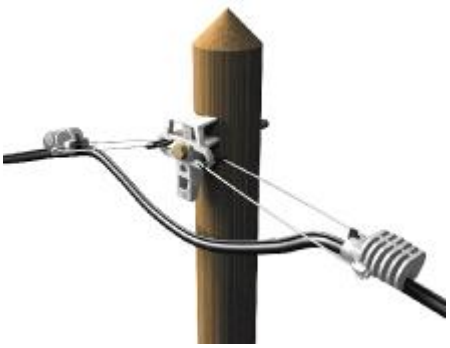


Figure 68 Shows a Full Termination using a UPB and clamps

10.5.4.1 Products Required

- AC7–200 & AC10–320 Aerial Cable Terminating Clamp
- UPB Bracket
- Bolt 16 mm x 300 mm or Bolt 16mm x 350mm
- EC13 Earthing & Bonding Clamp*

1. (* This is an additional item which is to be used in conjunction with the system whenever earthing & continuity of the catenary wire is required. Particularly for use with fibre optic aerial cable)

Installation Procedure

- Pass the free end of the bail wire through apertures B or C (one clamp per aperture) of the UPB Bracket.
- The clamp will hang easily by the 11kV thimble when situated in the central or lower apertures of the UPB Bracket.

Note: **THE 11kV THIMBLE MUST NEVER BE REMOVED FROM THE BAILWIRE.**

- Insert the free end of the bail wire into the open slot at the side of the clamp body.
- The clamp can be installed in any plane; however, the bail wires must NEVER touch each other.
- Make sure that the sliding wedges of the clamp are in the furthest back position to ensure the maximum aperture and place the AC 7 or AC 10 clamp body on to the insulated Catenary Wire. Push the jaws forward ensuring that they are parallel and level.
- When the AC7–200 & AC10–320 Aerial Cable Terminating Clamp has been installed on the first pole, the engineer on the ground must ‘set’ the zinc alloy teeth by means of a strong pull on the cable.
- Tension the cable by the usual method to 120% of its stringing tension.
- It is recommended that the cable be tensioned level with the UPB Bracket to ensure ease of attaching the AC7–200 or AC10–320 Aerial Cable Terminating Clamp to the cable.
- With the cable tensioned to 120% of final installation tension, (visual check), the bail wire attached to the body of the clamp and the wedges in the fully opened position:
- Extend the AC7–200 or AC10–320 as far as possible out along the cable.
- Place the alloy-toothed jaws onto the insulated catenary wire.
- A small force should be applied, and a positive reaction can be felt when the jaws are fully and properly located.
- Pull the body of the AC7–200 or AC10–320 Aerial Cable Terminating Clamp backward to set the teeth into the insulation of the catenary wire.
- Release the tension from the cable.
- The cable will move back into its locked/stringing position and thus complete the installation of the AC7–200 or AC10–320 Aerial Cable Terminating Clamp.
- Where the cable is terminated on the pole for Jointing or Block Terminal the steel must be left insulated and attached to the cable to the point where the bend radius is required to allow the cable to turn up the pole for the Joint or

Block Terminal position.
(Fig 69. Steel stripped by Bend Radius)

- At the bend radius where the steel has been exposed cut the steel leaving an approximate length of 120 – 150mm (This is a suggested length only) of steel from where it has been separated from the cable.
  (Fig 70. Steel Exposed at Bend Radius Not covered)
- The steel must then be covered with a suitable length of Cable Abrasion Protector.
- (Fig 71. Steel covered by Cable Abrasion Protector)

Figure 69

Figure 70

Figure 71

10.5.4.2

On poles where the cable is running straight through where a full termination is required due to road crossings, gateways, etc, the cable is still terminated as described above, but a loop of cable must be left between the clamps. The loop can be cleated to the pole or free left hanging.

10.5.4.3

Where Power cross over BT plant or BT plant cross Power when using the AC7 and AC10 type clamps, the cable route must be isolated on the poles at both sides of the Power crossing. This is achieved by introducing a large

enough loop between the clamps to remove a 300mm section of the catenary wire/steel as Fig 72.

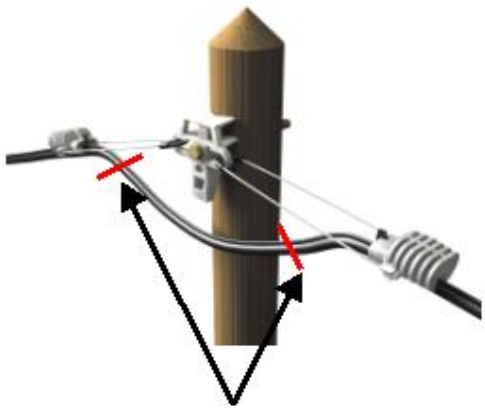


Figure 72

Cut out the wire/steel catenary wire between these two points on each pole either side of the power crossings. Loop can be larger than shown and can be cleated to the pole if required. There must be a minimum 100mm of catenary wire left intact after the AC type clamps.

If a large enough loop cannot be achieved on existing Arial Cable, remove a 300mm section of the catenary wire/steel then the Bare Wire Clamps BWC 25 and BWC 47 should be used.

10.5.5 BWC - 25 & BWC - 47 Bare Wire Cable Clamp

The Telenco BWC 25 Bare Wire Cable Clamp is suitable for use with a 2mm bare single strand catenary wire.

The Telenco BWC 47 Bare wire cable clamp is suitable for use with bare multi-strand catenary wire.

The BWC 25 & BWC 47 BARE WIRE CABLE CLAMP are designed to install directly onto the bare steel of the catenary.

The BWC 25 & BWC 47 BARE WIRE CABLE CLAMP should be used in the following situations:

- As a full termination system when replacing existing terminations
- Where service points occur
- In cases where high pulling angles occur
- Full terminations for road crossings
- Full terminations for field & gate openings (only needed where the pull-on pole exceeds the limit for using a clamp aerial cable).

- As a full termination when using the existing hole at 200mm from the top of the pole in order to gain height and avoid pole changing

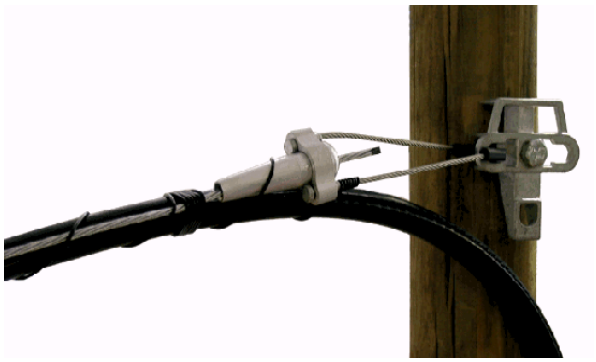


Figure 73 - BWC47 clamp on a bare multi strand catenary wire

10.5.5.1 Products Required

- BWC 25 & BWC 47 Bare Wire Clamp
- UPB Bracket
- Bolt 16mm x 300mm or Bolt 16mm x 350mm
- Wire Lashing 2A
- EC13 Earthing & Bonding Clamp* If required

  (* This is an additional item which is to be used in conjunction with the system whenever earthing & continuity of the catenary wire is required. Particularly for use with fibre optic aerial cable)

Installation Procedure

- Use the existing hole 200mm down from the top of the pole if it is not already utilised
- If the top hole is utilised, then drill the pole 300mm down from the existing hole at 90° to the cable run, using a suitable 18mm auger giving clearance for a 16mm bolt
- Insert the bolt through the central hole of the UPB Bracket and run it through the pole. Secure the bolt at the rear with the washer and nut supplied
- If a service in parallel or a stay may be required in the future, then add another UPB Bracket to the back of the pole instead of the washer
- Pass the BWC 25 and 47 Bare Wire Clamp bail wire through one of the central apertures of the UPB Bracket

- Place the crimped ends of the flexible bail wire into the grooves at the sides of the collar of the clamp
- Put the body of the clamp into the collar from the pole side of the collar, making sure that the raised nodule passes through one of the side grooves
- When the clamp body is correctly located, it shall be rotated through 90°, thus enabling the raised nodule to act as a securing device
- The BWC 25 and 47 will hang easily by the 11kV thimble secured in the UPB, from either the two central apertures or the lower stay wire aperture
- It is particularly important to make sure that the steel of the existing stranded catenary wire is cut square. When cutting the catenary wire, it is recommended to wrap the wire with tape first to stop it splaying out when being cut with Bolt Cutter 2, item code 112901
- To complete the installation, push the catenary wire into the clamp and tension
- Cut the exposed catenary wire within the confines of the bail wire and protect the exposed steel with a silicon protective cap or if Silicon Protective Cap is not available then use a Sleeve Dropwire 2A (Dropwire Sleeve item Code 016330) held in place with silicon sealant
- The cable must then be ‘bound in’ and ‘locked off’. See Figures 74, 75, 76 and 77
- The cable will move back into its stringing position and thus complete the installation of the BWC – 25 or 47 Bare Wire Terminating Cable Clamp

  In cases where the reason for terminating is a service drop-out or a severe angle, then the hole should be drilled at 90° to the line of the cable, the UPB Bracket installed, and the bolt secured at the rear with the washer and nut. In this situation, a second UPB Bracket should be fitted at the rear of the pole to enable a stay or stays to be installed.

Binding-In Examples

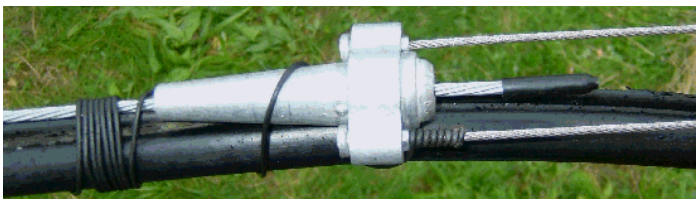


Figure 74

Figure 75, 76 and 77

Figure 78

Note: It is important to note the following regarding cable installation on the UPB Bracket:

- The bottom single aperture (‘C’) can be used for any cable.
- The central apertures (‘B’) can be used for dropwires or aerial cable clamps, but not in the same aperture.
- The top two apertures (’A’) are solely for use with dropwires. Under no circumstances can aerial cables be attached to these two apertures.

