

Specification CP10 - Cable Underground Installation, Support and Protection

For Communication Providers (CPs) – Cabling

This document provides standards for the installation, support and protection of all cabling components in BT's network

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.

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 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 proprietary 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 should be taken when cabling over fibre or lead cables to prevent damage.

3.2.3 In-Line joint Closures

Joint closures will be 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:

Support and protection are necessary 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 should 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 should 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:

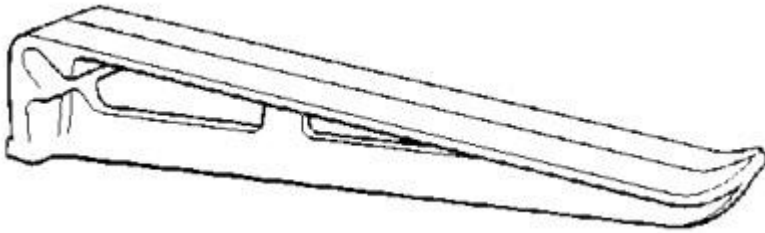
Bracket No.	Effective Length (mm)	Overall Length (mm)
3	80	150
5	130	170
8	200	250
12	300	350
18	450	500
24	600	650

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

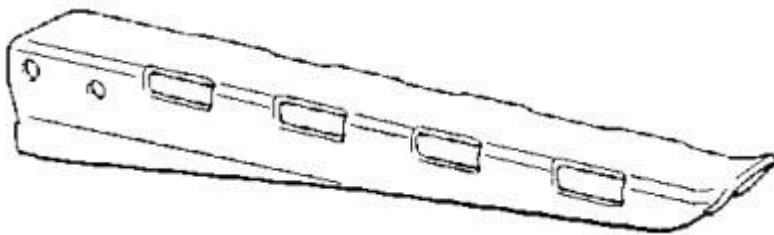
Figure 1 - a, b & c – Types of Bracket Cable Bearer:



Conventional Cast Iron Bracket (above)



New Cast Iron Bracket (above)



Pressed Steel Bracket (above)

