

## Specification CP10 - Cable Underground Installation, Support and Protection

### For Communication Providers (CPs) – Cabling

The purpose of this specification is to provide CPs with details of the Engineering Principles that apply where they want to use Openreach's ducts pursuant to and in accordance with the terms of Openreach's Physical infrastructure Access (PIA) product. This specification contains details of the Engineering Principles and standards for cable and joint installation, support and protection when using PIA. Nothing in this document removes obligations on the CP to comply with any and all health, safety and other laws and regulations and to comply with Good Industry Practice.

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## 1. General Notes

- 1.1** Issue 1 suffixes the first issue of a specification. When a specification is re-issued the issue number is advanced sequentially.
- 1.2** Except when a specification is completely re-written, a star in the margin adjacent to the main clause number indicates an amendment. A vertical line in the margin indicates the particular portion(s) amended.
- 1.3** When a specific issue of a supplementary specification is not quoted, then the latest issue of that specification shall be followed.
- 1.4** If any further information in connection with the specification is required, application should be made to the address given at the end of this specification.
- 1.5** In this document where we use words "shall" and "must" then these are obligations which a CP has to satisfy when using PIA. If we use the word "should" then a CP must use all reasonable endeavours to satisfy the requirement but may deviate subject to the other requirements set out

## 2. Scope

This document forms part of the Engineering Principles which CPs must comply with pursuant to the terms of the Physical Infrastructure Access (PIA) contract. This section details the performance requirements that CPs must meet when cabling components (including copper, fibre-optic cables, sub-duct or blown fibre tubing joints) are installed and secured in or on our network.

## 3. Cabling in Duct

### 3.1 General

This sub-section details the performance requirements that shall be met when cables are installed into underground duct.

**NOTE: This document does not cover any installation standards for cabling into buildings.**

### 3.2 Performance Requirements

All cabling components shall have a service life of no less than 25 years and be suitably robust for the underground environment.

Following installation, there shall be no visible damage to the outer part of the cable.

Prior to termination, all cable / tubing ends shall be effectively capped to cover sharp edges.

All joining of cables and sub-duct shall be positioned within the jointing chamber with at least 0.5m of cable between the joint and duct entry.

All cabling within chambers shall have sufficient slack to allow the cables and joints to be repositioned.

### 3.2.1 Copper Cable Installation

- a) Only the Openreach approved cable anchors shall be used to anchor cables
- b) Only the Openreach approved cable lubricants shall be used to lubricate cables installed by pulling techniques.
- c) The disposal of any scrap material e.g. lubricant shall be disposed of in accordance with environmental legislation.
- d) There shall be no damage to any of the copper pairs or any other component part of the cable.
- e) There shall be no damage to existing BT or other CP cables or plant.
- f) For safety, where cables ends are left in the joint box or manhole for jointing they shall be capped with appropriate propriety cap sealing ends.
- g) Anti-creepage devices shall be refitted on completion of any work.

### 3.2.2 Fibre Cable Installation (including sub-duct and blown fibre)

It is the choice of the CP whether to install optical fibre cable in sub duct or not.

If it is necessary to move existing plant, never bend cables below their minimum bending radius.

For safety, where fibre blowing techniques are used, the end of the duct must be fitted with an 'air guard' to contain any debris.

**NOTE: Precautions must be taken when cabling over fibre or lead cables to prevent damage.**

### 3.2.3 In-Line joint Closures

You must ensure that any joint closures are designed so that they are commensurate with the joints they are covering.

Any joint closures housed in a joint box owned by Openreach that have blown fibre tube or cables installed, shall incorporate a method to release any positive pressure which may build up. This is to ensure the safety of operatives and the public.

## 3.3 Cable Support and Protection

You must ensure there is adequate support and protection for your cables as these are necessary measures to minimise the risk of damage and prevent excessive bending of all cabling. Failure to provide adequate support and protection could result in personal injury, or a change in the transmission performance of the cable.

This section describes methods of supporting cables and joints in jointing chambers. These methods can be applied to all type of cables and joints. All the methods described have been devised to help reduce the incidence of cable sheath fractures resulting from the following causes:

- a) Sagging of the cable (and joint) due to its own weight
- b) Mechanical damage
- c) Vibration and creepage

The supporting methods referred to in this section must be applied to new cables and to existing cables where their fault histories indicate that they are inadequately supported.

Note: It is not acceptable to stand on any cables or joints during cabling activity.

### 3.4 Description of supporting devices

#### 3.4.1 Brackets, cable Bearer and Pins, Locking, Cable Bearer.

Brackets, Cable Bearer are the most commonly used type of supporting bracket (see **Figure 2** and **Figure 3**). They are located by means of Pins Locking, Cable Bearer in pressed steel channels fixed to the jointing-chamber wall, or exceptionally in rolled-steel joists fixed to the floor. Brackets are manufactured in grey cast iron, and although having an adequate factor for carrying cables, they must not be stood upon or thrown down on concrete floors. Brackets are made in various sizes as shown in **Table 1**. The pins are made of high tensile wire, bent to form self-locking pivots.

**Table 1 – Brackets, Cable Bearer:**

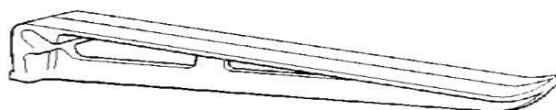
Bracket No.	Effective Length (mm)	Overall Length (mm)
3	80	150
5	130	170
8	200	250
12	300	350
18	450	500
24	600	650

The three designs of Bracket Cable Bearer are compatible with and attach to Bearers Wall Type using Pins Locking Cable Bearer in the conventional manner. The working physical dimensions of all bracket types remain unaltered.