10.6 Attachment of Universal Pole Bracket to Poles using Stainless Steel Banding

10.6.1 Installation Method

There should be a set of installations supplied with the banding installation tool.

- Estimate the length of steel banding required to go around the pole and cut the appropriate length. Bend back 2 - 3 cm of the banding & hammer flat. See figure 79. Then thread the banding through buckle (fig 80), making sure that the ears are facing outwards, away from the pole (Fig 81).

Figure 79

Figure 80

Figure 81

- Pass the banding around the pole and through the top slot of the Universal Pole Bracket (UPB) (Fig 82). Place the UPB and banding on the pole. Insert the end of banding through the buckle (see Figs 83 and 84).

Figure 82

Figure 83

Figure 84

- Ensure the UPB is correctly positioned on the pole before beginning to tighten the banding. For clarity Figure 85 shows the banding in position but not attached to a pole. There are 2 slots in the tool. Pull the black handle (Spring loaded) away from main body to allow the steel banding to be inserted (slot1). The second slot (2) contains the cutting mechanism. The third arrow (3) shows the banding buckle.

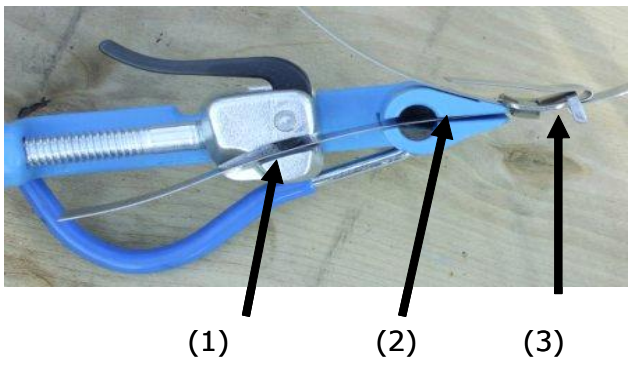


Figure 85

- Make sure the locking lever is closed down onto the Steel banding before tightening up. Wind handle in a clockwise direction ensuring that the banding is being tightened in a straight pull (Fig 86 and 87)

Figure 86

Figure 87

- When banding is tightened sufficiently, move the tool in excess of 90° towards the buckle (fig 88), then use the cutting lever (blue handle) to cut the banding by pulling it away from the main body of the banding tool and forward towards the pole (Fig 89) until the steel banding is cut.

Figure 88

Figure 89

- Remove the tool and bend back the end of the steel (Fig 90) and close the ears of the buckle by tapping with a hammer (Fig 91)

Bend the Steel back after it is cut.

Figure 90

Figure 91

- Complete the same procedure for the lower slot of the Universal Pole Bracket (see Fig 92)

Figure 92

- If two brackets are required, the process is the same as above. Ensure the two brackets are correctly aligned for the required terminations before applying tension. See fig 93

Figure 93

EQUIPMENT REQUIRED

Below is a list of the items required to install a UPB to a pole.

The stainless-steel banding comes in reels of 50 metres.

ITEM NAME	ITEM CODE
TOOL FIXING STAINLESS STEEL BANDING	013608
CLIPS BANDING STAINLESS STEEL	013603
BANDING STAINLESS STEEL	013610
UNIVERSAL POLE BRACKET	016988

SHEARS HAND 7” Or similar metal cutter	126 854
HAMMER JOINER 1lb	068 270
HAMMER JOINER ½lb	114 351

Table 5

Or other suitable hammer for tapping the banding and buckle into place as shown in points 2 and 8.2 above.

10.6.2 Use of Steel Banding on DNO Poles

This method can be applied to fixing the UPB on Joint User poles where power feeds run down the pole. This is an exception to detail currently contained in ISIS EPT/PPS/B038 that states under paragraph 5.2.3:

There shall be a minimum separation of 50mm between BT plant and DNO cables. Where it is necessary for cables to cross each other, there should be sufficient clearance between them to avoid touching. Care should be taken not to trap cables under the termination of stays or aerial cable suspension wires.

As part of the on-site risk analysis a thorough visual inspection of the power cable running down the pole is needed to ensure there is no degradation of the cable or breaks in the insulation. Identify a suitable position on the down feed where no cleats are used (and hence the cable is not tight against the pole) and carefully position the steel banding beneath the down cable. Users must ensure there are no sharp edges on the steel banding to damage the power cables that could be generated by uneven cutting or burrs turning up on cut edges and Gloves IR are worn when working on the pole. The power cables should not be touched nor moved on the pole. Complete the securing of the Universal Pole Bracket. As the banding is tightened the tendency is for the banding to bite into the pole and hence should offer no degradation to the power cable.

On subsequent visits to the pole the risk assessment needs to include a visual examination of the power cable where it passes over the steel banding, again looking for degradation or damage to the insulation.

This process has been accepted by the Energy Network Association and details have been forwarded to all Distribution Network Operators (Power Companies).

10.7 Aerial Cable Relief Clamp (ARC)

- The Aerial Cable Relief Clamp (ARC) is used at in-line intermediate poles. It is designed as a retro-fit solution to prevent further wearing of already installed figure-8 cables laying on an existing Hook Aerial Cable 1 that are bound in with Wire Lashing 2A
- It is composed of a pair of UV resistant thermoplastic jaws forming a straight groove and two tightening bolts
- The saddle shaped clamp allows its installation as a retrofit solution
- The nylon parts provide an 11 kV dielectric insulation between the cable catenary wire and the pole/clamp

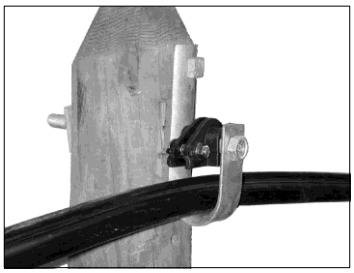


Figure 92 - A cable siting in a Hook Aerial Cable 1 before the cable is attached

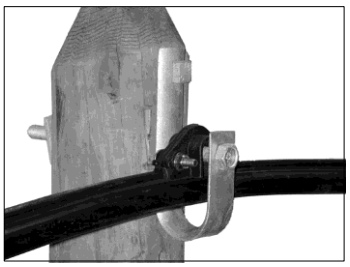


Figure 93 - The ARC attached to the cable

When not to use an ARC - Figure 94 (Below)

In this situation, the webbing is in poor condition and should be re-terminated using a Universal Pole Bracket and the relevant Telenco Bare Wire and In Line Barrel Clamps.

Figure 94

Products required

- Aerial Cable Relief Clamp (ARC)
- Hook Aerial Cable 1 (lightweight A/C up to 9m POP)
- Hook Aerial Cable 1A (heavyweight A/C up to 9m POP)

Installation Procedure

1. Proceed with using the Aerial Cable Relief Clamp (ARC) if the cable is laying in the Hook Aerial Cable 1 and has become unbound (see figure 92 above); or if the ARC is the choice of straight through suspension.
2. Place the Aerial Cable Relief Clamp (ARC) over the existing through bolt. All lightweight aerial cable up to 30 pair can be fitted with an ARC in existing Hooks Aerial Cable 1. When heavyweight aerial cable larger than 30 pair is being installed, then the larger Telenco Hook Aerial Cable 1A must be fitted (see fig 93 above).
3. Lift up the cable and insert the catenary wire in the clamp jaws. Tighten the two nuts of the clamp using a 13mm spanner.
4. No binding in is required.
5. The ARC must only be fitted to A/C that has damage free webbing over the catenary wire

10.7.1 Inline Repair

The process below (ILC 25 & 47) is no longer used and has been superseded by using the Grips Wire Suspension as described in section 10.2.2.1. This section is purely for reference purposes only as they may still exist in the network.

1. Insert the bare wire end of the exiting Steel into one of the Inline Clamp ends, push it in to the clamp till it stops.

2. Insert the “new” length of bare wire/steel length into the opposite end, push until it stops. Make sure you have enough “new” bare wire/steel to bridge the damage.
3. Place another Inline clamp of the same on to end of the damage and bridge the gap of missing/Damaged Steel with “new” Bare Wire/Steel.

Bind in the new Steel and Inline Clamps as shown in the pictures below**.**

Figure 95 - Layout of the ILC

10.8 Dealing with existing lashed aerial cable

For information, including required standards when dealing with existing lashed aerial cable, see ISIS EPT/ANS/A012.

11 *Tensioning of Self-supporting Aerial Cable Combined with 7x1.6 mm and 7x1mm Suspension Wire*

11.1 General

Note: Optical Aerial Cable must not be taken round the sheave of Block Snatchs. The minimum bend radius must be maintained.

Optical fibre cables shall not be subjected to a bending radius of less than the following:

CABLE TYPE	MINIMUM BEND RADIUS
Cable Optical Fibre 26	12x Cable diameter

(COF 26)	Minimum (minor axis)
Cable Optical Fibre 204 (COF 204)	180mm Minimum
Cable Optical Fibre 209 (COF 209)	135mm Minimum

Table 6

11.2 Tensioning using Platform Elevating Winch

Tensioning is performed after the slack has been taken up see section 9.2.3. Set up as shown in figure 96 inserting a Dynamometer in line between the Winch Line and the Grip Pulling Aerial Cable using a suitable D shackle.

Pass the winch rope around the pulleys on the PE and secure it onto the winch drum. Operate the winch to take up the final tension and apply the brake on the winch. Reposition the Grip Pulling Aerial Cable on the rope tail to hold the cable in position then release the winch brake and winch tension. Remove the winch rope; dynamometer and associated Grip Pulling Aerial Cable then terminate the cable as described in Section 10.