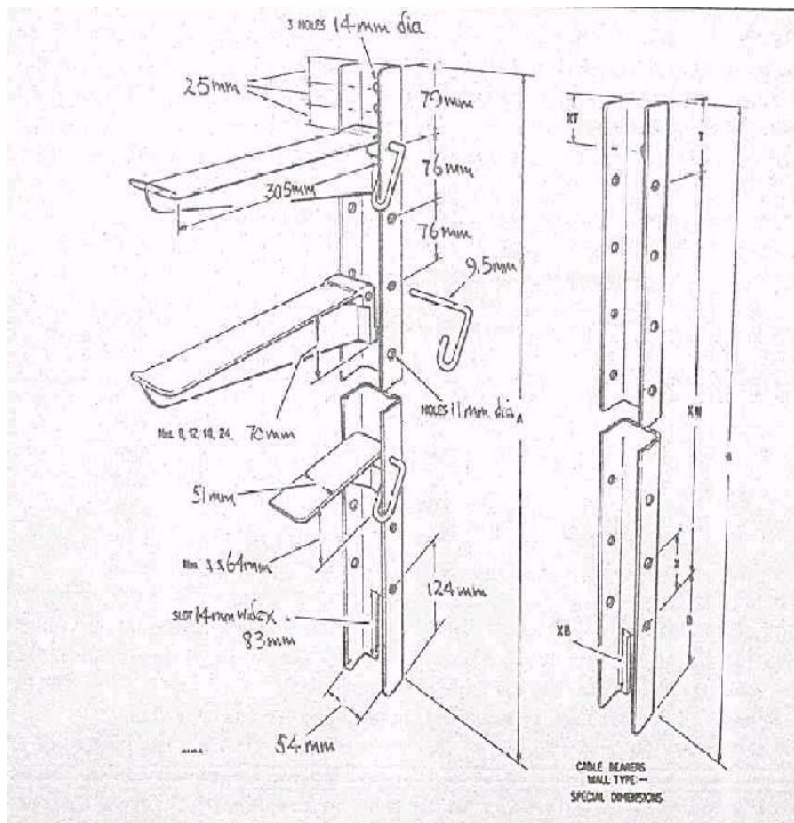
3.4.2 Cable Bearers, Wall Type

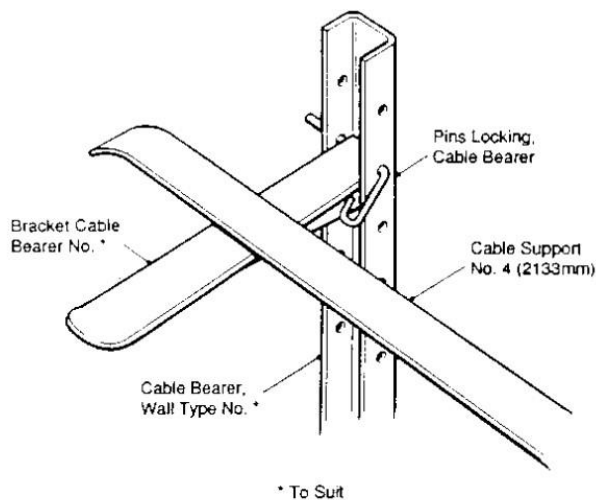
These bearers are of light, pressed-steel channel section, fixed to the jointing-chamber wall by means of Bolts, Foundation, Indented, No.2 which are set in the walls at the construction stage or Bolts, Expansion, 13mm x 64mm for additional channels placed upon existing walls (see **Figure 2**). Three 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.

Cable Bearer Wall Type Numbers	Overall Length A (See Fig. 1)(mm)	Pairs of Brackets Fixing Holes
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

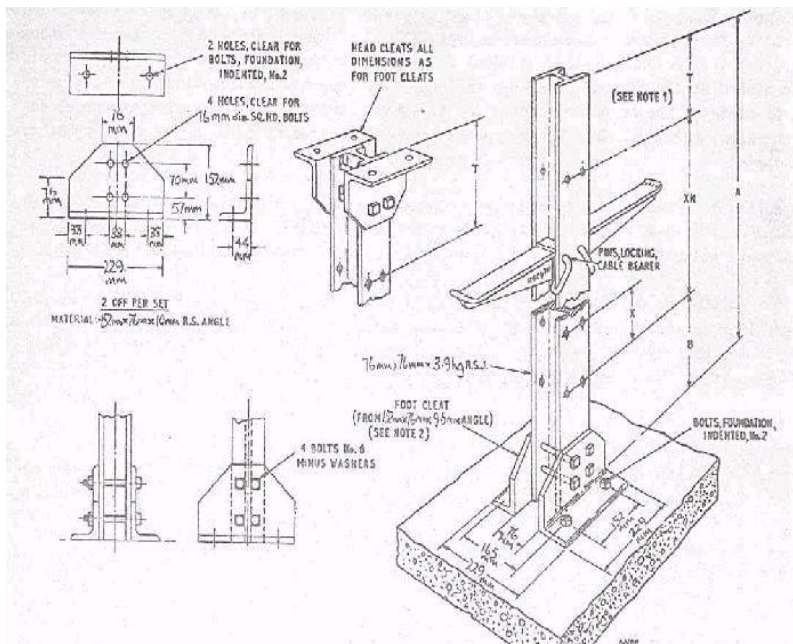


Figure 4 – Brackets, Joint Box

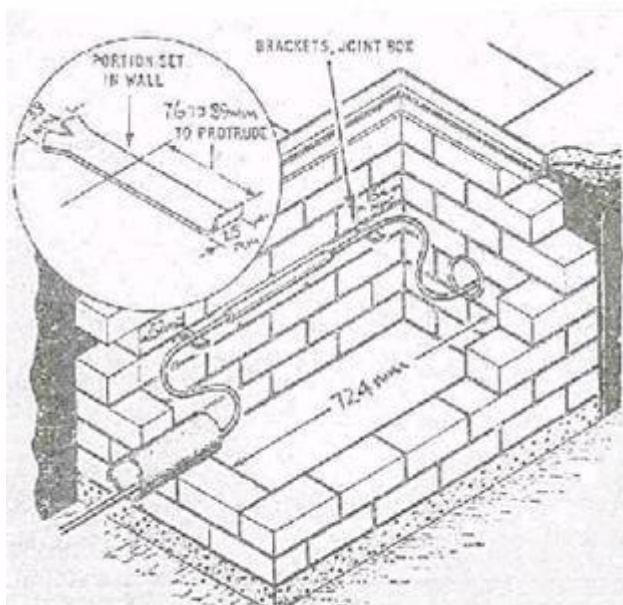


Figure 5 – Restrainers:

