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# ***Specification for Aerial Cabling***

*Provision, Renewal, Recovery of Aerial Cable Within  
the Openreach Access Network*

## ***About this document ...***

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# 1 Introduction

This Document forms part of the Access Network Specification range of ISIS Documents and is applicable to both Openreach Direct Labour and Contractors.

The information below details the performance requirements for the Provision, Replacement and Recovery of Aerial Cables within the Openreach Network. Practices and items of plant are only detailed where necessary to ensure that Openreach Network & Plant are not compromised.

*Note:* The Specifications for Dropwires, Poles & Stays are covered in other Documents within the range. See EPT/ANS/A001 for an index of all Access Network Specifications.

## 2 Glossary

### 2.1 Product

Item	Description & Application
Aerial Cable Relief Clamp (ARC)	Item Code (016971) -The body of the Aerial Cable Relief Clamp is constructed of two halves. The halves are made of UV resistant non-conductive fibreglass reinforced thermoplastic and are secured together with two galvanised bolts, nuts and washers. Used at In-line intermediate poles as a retro fit solution to prevent further wearing of already installed fig of 8 Cables bound in (using Wire Lashing) on Hook Aerial Cable 1
Banding Stainless Steel	Item Code (013610) Stainless steel strip banding 20mm x 0.7mm x 50 metres. It is contained in a plastic "Easy carry container". For attaching Universal Pole Bracket to all BT Hollow & Joint User wood & steel poles,
Barrel Clamp Single Strand Bare Wire 2.5mm (BWC 25)	Item Code (016973) The clamp body is made from high strength aluminium alloy and contains spring loaded jaws. It is cone shaped and is stamped with the number 25. The cone fits into an aluminium collar. The clamp body and collar is 70.5mm by 42mm. A bail wire (160 mm x 2.5 mm) made of stainless steel strands twisted to form a high strength rope laid wire is fitted with two ferrules and an insulated UV resistant thermoplastic thimble. The thimble has a minimum insulating value of 11kV. The bail wire is attached to the collar and held by the two ferrules. Used for Full Termination of single strand 2.63mm bare catenary wire when replacing existing terminations
Barrel Clamp Multi Strand Bare Wire 7 x 1.6mm (BWC 47)	Item Code (016974) The clamp body is made from high strength aluminium alloy and contains spring loaded jaws. It is cone shaped and is stamped with the number 47. The cone fits into an aluminium collar. The clamp body and collar is 104mm by 55mm.

	A bail wire (260 mm x 4 mm ) made of stainless steel strands twisted to form a high strength rope laid wire is fitted with two ferrules and an insulated UV resistant thermoplastic thimble. The thimble has a minimum insulating value of 11kV. The bail wire is attached to the collar and held by the two ferrules.
Barrel Clamp Terminating Stay Wire (SWC 63)	Item Code (016980) The clamp body is made from high strength aluminium alloy and contains spring loaded jaws. It is cone shaped and is stamped with the number 63. The cone fits into an aluminium collar. The clamp body and collar is 104mm by 55mm. A bail wire 5.3mm x 160mm is made of a single strand stainless steel wire. The bail wire is attached to the collar and held by two ferrule shapes formed on the ends of the single strand wire. For terminating stay wire to Universal Pole Bracket (UPB)
Bolt Expansion 1A	Item Code (071906) A fixing consisting of a zinc plated expanding bolt with a 3/8 <sup>th</sup> UNC thread.
Bolt Expanding 2A	Item Code (021689) A 16mm x 90mm bolt with a 30mm dia washer. It requires a 16mm hole to be drilled into the walling
Bolt Hex Head 16mm x 300mm	Item Code (016977) A galvanised steel hexagonal headed bolt which is 300mm long and is fitted with two galvanised steel washers and one nut. For attaching UPBs to wood poles.
Bolt Hex Head 16mm x 350mm	Item Code (016978) A galvanised steel hexagonal headed bolt which is 350mm long and is fitted with two galvanised steel washers and one nut. For attaching UPBs to wood poles.
Cable PET Aerial (polyethylene twin)	Item Code (Various) A Self Supporting Cable with a figure of eight construction. The core is made up of solid polyethylene insulated copper conductors and filled with Jelly. The suspension wire is made of galvanised steel. Used in the Access Network. See table at Section 3.7 for further details.
Cable PEQ Aerial (polyethylene quad)	Item Code (Various) A Self Supporting Cable with a figure of eight construction. The core is made up of cellular polyethylene insulated copper conductors arranged in Quad formations. The suspension wire is made of galvanised steel. Used in the Core Network. See table at Section 3.7 for further details.
Cable PEUT TS FF Aerial (polyethylene unit twin transverse screen fully filled)	Item Code (Various) Self Supporting Cable with a figure of eight construction. The core is made up of cellular polyethylene insulated copper conductors and filled with jelly. In addition, a longitudinal transverse screen is provided in the Cable. The suspension wire is made of galvanised steel. Used in the Core Network. See table Section 3.7 for further details.
Cable Optical Fibre 26 (COF 26)	Item Code (Various) Self Supporting Cable with a figure of eight construction. The core is of loose tube construction containing 8, 16 or 24 Fibres plus 2 pairs, or a quad, of insulated copper conductors. A protective layer of corrugated steel tape surrounds the Cable core elements. Used in the Access and Core Network. See table section 3.7 for further details. COF26 is suitable for installations crossing below 11kV power lines.

Cable Optical Fibre 204 (COF 204)	This non-pressurised cable is designed for external overhead (OH) use. It is available with 12, 24 and 48 singlemode fibres. The cable is of a 'figure of 8' cross section. One segment of the cable contains a suspension wire assembly; the other segment contains a number of elements which are formed around a central strength member. These elements include one or more tubes - each tube contains 12 colour coded optical fibres and Petroleum Jelly type filling compound, and where required, dummy tube elements. All of the cable elements are wrapped with a water swellable tape. The suspension wire assembly make-up is 7 x 1.0mm galvanized steel wire strand. COF204 is suitable for installations crossing below 11kV power lines.
Cable Optical Fibre 209 (COF 209)	This cable is designed for OH (Overhead) use. It is of figure 8 construction. One lobe contains a solid 2.65mm steel wire suspension member; the other lobe contains 8 element tubes. Each element tube contains 12 fibres and Petroleum Jelly (PJ) type water blocking filling compound. Water swellable materials are also included in this lobe of the cable. The cable has a black polyethylene sheath. Major axis of the cable is 16.3mm (nominal). Minor axis of the cable is 9.9mm (nominal). Cable weight is 140 kg/km. The minimum bend radius of the minor axis is 135mm. COF209 is suitable for installations crossing below 11kV power lines.
Capping Steel 1	Item Code (070320) A galvanised steel channel section 2400mm long x 76mm wide. Used on wooden poles for protected cable space up to 19 mm in diameter.
Capping Steel 4	Item Code (070323) A galvanised steel channel section 2400mm long x 54mm wide. Used on wooden poles for protected cable space up to 51 mm in diameter.
Capping Steel 5	Item Code (070324) A galvanised steel channel section 2400mm long x 80mm wide. Used on wooden poles for protected cable space up to 76 mm in diameter.
Capping Steel 8	Item Code (016272) A galvanised steel channel section 610mm long x 100mm wide. Used on wooden poles for protected cable space up to 89 mm in diameter.
Capping 22	Item Code (070316) Black PVC channel section 2440mm long x 51mm wide. Used on walls and wooden poles for protected cable space up to 19mm in diameter.
Capping 23	Item Code (070317) Black PVC channel section 380mm long x 51mm wide. Used on wooden poles for protected cable space up to 19mm in diameter.
Capping 26	Item Code (072903) Black PVC channel section 2440mm long x 111mm wide. Used on poles and walls for protected cable space up to 42 mm.
Clamp Aerial Cable 1	Item Code (016316) Multi stranded "U" shaped clamp formed by laying 6 galvanised high tensile steel wires, each 2.64mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 850mm.



Clamp Aerial Cable 2	Item Code (073194) Multi stranded "U" shaped clamp formed by laying 6 galvanised high tensile steel wires, each 2.64mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 914mm.
Clamp Aerial Cable 3	Item Code (073195) Multi stranded "U" shaped clamp formed by laying 6 galvanised high tensile steel wires, each 2.95mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 1168mm.
Clamp Aerial Cable 4	Item Code (073196) Multi stranded "U" shaped clamp formed by laying 7 galvanised high tensile steel wires, each 2.95mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 1200mm.
Clamp Aerial Cable 5	Item Code (073197) Multi stranded "U" shaped clamp formed by laying 7 galvanised high tensile steel wires, each 3.25mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 1345mm.
Clamp Aerial Cable 6	Item Code (073198) Multi stranded "U" shaped clamp formed by laying 10 galvanised high tensile steel wires, each 3.25mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 1500mm.
Clamp Aerial Cable 7	Item Code (073199) Multi stranded "U" shaped clamp formed by laying 12 galvanised high tensile steel wires, each 3.25mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 1732mm.
Clamps Aerial Cable 1 to 7	See Table in Section 3.7 for application of this range of products.
Clips banding Stainless Steel	Item Code (013603) Stainless steel buckle 43mm x 28mm. One side has two bendable lugs. The buckle has a slot with serrated teeth. For securing Banding Stainless Steel to form a complete loop. Two loops are required to secure a UPB to a pole.
Collar Hollow Pole 1	Item Code (016317) Galvanised steel band with welded rings. For use on Glass Reinforced Plastic Poles only. Fitted before the pole is erected. It will accommodate a pole stay and Lightweight Aerial Cable. Obsolete item superseded by UPB & steel banding
Collar Hollow Pole 2	Item Code (016318) Galvanised steel hinged band with welded rings. For use on all types Hollow Poles, before and after erection. The collar is fitted 50mm below the cap with the hinge uppermost. Obsolete item superseded by UPB & steel banding
Connector Bend	Galvanised steel curved capping. Used for inter-connecting ducts to Capping Steel.
Earthing & Bonding Clamp (EC13)	Item Code (016979) The body is made of two pieces of non-corrosive Zinc Alloy with two formed cutaways. It is capable of being installed on all insulated and non-insulated wires from 3mm to 13mm. This clamp is used to attach an earthing wire to the Catenary wire of a figure of 8 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.
Filler Rod 1	Item Code (055661) Black Polyethylene flexible rod 7.6mm in diameter x 650mm long. Used with Optical Fibre Aerial Cables, where the Pull-on-Pole is greater than 9 metres or when more than one Clamp Aerial Cable is used at the pole.
Grips Insulator Pole	Item Code (016234) Multi stranded "U" shaped clamp formed by laying 6 galvanised high tensile steel wires, each 2.00mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Approximate length 430mm. Supplied with 2 "O" clips 9-11 mm diameter. Used for attaching an Insulator Stay 2 to the suspension wire of the cable.
Grips Wire Suspension 1	Item Code (016444) Straight grip formed by laying 5 galvanised high tensile steel wires, each 1.25mm diameter, in a spiral wrap formation, with an internal coating of aluminium oxide. Centre mark only, BLACK. Approximate length 430mm. Supplied with 1 "O" clip 5-7mm diameter. Used for a full termination of Lightweight Aerial Cable except at Power Crossings. Also used to extend Catenary wires.
Grips Wire Suspension 2	Item Code (016227) Straight grip formed by laying 5 galvanised high tensile steel wires, each 3.93mm diameter, in a spiral wrap formation, with an internal coating of aluminium oxide. Strand end marker and cross over mark both RED. Approximate length 940mm. Supplied with 1 "O" clip 9-11mm diameter. Used for a full termination of Heavyweight Aerial Cables except at Power Crossings. Also used to extend Catenary wires.
Grips wire suspension 3	Item Code (016231) Multi stranded "U" shaped grip formed by laying 3 galvanised high tensile steel wires, each 1.82mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Cross over marks in BLACK. Approximate length 406mm. Used for terminating Lightweight Aerial Cables on the span side of Insulator Stay 2 at Power Crossings.
Grips wire suspension 4	Item Code (016232) Multi stranded "U" shaped grip formed by laying 3 galvanised high tensile steel wires, each 2.03mm diameter in a spiral wrap formation, with an internal coating of aluminium oxide. Cross over marks in RED. Approximate length 515mm. Used for terminating Heavyweight Aerial Cables on the span side of Insulator Stay 2 at Power Crossings.
Hook Aerial Cable 1	Item Code (016240) - "D" section steel bar coated with nylon and formed into a "J" shape. Used to support an Aerial Cable on Joint User Poles.
Hook Aerial Cable 1A	Item Code (016990) - This hook is used in place of the Hook A/C 1 where a Heavyweight Aerial Cable (ie over 30/0.5) is supported using an Aerial Cable Relief Clamp (Telenco ARC).
In Line Barrel Clamp Single Strand 2.5mm (ILC25)	Item Code (016975) – OBSOLETE. The body is manufactured of high strength aluminium alloy and is conical shaped with a taper from the centre to the two ends. The conical body contains two sets steel sprung