**Figure 1 - a, b & c – Types of Bracket Cable Bearer:**



**Conventional Cast Iron Bracket (above)**



**New Cast Iron Bracket (above)**



### Pressed Steel Bracket (above)

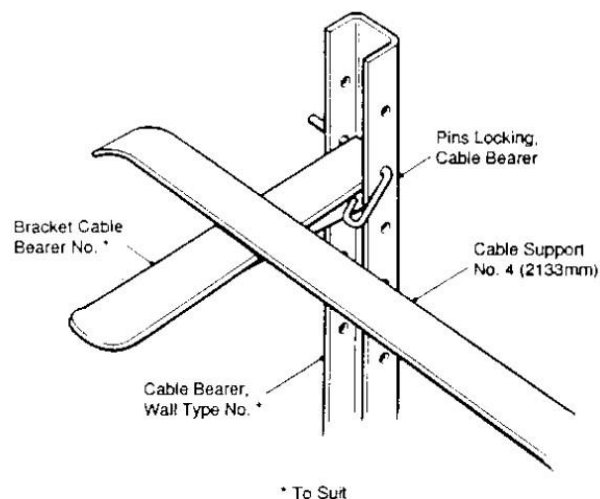
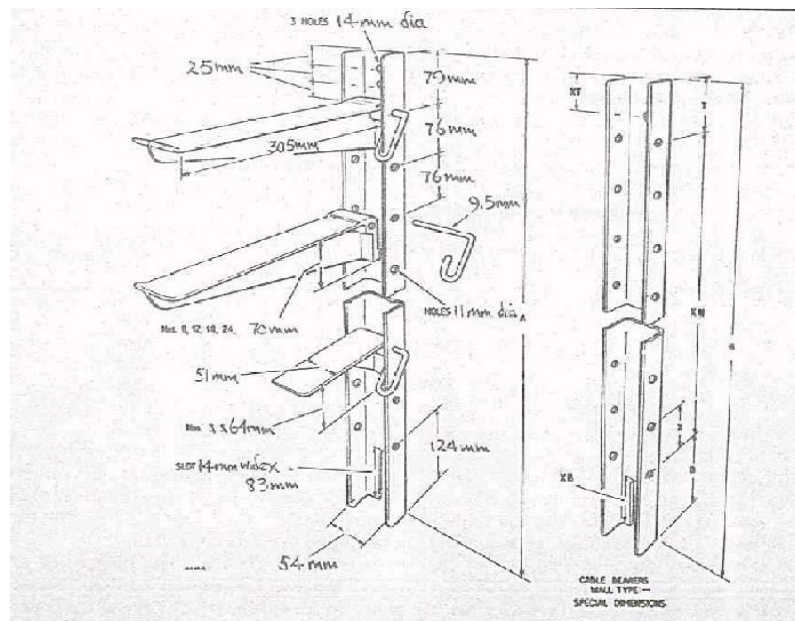
#### 3.4.2 Cable Bearers, Wall Type

These bearers are of light, pressed-steel channel section, fixed to the jointing-chamber wall by means of Bolts, Foundation, Indented, No.2 which are set in the walls at the construction stage or Bolts, Expansion, 13mm x 64mm for additional channels placed upon existing walls (see **Figure 2**). Three holes are drilled at 25mm, centers at the top of the channel and a corresponding slot is provided at the bottom of the channel. These holes and the slot allow some adjustment to be made to compensate for small discrepancies in the fixing centers and / or the duct levels. Holes spaces at 76mm centers are drilled in each of the sides of the bearers to take the locking pins (an exception is the smallest type of bearer which has only one hole in each of its sides). The description of the item is Cable Bearers, Wall Type, No. xx. The number 'xx' indicates the number of brackets which the bearer will carry (at 76mm bracket spacing for type No. 2 and 152mm bracket spacing for types Nos. 3-12). The various sizes of cable bearers and the number of pairs of holes in each size are shown in **Table 2**.

**Table 2 - Cable Bearers, Wall Type.**

<b>Cable Bearer Wall Type Numbers</b>	<b>Overall Length A (See Fig. 1)(mm)</b>	<b>Pairs of Brackets Fixing Holes</b>
1	178	1
2	279	2
3	508	5
5	813	9
8	1270	15
10	1574	19
12	1879	23

**Figure 2(a) & (b) (below) – Cable Bearer, Wall Type Assembly**



### 3.4.3 Cable Bearers, standard type

These consist of lengths of rolled-steel joists, 76mm x 76mm x 3.9Kg, fixed by cleats to the floor, and, where necessary to the roof (see Figure 3).

### 3.4.4 Brackets, Joint-box

These supporting brackets are made of wrought iron and mild steel (see inset of **Figure 4**), and are built into the side walls of Footway Joint Boxes No. 2, which is the only type of jointing chamber in which they are used. The brackets project 76mm to 89mm from the face of the wall.