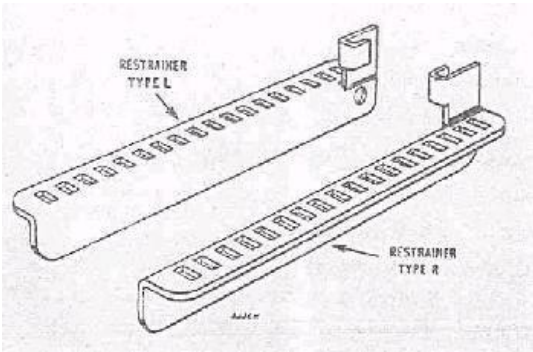
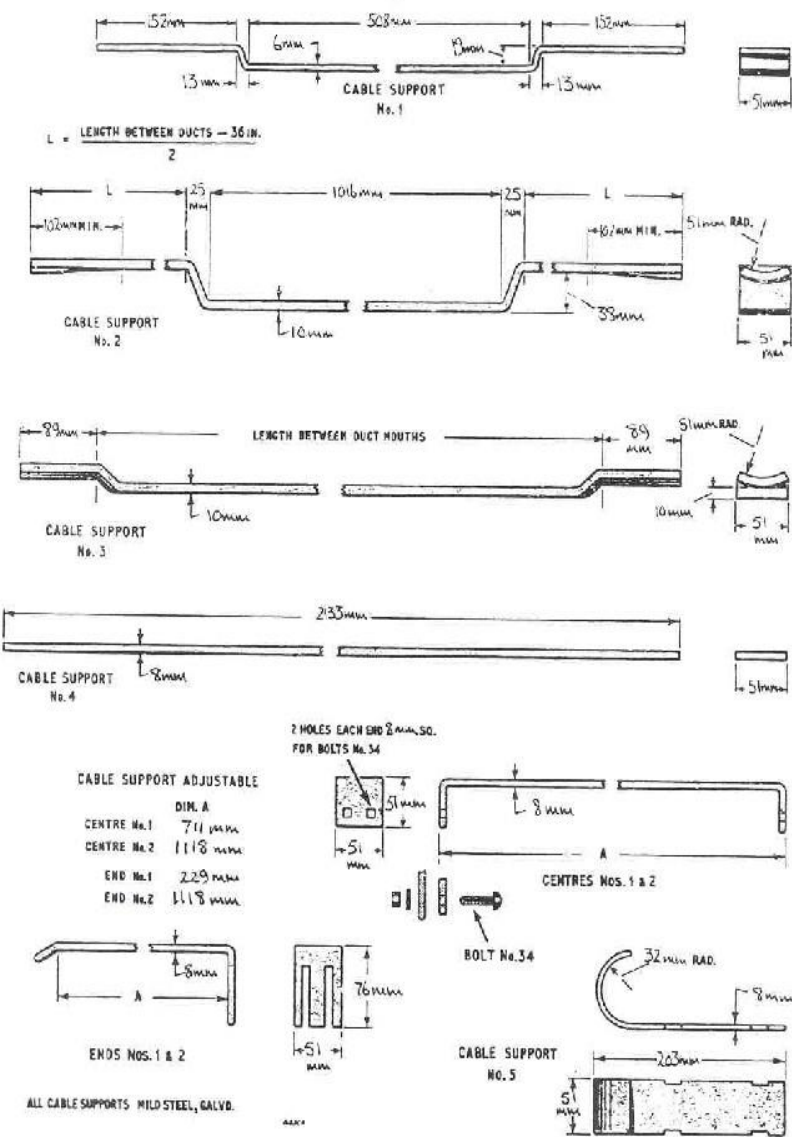


Figure 6 – Cable Supports



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 should 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 Centres & Ends together

3.5 Method of use for supporting devices

3.5.1 Brackets and Bearers

The size of Brackets, Cable Bearer to be used 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 should 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, it is frequently necessary to 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.