	loaded jaws set at both ends of the central position. The cone is marked with the size, 25, for single strand 2.63mm. ILC25 is used for extending bare steel catenary wire for single strand 2.63mm
In Line Barrel Clamp Multi Strand 4.7mm (ILC47)	Item Code (016989) – OBSOLETE. The body is manufactured of high strength aluminium alloy. The body is conical shaped with a taper from the centre to the two ends. The conical body contains two sets steel sprung loaded jaws set at both ends of the central position. The cone is marked with the size, 47, for 7 strands of 1.6mm. Used for extending bare steel catenary wire for 7 strand 1.6mm.
Insulator Stay 2	Item Code (012501) Made of Vitreous Porcelain, colour, brown, size 114mm long x 75mm wide. Used for insulating pole stays in the proximity of power lines.
Nail Bonding	Item Code (072034) Galvanised steel round headed nail approximately 38mm long. Used in conjunction with Washer Galvanised 19 for securing Aluminium Strip and Cappings to poles.
Plate Wall 4	Item Code (013751) Galvanised steel flat bar 40cm long x 51mm wide x 9.52mm thick with a welded loop at one end and 4 fixing holes. Fitted with a galvanised steel thimble. Use with Bolt Expansion 2a. Used to attach Heavyweight Aerial Cable to brick buildings. The Plate Wall 4 is attached to brick using Bolts Expanding 2A.
Plate Wall 5	OBSOLETE - Replaced by Plate Wall 5A. Galvanised steel flat plate 114 mm x 100mm with 4 fixing holes. Fitted with a welded loop and a galvanised steel thimble. Used to attach Lightweight Aerial Cable to brick buildings. The Plate Wall 5 is attached to brick using Stud Expanding 1A.
Plate Wall 5A	Item Code (018388) Galvanised steel flat plate 114 mm x 100mm with 2 fixing holes. Fitted with a welded loop and a galvanised steel thimble. Used to attach Lightweight Aerial Cable to brick, render/pebble dashed buildings. The Plate Wall 5A is attached to brick using Stud Expanding 2A.
Strip Aluminium	Item Code (Various) Strip Aluminium 16 x 80mm, 16 x 120mm and 16 x 160mm. Used for securing Aerial Cables to poles.
Stud Expanding 1A	Item code (016303) Used for attaching Plate Wall 5 to brick. Designed for use in an 8mm hole.
Staple Galvanised 45mm	Item Code (016270) Galvanised steel staple, "U" shaped approximately 45mm wide. Used to retain single strand suspension wire to poles when making a termination.
Staple Galvanised 65mm	Item Code (016271) Galvanised steel staple, "U" shaped approximately 65mm wide. Used to retain multi strand suspension wire and CAC's to poles when making a termination
Termination Clamp Aerial Cable Lightweight (AC 7-200)	Item Code (016962) The AC 7-200 has four main components. They are:- 1. A high strength aluminium alloy body approx 64mm x 66mm x 30mm with a machined slot. 2. Two sliding toothed wedges which are fitted into the main body. The

	<p>size of the wedges is approx 40mm x 12.5mm. They are retained by a plastic clip.</p> <p>3. One multi stranded stainless steel bail wire with a loop length of 200mm.</p> <p>4. One insulated UV resistant thermoplastic thimble giving insulation up to and including 11 kV.</p> <p>Used for Full Termination of light weight Aerial Cable with a single strand of 2.63mm.</p>
Termination Clamp Aerial Cable Heavyweight (AC 10-320)	<p>Item Code (016970) The AC 10-320 has four main components. They are:-</p> <p>1. A high strength aluminium alloy body approx 80mm x 72mm x 42mm with a machined slot.</p> <p>2. Two sliding toothed wedges which are fitted into the main body. The sizes of the wedges are approx 50mm x 14mm. They are retained by a plastic clip.</p> <p>3. One multi stranded stainless steel bail wire with a loop length of 200mm.</p> <p>4. One insulated UV resistant thermoplastic thimble giving insulation up to and including 11 kV.</p> <p>Used for Full Termination of heavy weight Aerial Cable with a 7 strands of 1.63mm.</p>
Tool Fixing Stainless Steel Banding	<p>Item Code (013608) The tool has two slots .One has a clamp operated by a locking handle. This clamp has a threaded shaft which passes through a U shaped cast frame and has a double handle. The second slot has a handle attached. When the banding is tensioned to its limit the banding can be cut by moving the handle.</p> <p>Tool used for tensioning stainless steel banding prior to the banding being secured in the Clip Banding Stainless Steel.</p>
Universal Pole Bracket (UPB)	<p>Item Code (016988) The UPB is made from a high strength corrosion resistant aluminium alloy. Its dimensions are 120mm x 114mm x 46 mm. It has two upper apertures, each suitable for three dropwires. Two central apertures each suitable for either, one Aerial Cable or dropwire One lower aperture suitable for either dropwires, Aerial Cable or stay wires. See drawing in appendix 1</p> <p>Two recesses are provided on the bracket to facilitate use of stainless steel banding to attach the bracket to wood or to all types of hollow poles.</p> <p>Used to secure and support AC 7-200, AC10-320, BWC 25, BWC47 and SWC 63 clamps and dropwire clamps.</p>
Washers Galvanised 16	<p>Item Code (016161) Galvanised steel tubular washer 65mm long and 27mm dia, can be used with Bolts Hex Head to secure UPB's to poles where the bolt is too long.</p>
Washers Galvanised 17	<p>Item Code (016162) Galvanised steel tubular washer 20mm long and 27mm dia, can be used with Bolts Hex Head to secure UPB's to poles where the bolt is too long.</p>
Washers Galvanised 18	<p>Item Code (016163) Galvanised steel tubular washer 40mm long and</p>

	27mm dia, can be used with Bolts Hex Head to secure UPB's to poles where the bolt is too long.
Washers Galvanised 19	Item Code (073202) also (046706) Galvanised steel flat washer 16swg with a hole approximately 6.5mm in the centre. Used in conjunction with Nail Bonding and Lead Strip to secure cables to poles.
Wire Lashing 2A	Item Code (058856) Single Strand galvanised steel wire with PVC covering. Used for binding in Aerial Cable on Hooks Aerial Cable 1 and to retain Aerial Cable to Clamps Aerial Cable.
Wire Steel 7/1.6mm	Item Code (054853) Seven strand galvanised steel wire, each strand 1.6mm in diameter. Used for suspending Aerial Cables between buildings up to 6 metres apart.
Wire Steel 7/2.0mm	Item Code (054852) Seven strand galvanised steel wire, each strand 2.0mm in diameter. Used to make full terminations on Joint User Poles when an Insulator Stay 2 is fitted. Also used for pole stays.

## 2.2 Terms

Item	Description
Aerial Cable Lightweight	A Cable containing a single strand suspension wire
Aerial Cable Heavyweight	A Cable containing a multi-strand suspension wire
Anti Galloping Twists	Twists applied to the Cable during installation to prevent galloping of the cable in certain wind conditions.
BT	Block Terminal
C.A.C	Clamp Aerial Cable
Full Termination	A Full Termination is where all the cable restraint is provided only by the Suspension Wire.
Pull on Pole	The Pull-on-Pole provides a means of representing the out of balance forces resulting on the pole from a change in the direction of the cable route.
SA	Specification Authority (Openreach Network Capability & Development)
Stay	Current method of providing Pole / Route stability.

# 3 Requirements

The work executioner shall comply with the following requirements:

## 3.1 General

- Only items approved by the SA shall be used when constructing the Openreach overhead network (see section 3).

- Telenco is the preferred fixing method for Full Termination of Aerial Cable. The only exception to this rule is where its implementation is still subject to commercial negotiation between the Supplier and Openreach.

### **3.1.1 Further requirements**

- For intermediate Poles, Clamps Aerial Cable remains the preferred method of attachment. Telenco products should only be used in the following circumstances:-
- Where Cable are running in parallel,
- Where a Hook Aerial Cable has been upgraded with a Telenco Aerial Cable relief clamp (ARC)
- Pole Renewal situations where the cable needs to be extended Telenco Products may only be used by Suppliers who have formally agreed to their use with Openreach.
- The Works Executioner must be suitably accredited for the product used
- Telenco or Traditional.
- There shall be no damage to the Cables Sheath, Pairs or Fibres.
- There shall be no damage to the Cable Suspension/Support wires.
- There shall be no in-span joints.
- Un-terminated ends of Aerial Cables shall be sealed to prevent the ingress of moisture.
- All existing Cables & Joints shall be protected from damage during installation of any new Aerial Cables
- Fragile cables are clearly marked. As such, Fibre Optic, Coax and other cables so marked Must Not be moved unless indicated in the Works Instruction or agreed with the Openreach representative and should be treated with care.
- Sufficient Cable should be left for Testing / Jointing
- Any Aerial Cable lead in should be routed & cleated neatly. And cappings fitted where required.
- Any Cable entry through wall should be agreed with Building owner
- Where a Block Terminal is worked on as part of the cabling operation then:
- All Non-IDC blocks should be cleaned and external blocks sprayed with Spray De-Watering 1A.
- Dropwire connections should be dry and free from corrosion.
- On a BT41 the lid should be replaced with a slide-on type.

- All BT lids should be securely fastened to the Box Connection.
- BT 71 should be covered with the correct plastic bag.
- BT's and Box Connections should be fitted with the appropriate mounting.
- The BT or Box Connection should be sited in the correct position so that it is not obstructed by the pole ring, steps or cables.
- Plant Network Security Checks and Reporting procedures should be observed.

### 3.2 Minimum Bending Radii of copper Cables:

Copper cables shall not be subjected to a bending radius of less than 12 times the diameter of the cable.

*Note:* The diameter is taken as the sheathed section of the cable containing copper conductors. This does not include the sheathed section of the suspension wire.

### 3.3 Minimum Bending Radii of fibre Cables:

CABLE TYPE	MINIMUM BEND RADIUS
Cable Optical Fibre 26 (COF 26)	12x Cable diameter Minimum
Cable Optical Fibre 204 (COF 204)	180mm Minimum
Cable Optical Fibre 209 (COF 209)	135mm Minimum

*Note:* The diameter is taken as the sheathed section of the cable containing copper conductors. This does not include the sheathed section of the suspension wire.