### 3.4.5 Restrainers

These are made of lengths of 25mm mild steel angle, slotted along their length and provided with a "stop" and a fixing hole (see **Figure 5**). They are intended for use in conjunction with Straps Cable Fixing

(or Strip, Binding and clips, Binding) for restraining plastic sheathed cable in position on Brackets, Cable Bearer. The range of sizes is shown in **Table 3**, the numbers corresponding with those for Brackets, Cable Bearer. The suffixes L and R indicate the direction in which the slotted angle is bent.

**Table 3 – Restrainers**

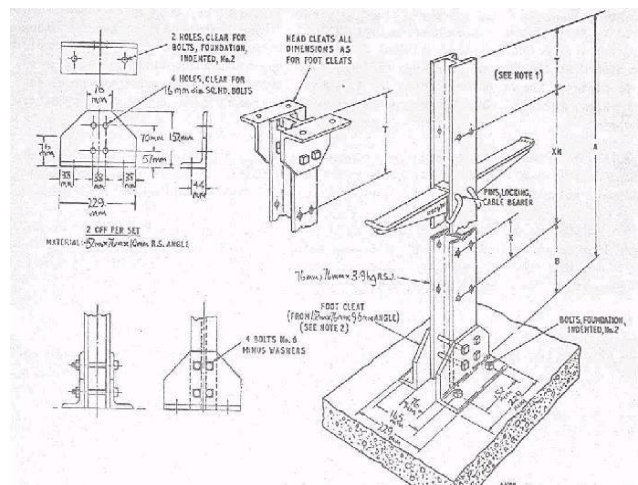
Restrainer Number (See Note)	Effective Length (mm)	Overall Length (mm)
3L and 3R	25	121
5L and 5R	127	171
8L and 8R	203	248
12L and 12R	305	349
18L and 18R	457	502
24L and 24R	610	654

**NOTE: The Restrainer Number selected should be the same as the Bracket, Cable Bearer, Number with which the restrainer is associated.**

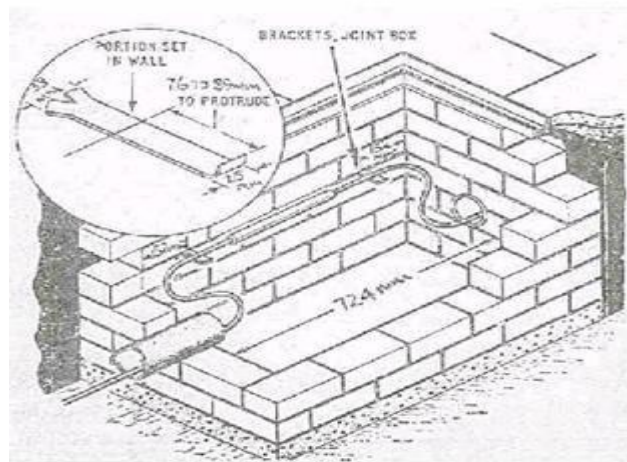
### 3.4.6 Supply of Cable Supports and Cable Bearers

The following items should be manufactured by local contractor; Cable Supports Nos.2 and 3, Cable Bearers Wall Type Special and Cable Bearers Standard Type (contact the Specification Authority for construction details).

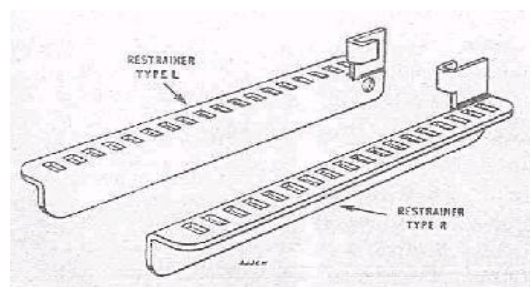
**Figure 3 – Cable Bearer, Standard Type**