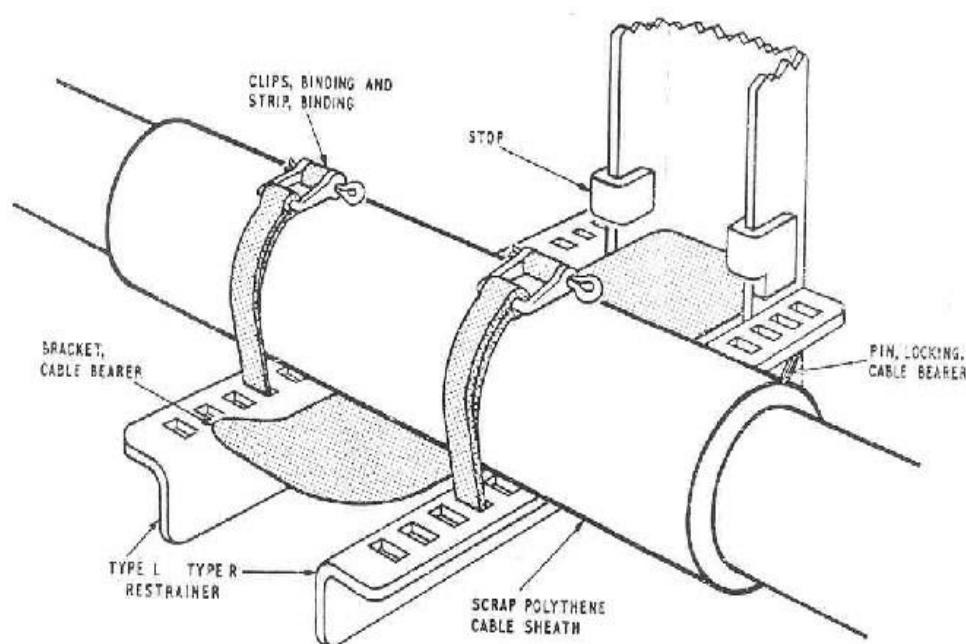
3.5.3 Restrainers

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) should 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

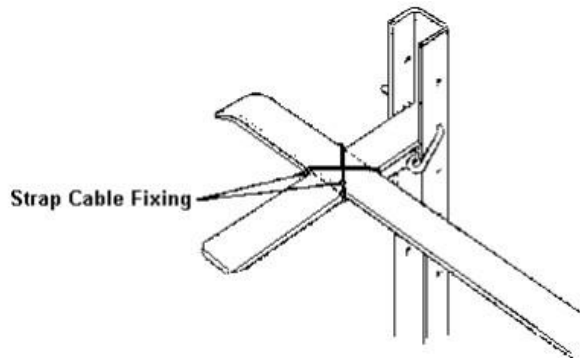
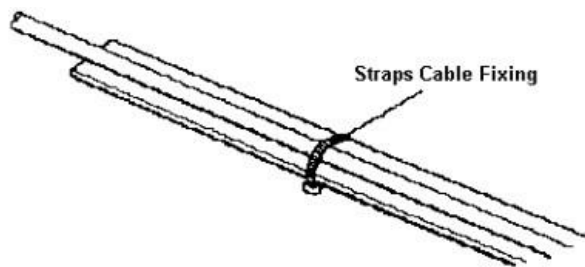
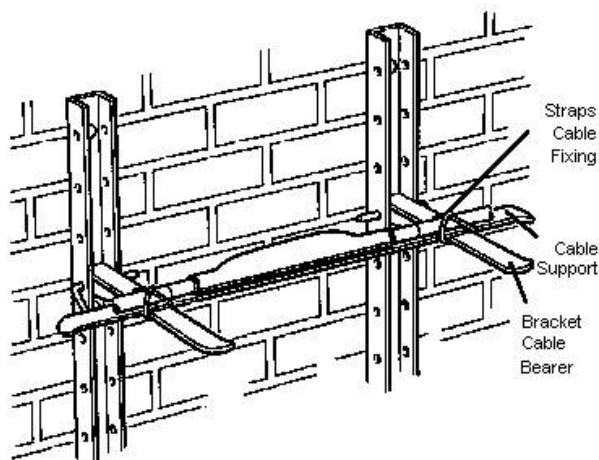


Figure 8 (b) - Cable to Cable Support (below):

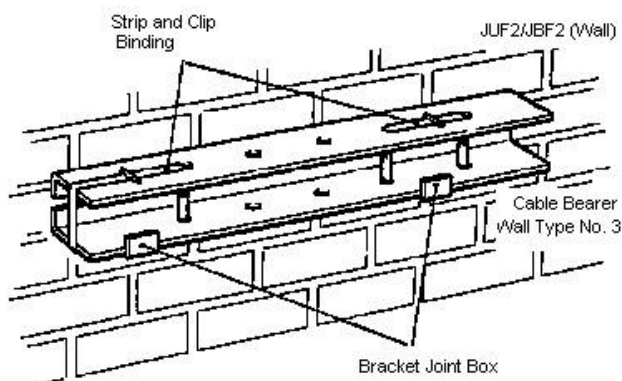


All joints should be supported in joint boxes and manholes. Lay in-line joints across Brackets, Cable Bearers using Cable Supports where necessary and secure the cables using Straps Cable Fixing (**see Figure 9**)