### 3.4 Positioning of Cables on Poles

- When the pole has no fittings the first Aerial Cable should be placed 300 mm from the top of the pole.

- Second and subsequent cables in line of route should be spaced at 300 mm apart progressively down the pole. **The only exception to this is when using Telenco products (UPB's) where two cables can be erected on opposite sides of the pole, i.e the aerial cables run in parallel. (Tram lining).**
- If the pole has fittings which prevent the cable being attached at the correct position the first Aerial Cable should be placed approximately 150 mm below the fitting.
- When using Telenco Universal Pole Bracket (UPB), the attachment should be made wherever possible, using the pre drilled hole at the top of the pole. Where a Ring Pole Head or Hook Aerial Cable 1 is already occupying the hole, existing plant should, where possible, be transferred onto the UPB. If this is not possible, then provide a new hole at 90 degrees to the cable run, 300mm down from the existing hole and to accommodate UPB.

### 3.5 Full Terminations

A Full Termination is where all the cable restraint is provided by the suspension wire. See below for details of methods of full termination.

**Full Terminations must be made at:**

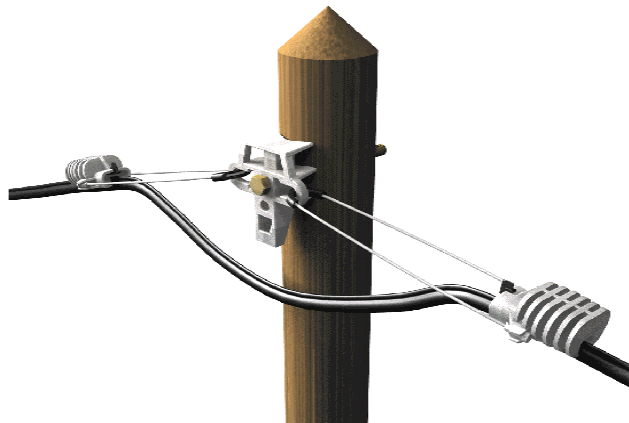
- Terminal Poles, ie beginning and end of routes.
- Road Crossing including entrances where there is clear legal use for vehicular access.
- Full terminations for field & gate openings (only needed where the pull on pole exceeds the limit for using a clamp aerial cable).
- Jointing positions
- Railway crossings
- Copper Cables where pull on pole is greater than 9 metres (see EPT/ANS/A014 for details of how to determine pull on pole).
- For Optical Fibre Cables with pull on pole greater than 9 metres use Clamps Aerial Cable as described in section 3.7.
- It is recommended that additional full terminations are provided wherever longitudinal staying or strutting has been provided for route stability. (See Route Stability Specification EPT/ANS/A014 for details)

### 3.6 Full Termination Options

- **Telenco is the preferred fixing method for Full Termination of Aerial Cable. The only exception to this rule is where its implementation is still subject to commercial negotiation between the Supplier and Openreach.**



### 3.6.1 Telenco AC7-200 & AC10-320



*Figure 1 - Full Termination using Telenco AC7-200 / AC10-320*

- AC7-200 should be used for Lightweight Aerial Cable, AC10-320 for Heavyweight.
- The AC7 or 10 should be fitted as shown in Figure 1 above
- A UPB is required which should be attached to the Pole using Bolt 16mm x 300mm or 16mm x 350 dependant on the diameter of the Pole. When terminating an end of route, the hole should be drilled in line 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.

**Note: See Appendix 1 for a picture and details of plant attachment positions on UPBs**

- 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.
- Exposed steel must be covered and protected with either a suitable length of Cable Abrasion Protector or Wire Lashing.
- For Lightning Protection, the use of an Earthing & Bonding Clamp may be required. See Glossary for further details.

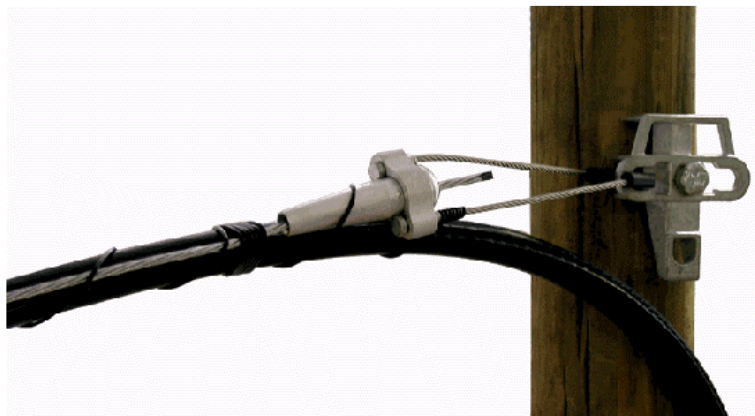
### 3.6.2 BWC - 25 & BWC - 47 Bare Wire Cable Clamp

The Telenco BWC 25 (Lightweight) & 47 (Heavyweight) is suitable for use with bare single or multi strand catenary wire.

BWCs 25 & 47 may be utilised in the following situations:

- As a Full Termination system when replacing existing terminations
- Where service points occur
- Where Pull on Pole is greater than 9m

- Full terminations for road crossings
- Full terminations for field & gate openings.
- 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. (Using the Universal Pole Bracket)
- BWC Installation
- The BWC should be installed as shown in Figure 2 below
- The exposed catenary wire should be cut within the confines of the bail wire and the end should be protected with a silicon protective cap. If this is not available, a Sleeve Dropwire 2A (item Code 016330) may be used held in place with silicon sealant.
- The cable must be 'bound in' and 'locked off'



*Figure 2: Full Termination using BCW 47 clamp on a bare multi strand catenary wire*

### **3.6.3 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 3 (Below) shows an example of the AC7-200 and a dropwire. This picture shows an example of the dropwire and the aerial cable on the ring.
- Figure 4 (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 3: Attachment to Ring using Telenco AC7-200*



*Figure 4: Attachment to Ring using Telenco BWC 25*

### 3.7 Attachment of UPBs using Banding Stainless Steel

Attachment to Poles (BT Wooden & Hollow poles, also Wooden & Steel Joint User poles) can be made using Telenco UPB's & Banding Stainless Steel, subject to the following.

#### 3.7.1 Pole Limitations:

- Hollow Poles - Lightweight Aerial Cable & Stays
- Wooden Poles - All Aerial Cables, dropwires & Stays
- Wooden & Steel Joint User Poles - All Aerial Cables and dropwires
- Dropwire numbers on JU poles limited to that in the licence agreement for that pole.

#### 3.7.2 Fixing Requirements

- Only SA approved Stores & Equipment may be used
- Operatives undertaking this work must be accredited in the use of Telenco products.
- Bandings shall pass through the Top & Bottom slots of the UPB (See Figure 5) below.
- The end of the banding shall pass through the buckle and be bent back and ears shall be bent over to lock the banding in place.
- 2 UPB's may be fitted back to back. In such cases the UPB's should be correctly aligned for the associated terminations.



*Figure 5: UPB attached to Pole via Banding Stainless Steel*

#### 3.7.3 Extending existing Aerial Cable Catenary Wires

The following engineering activities are permitted:

- Extension of Bare Steel Catenary Wire at Termination Points (Typically during Pole replacement where an extra length of wire is required to reach the new pole position, to avoid the need to replace a full cable length).

- Repair of Bare Steel Catenary Wire at Termination Points. (Where the existing termination has failed).

On In-line jointing of Bare Steel Catenary Wire for Inline Repairs. (Where damage has occurred through Tree rubs etc.)

The Catenary may be extended by either of the options shown below.

1) Telenco ILC 25 or 47: - Installed as shown in Figure 6 (Below).

*Note:* ILC's are now obsolescent, but existing stocks can still be used until exhausted.

2) Grip Wire Suspension 1 or 2: - This construction replaces the ILC 25/47. The layout is the same as with the ILC arrangement, but instead incorporates a Grip Wire Suspension (GWS) provided in lieu of the ILC to connect the butt ends of the catenary wires. See Figure 7 (below).

Key requirements:

- "O" Clips shall be provided approx. 20mm back from each butt end of the catenary wire
- Sheath and Catenary shall be bound in with wire lashing 1B (see figure 7)



*Figure 6: In Line Barrel Clamp Construction*



*Figure 7: GWS Construction*



### 3.7.4 Full Termination using Wire Wrap

This is an alternative to the Telenco Terminations shown above.

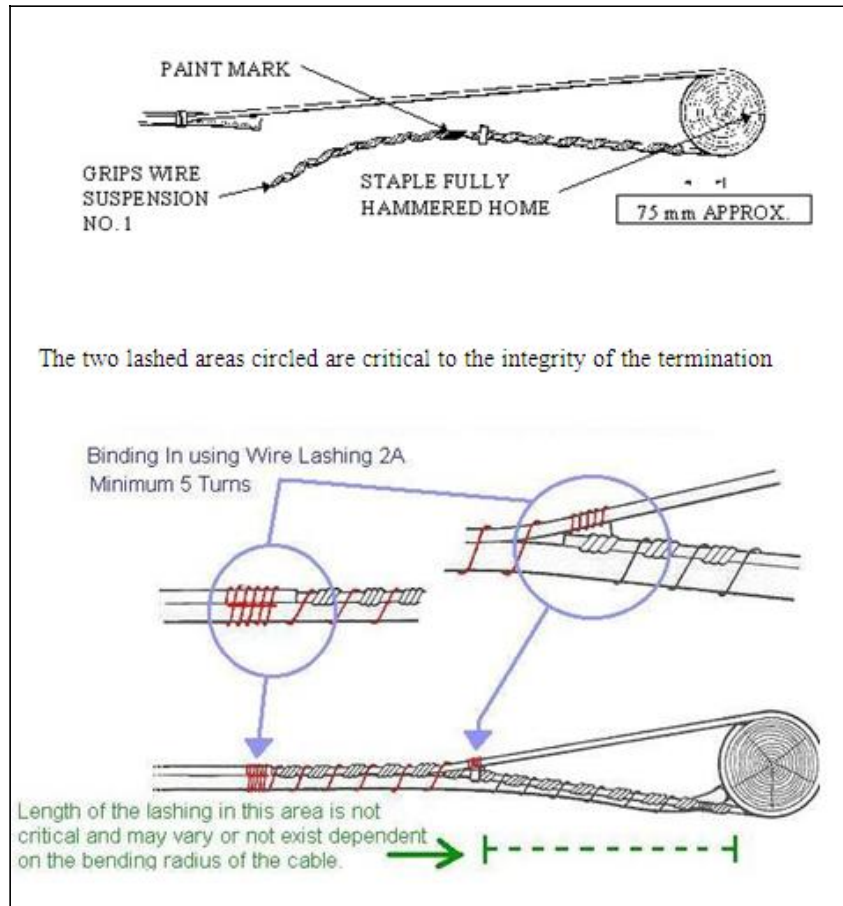


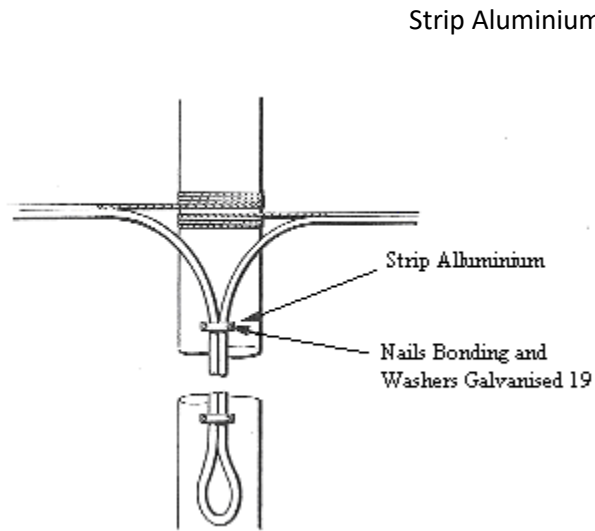
Figure 8: Full Termination using Wire Wrap.

