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Sub-Duct Mono-Bore Installation & Cable Placement

Installation Practice

About this document ...

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1 *Introduction*

This document is re-issued with the launch of Sub-duct Monobore 4 which has a smaller diameter and wall thickness than Sub-duct Mono-bore 3A.

2 *Scope*

This document (Issue 2) details the equipment and work practices for the installation of Sub-ducts Mono-bore 3A and 4 in BT duct and the subsequent installation of optical cable in the sub-duct.

3 *Safety*

Underground cable installation and cabling associated operations **MUST** only be carried out by staff who have had the appropriate training.

Specific safety requirements are included within the practices detailed in this document. These practices should be applied in conjunction with the safety requirements referenced in the Cabling in Duct Manual which is indexed in EPT/UGP/E031.

4 *Description*

Sub-duct Mono-bore 3A and 4 are circular ducts made from high density polyethylene, each containing a pre-installed cabling rope along its length. The re-usable rope supplied with Sub-duct Mono-bore 3A is titled Rope Cabling 9. The rope supplied with Sub-duct Mono-bore 4 has a much lower breaking strain similar to that of drawrope and is identified by having green colour in its braid. The inner surface of the sub-duct is pre-lubricated to reduce friction during cable installation.

The supply length for Sub-duct Mono-bore 4 is 2000 metres and the supply length for Sub-duct Mono-bore 3A is 1800 metres. Both are supplied on a 2.4 m flange diameter cable drum. The outside surface of the sub-duct has length markings at 1 metre intervals. The reading at the free end of the sub-duct indicates (in metres) the length of sub-duct remaining on the drum.

Refer to Appendix 1 Item 1 for ordering details.

5 *Advantages of Using Sub-duct*

When installed in the duct network, the sub-duct provides the following benefits:

- Physical protection for cables enables recovery of old cables from the same bore as the sub-duct.
- Opportunity for mixing normally segregated cables in the same duct thus reducing the need for new duct work in some cases.
- Enables rodding and cabling over sub-duct without causing damage to optical cable contained inside.
- Long length cabling with low winch tensions thus reducing need for figure of eighting.

These benefits must be considered against additional cost of sub-duct, the additional operation to install the sub-duct and the extra duct space required to house the sub-duct. The decision as to when and where to install the sub-duct must be made in line with planning policy.

6 ***Sub-duct Shrinkage After Installation in Duct***

When subjected to a tensile force, sub-duct will at first stretch before returning to its original length after the force is removed. When subjected to large cabling forces (greater than 6 kN for SDMB3A and 5 kN for SDMB4) permanent deformation will occur causing the sub-duct to stretch and neck down. The resultant decrease in diameter may cause difficulties during subsequent cable installation. During installation within its tensile limits sub-duct may stretch by up to 4% followed by contraction when the installation forces are removed. Further shrinkage will gradually (over at least 24 hours) occur due to the release of energy resulting from changes in restraining forces such as friction between the sub-duct and the main duct.

Due to its reduced size SDMB4 will stretch up to a third more than SDMB3A for the same applied cabling tension.

Note: After the sub-duct has been pulled in, it must be left unrestrained for at least 24 hours before joining or cable installation.

To allow for shrinkage, leave an excess of at least 5 metres of SDMB4 or 3 metres of SDMB3A on each leg to be joined at sub-duct joining points.

At winching and cable drum cabling positions an additional length may be left to act as a cable guide during cable installation.

If there is any setting back to be carried out in intermediate manholes after cable installation, an additional allowance must be made at the ends of the sub-duct.

The excess can be provided by pulling the sub-duct through a sufficiently long assembly of Guides Cabling 4A.

7 ***Checking the Pre-installed Rope Prior to Installation***

Sub-duct is supplied with 3% excess length of pre-installed rope. During installation, the sub-duct will stretch. It is important that this excess is not removed as this will result in the rope tightening within the sub-duct producing a capstan effect on the drum and the pull required to install the sub-duct will increase considerably and may result in the winch rope breaking.

Prior to fitting a pulling device to the end of the sub-duct, check that the rope in the sub-duct is slack. Typically, on a full drum of sub-duct it should be possible to pull out at least 2 metres of slack rope from the free end of the sub-duct.

Note: **After carrying out the above check do not cut the excess rope. Push it back into the sub-duct and secure the end of the rope as described in Paragraph 8.**

8 ***Fitting Pulling Devices to Sub-duct Prior to Installation***

It is important to ensure that the end of the pre-installed rope is not lost down the sub-duct during any operation.