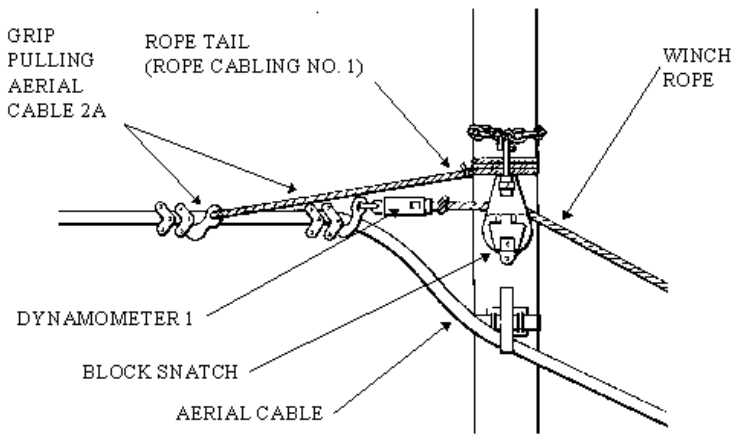


Figure 96

11.3 Tensioning using The Tensioner 2B

11.3.1 Tensioner 2B

The Tensioner 2B is a mechanical ratchet tensioning device capable of pulling cables to a maximum tension of 4450N. It may **only** be used at ground level with a ground anchor point or aloft with the operator operating the device from the cage of a platform elevating. A Dynamometer should be used in line to ensure that the maximum load of 4 kN (408 kg) is not exceeded. When a dynamometer is not available, Heavyweight Aerial Cable can be erected under certain circumstances. For further information see EPT/ANS/A012.

Note: A dynamometer must be used in scenarios where a height of 5.6 metres or greater is required.

Note: For 104/0.9 cable, a dynamometer must be used in all scenarios.

The device must not be used for lifting and it must be used in accordance with the manufacturer's operating instructions supplied.

The two ways of setting up for tensioning with a Tensioner 2B are covered below in 11.4 and 11.5.

11.4 Use of Tensioner 2B at Ground Level

11.4.1 Preparing the Anchor Point

Warning: Make sure the ground area has been searched for services before driving in the stakes. Refer to: Safe Digging SFY/ESP/C026 (Section 6). Guide to Buried Plant Locators ISIS EPT/PPS/D010.

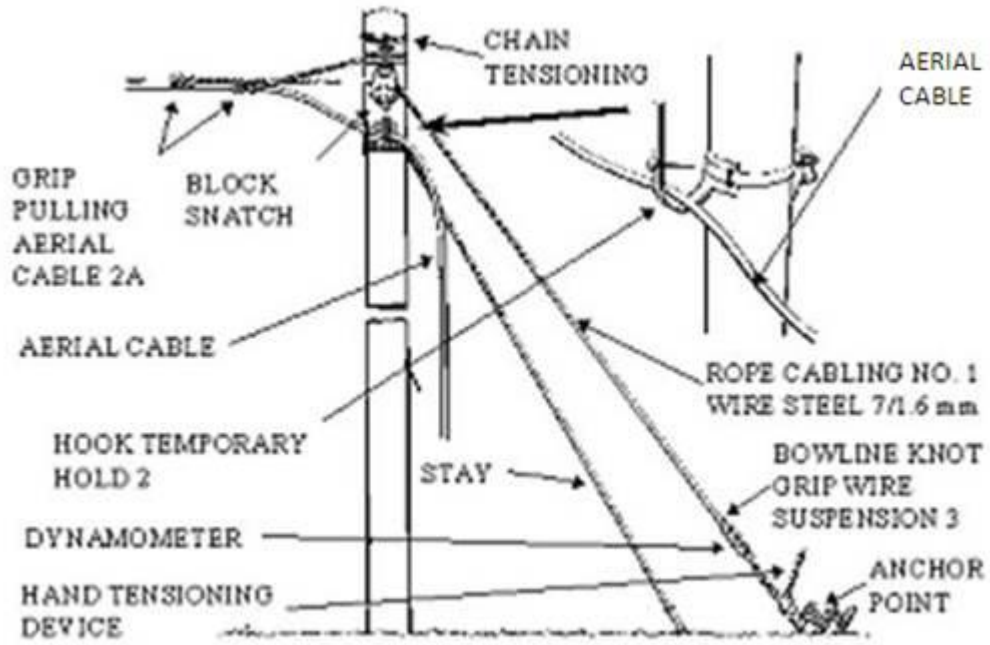


Figure 97

Warning: Wear Gloves IR when driving the Crowbar 1 into the ground

Before tensioning, a stay, or a temporary stay should be provided. The on-site risk assessment procedure detailed in EPT/OHP/B035 must be followed before any stay or temporary stay bars are driven into the ground. Assuming the risk assessment indicates outcome ‘C’ a temporary stay can be provided by driving three Crowbar No 1’s into the ground at a 45-degree angle and by lashing these bars together using Rope Cabling 1. If Crow bars etc are unavailable, an Anchor Stay 2 should be installed to provide the necessary anchorage. If the AS2 cannot be left in-situ after tensioning, the area around the stay tendon should be excavated and the tendon bolt cropped below ground level. See figure 98 below.

Figure 98 - Set up of a temporary back stay using the Anchor Stay 2 (Platipus)

Figure 99 – a closer image of the set up using the Anchor Stay 2

Figure 100 - Pole Top set up with a temporary back stay

The Vehicle Recovery Eye on an Openreach vehicle can also be used as temporary back stay.

There are limitations to this which must be adhered to. These are:

- The vehicle needs to be parked correctly – handbrake on and in gear (the opposite one to the direction of pull so first gear if the rear recovery point is being used etc)
- The wheels closest to the connection need to be chocked against the direction of pull
- The total weight of the applied to the recovery point must not be greater than the Maximum Authorised Mass of the vehicle

Note: Ideally an angle less than 45 degrees from the recovery eye to the pole would be preferable.

11.4.2 Preparing for Tensioning

Tensioning is performed after the slack has been taken up and anti-galloping twists have been inserted.

For this exercise the pole should already have been rigged with a Block Snatch No 1, Hook Temporary Aerial Cable and a Grip Pulling Aerial Cable with a rope tail of Rope Cabling 1 attached to the pole. The cable should be supported in the Hook Temporary Hold.

Prepare a length of Wire Steel 7x1.6mm or 7x1mm with a Grip Wire Suspension 4 at either end that is long enough to reach from the anchor point up to the cable at the top of the pole, see figure 101.

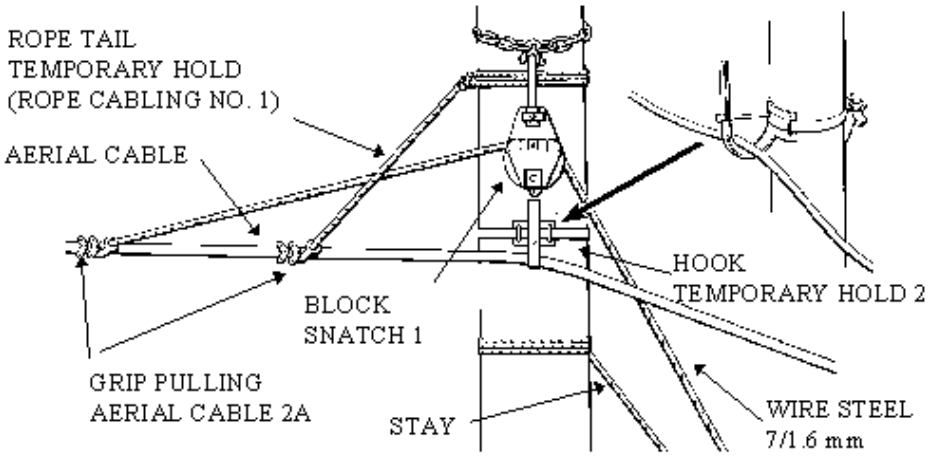


Figure 101

Fit a Tensioner 2B to the leading Crowbar No 1 and attach one end of a Dynamometer to the tensioning device. Attach the other end of the Dynamometer to the tensioning steel.

Attach a Grip Pulling Aerial Cabling to the other end of the steel.

Attach a Blocks Snatch to the pole using a Chain Tensioning in a position above where the termination is to be made. Pass the steel through the block snatch and attach the Grip Pulling Aerial Cable onto the Strength member of the cable.

Operate the tensioner until the appropriate height clearance and tension are achieved.

Terminate the cable and release the tension before recovering the tensioning steel, dynamometer, ground anchor etc.

11.5 Use of a Tensioner 2B Aloft

> **Warning:** Tension must not be applied to cables - except by hand - whilst anyone is on the pole.

Tensioning is performed after the slack has been taken up and anti-galloping twists have been inserted see section 11.4.

For this exercise the pole should already have been rigged with a Hook Temporary Aerial Cable and a Grip Pulling Aerial Cable with a rope tail of Rope Cabling 1 attached to the pole. Stays or temporary stays should be provided where necessary. The cable should be supported by the Grip Pulling Aerial Cable and the Hook Temporary Hold. See figure 101.

Fit a Grip Pulling Aerial Cable to the Winch Line and secure to the Suspension Strand.