- Grips Wire Suspension No 1 (GWS No 1) should be used for Fully Terminating Lightweight Aerial Cable and Grips Wire Suspension 2 for Heavyweight Cable.
- The minimum number of wraps around the pole on new work is three.
- The staple (45mm for Single strand / 65mm for Multi Strand) should be hammered home to prevent the suspension wire crossing over. Do not crush the suspension wire with the staple.
- The crossover paint mark should be aligned with the end of the suspension wire and the end of the grip should be approximately 75 mm from the line of pole centre.
- "O" Clip (supplied with the grip) should be fitted & Crimped over the end of the Grip Wire Suspension.
- Leave approximately 100 mm of suspension wire exposed between the Grip and the point where it enters the Sheath.

- The Cable should be bound to the grip using Lashing Wire 2A. The length of the binding should be such that it supports the cable and enables a suitable bend radius to be maintained.

### 3.7.5 Back to Back, In-line, Full Terminations

Where back to back in line Full Terminations are made the loop of cable created by the exposure of the suspension wire should be cleated to the pole - see figure 9 below.



*Figure 9 - Back to Back in Line Full Terminations*

- End of Route or jointing positions: At the end of routes a Full Termination should be performed.
- Back to Back Terminations can create too large a bend radius on the loop left to be attached to the pole. Consideration should be given to the loop size if using this method of termination. In such situations, Full Terminations may be provided.

### 3.7.6 Full Termination at Hollow Poles

- Full Termination is performed on Hollow Poles in the same manner as for wooden poles except that staples are **NOT** used.
- Older Type Hollow Poles (ie Stainless & GRP). No more than 1 Lightweight Aerial Cable may be attached. Heavyweight Cable must **NOT** be terminated to these Poles.
- Galvanised Hollow Poles are available in 'Light' and 'Medium' gauge with lengths of 9 & 10 Metres. The Loading capability for these Poles is the same as their wooden counterparts. Note: Rings are not an integral part of these poles therefore a Collar Hollow Pole or a Telenco Universal Pole Bracket should be fitted for the suspension wire to be looped through. See glossary for details of these products.

### 3.7.7 Orientation for Full Termination

The orientation of the collar should be as shown in figure 10 (below)

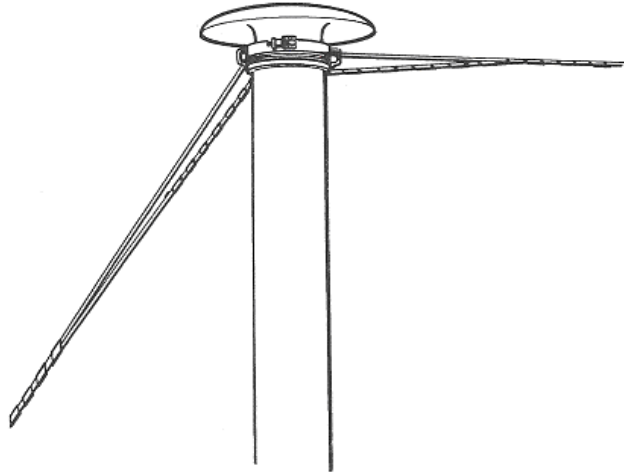


Figure 10

## 3.8 Terminations on Joint User Poles

Full Termination using the wire wrap method or, Termination using Clamps Aerial Cable (CAC) may be used if the following conditions apply:

- Power Cables are NOT running down the pole and:
  - a. All Power conductors are insulated.
  - b. Separation between the Power and Openreach plant is sufficient to prevent contact between the power conductors and the suspension wire or Clamps Aerial Cable when fitting. See ISIS EPT/PPS/B038 & B046 for power separation details.
- In situations where the Power Cable runs down the Pole, the only acceptable method of Full termination is using a Telenco UPB fixed using Banding Stainless Steel.

### 3.8.1 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.

### 3.8.2 Telenco AC7-200 & AC10-320 (Where Power Crossing Insulation is required)

- The AC7 or 10 should be fitted as shown in Figure 11 (below)
- To provide the necessary insulation, a 300mm (12") section of the catenary wire/steel should be removed from the cable (as Fig 11 below).



- If a large enough loop cannot be achieved on existing Aerial Cable, remove a 300mm (12") section of the catenary wire/steel then the Bare Wire Clamps BWC 25 and BWC47 should be used.

*Note:* 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.

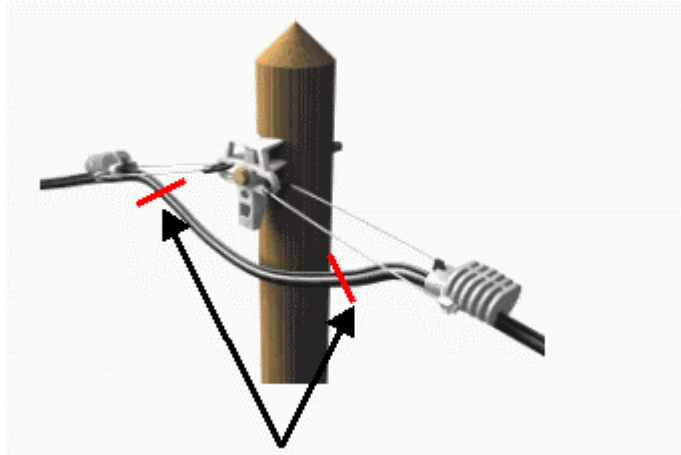


Figure 11 Telenco AC7 / AC10 in Power Crossing situation

### 3.8.3 Wire Wrap method of Termination (Where Power Crossing Insulation is required)

An Insulator Stay No 2 should be fitted into a Suspension Wire as shown in Figure 11 (below).

*Note:* This method may also be used on maintenance work where the suspension wire is too short to achieve a Full Termination.

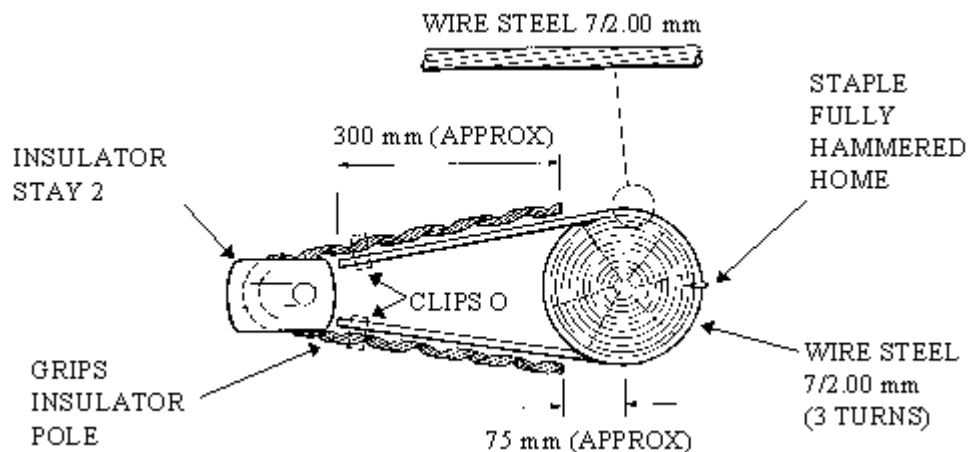


Figure 12: Insulator Stay No 2 Installation

- The Wire Steel 7/2.00 mm must be wrapped three times around the pole with all wraps passing through the staple (45mm for single strand / 65mm for multi strand).
- The Staple should be hammered home to prevent the Wire Steel from crossing over.  
Note: The suspension wire should not be crushed by the Staple.
- The end of the grip should finish approximately 75 mm from the line of pole centre.
- "O" clips should be fitted and crimped over the end of the Grip Wire Suspension.
- The Grips Wire Suspension should be attached to the Cable Suspension Wire and pass through the Insulator such that the Insulator is in compression, not 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 13

- The Cable should be bound to the grip using Lashing Wire 2A such that it supports the cable and enables a suitable bend radius to be maintained. See Figure 13 below.

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

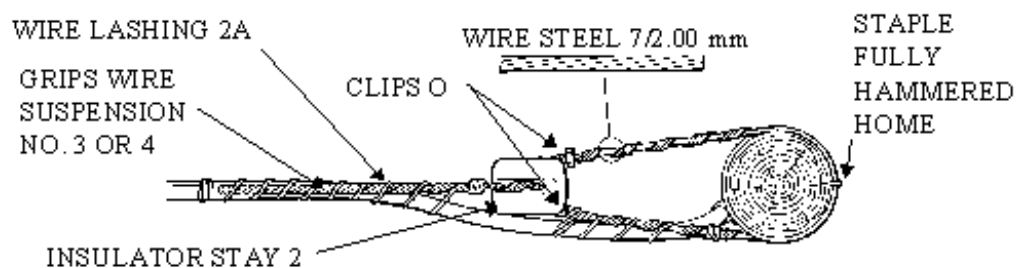


Figure 13: Aerial Cable Lashed to Grip following installation of Insulator Stay 2

### 3.8.4 Full Termination on Joint Use Poles by use of a Through Pole Eye Bolt

The 'wire wrapping' method detailed above may be rejected by some DNOs where their poles have electricity cables fed down the pole. An alternative method of may be considered if agreement for its use can be obtained from the DNO. This method is not recommended for general use on Openreach poles as it is more labour intensive than the wire wrapping method.

**Warning:** All safety requirements of ISIS EPT/PPS/BO46 must be met before commencement of work.

- Alternative Joint User Termination  
This type of Termination is dependant upon the relevant DNO either fitting or allowing Openreach or it's contractors to fit the eye bolt to their pole. Permission via the local Openreach Planning Department must be obtained prior to fitting of any Eye Bolt.

The correct distance from any power plant must be adhered to. (See ISIS EPT/PPS/BO38 & EPT/PPS/B046 for clearances)

- The eyebolt requires a 22mm hole through the centre of the pole at the relevant height and in line with the direction of the cable to be attached.
- A Washer, Square Curved, should be fitted, square side first, onto the shaft of the eyebolt. The threaded shaft of the eyebolt should feed through the hole and another Washer Square Curved, should be fitted, curved side first onto the shaft of the eyebolt together with the retaining nut (supplied with the eyebolt) and be fully tightened.

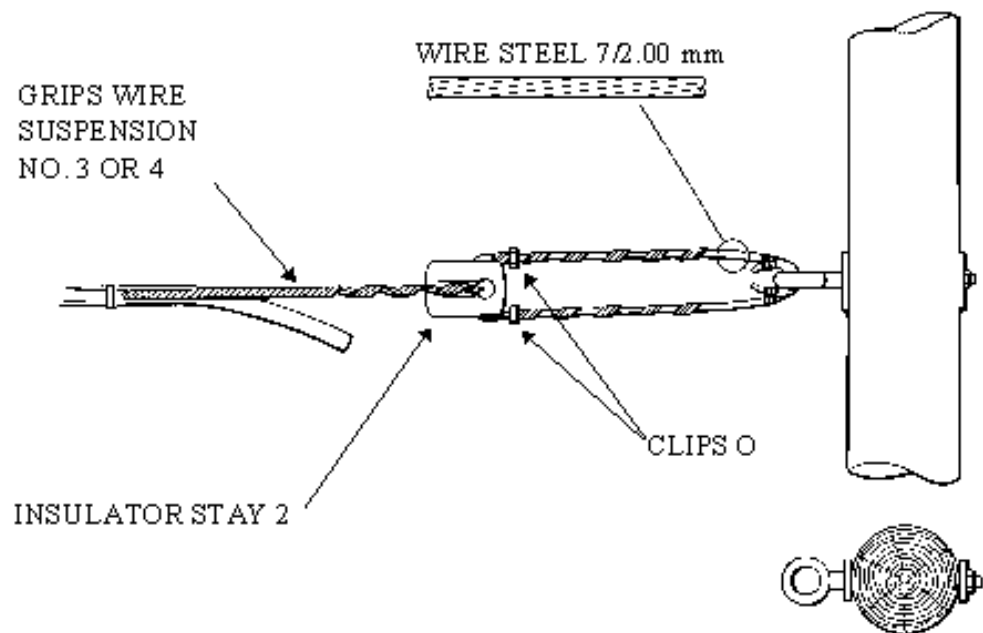


Figure 14: Full Termination on Joint Use Poles using through Pole Eye Bolt

- The Stay Thimble should be fitted to the eyebolt unless using a telenco clamp when the thimble is not used.
- A one metre length of Wire Steel 7/2.00 mm should be formed in a loop around the thimble as shown above. The Wire Steel 7/2.00 mm should be bound to the thimble by two short lengths of Wire Lashing 2.