Using a Cutter Circumferential 1A (see Appendix 1, Item 2), cut the end of the sub-duct square taking care not to damage the rope inside the sub-duct.

Swivels are an important protection device. Prior to winching, open the component and check for damage & wear, ensure the bushings are clean, free to rotate and that the correct fuse is fitted. Excessively damaged or worn swivels or fuses must not be used and should be replaced as soon as possible. To prolong the life of the swivel, once a week, lightly greasing the internal bushings and stub with Multi-Purpose Grease I/C 104233.

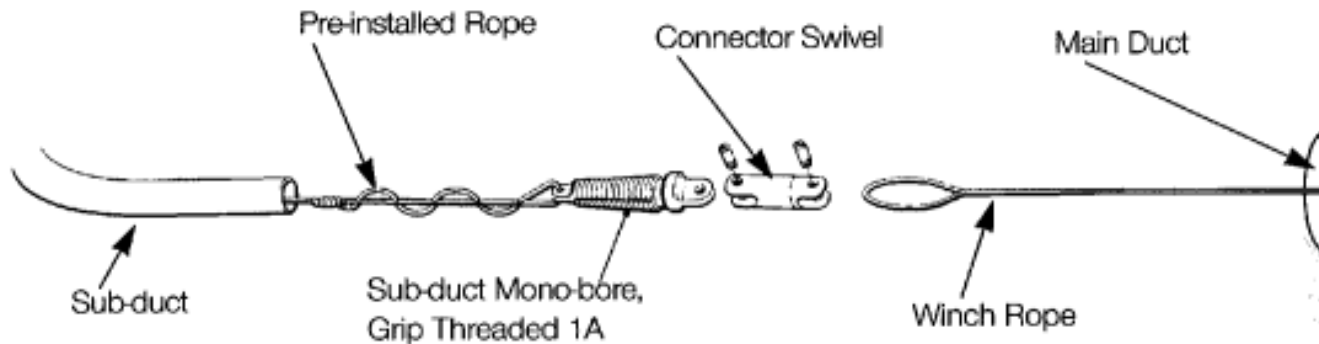
8.1 **Using a Sub-duct Mono-bore, Grip Threaded 1A (See Appendix 1, Item 4)**

Pass the end of the pre-installed rope through the eye on the Sub-duct Mono-bore, Grip Threaded 1A at the smaller end of the taper and splice the rope to make an eye as shown in Figure 1a. Refer to Appendix 2 for further information on methods of splicing ropes.

Using Sub-duct Mono-bore 3A, Tommy Bar 1A (See Appendix 1, Item 6), screw the grip into the end of the sub-duct until the shoulder butts up against the end of the sub-duct.

Note: To assist with fitting the larger pulling eye into SDMB 3 see item 5 of Appendix 1 for details of Sub-duct Mono-bore 3A Clamp 15A pictured in item 6 of Appendix 1

Figure 1a Sub-duct Preparation and Installation



Note: For Sub-duct Mono-bore 4 use a Connector Swivel 22mm 2A fitted with a 5 kN fuse between the cabling rope and Sub-duct Mono-bore 4, Grip Threaded 1A.

Note: For Sub-duct Mono-bore 3 use a Connector Swivel Sub-Duct (Non-Fused) see item 7 of Appendix 1 between the cabling rope and Sub-duct Mono-bore 3 Grip Threaded 1A.