**Figure 4 – Brackets, Joint Box**

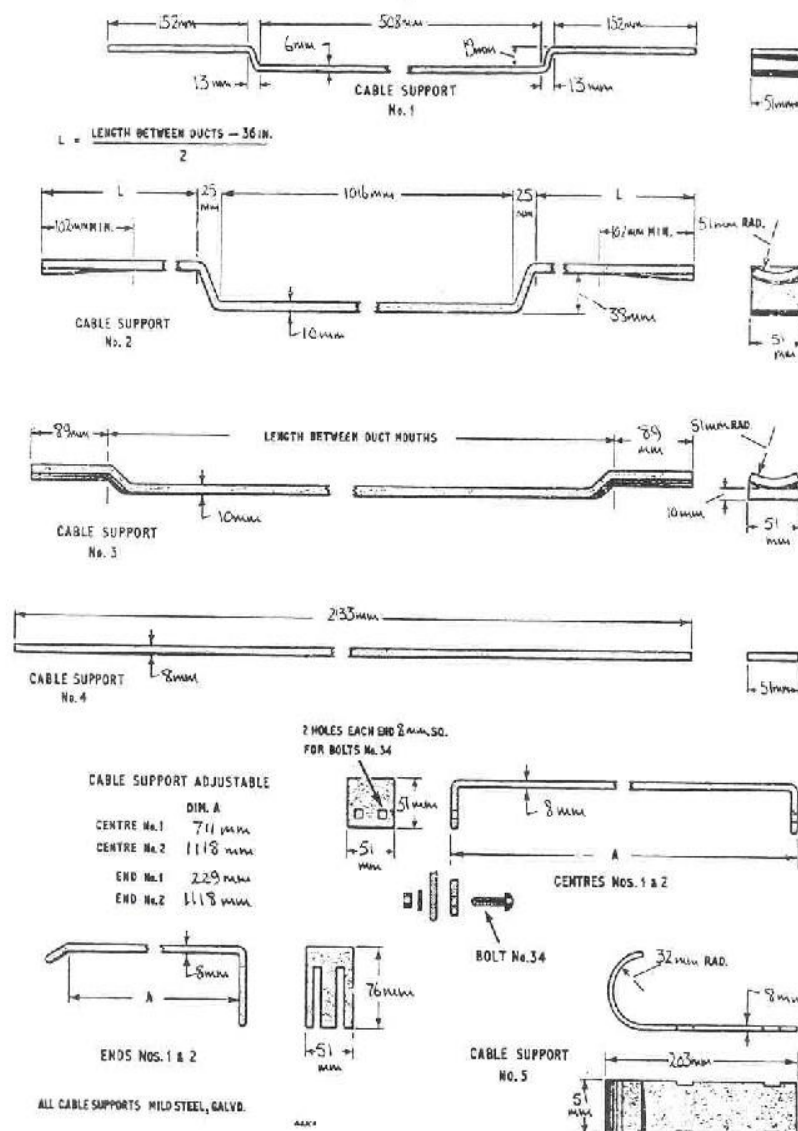


**Figure 5 – Restrainers:**



**Figure 6 – Cable Supports**





### 3.4.7 Cable Supports

These are galvanised mild steel bars designed to give support to cables and joints in most jointing chambers (see **Figure 6**). Six types of bar, Cable Supports Nos. 1- 5 and Cable Support, Adjustable are shown in **Figure 6**.

Cable Supports Nos.1 and 2 and Cable Support, Adjustable are typically used for the support of joints, and Cable Supports Nos. 3 -5 are typically used for the support of cable, however, that may be used for either purpose. All the cable supports except Nos. 2 and 3 are designed to rest on Brackets, Cable Bearer Nos. 2 and 3, which are curved at their ends, are designed to rest in the duct mouth into which they project by 76mm. Cable Supports No. 1 are for use in Footway Joint-boxes No. 4 only, Cable Supports Nos. 2 and 3 are primarily for use in Buried Boxes Nos. 7 and 8, and the remaining Cable Supports are for use in nearly all types of jointing chamber. Cable Support No. 4 is 2133mm long, but it may be cut if a shorter length is

needed; the cut end must be painted with Paint, Black for Ironwork. Cable Support No. 4 may be used to extend Cable Supports, Adjustable. Cable Support No. 5 is typically used as a supporting device for a cable which does not rest squarely on a cable bracket.

**The following table is for guidance purposes only**

Chamber	Chamber Length (mm)	No. of Brackets	Bracket Bearer Spacing (mm)	Recommended Supports
JRF102	725	2	375	Use existing brackets, no additional support required. Cable Support Adjustable Centre No.1 is optional
JRF104	915	2	365	Use existing brackets, no additional support required. Cable Support No.1 or Cable Support Adjustable Centre No.1 are optional
JRF106	1310	2	710	Cable Support No.9
JRF111	1690	2	920	Cable Support Adjustable Centre No.2
JRF110	2315	3	915 & 915	Cable Support No.4
JRCX11	1820	3	800 & 400	Cable Support Adjustable Centre No.2 + Cable Support Adjustable End No.1 at one end
JRCX14	2285	4	800 & 400 & 400	Cable Support No.4
JRCX12	1220	2	700	Cable Support No.9

Note: 1. Cable Supports may be cut to size if required.

Note: 2. Alternative combinations of any support (see list below) may be used to suit the size of the chamber and available space.

Note: 3. Includes Modular Boxes

Support	Length (mm)	Item Code	Comments
Cable Support No.1	838	070288	Typically used for in-line joints
Cable Support No.4	2133	070291	Flat Bar
Cable Support No.9	1100	075851	Flat Bar
Cable Support Adj Centre No.1	711	070297	
Cable Support Adj Centre No.2	1118	070298	
Cable Support Adj End No.1	229	070301	
Cable Support Adj End No.2	1118	070302	
Bolt No.34		070296	Required to fix Cable Supports Centers & Ends together

## 3.5 Method of use for supporting devices

### 3.5.1 Brackets and Bearers

The size of Brackets, Cable Bearer that you must use will normally depend on the number and diameter of the cables to be supported, the aim being to plan the layout so that short brackets will meet requirements. Sometimes, however, it is necessary to use long brackets, e.g. Brackets, Cable Bearer, No. 24, to give a greater outreach when cables cannot be set close to the jointing-chamber wall; long brackets must not be used as a means of reducing the number of tiers of brackets. The Cable Bearers, Wall Type or Cable Bearers, Standard Type associated with the Brackets, Cable Bearer are spaced 914 mm apart, except where they are installed in the smaller surface entry joint-boxes or where special requirements necessitate some other spacing. Normally the cable, and not, the joint sleeve, rests on Brackets, Cable Bearer, the sleeve being situated between the brackets. Cable Bearers, Wall Type are always used in joint boxes (except Footway Joint Boxes No. 2 and Buried Boxes Nos. 7 and 8), and generally in manholes; Cable Bearers, Standard Type are used in manholes in which the positioning of cables is restricted because of their large minimum bending radius or where manholes are built on an existing cable track and it would be expensive and inconvenient to piece-out the cables to enable them to be set against the manhole walls. The supporting device used in Footway Joint Boxes No. 2 is a Bracket, Joint Box, and **Figure 4** illustrates the way in which a cable is supported on these items set into the wall of a brick-built box.