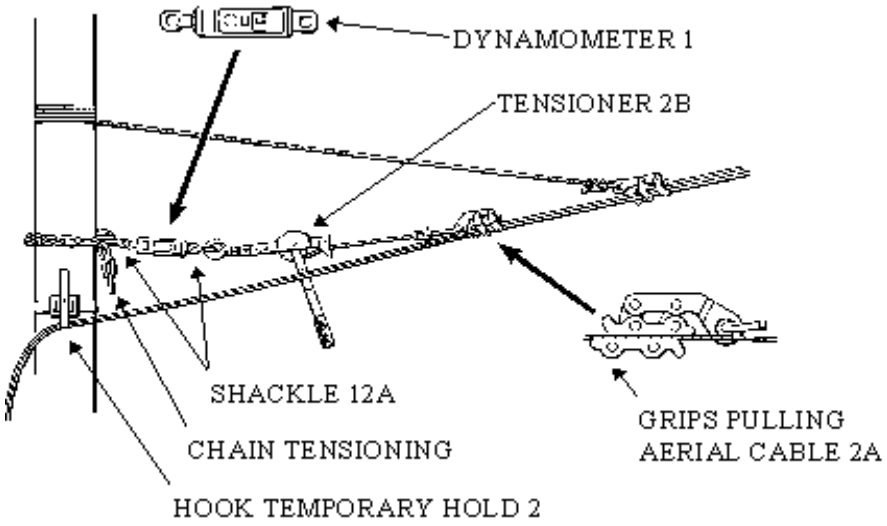


Figure 102

11.5.1 Preparation for Tensioning

The Tensioner 2B should be set up as shown in Figure 102 with a Dynamometer in line attached to the pole with a Chain Tensioning 900 mm and onto the strength member of the cable using a Grips Pulling Aerial Cable.

Operate the tensioner until the appropriate height clearance and tension are achieved. Terminate the cable and release the tension before recovering the tensioning steel, dynamometer, ground anchor, etc.

12 *Recovery of Self-supporting Aerial Cable Combined*

When Self-supporting Aerial Cable Combined has to be released (for pole renewal, or recovery) the following procedure should be followed:

12.1 Recovery - (not power or road crossing)

> **Warning:** Make sure the ground area has been searched before driving in the stakes. Refer to: EPT/OHP/B035 and EPT/PPS/D010.

Temporary back stays should be installed on poles as necessary to take tension loads that will be imposed where permanent stays do not exist.

Rig the terminal pole as for tensioning (see Section - 11). Pass the winch rope or tensioning rope depending on the method chosen through the Block Snatch. Fit a Grip Pulling Aerial Cable to the winch or tensioning rope and secure to suspension wire forward of the termination.

Attach a second Grip Pulling Aerial Cable to the suspension wire via a rope tail attached to the pole. There should be some slack in the rope tail.

Fit Hook Temporary Hold to the intermediate poles (where Clamps Aerial Cable are used). Release the Clamps Aerial Cable or (Wire Lashing 2A from Hook Aerial Cable No 1) from intermediate poles and place in the Hooks Temporary Hold.

Apply tension to the suspension wire and remove the wire wraps from the termination pole. Gradually release tension until slack is taken up by second Grip Pulling Aerial Cable. Continue until tension on winch/tensioner is removed completely. Move Grip Pulling Aerial Cable along suspension wire and take up on winch/tensioner and move second Grip Pulling Aerial Cable to a position closer to the pole to provide some slack in the rope tail. Release tension again and repeat until the cable is de-tensioned and may be lowered to the ground.

12.2 Recovery of Aerial Cable suspended above Road Crossings and Low Voltage power

12.2.1 Road Crossings

This process utilises ‘Rings’ to support an Aerial cable as it is recovered across a road. This section is provided for teams who hold the necessary equipment and are competent in its use. Where the Rings are unavailable, a

temporary road closure may be required to facilitate recovery of the cable over the carriageway.

Rig both poles either side of the crossing as shown in figure 103.

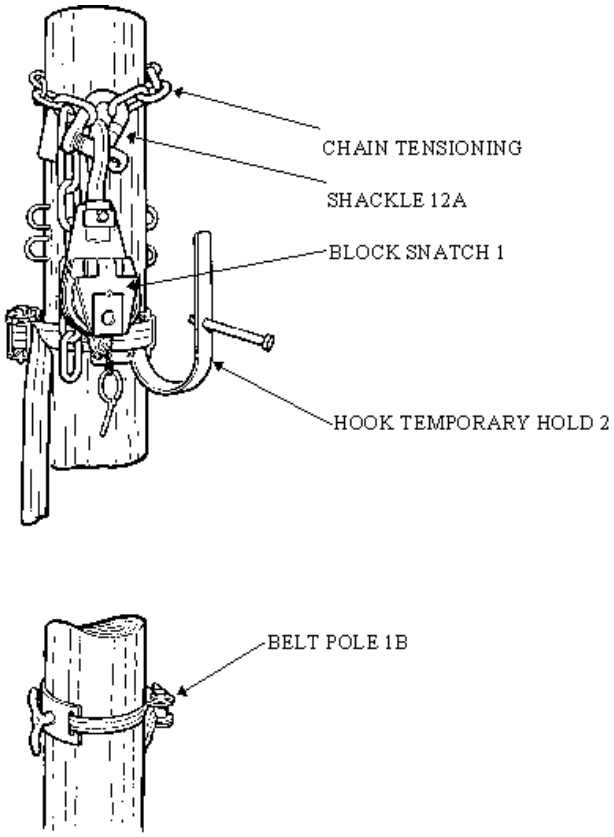


Figure 103

Attach a Sash Line 15 to the pole belt at pole A, feed it over the Block Snatch 1 and Lay across the road when it is safe to do so. Use Weight Sandbag Item Code 068971 at either side of the road to keep the Line Sash flat on the road. The rope should be placed under the bag and approximately 100 mm from the bottom of the bag.

Pass the sash line over the Block Snatch 1 at Pole B. See Figure 104.

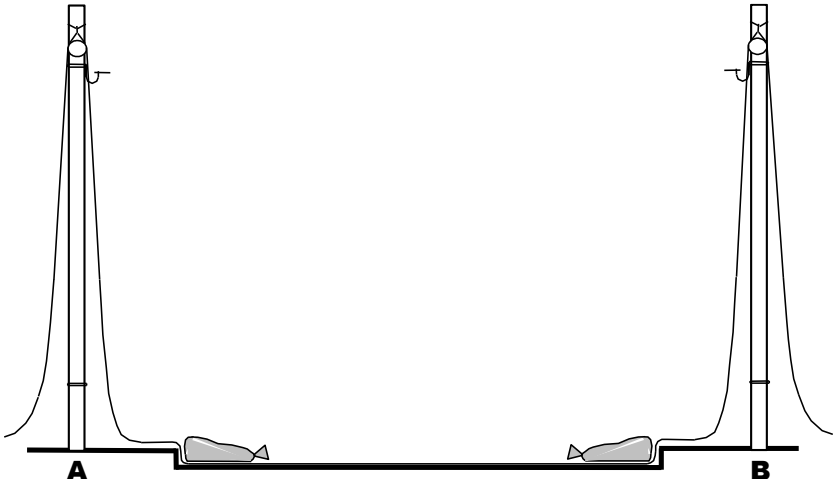


Figure 104

Make sure that the road is clear.

Pull the sash line up from Pole B. See figure 105. The Line Sash should pull from underneath the sandbag without the need to remove the sandbag.

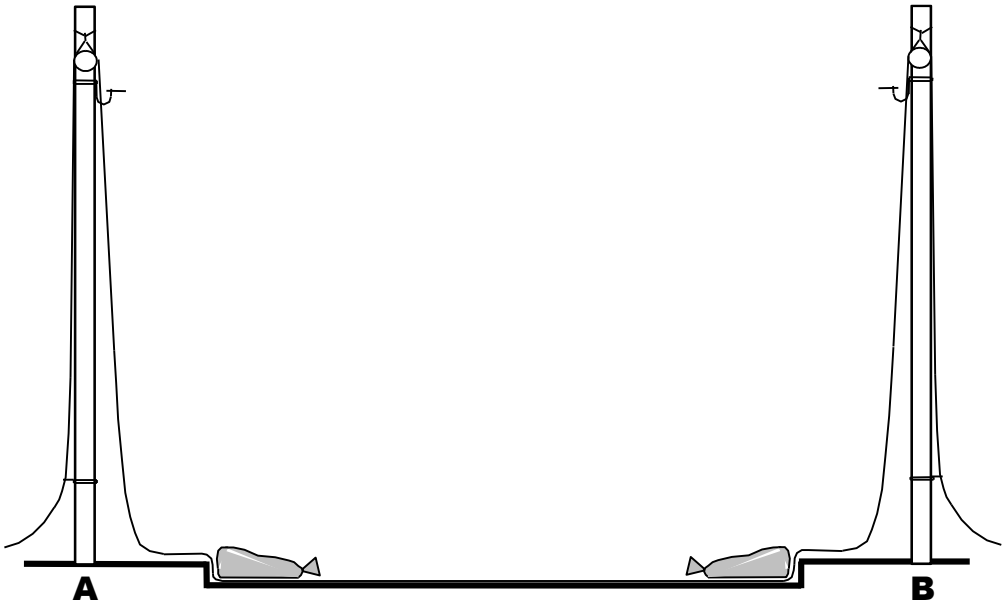


Figure 105

Prepare the end of a length of Wire Steel 7x1.6 mm using a Grip Wire Suspension 3 or 4 as shown in Section 9.3.1.

Attach the prepared end to the Line Sash 15 using a bow-line knot. Attach another length of Line Sash 15 again using a bowline. This will be used to apply back tension to the pulling line during installation of the wire steel.

Applying back tension by hand at pole A, pull the wire steel by hand, using the pulling line at Pole B, through the hook temporary hold and past the pole to enable sufficient rings to be fitted around the steel and support rope.

Tie off the sash line on either pole maintaining clearance across the road.

Attach the rings with 1 metre of Line Sash 2 between each, see figure 106. Tie the rear ring to the pole or convenient attachment on the pole and the lead ring to the front end of the wire steel.