8.2 Using a Standard Cable Grip - Sub-duct Mono-bore 3 Only

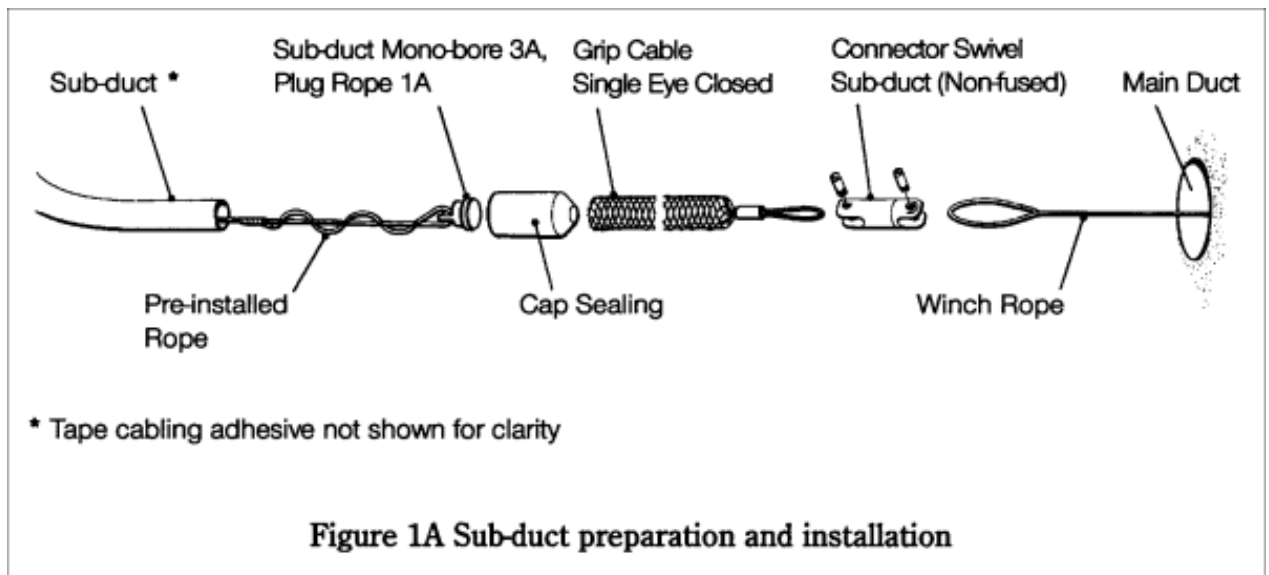
Feed the end of the pre-installed rope through the eye on the Sub-duct Mono-bore 3A, Plug Rope 1A (See Appendix 1, Item 3) and splice to make an eye as shown in Figure 1b. Refer to Appendix 2 for further information on methods of splicing ropes.

Insert the plug into the end of the sub-duct and seal with a Cap Sealing 16 E (shrinkdown cap).

Fit a Grip Cabling Single Eye Closed 1 onto the end of the sub-duct, having prepared the end of the sub-duct with Tape Cabling Adhesive in the normal way.

Note: Use a Connector Swivel Sub-Duct (Non-Fused) see item 7 of Appendix 1 or a Connector Swivel 1 (Item Code 112795) between the cabling rope and Sub-duct Mono-bore 3.

Figure 1b Sub-duct Preparation and Installation



9 ***Lubricating Sub-duct During Installation***

Use of lubricant during sub-duct installation will reduce the pull required by the winch to install the sub-duct. The recommended lubricant is Lubricant Cable 2A. A chart is supplied with each container of Lubricant Cable 2A which recommends quantities of lubricant to be used.

Lubricant Cable 2A is extremely slippery and care must be taken to avoid spillages. Any spillage must be mopped up thoroughly. Wear gloves and eye shields during use. Gloves soaked in lubricant will be very slippery - use disposable gloves or keep a pair especially for use during lubricant application.

9.1 **Sub-duct Lubrication at the Drum End**

The recommended method of lubricating the outside of the sub-duct is as follows:

Cut approximately 1m of Duct 58A (split). Fit the Duct 58A around the winch rope and any existing cables or sub-ducts. Slide the Duct 58A approximately 300 mm into the main duct. See Figure 2.

Assemble sufficient Guides Cabling 4A to reach from the main duct mouth to the edge of the jointbox or manhole. Pass the sub-duct through the Guides Cabling 4A.

Insert the Guides Cabling 4A into the Duct 58A. Use rags to pack the gap between the Duct 58A, the Guides Cabling 4A and any cables. Tighten the Duct 58A onto the Guides Cabling etc using Straps Cable Fixing 10A Black as shown in Figure 2. Seal any remaining gaps with Tape Plastic Adhesive.

Secure the Duct 58A/Guide Cabling 4A assembly at an incline to minimise leakage of the lubricant.