### 3.5.2 Tape Binding

A cable having a plastic sheath without a substantial metal sheath in addition tends, after setting, to return to its original position. Therefore, when such a cable is set and laid on brackets, without the use of cable supports, you must attach or anchor the cable to the bracket. For cables of diameter up to and including 19 mm, a simple means of attachment to the brackets may be provided by bindings of Tape, Plastic Adhesive, ½ inch, each binding having about six turns. If the cable is attached to a cable support the tendency of the cable to depart from the position into which it has been set is nullified in the vicinity of the support; away from the support, however, the measures referred to above to prevent movement of the cable may still be required.

**NOTE: Where additional support is required, Straps Cable Fixing, tensioned and cut using the appropriate tool, may be used to secure the cable in position.**

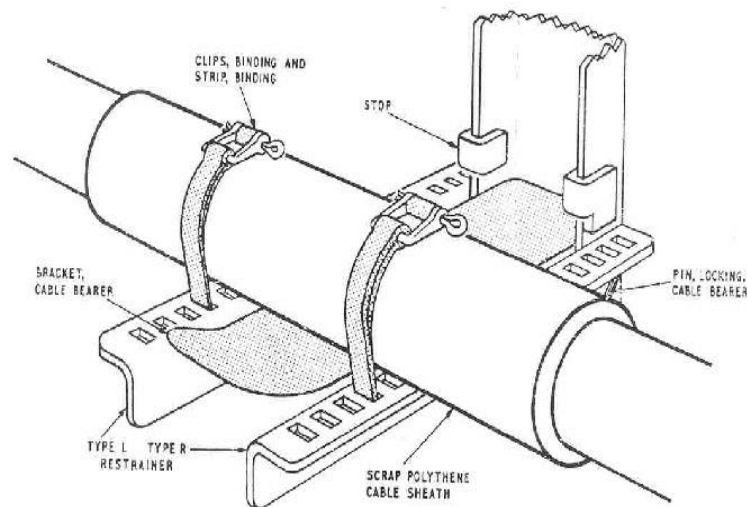
### 3.5.3 Restrainers

Restrainers may be used (see **Figure 1**) if it is necessary, to anchor in position on the brackets a cable, over 19 mm diameter, having a plastic sheath without a substantial metal sheath in addition.

Two restrainers are located, one along each side of the Bracket, Cable Bearer, by means of the Pin Locking, Cable Bearer, which also retains the bracket in position.

Straps Cable Fixing (or Clips, Binding and Strip, Binding) must be used in accordance with the manufacturer's instructions.

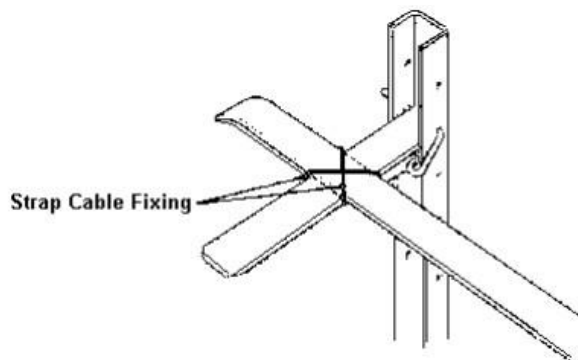
**Figure 1 - Use of Restrainers**



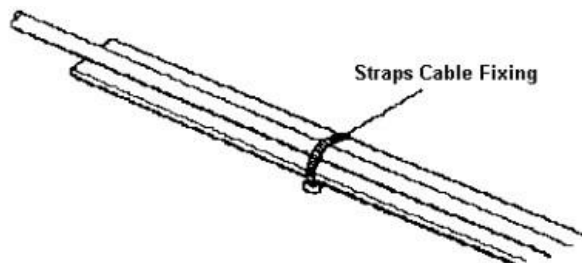
### 3.5.4 Cable Supports

Straps Cable Fixing, tensioned and cut using the appropriate tool, may be used to secure ironwork, cabling and joints as shown in **Figure 8**.

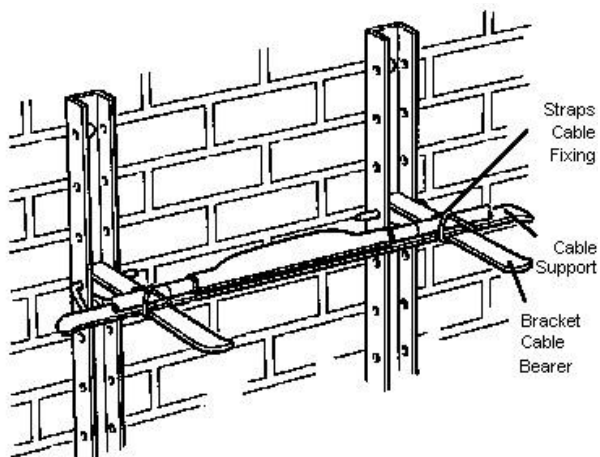
**Figure 8 (a) & (b) (below) – Securing with Straps Cable Fixing – Cable Support to Bracket**