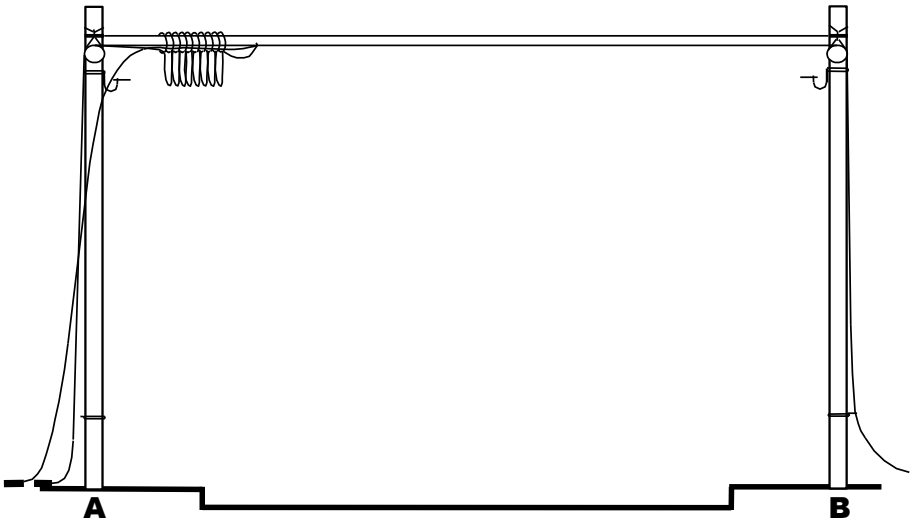


Figure 106

Apply back tension by hand at Pole A using the Line Sash and pull by hand from Pole B so that the Wire Steel and rings are pulled across. See Figure 107.

The Line Sash may be tied off at the pole belts at either side if difficulties are encountered at any time during the crossing.

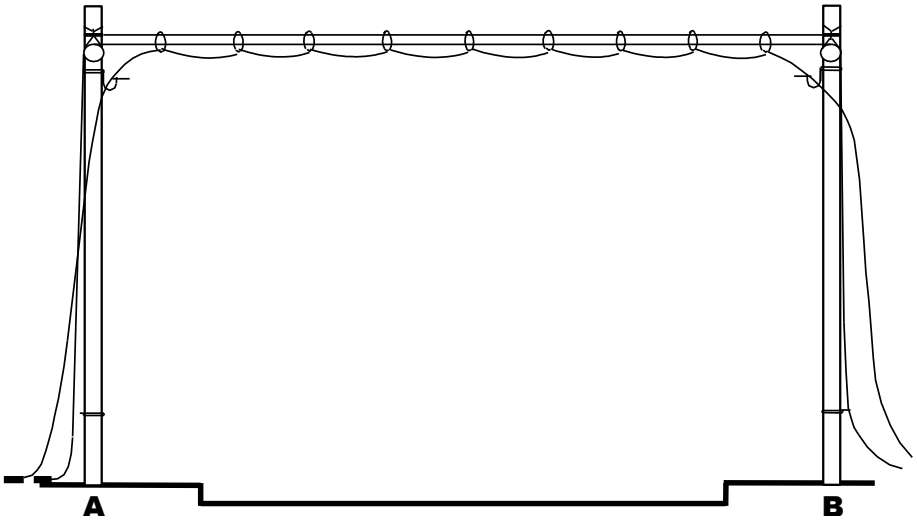


Figure 107

Tension and terminate the Wire Steel in the same manner as for fully terminating a cable suspension wire using the wire wrap method. See sections 10 and 11.

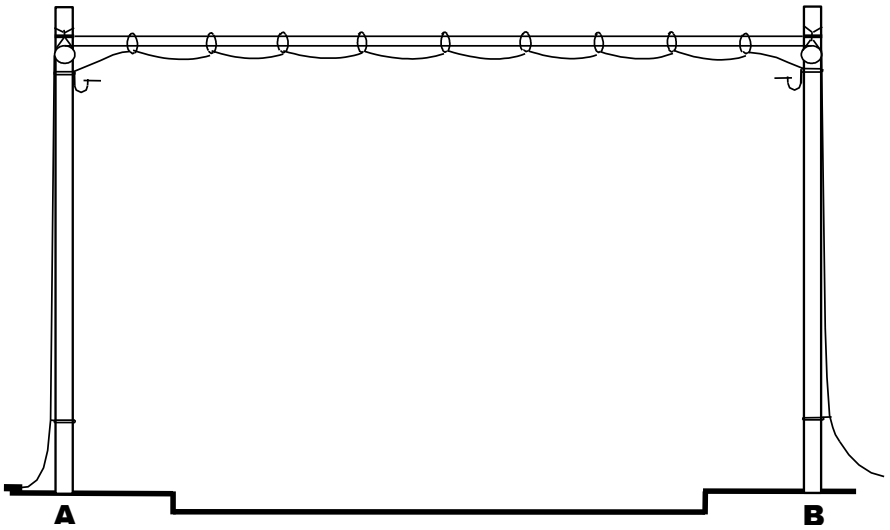


Figure 108

Release the tension in the cable as described in section 12.1. Prepare the end of the cable as shown in section 9.3.1 and attach a Line Sash 15 using a bowline.

Pull the cable and Line Sash back from Pole A. Use the Line Sash at Pole B for back tensioning by hand, as the cable is recovered, to prevent the cable end from dropping between the rings.

Tension and tie off the Line Sash on both poles using a clove hitch and two half hitches. Tie the lead ring to the end of the steel and attach a Line Sash 2 or 15 to the steel to be used for back tensioning at pole B.

Apply back tension by hand at pole B and pull the steel and the rings back to pole A and recover the rings. See figure 109.

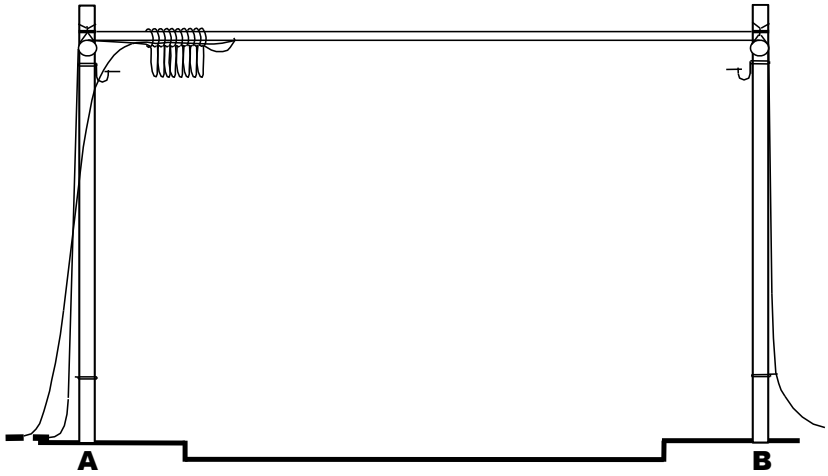


Figure 109

Release the Line Sash at pole B and tie the two Line Sash's together. Tie a single Line Sash passing over the Block Snatch 1 to the lead end of the Line Sash to be recovered and tie it off on the pole belt. See Figure 110.

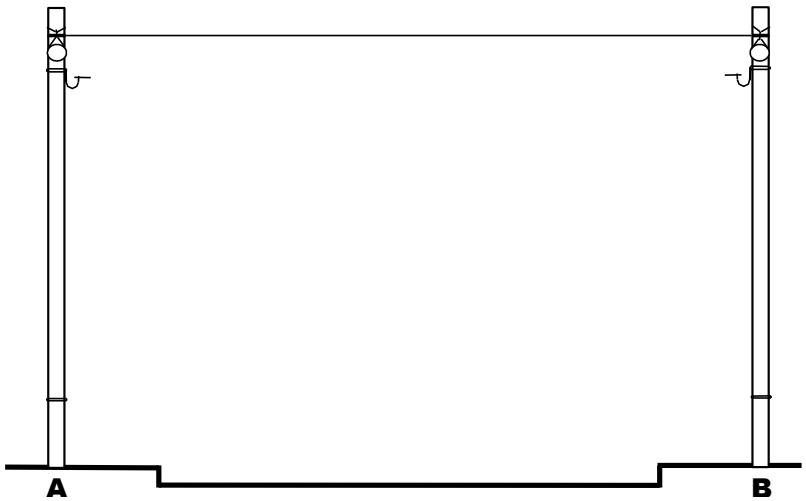


Figure 110

Check that the carriage way is clear of vehicles or pedestrians and when clear lower the Line Sash to the ground. Clear the Line Sash from the carriageway.

Recover the equipment from both poles.

12.2.2 Low Voltage Power Crossings

This process utilises 'Rings' to support an Aerial cable as it is recovered. This section is provided for teams who hold the necessary equipment and are competent in its use. Where the Rings are unavailable, the relevant DNO must be contacted to de-energise the power and also a temporary road closure may be required.

Only one Platform Elevating vehicle available, or site conditions only allow one Platform Elevating to be in position on one side of the LV power lines:-

Warning: Make sure the sash line/s are kept under control in windy conditions.

Three persons will be required as a minimum for this activity, (not including those present for traffic control). A MEWP operator, GSP and at least one other suitably skilled engineer.

Wherever there is a risk, however slight, of accidental contact between Openreach plant and power conductors, gloves IR must be worn. They must also be worn whenever ropes or sash lines which may come into contact with power lines are handled. This is essential, the sash line may become wet with rain and so lose its insulating properties.

Warning: This activity must only be carried out in dry conditions.

Under NO circumstances must any attempt be made to throw a cable or sash line over power cables.

Note: This process is only applicable for pole-to-pole distribution.

1. Fit a Pole belt 1B to Pole A and Pole B at ground level.

2. At Pole A secure the cable dispenser to the pole using Straps Lashing and wind a sufficient length of sash line 15 onto the cable dispenser to go up and down the pole and across the span length to Pole B. Use a double sheet bend knot to attach the sashline No.15 to the dropwire on the drum.
3. Tape the free ends.
4. Take a length of sash line No.2 (2 x pole height) and a Pulley No.4 and ascend Pole A. Fit a Pulley No.4 to the pole ring. Open the side of the pulley and insert the sash line. Descend the pole and attach the free ends of the sash line to the pole belt.
5. At Pole B fit a Pulley No.4. Install a length of sash line No.2 through the pulley so that sufficient sash line can go up the pole and down to the ground. Secure the sash line to the Pole belt (one end through the cleat and the other end around the figure of 8).