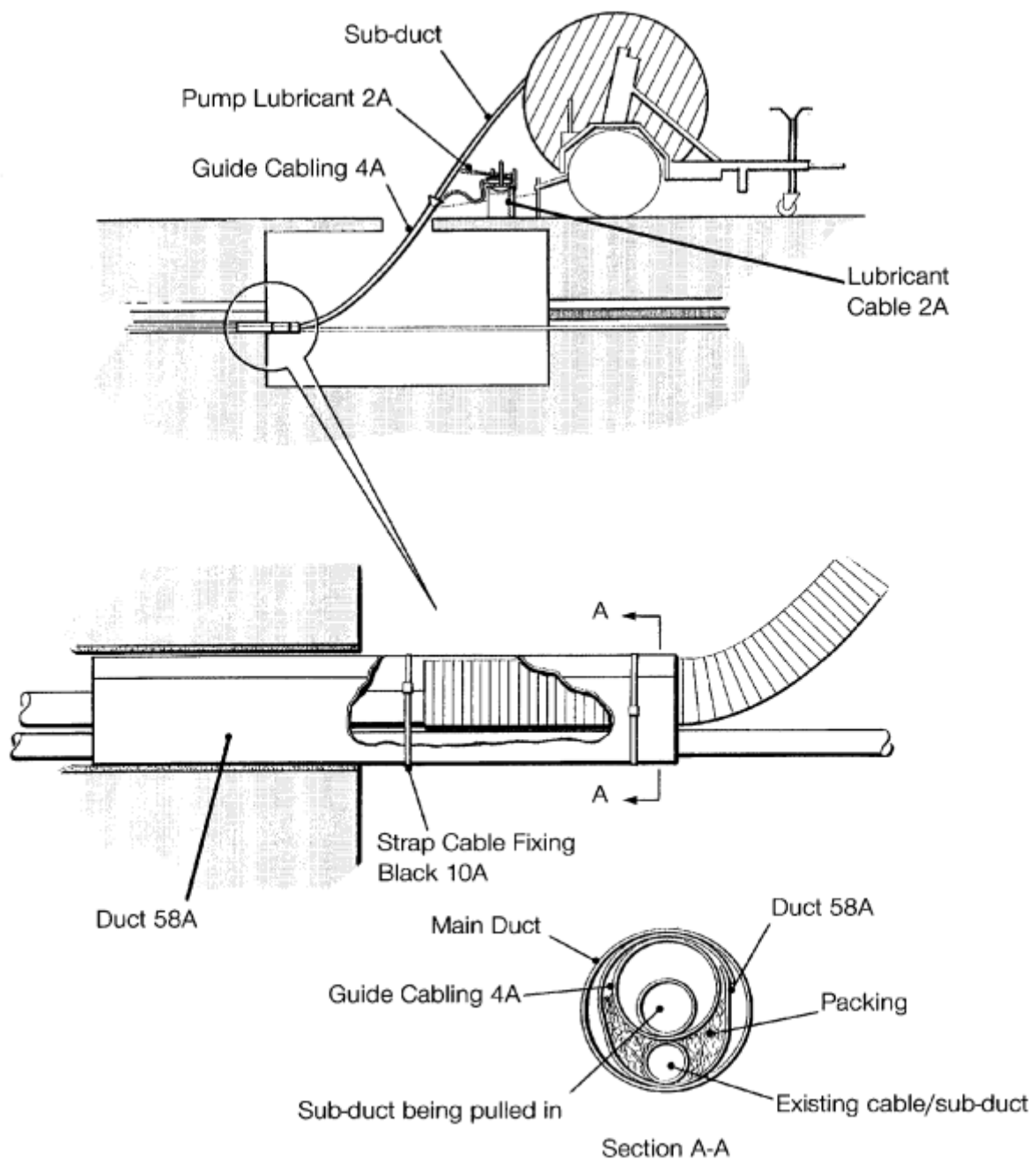
Insert the suction pipe of the Pump Lubricant 2A into the pouring hole of the Lubricant Cable 2A container. Secure the pump base plate onto the lubricant container by tightening the three hand knobs (do not over tighten). Remove the plug from the end of the pump outlet hose and place the end of the hose at the open end of the Guide Cabling 4A. Operate the pump as necessary.

After completing the pull, use a Bin Storage 13 or other suitable receptacle to collect excess lubricant from Duct 58A assembly when it is dismantled.

9.2 Sub-duct Lubrication at Intermediate Points

Installation of the sub-duct may be assisted by providing lubricant at intermediate points. This may be done by inserting the outlet hose from the pump at least 1 metre into the main duct and operating the pump. Where conditions permit, the pump/lubricant assembly should be set up outside the manhole or a joint box and pump operated as necessary. In all cases, persons **MUST NOT** be in manholes or joint boxes where ropes or sub-ducts are under tension.

Figure 2 Sub-duct Lubrication



10 *Sub-duct Installation*

10.1 Single sub-duct installation

The sub-duct should be installed using the normal cabling practices detailed in the Cabling in Duct Manual Indexed in ISIS Document EPT/UGP/E031.