**Figure 8 (b) - Cable to Cable Support (below):**

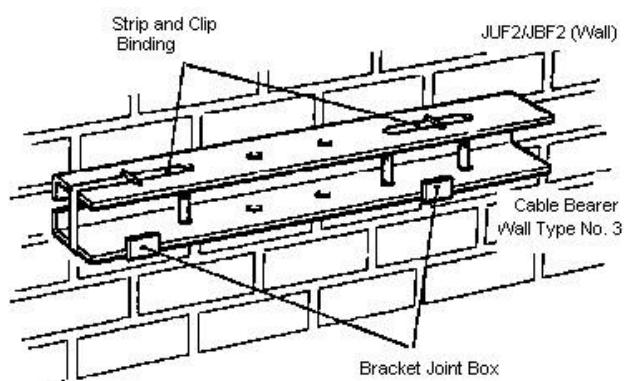


All joints must be supported in joint boxes and manholes. Lay in-line joints across Brackets, Cable Bearers using Cable Supports where necessary and secure the cables using Straps Cable Fixing (**see Figure 9**)

**Figure 9 (Below)**

Fit directly to a cable bearer using the mounting bracket and a Pins Locking.

In JUF2/JBF2s where Brackets Joint Box have been fitted, attach a Cable Bearer Wall Type No 3 to the brackets and secure using Strips Binding and Clips Binding (see **Figure 10**). The sleeve may then be fixed to the cable bearer using the mounting bracket and a Pins Locking.

**Figure 10 (below)**

### 3.6 Layout of cables in jointing chambers

In order that the provision of good support is not hindered by lack of space, and so that there is easy access to cable joints for maintenance purposes, every effort must be made to ensure that all cables occupying a particular duct way are supported on brackets at one level, and that bracket levels are allocated to duct-ways in a systematic manner.

**See above for guidance on Minimum Bend Radius for various cable types.**

In order to limit the bending radius, a cable in a particular duct-way often has to be accommodated on brackets aligned with other duct-ways. **Figure 11** and **Figure 12** illustrate the principles which must be followed when arranging cables in a jointing chamber. In these situations, it is important to ensure that Minimum Bend Radius rules are followed.

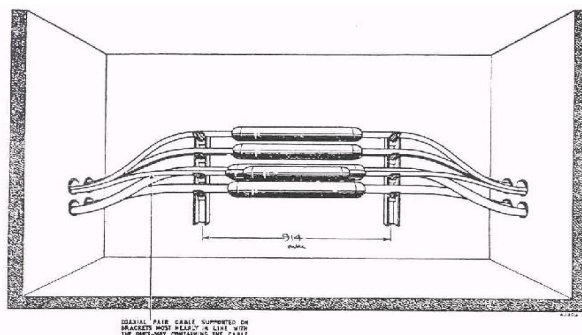
**The cables must be secured along their lengths where practical to minimise the risk of accidental damage.**

The routing of cables from the duct mouth to a suitable bearer must provide a clear and safe working area in front of the joints, provide secure support and protection for the plant, and accommodate cable bend limits.

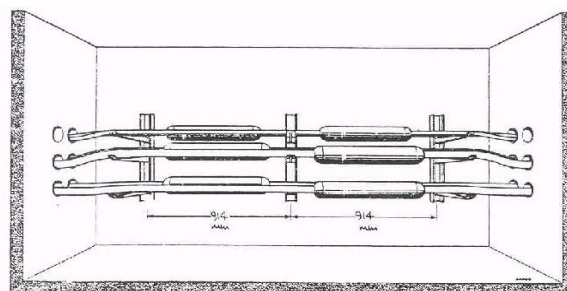
**NOTE: Special attention must be paid to the choice of supporting device for cables of fragile construction, i.e. coaxial, fibre, balance cables etc.**

Cable coils should be fully restrained and supported. They must be tied together with PVC tape to ensure the coils unravel. An ideal example of a cable coil is shown in **Figure 13**. Coils must be positioned to avoid obstructing access to other plant to minimise the risk of future installation of plant obstructing the subsequent need to use the coil.

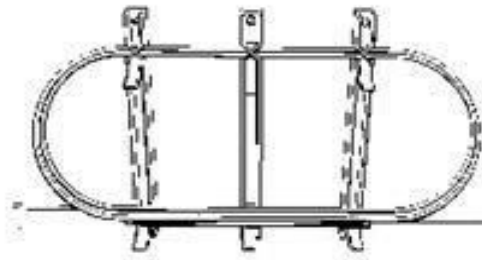
**Figure 11 - Cables may be elevated to suitable positions (Cable Supports not shown)**



**Figure 12 (Below) - Cables may be recessed to suitable positions (Cable Supports not shown)**



**Figure 13 (Below) - An idealised example of supporting a cable coil**



### 3.7 Supporting Cables and Joints in small chambers

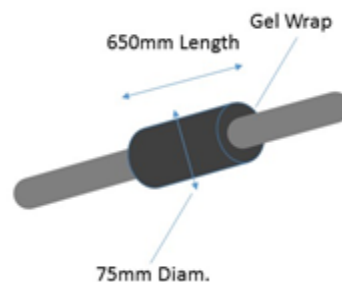
In joint boxes; JB23, JB26, JRC2, JBC2, JUF2 & JBF2, without pre-installed mounting bolts, it is no longer necessary to support joints or cables. Where there is sufficient cable, coil it against the wall and stand the joint in the corner of the box. Coils must be PVC taped together to avoid unravelling.