Note: At both poles the crossing side of the sash line must be placed in the cleat of the pole belt.

6. Using a reef knot secure a length of sash line No.2 (long enough to reach the two poles plus an additional 5 metres) to the sash line No.2 at Pole A to the span side.
7. Using traffic control, pay the sashline out towards Pole B. Pass the sashline to the platform operator whilst managing the coil. The sashline then needs to be pushed through a length of Stay Guard High Visibility. Tie a suitable weight (non power conducting) such as 3 x Tape Plastic Adhesive or an Insulator Stay 2 to the sashline and lock off the sash line by drawing it into the split in the stay guard.
8. Position the platform bucket maintaining the clearances detailed in the Overhead Power Glove Box Guide. Making sure that Gloves IR are being worn, position the Stay Guard containing the sashline over the power cable making sure it does not come into contact with the power cables. Carefully unlock the sash line from the split and hold the weighted line.

Note: When manoeuvring or positioning the MEWP bucket it must never be closer than 1 metre (in any plane) from any Live conductor/s. Also, the bucket controls must be switched to ‘OFF’ or the emergency stop activated.

9. Feed the sashline through the Stay guard until the weight touches the ground.
10. Wearing gloves IR, take hold of the sashline at ground level and carefully pull the sashline through the stay guard. Continue to lay the sashline out until it can be attached using a reef knot to the sashline installed through the Pulley No.4 at Pole B (to the end that is positioned in the cleat of the pole belt).

Note: A Pulley No.4 is required as the sash line knot will not pass through the jaws of a Pulley No.6.

11. When safe to do so, and while still wearing gloves IR, pull the sashline up at Pole B until the sashline is taught between Pole A and Pole B. The platform operative may need to feed the knots through the stay guard. Ensure the sashline is attached to the figure of 8 on the pole belt.
12. Check the separation distances can be maintained before going further.
13. Using a double sheet bend knot, tie the sashline No.2 which is attached to the figure of 8 on Pole A to the sashline No.15 (previously wound onto the dropwire dispenser). Remove the sashline from the pole belt, while maintaining tension wind any slack back onto the drum. Adjust the back tension on the dispenser if necessary.
14. At pole B, wearing Gloves IR, continue to pull the sash line No.2 until the sash line No.15 is pulled across. Secure the sash line 15 in the figure of 8 in the Pole Belt.
15. Return to the Dropwire Dispenser and lock off the drum.
16. At pole B, fit a 'Come Along' (Grip pulling Aerial cable 2A) to the sashline 15 (span side) and secure to the pole using a clove hitch and a half hitch knot.

Note: Attach a suitable length of rope cabling to the 'Come Along'. One side attached to the 'Come Along' and the other secured to the pole.

17. Descend the Pole and untie the sashline 15 from the figure of 8 in the Pole Belt. Also untie the sashline no.2 from the sashline no.15.
18. Ascend Pole B and remove the Pulley No.4. Secure the sash line No.15 using a clove hitch and a half hitch to the pole. This should be positioned as close as possible to the pole ring or UPB. Manage any lose ends.

Note: This is the preliminary support rope.

2.

19. Remove the Come Along from the sashline 15.
20. At Pole A, ascend the Pole and fit a Come Along to the Sashline 15 and secure to the pole using a clove hitch and a half hitch knot.
21. Descend the Pole and remove the Sashline 15 from the dispenser.
22. Ascend Pole A and remove the Pulley No.4. Secure the sash line No.15 using a clove hitch and a half hitch. Manage any lose ends
23. Remove the Come Along from the sashline 15.
24. When the sash line is tensioned the platform operator can open the split in the stay guard and carefully slide it off the sash line.
25. Repeat steps 1 to 15 to provide a second sash line No.15

Note: This is the "pulling line".

26. When the sash line is tensioned the platform operator can open the split in the stay guard and carefully slide it off the sash line. Once the two sash lines are secured at both poles and there is no risk of the sash lines falling, the MEWP Operator is no longer required, and Traffic Management can be removed.

27. Remove the Sashline 15 form the dispenser at Pole A and attach the free end to the figure of 8 on the Pole Belt.
28. Dress Poles A and B with temporary J hooks.
29. Remove the sash line 15 from the pulleys and feed the sash line through the temporary J Hooks at both poles, two persons will be required to maintain height/tension of the sashline. Re-secure the sashlines to the pole belts.

Note: Position the sashline no.15 over the J hook prior to removing the Pulley No.4.

30. At Pole A, prepare the end of a length of Wire Steel 7x1.6 mm (HW Aerial Cable steel) using a Grip Wire Suspension 4 as shown in section 9.3.1.
31. At pole A, attach the line sash No.15 to the prepared end of the wire steel using a Bow-line knot. Attach another length of Line Sash 15 using a Bow-line knot through the eye of the Grip Wire Suspension. The length of the additional sash line 15 needs to be 4X the height of the Pole plus the length of the span. This will be used to apply back tension to the pulling line during installation of the wire steel.

> **Caution:** Wherever there is a risk, however slight, of accidental contact between Openreach plant and Power Conductors, Gloves IR must be worn.

32. Remove the Sashline 15 from the Pole Belt whilst maintaining the tension of the span
33. Whilst back tension is being applied by hand at pole A, pull the wire steel by hand using the pulling line at Pole B. The wire steel should be pulled through the hook temporary hold at Pole A and past the pole to enable sufficient rings to be fitted around the steel and support rope (enough to be able to put the rings on).

> **Caution:** Do not pull the wire across to Pole B at this point.

34. Tie off the sash line on both poles maintaining clearance across the road.
35. Prepare a length of sash line No.2 (approximately the span length plus 5 metres) with loops tied at 1 metre intervals. The Rings will feed through the prepared loops.
36. At pole A, make fast the rear Ring sash line to the pole or convenient attachment.

37. Attach the Rings through the pre-made loops. The Rings must be fitted around the preliminary support rope, the Aerial cable, the wire steel and the back tension rope.
38. Tie the lead Ring sash line using a bow line knot to the leading end of the wire steel.
39. Descend Pole A and untie the Sashline 15 from the Pole Belt.
40. Apply back tension by hand at Pole A using the Line Sash and from Pole B pull the wire steel and rings across by hand. Ensure enough wire steel has been pulled through for termination.

Note: The Line Sash may be tied off at the pole belts at either side should difficulties be encountered at any time during the crossing.

41. Tie off the Sashlines at Pole A and Pole B on the 'figure of 8s' of the Pole Belts.
    3. Starting at Pole B, tension and terminate the Wire Steel using a Bare Wire clamp 47. Cut the wire steel (25mm) from the end of the bullet of the BWC 47. Make fast the rings sashline and the back tension sashline. Repeat at Pole A.

Note: Alternatively, the wire steel can be terminated using the wire wrap method. See sections 10 and 11.

42. At the top of pole B attach a chain and D shackle. Attach a tensioner 2B with a 'Come Along' fitted to the Aerial cable.

Note: For heavy weight Aerial cable this must be done from a MEWP or at ground level.

43. Ratchet the tension of the Aerial cable then attach a second 'Come Along' to the Aerial cable (in front of the existing Come Along which is attached to the tensioner 2B). The rope cabling holding the second Come Along must be secured to the pole using a clove hitch and a half hitch.
44. Remove the Aerial cable from the pole.
45. Attach a GWS to the free end of the Aerial cable. Attach a sashline no.15 through the eye of the GWS using a bow line knot and take to ground level. Secure to the pole belt.

Note: For Light-weight use a GWS 3 and for Heavy-weight use a GWS 4.

46. De-tension the Aerial cable. Remove the tensioner 2B, the second Come Along, the chain and D shackle from the pole.
47. At pole A, place the Aerial cable through the J hook and remove the Aerial cable from the pole. Attach a GWS to the free end of the Aerial cable. Attach a sashline no.15 using a bow line know through the eye of the GWS and lower to the ground. Secure in the pole belt.

48. Descend Pole A. From pole A, pull the sashline no15 until the eye of the GWS at pole B is in a suitable position to attach the rings sashline and the back tension sashline that are made fast to the pole.
49. At pole B, tie the sashline no.15 to the figure of 8 on the pole belt. Ascend pole B, tie off the rings sashline and the back tensioning sashline using a bow line knot through the eye of the GWS.
50. At pole B remove the sashline no.15 from the pole belt.
51. Remove the sashline no.15 from the pole belt at pole A. Whilst providing back tension at pole B, pull the sashline no.15 and Aerial cable until the Aerial cable is through the J hook at Pole A.
52. Secure the pulling line at both poles.
53. Recover the Aerial cable.
54. Pull all the rings back to pole B.
55. At pole B, wrap a Grip Wire Suspension 4 onto the steel wire. Tie the lead ring sashline and the back tension sashline to the eye of the Grip Wire Suspension. Cut the steel wire between the Grip Wire Suspension and the BWC 47.

Note: Some of the Rings may need to be disconnected in order for the Grip Wire Suspension to be attached.

56. Recover the BWC 47.
57. At pole A attach a Grip Wire Suspension 4 to the steel wire. Attach another sashline 15 through the eye using a bowline knot and attach to the pole belt. Place through the temporary J hook with the existing sashlines. Cut the steel wire between the Grip Wire Suspension and the BWC 47.
58. Recover the BWC 47.
59. Descend the pole and whilst maintain back tension, pull both sashlines together until the rings and the steel wire reach pole A.
60. Recover the equipment and the sashlines from both poles following the process for dropwire recovery over Power crossings detailed in EPT/OHP/B011.