It is not necessary to attempt long, difficult sub-duct pulls because short lengths of sub-duct and its pre-installed rope can be joined quickly and easily.

It is not necessary to attempt long, difficult sub-duct pulls because the sub-duct and its pre-installed rope can be installed in short lengths (typically 500 to 600 metres) and can be joined quickly and easily (see below) to provide a long continuous bore for subsequent cable installation.

Important

Always protect Sub-duct Mono-bore 4 against damage from excessive cabling forces by the use of a Connector Swivel 22 mm 2A fitted with a 5kN fuse (See section 8).

When installing the sub-duct, where conditions permit, benefit may be gained by positioning the cable drum trailer at one end and progressing down the route with the winch, pulling the sub-duct in short bites without joins. This helps to reduce the pulling tensions required.

When pulling in a sub-duct, an extra length of sub-duct must be provided at the ends to allow for shrinkage (see Section 6) and setting back (where necessary) as described in Section 11.

The presence of dirt and grit in a sub-duct reduces the low friction properties of the inner surface which in turn results in increased tensions required to place a cable in the sub-duct.

To prevent the ingress of dirt and grit secure the pre-installed rope in the ends of the sub-duct and seal the ends. For SDMB4 the SDM4, Plug Rope performs both of these functions. For SDMB3A the Sub-duct Mono-bore 3A, Plugs Rope 1A should be used to secure the rope and sealed with a Cap Sealing 16 E.

Do not restrain the sub-duct for at least 24 hours after being pulled in to allow for shrinkage.

Two sub-ducts shall be joined using Sub-duct Mono-bore, Connector Straight (see Appendix 1, Item 14) in accordance with the fitting instructions supplied with the connector.

Use Sub-duct Mono-bore 3A, Cutter Circumferential 1A (see Appendix 1, Item 2) to cut the sub-duct. Use Sub-duct Mono-bore, Chamfering Tool (see Appendix 1, Item 11) to chamfer the ends of the sub-duct. Splice the pre-installed rope in the sub-duct using a butt splice described in Appendix 2.

If a part of the sub-duct has been set back, secure that section to the cable bearers using Straps Cable Fixing 10 A Black.

Where the sub-duct is likely to creep under the influence of road traffic etc fit Anchors Cable 4 or 5 as detailed in ISIS EPT/ANS/A003.

10.2 Dual sub-duct installation

Dual installation is useful where we need to install two or more sub ducts down the same route each one is cabled individually. This can be particularly difficult and time consuming when night working or jobs with complex Traffic Management.

This is a pair of sub ducts drummed together in parallel on the same drum with both ends of each length accessible so the two sub ducts can be payed off the drum simultaneously. Labelled 'Duct 1' and 'Duct 2' every 50cm for easy identification in subsequent boxes. Costs are only marginally more than individual sub ducts but labour savings are substantial

Doubles cabling productivity on any routes where more than one sub duct is needed to follow the same route. Reduced DL and contractor labour costs. Awkward jobs completed more easily and in less time, with less disruption to the community and lower Traffic Management costs and issues.

2 x 2000m – 106466

2 x 1000m – 106467

2 x 600m 106468



11 *Turning Sub-duct in Manholes and Setting Back*

For changing direction of the sub-duct in manholes, a large turning wheel titled Turning Wheel Sub-duct is required. Wheels supplied with Guide Cabling 12, Guide Cabling 13A, Guide Cabling 14 or Guide Cabling 16 are not large enough and therefore should not be used with sub-duct.

Turning Wheel Sub-duct is profiled to guide the sub-duct (without crushing) around a radius of 300 mm (see Appendix 1, Item 9).

After turning a sub-duct in a manhole, it may be necessary to set the sub-duct back onto cable bearers. Similarly after installing a sub-duct straight through in a manhole, it may be necessary to set it back onto cable bearers to avoid it getting in the way of access steps etc. However, additional bends in the sub-

duct introduced as a result of setting back will increase the tension required to place the cable in the sub-duct.

It is preferable to carry out the setting back operation after the cable has been installed in the sub-duct.

However, this may not always be possible. In cases where the sub-duct has been set back and secured to the cable bearers prior to cable installation, extra lubrication must be provided during cable installation to prevent the rope from welding itself to the sub-duct (see Paragraph 13 for details). The best place to provide the extra lubrication is just before the bends.