The Grips Insulator Pole should feed through the Insulator Stay No. 2 such that the insulator is in compression - not in tension.

- "O" Ring (to be ordered separately) should be fitted and crimped 25 mm from the end of the grip.

### 3.9 Use of Clamps Aerial Cable (C.A.C)

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 Tables 1 & 2 (below).

PULL ON POLE in metres	METHOD OF ATTACHMENT
0 - 5	Single Clamps Aerial Cable
5 - 9	Two Clamps Aerial Cable
Greater than 9	Copper Cables Full Termination  Optical Fibre Cables - Two Clamps Aerial Cable with Filler Rod 1

Table 1: Pull on Pole / C.A.C Attachment requirements

Note: See ISIS EPT/ANS/A014 for details of how to determine pull on pole.

#### Aerial Cables & Associated Clamps

Aerial Cable			Approved Clamp	
Cable Type	Nom Dia	Suspension Wire	CAC	Colour Code
<b>PET Aerial</b>				
10/0.5	16.5 mm	1/2.65 mm	2*	Purple
20/0.5	19.0 mm	1/2.65 mm	2*	Purple
50/0.5	26.0 mm	7/1.60 mm	4	Blue
100/0.5	31.6 mm	7/1.60 mm	5	Green
5/0.6	17/5 mm	1/2.65 mm	2*	Purple
10/0.6	20.0 mm	1/2.65 mm	2*	Purple
20/0.6	25.5 mm	7/1.60 mm	4	Blue
50/0.6	33.5 mm	7/1.60 mm	6	Red
100/0.6	42.0 mm	7/1.60 mm	7	Black
<b>PEQ 6 Aerial</b>				
14/0.63	23.5 mm	7/1.6 mm	3	Yellow
28/0.63	27.0 mm	7/1.6 mm	4	Blue
60/0.63	31.0 mm	7/1.6 mm	5	Green
104/0.63	37.5 mm	7/1.6 mm	6	Red
14/0.9	27.5 mm	7/1.6 mm	4	Blue
28/0.9	32.0 mm	7/1.6 mm	6	Red
60/0.9	39.5 mm	7/1.6 mm	7	Black
104/0.9	46.8 mm	7/1.6 mm	7	Black
<b>PEUT TS FF Aerial</b>				

20/0.6	27.0 mm	7/1.6 mm	4	Blue
40/0.6	32.2 mm	7/1.6 mm	6	Red
80/0.6	39.0 mm	7/1.6 mm	7	Black
<b>Fibre Optic</b>				
COF 26	25.5 mm	7/1.6 mm	3	Yellow
COF 204	19.2 mm	7/1.0 mm	**	
COF 209	16.3 mm	1/ 2.65 mm	**	

Table 2: Aerial Cables &amp; Associated Clamps

Note: \*On Hollow Poles use CAC No1

Note: \*\* For COF 204 and COF 209 use Telenco clamps

Note: Clamps Aerial Cable do not constitute a Full Termination

### 3.9.1 Fitting of CAC's where Pull on Pole is less than 5 metres

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

Note: See Route Stability Specification EPT/ANS/A014 for details of how to determine pull on pole.

- Only one Clamp Aerial Cable should be used where pull on pole is less than 5. (See Table 1)
- The Clamp Aerial Cable should be positioned at the appropriate height on the Pole
- The two legs of the Clamp should cross the pole as shown in Figure 15 below
- The helix of the legs should be wrapped around the Cable such that all the available loops of the helix are occupied by the Cable.
- The Staples should be driven fully home.

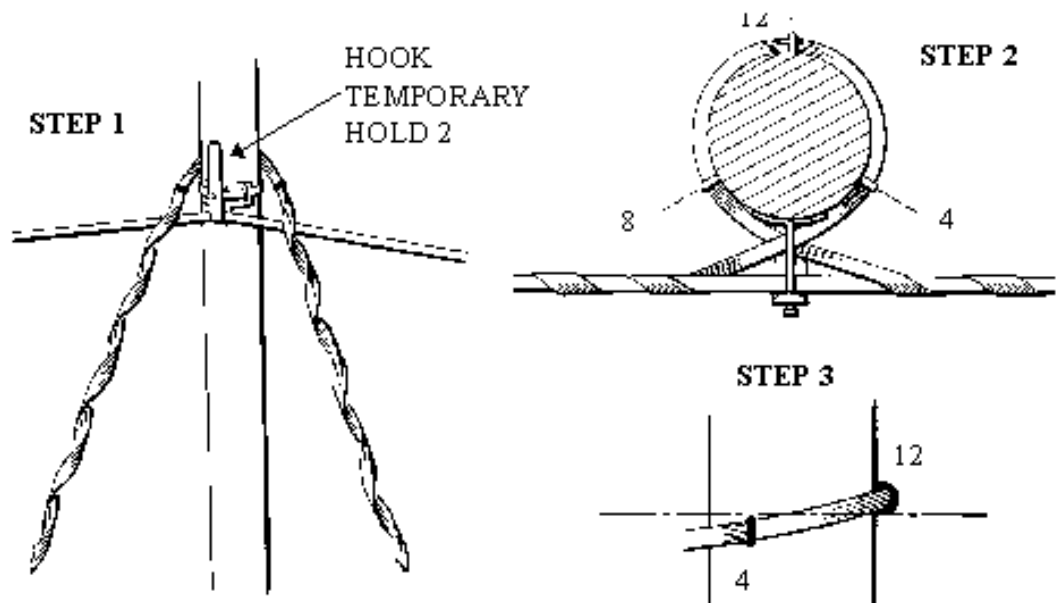


Figure 15: Installation of single Clamp Aerial Cable

### 3.9.2 Fitting of CAC's where Pull on Pole is between 5 and 9 metres

*Note:* See Route Stability Specification EPT/ANS/A014 for details of how to determine pull on pole.

Where the pull on pole is greater than 5 metres but less than 9 metres, 2 Clamps Aerial Cable should be used back to back, one clamp on each leg of the Aerial Cable (see figure 16 below). The requirements are 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.

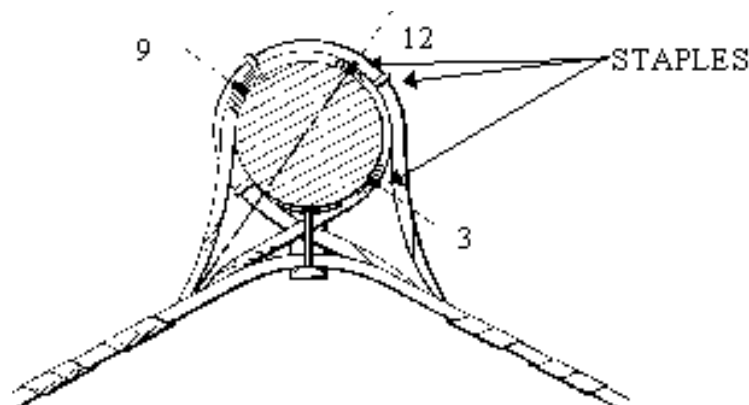


Figure 16: Back to Back installation of Clamps Aerial Cable

### 3.9.3 Termination Requirements where Pull on Pole is more Than 9m

- On Copper Cables, a Full Termination is required where pull on pole is greater than 9 metres.

- On Fibre Cables, where 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. (See Figure 17 below).

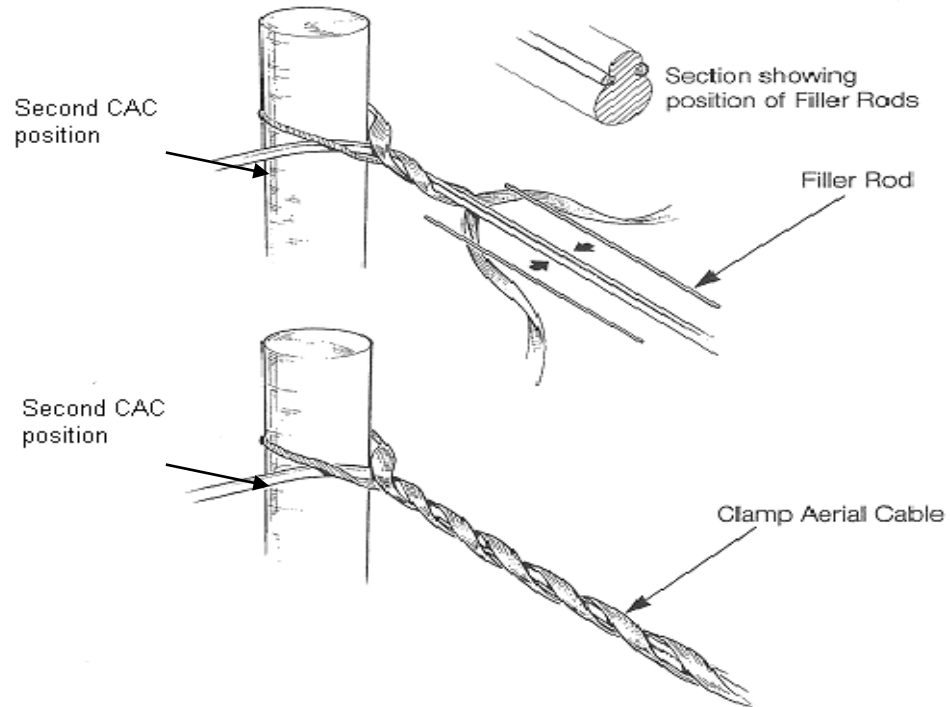


Figure 17: Installation of Clamp Aerial using Cable Filler Rod 1 for Optical Cables.

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

- COF204 – minimum bend radius = 180mm.
- COF26 – minimum bend radius = 12 times the diameter of the cable.
- COF 209 – the minimum bend radius of the minor axis of the cable is 135mm.

*Note:* See Route Stability Specification EPT/ANS/A014 for details of how to determine pull on pole.

*Note:* The diameter is taken as the sheathed section of the cable containing copper or fibre elements. This does not include the sheathed section of the suspension wire.

### 3.9.4 Aerial Cable Termination at Intermediate Hollow Poles

For Aerial Cable Termination at intermediate hollow poles the Clamp Aerial Cable is fitted as shown in Figure 18 below.