13 *Method of In Situ Repair of Damaged Aerial Cable*

This section includes suspension wire repair products and clarification on the use of gas in platform elevating vehicles.

13.1 Introduction

Before any repair is carried out, thought should be given to ensure that the action taken provides the best value for money e.g. If shotgun damage is this going to happen again, would it be cheaper (whole life cost) to provide service by another method. Options to be considered include;

- Replace Aerial Cable following tree pruning/obstacle removal
- Re-route and replace Aerial Cable length
- In-situ repair of damaged Aerial Cable (only where further damage is unlikely or where the cause of damage has been negated or removed) and also use Protector Cable Abrasion.
- Recover and replace with Underground Cable length.

The following works practice has been devised for the In-situ repair of Cable Aerial Self Supporting Combined (CASSC) that has been damaged by tree rubs, shotgun/air rifle pellets.

The following must be noted:

- The use of Gas in a Platform Elevating Bucket is not permitted. Repairs may be only closed using a Small In-Line Clip Closure
- A Maximum of <u>two repairs</u> are permissible in any one cable span
- Large in-line clip closure or Cap end mechanical clip closure must not be used
- Kit Aerial Closure 1 must not be used for in situ repair

13.2 Procedures

13.2.1 Inspect

Inspect the cable pairs and suspension steel to confirm damage is to the pairs only. If the suspension steel has been damaged, then it should be repaired as detailed in EPT/ANS/A012 or section 10.2.2.1 in this document.

13.2.1.1

13.2.2 Damaged Pair repair – Cable only within the closure

1. Split cable from suspension wire. This can be achieved by piercing the webbing between the cable and the suspension wire either side of the damaged cable sheath with a bradawl.
2. Use a “cheese wire” to make circumferential cuts at each end of the damaged sheath and split the webbing away from the cable (the draw string from an aerial cable is ideal for this operation).
3. Remove the damaged sheath from the cable using a cable stripper and repair any damaged conductors (leave sheath on suspension wire).
4. Fit the Clip Closure as per Manufacturer’s instructions.

To stop the split between the suspension wire and the cable propagating, bind in over the complete closure and suspension wire, using Wire Lashing 1B (I/C 054800)

Figure 111

Repairing & Binding
in UCJ to Aerial Cable

14 *Method of retrospective fitting of Protector Cable Abrasion (PCA) to Aerial Cable*

Openreach Cables are designed to withstand light contact with smaller branches (twigs) and foliage. However, where the contact is with more substantial branches, Cables can be protected against damage using Protector Cable Abrasion, which is an extremely robust spiral wrap product (AKA tree Guard).

Only where contact with a tree is or is very likely to cause a significant deviation in the cables route, should pruning be considered.

The installation methods for PCA are shown below, together with information on sizing for various cables.

Note: PCA need only be applied to the immediate sections of the Cable that are in contact or are very likely to be in contact with significant tree branches. There is no need to apply it, just because the route happens to pass through trees!

14.1 Fitting PCA

Note: The PCAs used in this guidance are shown as **Yellow in colour** for clarity. The PCAs supplied for use in the network are **Black in colour.**

- Choose the size of PCA from table
- The PCA may be cut to make it shorter if required. For safety reasons, gloves and eye shields must be worn (see Section 14.1.1 below) and a suitable tool, such as cutters or hacksaw should be used with caution
- Take the 1 metre length of PCA and wind on as shown. More lengths can be added if required by 'butting ' up to the previous length and keep adding as required, if the span is non road or vehicular access crossing the entire span may be protected

  If fitting to a cable that is crossing a carriageway or vehicular access then NO MORE THAN 15 LENGTHS of PCA can be fitted because it will cause increased sag in the cable
- Grip the spirals and twist them in opposite directions to open up the spirals. Place the PCA on the section of cable to be protected or reinforced (Fig: 112) then move the PCA through 45º to the cable (Fig 113) and the PCA will start to form around the cable

Figure 112

Figure 113

- Continue to wrap the PCA through to 90º as in Figures 114 and 115

Figure 114

Figure 115

- Continue to wrap one side of the spiral protector around the cable (Fig 116) Repeat this last action with the other arm of the spiral protector (Fig 117)

Figure 116

Figure 117

14.1.1 Fitting Protector Cable Abrasion using Filler Rod

Fitting of the Protector Cable Abrasion (PCA) or ‘Tree Guard’ can cause discomfort in the hands when fitting several lengths of the larger PCA product - types 2, 3, 4 and 5.

To aid the installation process, a polyethylene Filler Rod (item code 055661) can be used.

Process Detail:

Caution: Gloves and eye shields must be worn during this operation

- Clip on the PCA as usual by opening up the spirals at mid-point

Figure 118

- Insert Filler Rod into one half of the PCA

Figure 119

- Using the Filler Rod as a lever, wind on the PCA as usual. See Figure 120 below

- Repeat the action for the other half of the PCA

Figure 120

This solution can only be used for PCA 2, 3, 4 and 5. Note that the Filler Rod will not fit through PCA 1. As this size doesn't cause handling difficulties, it has been discounted from this process.

14.2 Fitting PCA to Aerial Cable where In-Line Closures are provided

- It is important to use the appropriate size of PCA and potentially two separate sizes may be required- one for the aerial cable either side of the closure and the largest size (PCA No 5) to cover the inline closure itself. See figure 121
- Figure 122 shows the fitting of the large PCA (No 5) to the inline closure

Figure 121

Figure 122

- Figures 123 and 124 show the completed task. Please note that the steel catenary wire is bound in to prevent cable separation

Figure 123

Figure 124

14.3 Fitting PCA to Aerial Cable where In-Line Shrink down closures are provided

- If an inline shrink down closure requires covering with PCA, it is important to use the appropriate size PCA to the size of the Aerial Cable
- Figure 125 shows the damaged aerial cable sheath
- Figure 126 shows the shrink down closure fitted to the cable

Figure 125

Figure 126

- Figure 127 shows the PCA being fitted to the cable. Please note that the steel catenary wire is bound in to prevent cable separation. Place a few turns of insulation tape on to the aerial cable at each end before the final turns of the PCA are completed
- Fig 128 shows the competed task

Figure 127

Figure 128

14.4 List of Products and Cable Sizes

When ordering PCA from the stores system the unit of issue is per Bag: -

PCA No 1 is supplied in bags containing 20 x 1metre lengths per bag.

PCA No 2 to No 5 is supplied in bags containing 10 x 1 metre lengths per bag.

PCA 1 - Item code 048987 (Unit of issue 1 bag which contains 20 x 1 metre lengths).

This PCA is capable of being installed on all dropwires including CAD55 & fibre drop cable, installed within the Openreach network. When installing PCA 1 on a dropwire it is advisable to put a few turns of insulation tape on to the dropwire within approx. 20mm of the end of the first PCA and approx. 20mm under where the next PCA is to be fitted. This is to stop the PCA moving.

PCA 2 - Item code 048988 (Unit of issue is 1 bag which contains 10 x 1 metre lengths). It is capable of being installed on the following aerial cables: -

Cable	Suspension wire	Nominal O/D	Colour code CAC
Cable PET Aerial			
10/0.5	1/2.65 mm	16.5 mm	Purple
20/0.5	1/2.65 mm	19.0 mm	Purple
Cable PET Aerial			
10/0.6	1/2.65 mm	20.0 mm	Purple
Cable PEQ 6 Aerial			
14/0.63	7/1.6 mm	23.5 mm	Yellow
Cable Fibre Optic	7/1.6 mm	25.5 mm	Yellow

Table 7 – PCA 2 capabilities

PCA 3 - Item code 048989 (Unit of issue is 1 bag which contains 10 x 1 metre lengths)

PCA 3 is capable of being installed on the following aerial cables: -

Cable	Suspension wire	Nominal O/D	Colour code CAC
Cable PET Aerial			
50/0.5	7/1.6 mm	26.0mm	Blue
100/0.5	7/1.6 mm	31.6mm	Green
Cable PET Aerial			
20/0.6	7/1.6 mm	25.5mm	Blue
50/0.6	7/1.6 mm	33.5mm	Red
Cable PEQ 6 Aerial			
28/0.63	7/1.6 mm	27.0 mm	Blue
60/0.63	7/1.6 mm	31.0 mm	Green
14/0.9	7/1.6 mm	27.5 mm	Blue
28/0.9	7/1.6 mm	32.0 mm	Red
Cable PEUT TS FF Aerial			
20/0.6	7/1.6 mm	27.0 mm	Blue
40/0.6	7/1.6 mm	32.2 mm	Red

Table 8 – PCA 3 capabilities

PCA 4 - Item code 048990 (Unit of issue is 1 bag which contains 10 x 1 metre lengths)

PCA 4 is capable of being installed on the following aerial cables: -

Cable	Suspension wire	Nominal O/D	Colour code CAC
Cable PEQ 6 Aerial			
104/0.63	7/1.6 mm	37.5 mm	Red
60/0.9	7/1.6 mm	39.5 mm	Black
Cable PEUT TS FF Aerial			
80/0.6	7/1.6 mm	39.0 mm	Black

Table 9 – PCA 4 capabilities

PCA 5 - Item code 048991 (Unit of issue is 1 bag which contains 10 x 1 metre lengths)

PCA 5 is capable of being installed on the following aerial cables: -

Cable	Suspension wire	Nominal O/D	Colour code CAC
Cable PET Aerial			
100/0.6	7/1.6 mm	42.0 mm	Black
Cable PEQ 6 Aerial			
104/0.9	7/1.6 mm	46.8 mm	Black

Table 10 – PCA 5 capabilities

15 *Working Practice for Prop Cable Telescopic on High Load Routes*

When high loads are forced to deviate from high load routes by the police escorts there is a need to quickly clear the route of obstructions.