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 should not be 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 should 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 should 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, should:- 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 should 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 should 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)

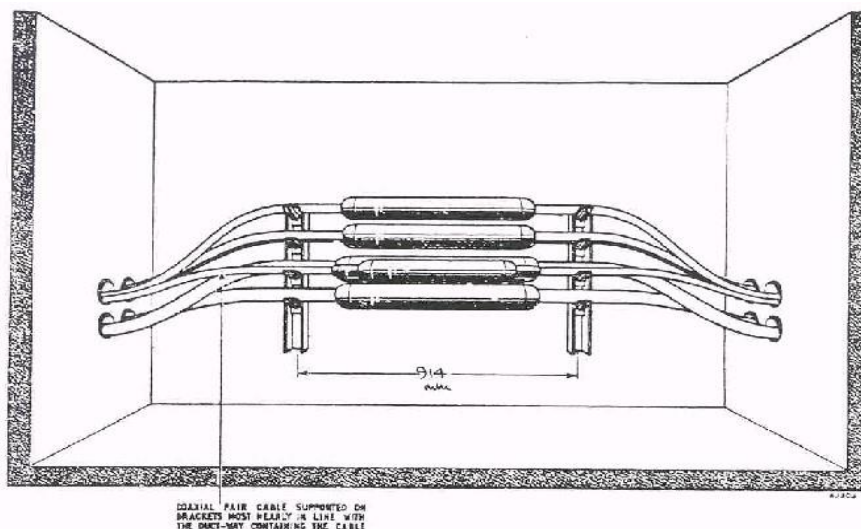


Figure 12 (Below) - Cables may be recessed to suitable positions (Cable Supports not shown)

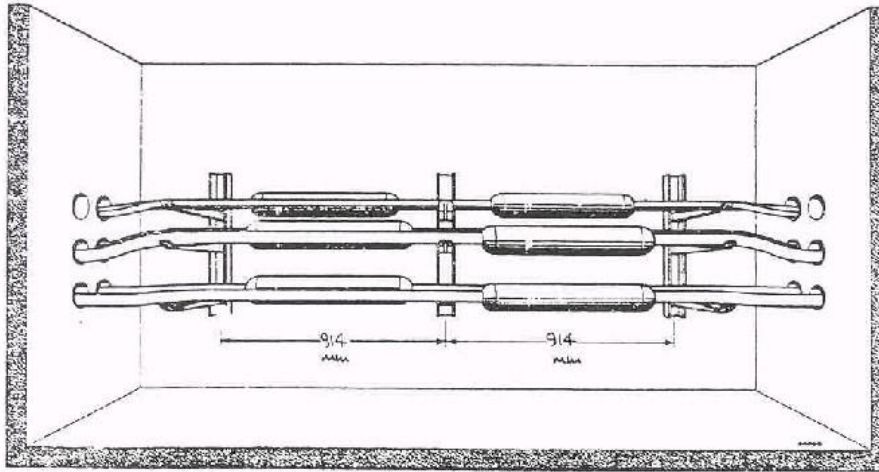
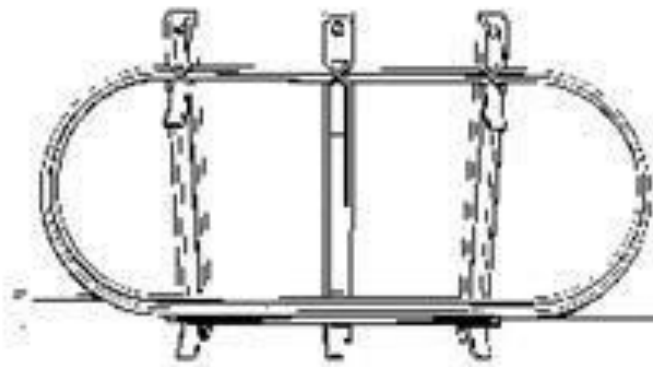


Figure 13 (Below) - An idealised example of supporting a cable coil



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 should be PVC taped together to avoid unravelling.

4 Cable and Joint Marking

4.1 Labelling Requirements

The marking system and materials should 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.

4.2 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.

4.3 Joint Marking

CP's must clearly mark joints with a label identifying your CP name or logo. The marking system and materials should 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.

5. Best Practice

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. Specification Authority

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

END OF SPECIFICATION