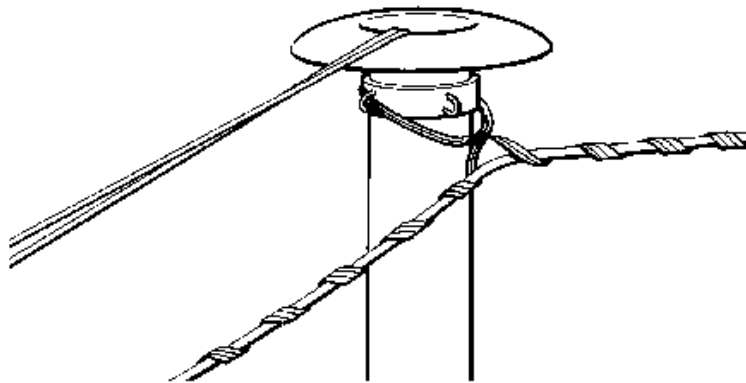


Figure 18: Installation of Clamp Aerial Cable on Hollow Pole

### 3.10 Joint User Poles Where Clamps Aerial Cable Cannot be used

- Where Clamps Aerial Cable can not be used at intermediate poles, use a Hook Aerial Cable 1 and bind the cable into position using Wire Lashing 2.

*Note:* For guidance on the use of Full Terminations and Clamps Aerial Cable on Joint Use Poles see section 3.6

*Note:* Hooks Aerial Cable 1 are used for permanent cable support at intermediate Joint User Poles and are commonly known as 'J' hooks.

#### 3.10.1 Fitting of Hook Aerial Cable 1

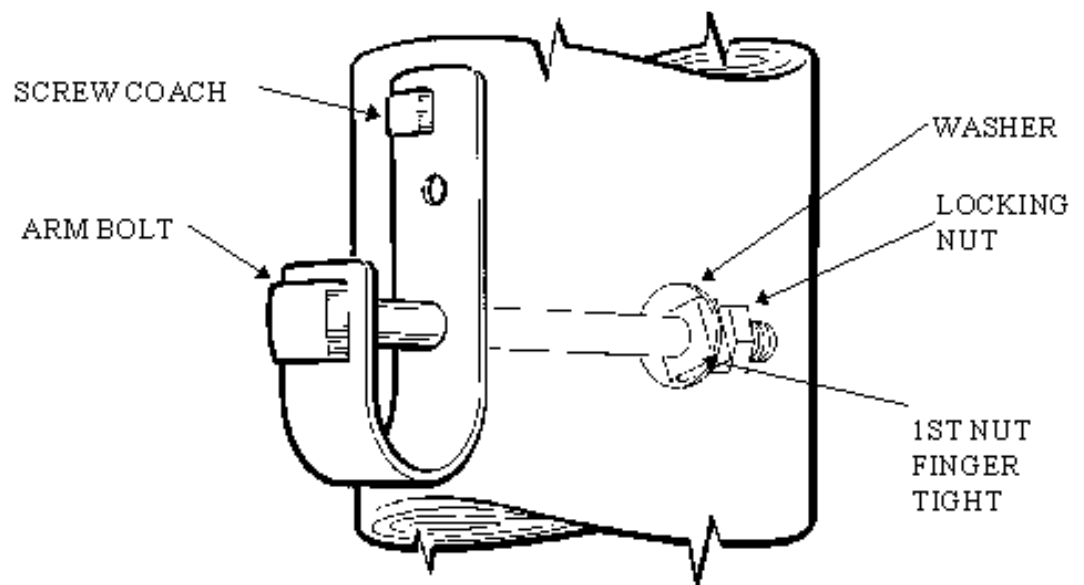




Figure 19: Installation of Hook Aerial Cable 1

- The hook requires a 19mm hole through the centre of the pole.
- The Bolt Arm should run through the hook and the pole and the first nut finger tight. The locknut should be tightened to secure the arm bolt.
- A Screw Coach should be driven through the top hole to secure the hook in its upright position.

### 3.10.2 Binding in Aerial Cable

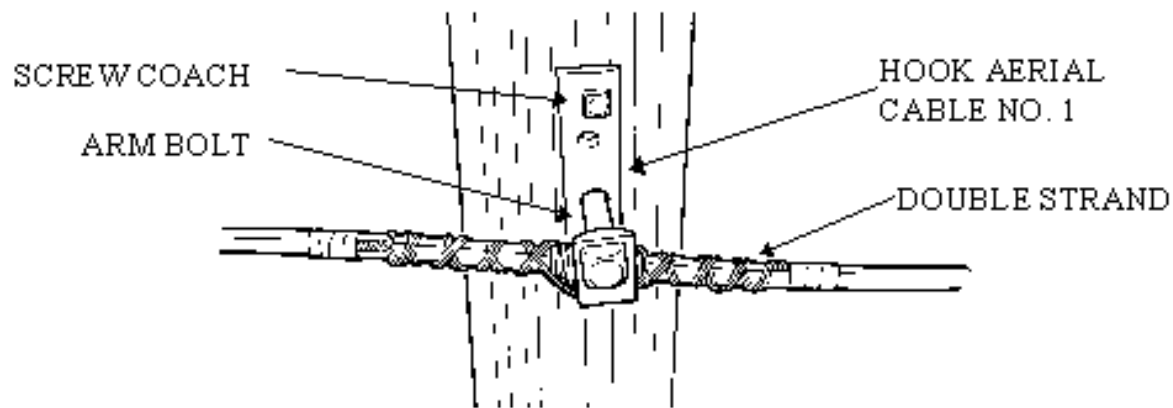


Figure 20: Binding Aerial Cable to Hook A/C 1.

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

### 3.10.3 Aerial Cable Relief Clamp (ARC)

This product may be used with Hook Aerial Cable to secure figure of 8 Aerial Cable to a Pole instead of binding in using Wire Lashing 2A. 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 that are bound in with Wire Lashing 2A.

- For Lightweight Aerial Cable use Hook Aerial Cable 1
- For Heavy Weight Aerial Cable use Hook Aerial Cable 1A

- The Aerial Cable Relief Clamp (ARC) is only for use at in-line intermediate Poles.
- The catenary wire section of the cable should be located in the jaws of the clamp.
- The two nuts of the clamp should be tightened to secure the cable.
- No binding in is required.

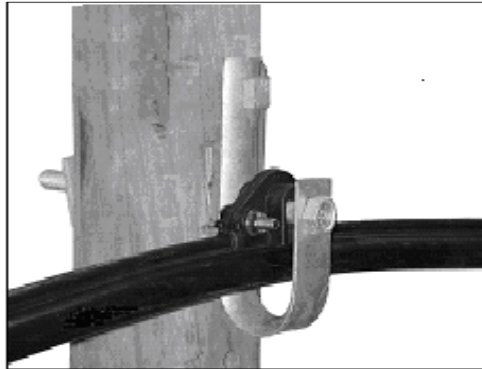


Figure 21: Installation of Aerial Cable Relief Clamp.

### 3.11 Pole Loading & Route Stability

- The maximum Pole loading capacities must not be exceeded.
- Stays shall be provided where required.

*Note:* See Route Stability Specification (EPT/ANS/A014) for full details on Pole Loading limitations and Staying Requirements.

#### 3.11.1 Introduction of two new Lightweight Aerial Cables

Two new 20/0.6mm and 50/0.5 copper Aerial Cables were introduced in 2010. These new cables incorporate a single strand 2.65mm catenary and are classed as Lightweight.

They have much lower pole loading characteristics and as such, offer significantly reduced route stability requirements and associated cost savings such as stays and knock-on civil engineering work. The new cables are also easier to handle and install.

#### 3.11.2 Item Codes for New Cables

- 50/0.5 Lightweight Aerial Cable - Item Code 056703
- 20/0.6 Lightweight Aerial Cable - Item Code 056702

All cables are printed with the relevant item codes along the sheathing, so as well as the general feel and view of the cable, it will be easy to identify and distinguish the Lightweight versions from Heavyweights.

Any orders for existing Heavyweight versions will continue to be met until stocks become exhausted. After this, eASC will auto-substitute such orders with the new Lightweight cables.

### 3.11.3 Revised Installation Practices - Tensioning

The previous installation practice for Lightweight Aerial Cables required them to be tensioned by hand. Only Heavyweight cables were tensioned using the Tensioner 2B.

To enable ease of installation, the Tensioner 2B can now be used on both of the new cables and also, all other cables in the Lightweight range. The decision on whether to use the Tensioner 2B or to tension by hand is made by the Engineer on site, based on the individual site circumstances.

*Note:* The Tensioner 2B may only be used at the pole top where a Platform Elevating is being used. Under no circumstances should it be used whilst personnel are actually on the pole. See EPT/OHP/B012 for further details on aerial cable installation practices.

When using the Tensioner 2B on Lightweight Aerial Cables, operational teams must ensure that excessive span tensions are not introduced which may exceed the pole top loadings. To check that span tension for Lightweight Aerial Cables is within limits, an onsite evaluation must be carried out by the operational team.

All other aspects of the installation practice, including site set-up, on-site Risk Assessment and general working practice remain the same; it is only the tensioning element that has altered.

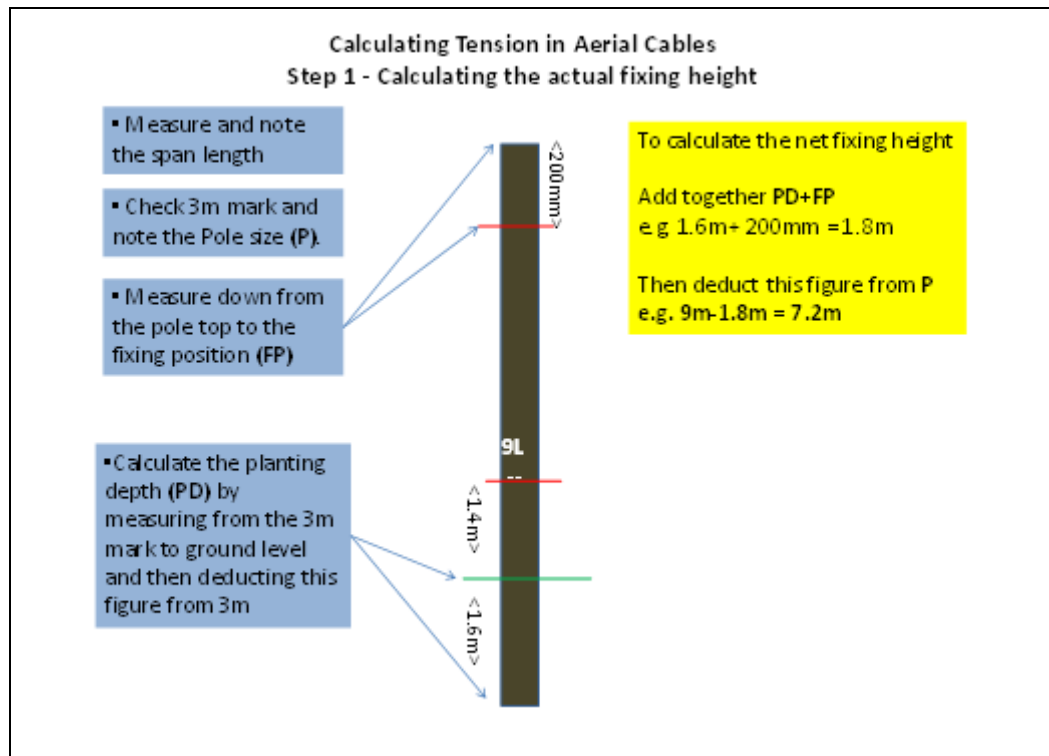
A straightforward four step process has been developed to enable the evaluation and MUST be followed in all cases where the Tensioner 2B is being used on Lightweight Aerial Cables.

The four stages are detailed below but can be summarised as follows.