## 4 Joints - Gel Wraps

4.1 Where the number of cables/sub duct entering and exiting the enclosure are different (as per the diagram below) this will be deemed an in-line splice/joint product and be subject to an additional charge as set out in our published pricing.



4.2 Where there is a 1:1 ratio of cable/sub duct entering and exiting the enclosure (as per the diagram below) then so long as the enclosure is no greater than 75mm diameter X 650mm length maximum then this will not be deemed as an in line splice/joint product and there will be no additional charge.



4.3 Where there is a 1:1 ratio of cable/sub duct entering and exiting the enclosure but it does not conform to the size (75mm X 650mm) this will be deemed as an in-line splice/joint product and be subject to an additional charge as set out in our published pricing.



## 5 Cable and Joint Marking

### 5.1 Labelling Requirements

The marking system and materials must be suitable for long use in an underground environment so that we may continue to quickly and easily identify the apparatus as belonging to CP's.

### 5.2 Cable, Sub Duct and Blown Fibre Tubing Marking

CP's must attach a label to optical fibre cables with CP name and PIA NoI Order reference in all jointing chambers and manholes. In large chambers it is recommended that additional labels are fitted to aid identification. Where a fibre cable, from an underground duct, is feeding a pole it shall be labelled on the pole. Blown fibre bundle doesn't require labelling.

### 5.3 Joint Marking

CP's must clearly mark joints with a label identifying your CP name or logo. The marking system and materials must be suitable for long use in an underground environment so that we may continue to quickly and easily identify the apparatus as belonging to you.

## 6 Best Practice

### 6.1 Using Pre-Installed Ropes

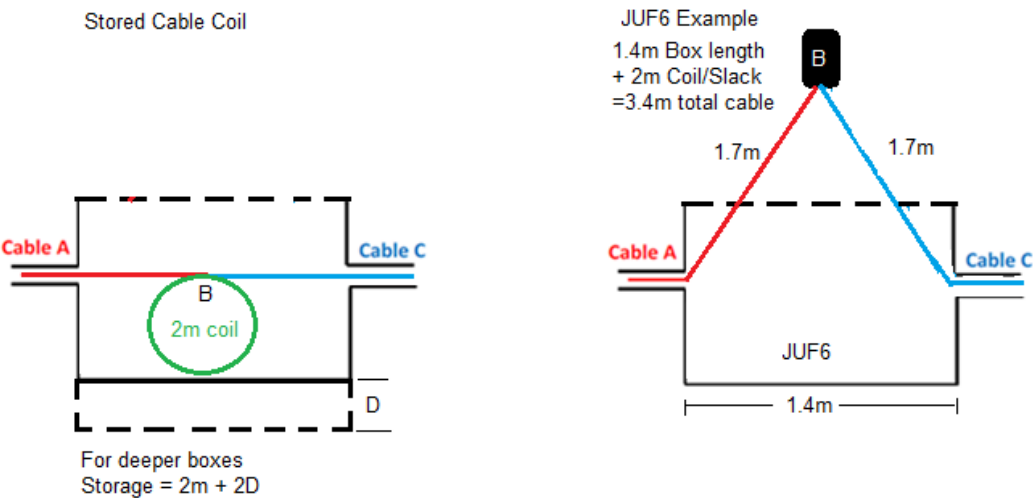
When working in the network if a CP or Openreach use an existing rope (that another CP has left in place following their own rodding and roping for a build they are going to complete at a later stage), then the CP may only use this rope on the strict understanding and condition that they pull a new rope in with their cable to replace the one they used.

### 6.2 Storing Coiled Cables in Joint boxes

The size of cable that can be stored is dependent on the joint chamber, access to and location of the chamber, the amount of usable space available and the need to ensure that existing plant can be accessed and supported safely and securely. Based on current Openreach build standards, the table below lists the maximum length of coiled cable allowed. All coiled cables must be zip tied and placed against the side wall of the chamber to avoid creating obstructions and risking damage. Where bracket bearers are available, the cable must be hung from them.

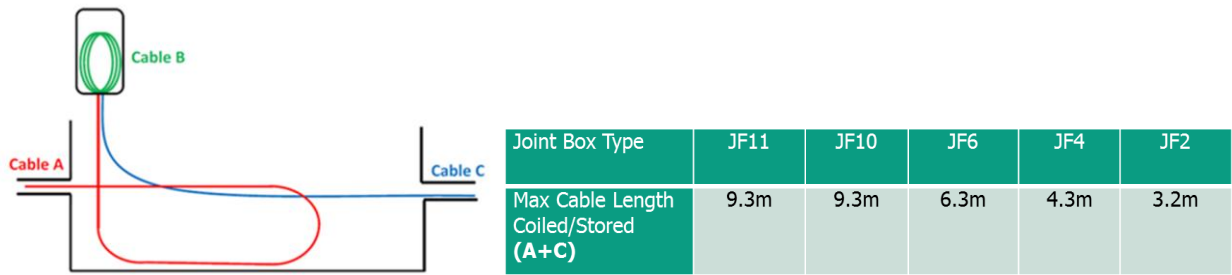
Where installing a distribution joint/cable splice you are allowed up to 2 metres of cable (in addition to the length of the chamber) to be coiled in the respective jointing chamber before having to purchase the cable coil hosting product. E.g. Where the chamber is 1.4 metres in length you are permitted to 3.4 metres of cable before purchasing the cable coil product, see diagrams below:





6.3 Maximum Cable Lengths

Based on current Openreach build standards, the table below lists the maximum length of coiled cable allowed.