Description of Prop Cable Telescopic (Item code 129519)

The item is a five-section telescopic rod with an application head for capturing the overhead cables. The rod can be extended to any height from 1.75m to 7.5m. The attributes of the item are detailed in **Table 11.**

Weight		≈ 5 kg
Length	Compact	1.75meters (excluding head)
	Extended	7.5meters (excluding head)
	Head	190mm
Radius	Bottom Section Outer radius	60mm
	Top Section Outer radius	30mm

Table 11

Each section of the rod is secured using an over centre locking mechanism. See Figure 129.

Procedure

Before carrying out any work you MUST make sure you are wearing the correct Personal Protection Equipment (PPE). i.e., Safety Helmet, Eye shields, Gloves, and long-sleeved High Visibility Jacket. See Health and Safety Handbook SFY/HSH/D040

- Check rods for any visible damage. Do not use damaged or splintered rods
- Check that the over centre locks provide sufficient grip to hold each rod section tightly when extended

Note: Over centre locks are factory set to provide correct grip between sections. Firm resistance to the locking action should be felt when operating the lock.

- If joint is loose the grip can be adjusted by tightening the nut adjacent to the locking device body with a 14mm spanner

Note: This nut is on a reverse thread

- Stand directly below the cable to be raised and extend telescopic rod, locking the joints securely, using the over centre locking mechanism, until the head is level with the cable

Note: Use 2nd person to warn operator of obstacles and members of the public if necessary.

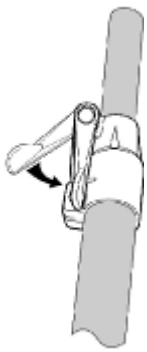


Figure 129 **–** Over Centre Locking Mechanism

- Position the two hooks on the head, either side of the cable and turn the rod 90° clockwise to capture the cable as shown in figure 130. This will retain the head on the cable

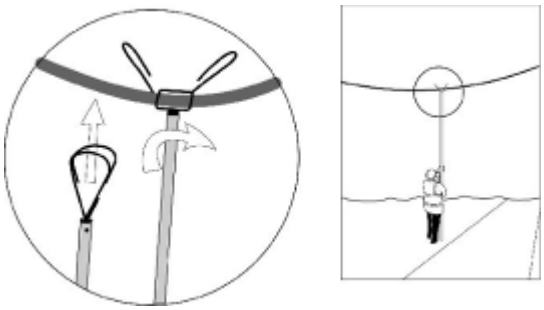
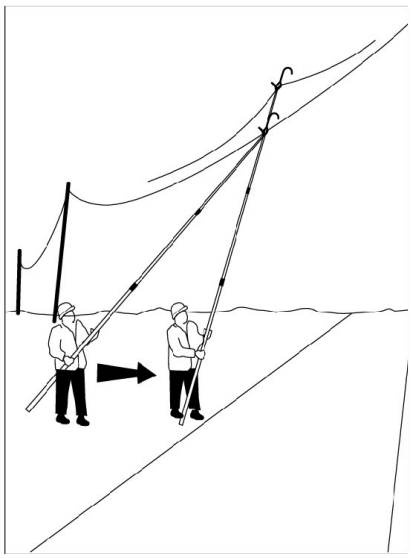


Figure 130 – Application Head

- Rest the rod on the cable using the attachment head and extend the rod to required length. See figure 131 position A.

Note: Ensure that Latches are completely closed. See figure 129

- Holding the rod at a comfortable position walk towards the cable until rod is vertical, ensuring that the cable is caught in the `V` groove of the attachment head and checking ground conditions underfoot. See figure 132 position B
- Place the butt of the rod on the ground directly below cable



Figures 131 and 132 (A and B) – Raising cable

- Remain in attendance at the rod to ensure that there is no slippage along the cable whilst the high load passes under. See figure 133

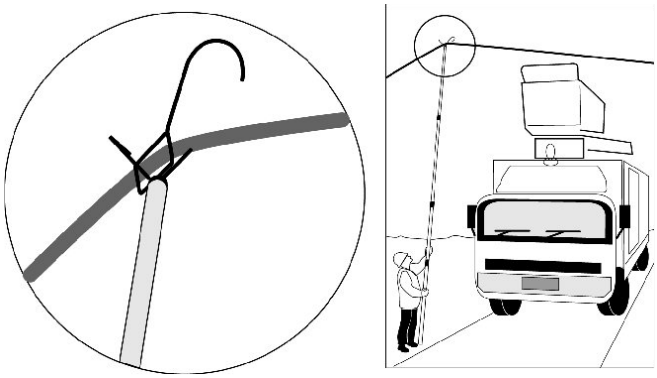


Figure 133 – High Load passing under cable

- Remove the rod when the High Load has passed through. Removal is a reverse action of raising the rod

15.1 Additional Guidance

- Check height of cable before High Load passes through
- The operator should use the rod as close as is safely possible to the High Load
- In most cases only one rod will be required, but for wider loads it may be necessary to use one either side.
- Operators will not walk with rods extended unless raising the aerial cable

15.2 Stores Item Codes

Item	Easc
Insulator Stay No 2	105240
Belt Pole 1B	126966
Hook Temporary Hold	127481
Rods clearance Telescopic 7 metres	008874
Stay Guard High Visibility	013612
PLATE WALL 4	013751
PLATE WALL 4	013751
Screw Coach	014700

THIMBLE 4	015853
Grip Wire Suspension 2	016227
Grip Wire Suspension 3	016231
Grip Wire Suspension 4	016232
GRIP INSULATOR POLE	016234
HOOK AERIAL CABLE 1	016240
STAPLE GALVANISED 65MM	016271
STUD EXPANDING 1A	016303
CLAMP AERIAL CABLE 1	016316
EYEBOLT EXPANDING 2A	016442
Grip Wire Suspension 1	016444
Clips O 5-7mm	016448
Clips O 9-11mm	016449
TERMINATION CLAMP AERIAL CABLE LIGHTWEIGHT (AC7)	016962
TERMINATION CLAMP AERIAL CABLE HEAVYWEIGHT (AC10)	016970
HOOK AERIAL CABLE 1A (HAC1A)	016990
PLATE WALL 5A	018388
PLATE WALL 5A	018388
Bolt Expanding 2A	021689
Draw Rope 1 Bagged 250m	041304
Wire Lashing 1B	054800
WIRE STEEL 7/2 00	054852
WIRE STEEL 7/1.60	054853
NAIL BONDING	072034
CAP SEALING 16A	072040
CLAMP AERIAL CABLE 2	073194
CLAMP AERIAL CABLE 3	073195
CLAMP AERIAL CABLE 4	073196
CLAMP AERIAL CABLE 5	073197

CLAMP AERIAL CABLE 6	073198
CLAMP AERIAL CABLE 7	073199
Tape Plastic Adhesive 25mm	075995
Pincers	115690
ROPE CABLING 1	126405
Belt Pole 1B	126966
LINE SASH 2 (4 HANK)	127429
LINE SASH 15	127430
DRILL TWIST MASRY 8X400MM	127449
TENSIONER 2B	127453
HOOK TEMPORARY HOLD 2	127481
Grip Pulling Aerial Cable 2A	127526
Straps Lashing	127545
Dispenser Dropwire 2B	127548
Pulley Dropwire 4	127580
PULLEY DROPWIRE 6	047036
SANDBAG WEIGHTED 2	068971
Gloves IR	IBuy
Gauntlet IR	IBuy
Chain Tensioning (a 1.4 tonne 6mm G100 lifting chain available from TW Engineering) TW Engineering, Eagle Road, Quarry Hill Industrial Park, Ilkeston, Derbyshire.DE7 4RB. Tel 0115 932 3223.	Local Purchase
Block Snatch1 (Min 450kg Rated) are available from TW Engineering, Eagle Road, Quarry Hill Industrial Park, Ilkeston DE7 4RB. Tel 0115 932 3223.	Local purchase
D Shackle (Min 450kg Rated) are available from TW Engineering, Eagle Road, Quarry Hill Industrial Park, Ilkeston DE7 4RB. Tel 0115 932 3223.	Local purchase
Bare Wire Clamp 25 (for lightweight A/C)	016973
Bare Wire Clamp 47 (for heavyweight A/C)	016974

TERM BARREL CLAMP 2.5 (BWC25)	016973
TERM BARREL CLAMP 4.7 (BWC 47)	016974
Wire Lashing 2A	054800
knife pocket 2	115027
STAPLE GALV 45MM	016270
STAPLE GALV 65M MM	016271
Universal Pole Bracket	016988
Bolt Hex Head 16mm x 300mm	016977
Bolt Hex Head 16mm x 350mm	016978
Aerial Cable Relief Clamp	016971
Barrel Clamp Single Strand Bare Wire 2.5mm (BWC25)	016973
Barrel Clamp Multi Strand Bare Wire 7 x 1.6mm (BWC 47)	016974
In-Line Barrel Clamp Single Strand 2.5mm (ILC 25)	016975
Barrel Clamp Terminating Stay Wire (SWC 63)	016980
Earthing and Bonding Clamp (EC 13)	016979
PROTECTOR CABLE ABRASION 1	048987
PROTECTOR CABLE ABRASION 2	048988
PROTECTOR CABLE ABRASION 3	048989
PROTECTOR CABLE ABRASION 4	048990
PROTECTOR CABLE ABRASION 5	048991
Tool Fixing Stainless Steel Banding	013608
Clips Banding Stainless Steel (BAG 100)	013603
Banding Stainless Steel (20mm) - 50m reel	013610
SHEARS HAND 7in	126854
HAMMER JOINER 1lb	068270
HAMMER JOINER 1/2LB	114351
AERIAL CABLE RELIEF CLAMP (ARC)	016971
BRADAWL 1/8IN. HANDLED	112151
Sling Lifting 4A	126742

Dynamometer	117441
Prop Cable Telescopic	129519

Table 12

END OF DOCUMENT