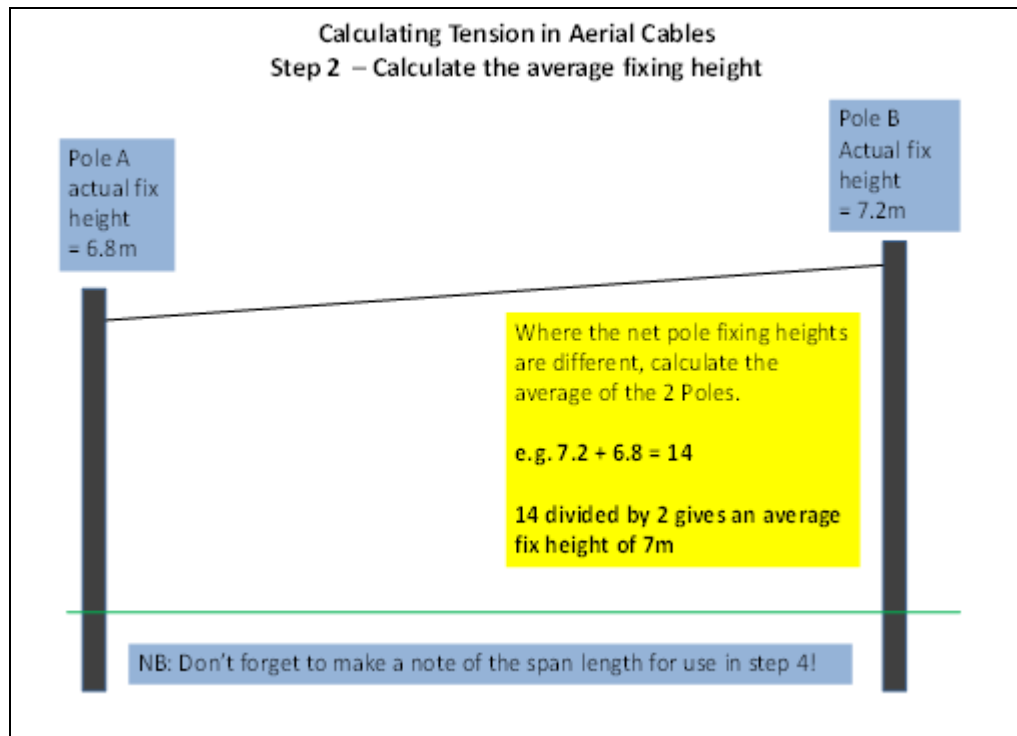
First, calculate the average fixing height of the cable, then deduct the actual span height from the fixing height to establish the "Span Dip". Then check this figure against the table which shows the MINIMUM span dip for cable types / span lengths.

Remember, the aim is to avoid over tensioning i.e. bar tight spans, so a dip is generally fine as long as wire height requirements are met.

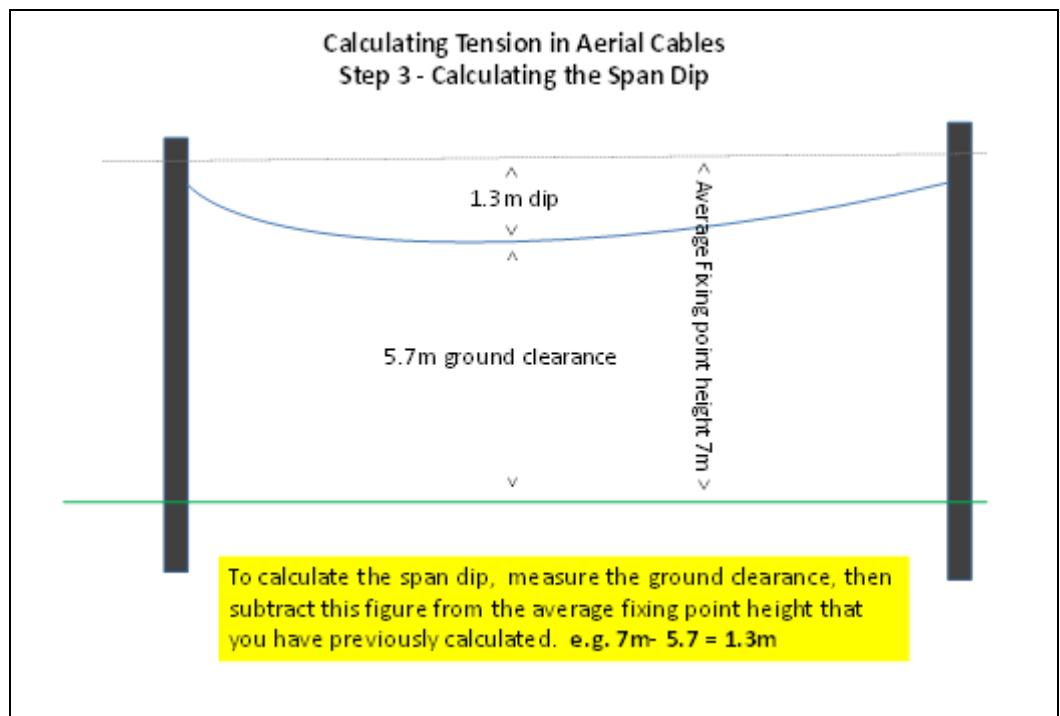
**Step 1** – Calculate the net fixing height on the pole/s:



**Step 2** – Calculate the average fixing height between poles:



**Step 3 – Calculate the amount of dip in the span:**



**Step 4** – Check the span dip against the MINIMUM required for your cable type and span length.

Calculating Tension in Aerial Cables Step 4 – Check Span dip against Cable Types / Span Lengths				
Minimum Permitted Dip For Aerial Cable Spans				
Cable Type		Span Lengths		
		61m to 68m	55m to 60m	Less than 55m
10/0.5, 10/0.6 & 20/0.5	A	1100mm	900mm	800mm
New 20/0.6	B	1500mm	1200mm	1000mm
New 50/0.5	C	1900mm	1500mm	1300mm

Assuming a 1.3m Span Dip has been calculated (as previous slide):

- Cable types in A can be installed at all span lengths, with a ground clearance of 5.7m and the tension will be not excessive
- Cable B can be installed with a ground clearance of 5.7m only up to 60m
- Cable C can be installed with 5.7m clearance, only up to a span length of 55m

Therefore, for Cable Types B&C, for spans longer than those above, taller poles will be required, unless a lower ground clearance is acceptable i.e. the route is not crossing a carriageway.

### 3.11.4 Termination on Poles

The new Lightweight Aerial Cables should be terminated using suitable Lightweight components i.e. Telenco AC7, BWC25 & ILC 25.

**Caution: DO NOT USE THE AC10**

When fitting an AC7 -200 clamp, ensure that that the teeth of the wedges are biting fully on the sheathing of the catenary wire. Once the teeth have bitten, gradually reduce the tension on the cable, making sure that the teeth are still penetrating the sheathing. When the Tensioner 2B has been removed, check and / or ensure the following:-

- That the tension in span is within limits (see section 3.1 above)
- That the cable meets the required wire height for site circumstances
- These cables and all other Lightweight Aerial Cables can be erected using the Tensioner 2B (subject to pole loading limits)
- Follow the steps in section 3.10.3 to ensure Lightweight Aerial Cable is erected within loading limits

- Use Telenco as the first preference for new Full Terminations. Never use an AC10! Continue to use a Clamp Aerial Cable as appropriate on intermediate route poles
- The Tensioner 2B should only be deployed at the pole top where a Platform Elevating is being used. Never use the Tensioner whilst standing on the pole!



Click [HERE](#)

- To view a slideshow detailing the span tension evaluation. A copy is also available from the Technical Documentation author. ([aei.doc.control@bt.com](mailto:aei.doc.control@bt.com))

## 3.12 Aerial Cable Tension

The maximum in line Load on any cable shall not exceed:

- Heavyweight Aerial Cable - 4 kN
- Lightweight Aerial Cable - Hand tension.

## 3.13 Aerial Cables to and between Buildings

- 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, ie a Full Termination should be made at each end.

### 3.13.1 Securing Lightweight Aerial Cable to Buildings

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 22).

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 2A's 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 22

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 Stud Expanding 1As 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.

### 3.13.2 Terminating Aerial Cable

#### 3.13.2.1 Construction 1: Using Telenco BWC 25

Normal installation practices apply to Telenco BWC 25

Important:



The metal 'thimble' must be left hanging downwards (See Figure 21)

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 23)



Figure 23: Bail wires fouling the eyebolt

### **3.13.2.2**

#### **Construction 2: Using Grip Wire Suspension 3**

Tension may be applied to the cable by hand, from the cage of a Platform Elevating or from the ground using one or two Pulley 5s as follows:

Pass a length of Line Sash 2 or 15 through the Pulley 5 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 pass the Grip Wire Suspension 3 round the bracket and wrap the legs of the around the exposed steel. Bind the cable to the Grip Wire Suspension using Wire Lashing 2A see Figure 23A

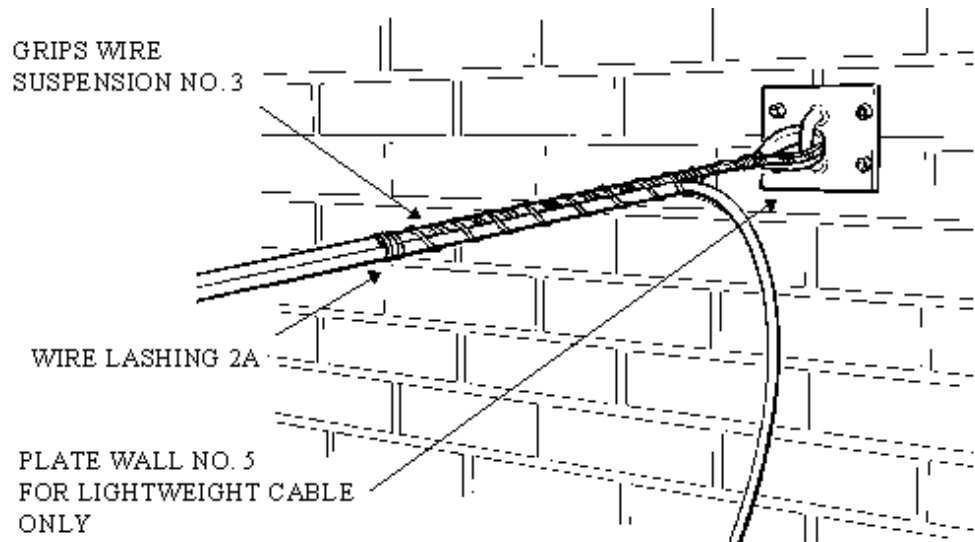


Figure 23A

### 3.13.3 Securing Heavyweight Aerial Cable to Buildings

Heavyweight Aerial Cable (7 strand suspension wire) may be secured to a brick or masonry structure including harled, rendered and pebble dashed, using a Plate Wall No 4. See Section 2 (Glossary) for Wall Plate fixing details



Figure 23B: Plate Wall 4.

#### 3.13.3.1 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 27
- AC7-200 or AC10-320 must not be used
- The metal 'thimble' must be left hanging downwards

### **3.14 Span Lengths**

The maximum span length for new Aerial Cable routes is 68 metres. Any span length exceeding 68m shall require authorisation from the Works Originator.

### **3.15 Anti Galloping Twists**

All Self Supporting Aerial Cables with 1/2.65 mm and 7/1.6 mm suspension strands should have approximately 1 Twist/ 7m in the span to prevent "Galloping" in the wind. These may be imposed on the cable by hand before tensioning.

### **3.16 Wire Clearances**

- All relevant clearances shall be maintained for the following:
- Carriageway - See EPT/ANS/A013 for details
- Power - See EPT/PPS/ B026, B037, B038 & B046
- Flying Wires - On Private Land, a Min distance of 3m above ground and 2m from Buildings is required. (This is a statutory requirement)
- 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.