Cable coil lengths may only exceed the maximum lengths outlined in the table above where there is a clear safety reason for doing so. This must be annotated by you on the Build Complete evidence report.

In exceptional circumstances, where chambers are deeper than standard specification as defined on Annex 5 of the Product Description it is permitted to allow an extra 2 times the extra box depth to the maximum cable length allowed (shown in the table on the previous slide), e.g. if the extra depth is 150mm then you are permitted to install an additional 300mm of cable.

It is permissible to joint in the back of van if capacity exists in the box and you can get the van close enough, so long as you adhere to safe working practices and the Engineer Principles including but not limited to cable lengths.

Permitted use for cable coils include to facilitate a distribution joint and to store cable in advance of completing a cable run but it is important that any such coils are used within a reasonable period of time to connect to a network and not used such as to prevent or limit others from using the duct or chamber, or as a pseudo

'reservation'. When leaving a cable coil in advance of completing a cable run you must label with the NoI reference and dated.

Manholes - Openreach do not stipulate maximum cable lengths for a 'slack network'.

## 6.4 Joint Chamber Space Utilisation & Use of Mobra Supports – Multiple Arms

All joint and cable coils must be 'independently secured' in position, such that they are not liable to collapse as other plant is moved. Plant must be secured to avoid risk of injury and network damage.

No-Drill MOBRA frames must be placed flush against the narrow, end walls of the chamber. They must not obstruct any duct entries. Only MOBRA arms may be moved for access purposes, frames must remain in position.

Mobra frames must be installed with all appropriate bracing to protect the integrity of the joint chamber.

MOBRA arms may be placed above/below each other, providing they are on frames at different ends of the chamber, can be 'packed/unpacked' safely and allow reasonable access and safe working positions.

Where using MOBRA arms all joint must be secured such that they can be moved to access to other plant without risk of snagging other network components.

Multiple joints, with suitably approved brackets, may be mounted on MOBRA arms. The maximum MOBRA Arm loading of 25kg must not be exceeded.

Chamber steps must remain accessible to safely enter/exit the chamber.

The use of existing space, including MOBRA arm loading, must account for fully populated Joint/ CBTs/ Manifolds. A partially build joint must not be limited or obstructed for future build.

You may fit a second MOBRA arms to an existing Openreach MOBRA Frame, providing the weight of the joints on each arm must not exceed 25kg.



Where there are no brackets/bearers CPs must support their distribution joints (including Gel Wraps) using the Joint Support Kit 1a - Refer to the following section.

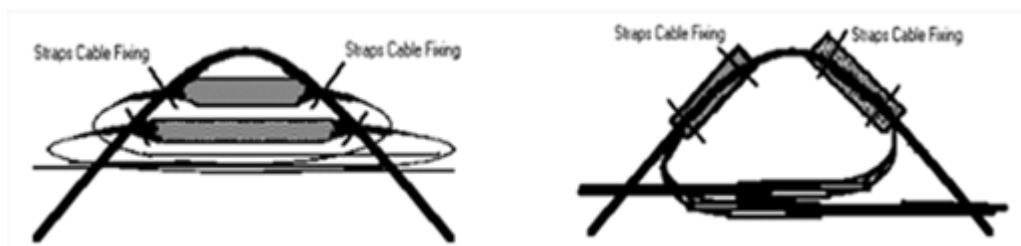
## 6.5 Joint Support Kit 1A

The Joint Support Kit 1A (item code 017807) is intended for use in joint boxes; JF4, JF6, JF10 and JF11 which do not have the necessary mounting bolts for the installation of standard brackets and bearers, or other means of joint support. Do not remove any existing brackets. The kit comprises two 2.5m lengths of Duct 102. The only other requirements are Straps Cable Fixing 1A (item code 072492 - not supplied).

Step 1 - The Duct 102 sections have been pre-cut (2.5m) to fit a JUF6. If the duct support is to be installed into a smaller JUF4, it will need to be cut down to approximately 1.9m (as joint-box dimensions may vary slightly, it may be necessary to cut the duct to fit).

Step 2 - Take the duct and fit it into the joint-box placing the ends on one side at each corner of the box and resting the arch on the opposite wall (see diagram) - care should be taken when handling the bent duct to ensure that it does not spring loose.

Step 3 - Place the joints across the arch and secure them using Straps Cable Fixing 1A at each end. Multiple joints can be mounted on a single support by placing them around the arch and at different heights.



Where a large number, or heavy joints are to be mounted, two sections of Duct 102 may be strapped together to provide a single, stronger support.



Joint Support Kit 1A can be cut to length and positioned to take into account the location of the joints in the box.



If the existing metal bearers are already underwater, consider providing Joint Support Kit 1A to position the joints out of the water



If cables are too short to strap the joint onto the bearer, strap a length of Joint Support Kit 1A between bearers to support the joint.



Off cuts of Joint Support Kit 1A can also help in a JB26 / JB102 to support joints out of any water.

Support joints and cables using Joint Support Kit 1A this will;

- Reduce the risk of kinks and strain on cables entering the joints.
- Reduce the chance of water entering a poorly fitted joint

## 7 Specification Authority

Technical Documentation Team (Chief Engineers' Office)  
Technical Documentation  
Openreach, Chief Engineer's Office

**END OF SPECIFICATION**