### **3.17 Requirement for existing lashed cables**

This section gives guidance on dealing with existing 'lashed' cable. Although it is not erected from new nowadays, there are instances of 'lashed' aerial cable in the network. This is where either lead or poly cables are fixed to a steel catenary wire suspended between poles.

The existence of 'lashed' cable in itself is not an issue, and action should not be taken simply because such cable exists, or has been identified for the first time. Additionally, if there are existing joints on the cable, and the requirement is simply to access those joints, then provided they are current approved closures, they can be worked on.



Figure 24: An example of 'lashed' cable

### 3.17.1 Scope of responsibility

Asset Assurance (AAP) works are primarily intended to remedy the defect at hand i.e. the 'D' pole / low wire. They are not intended to provide global uplift to nearby plant.

The scope of responsibility for this type of work extends only to the pole being worked on, plus one span and terminations to poles either side. Plant beyond this point is outside of scope and should not be addressed (See Figure 25 below).

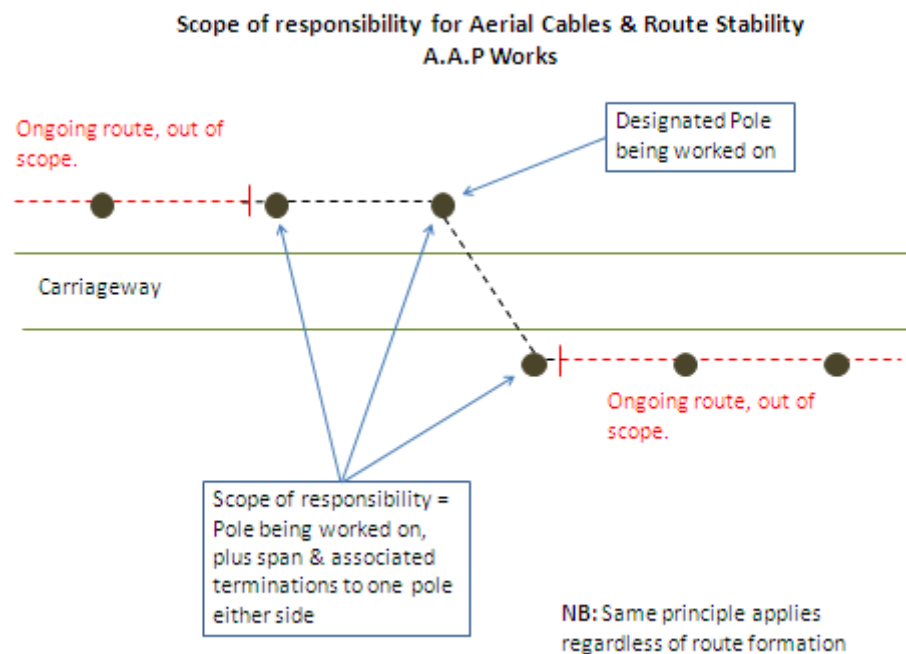


Figure 25: Scope of responsibility

### 3.17.2 Procedure

This procedure only needs to be followed if it is necessary to do certain works that require affected cable to be disconnected from the poles. This will generally be (but not limited to) pole renewals, either due to D poles in route, or low wires.

It is necessary to break the route up, into the following sections:-

- Sections where the cable is crossing either a carriageway, or railway
  - Other sections, where it is crossing fields, or following the edge of a road, fields etc.
- See Figure 26, below, for more detail:

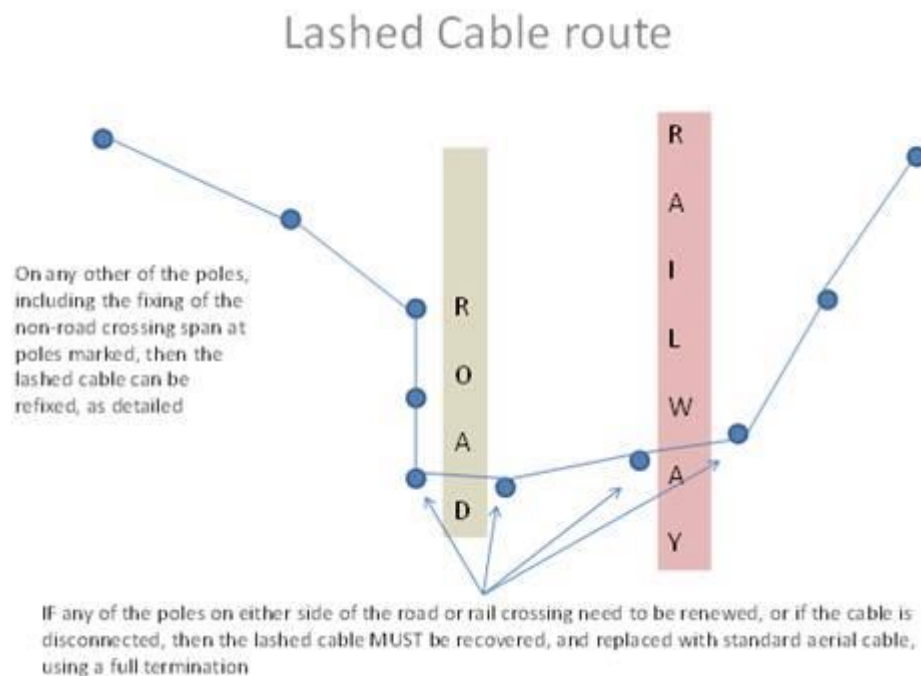


Figure 26: 'Lashed' cable route

### 3.17.3 For road crossings

There are two approved options for road crossing spans and either may be used.

The most appropriate solution may vary depending on site circumstances (i.e. location of existing joints). But in all cases, the option offering the most practical and cost effective engineering solution should be selected.

- Option 1 ~ Replace the existing catenary wire with new and then bind the existing cables to this using either wire lashing, or PCA (Tree Guard).
- Option 2 ~ Recover all 'lashed' lead or poly cable which crosses the road, and replace with a suitably sized length of standard Aerial Cable (ASSC). Terminate the new cable using Telenco UPBs (Universal Pole Brackets), and joint on the pole to old cables as necessary.

For the 'lashed' cable 'going away' from the road crossing poles, terminate this by providing a full wrap around termination with an insulator stay No.2, and a suitably sized Grips Wire Suspension and Grip Insulator Pole as detailed in ISIS EPT/OHP/B012

When providing this type of termination for lashed cables, one suitable sized full length of Protector Cable Abrasion (PCA) or 'Tree Guard' must also be provided. (see Figure 27)

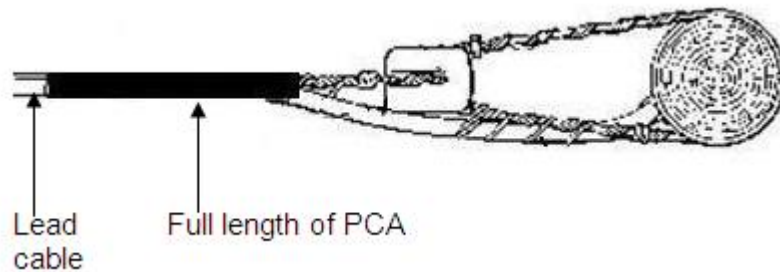


Figure 27 (Above)

#### 3.17.4 Bridging of the insulator

This method is only used to provide a full termination not an insulated termination due to the lead sheathed cable bridging the insulator.

Where an insulated termination is required, renew the relevant span with ASSC. In these cases, the length of cable renewed should be kept to the minimum.

#### 3.17.5 For non-road crossings / intermediate poles:

To support lashed cables at intermediate poles, the following methods can be used.

1. Provide a Hook Aerial cable 1 or 1A (J hook) depending on the size of the cable or if multiple cables exist as in Fig.1 and an Aerial Relief Clamp (ARC) clamping onto the catenary wire. (See EPT/OHP/B012 section 10.4.1) Either side of the termination; provide a full length of the correct size PCA (lashing wire not required) see Figure 28 below.
2. Alternatively and in cases where the 'Pull on Pole' exceeds nine metres, use full terminations as documented above



Figure 28 (Above)

### 3.17.6 For re-lashing cables to the catenary wire:

Where the binding wire or lashing wire is broken or coming adrift, then use a suitably sized length of PCA ensuring that any free ends of lashing wire are captured within the PCA. **See Figure 29** below.



Figure 29:

### 3.17.7 Corroded catenary wire - Non road crossing situations:

Where by exception, the catenary is corroded to such an extent that it cannot be captured; consideration may be given to replacing the affected span.

- Before undertaking this work, authorisation (DFE) must be obtained in advance from the AAPO.

## 4 ***Appendix 1 (use of the UPB)***

Cable Fixing Positions on a Universal Pole Bracket (UPB)

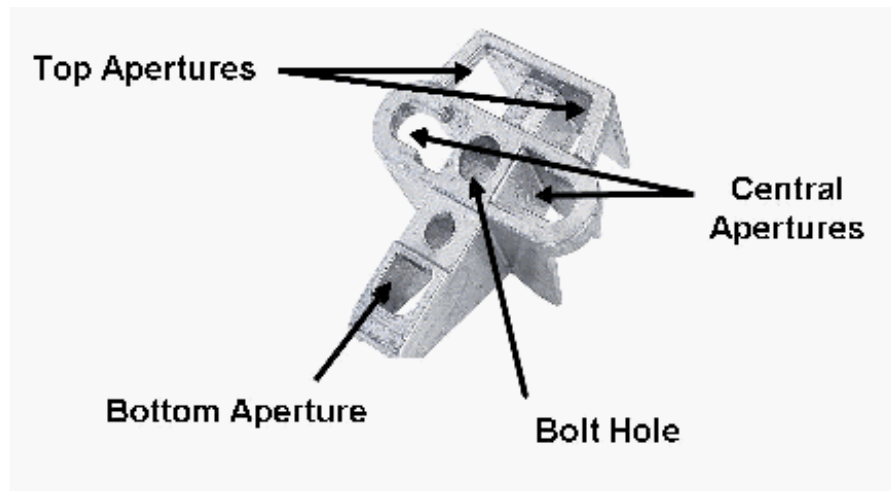


Figure 30: Plant fixing points on UPB

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

- **Top Apertures:** Each aperture supports up to a maximum of 3 dropwires only. No aerial cables or stay wires should be attached in these apertures.
- **Central Apertures:** Each aperture is designed to support 1 Aerial Cable or 3 dropwires. Aerial cables and dropwires should not be mixed in the same aperture and no stay wires should be fixed in these apertures.
- **Bottom Aperture:** The maximum breaking load for the aperture is 30kN. It will either support 1 aerial cable, 3 dropwires or a stay wire but they must not be mixed in the same aperture. The stay wire arrangement will support a maximum stay wire tension of 25.3kN and would generally not be expected to exceed 1 stay fitting. The only exception permissible is the use of 'V' stays to replace a single stay where obstructions prohibit the fitting of the single stay anchor.
- **Bolt Hole:** Used to fix to wooden poles with a galvanised steel hexagonal headed bolt either 300 or 350mm long fitted with one galvanised steel washer (rectangular) between the nut and the wood pole. If two UPB's are fitted, one on one side of the pole and the second one behind the pole, then attached to the pole with one bolt, no washer should be used.
- **Washer Tubular:** This can be used if the bolt is too long for fitting UPB's  
See Fig 31 below





Figure 31: Washer tubular on UPB

Where cable or stay combinations exceed the capabilities of the UPB, other methods for fixing need to be considered.

**END OF DOCUMENT**