In all cases, the sub-duct can be set back using a Puller Chain (see Appendix 1, Item 10) and Grip Cable Terylene 1A. The chain puller is supplied with a 6 metre long chain.

The required slack in the sub-duct can be provided by attaching the hook of the chain puller to an anchor in the manhole and the hook at the end of the chain to the grip tied round the sub-duct in a normal way and operating the lever. Extreme care must be exercised prior to and during this operation to ensure that the anchor is secure in the manhole wall and the chain puller and the grip are in good condition.

After setting back, secure the sub-duct to the cable bearers using Straps Cable Fixing 10 A Black.

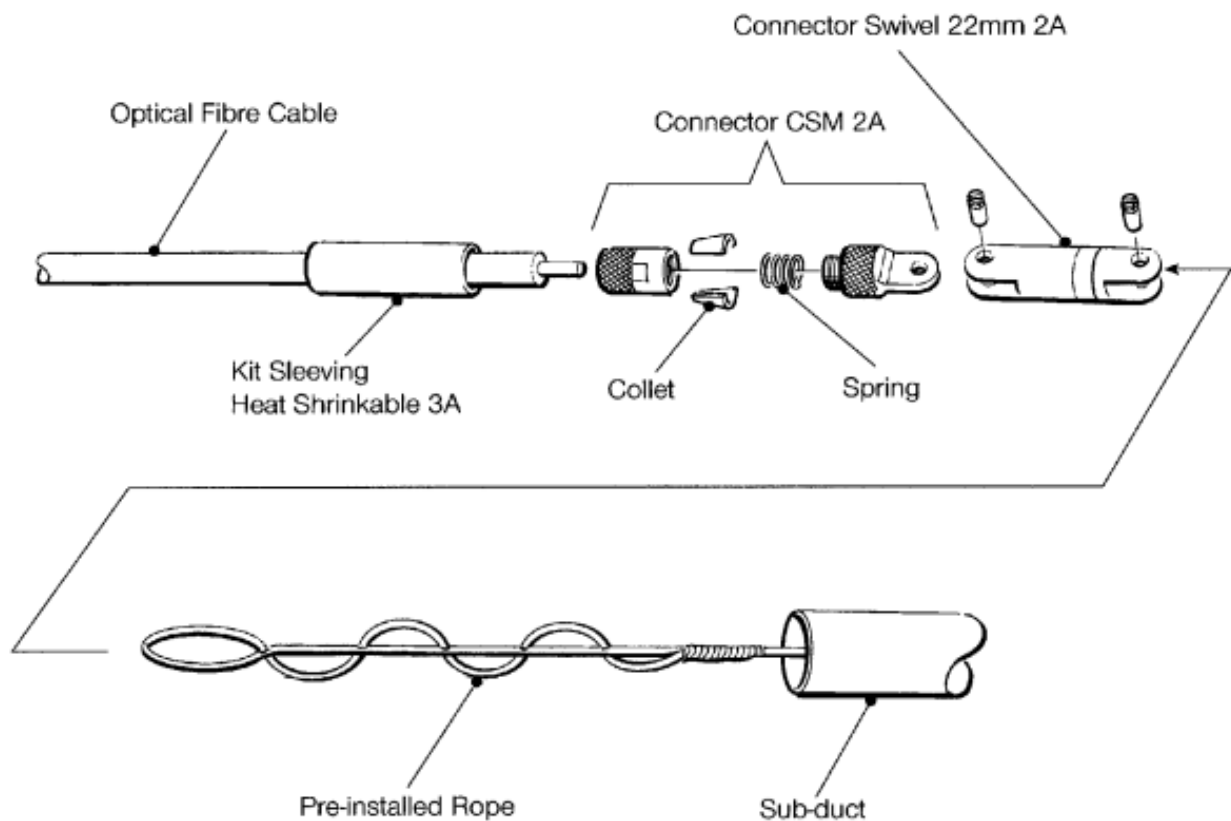
12 *Fitting Pulling Devices to Cables Prior to Installation in a Sub-duct*

12.1 For Optical Fibre Cables with a Steel Central Strength Member

Fit Connector CSM 2A (see Appendix 1, Item 13) and Connector Swivel 22 mm 2A (see Appendix 1, Item 14) to the end of the cable as follows:

Expose and cut the central strength member of the cable to a length of 35 mm. Fit Connector CSM 2A with the correct sized Collet CSM to the cable strength member as shown in Figure 3. For SDMB3A use a Kit Sleeving Heat Shrinkable 1B to provide a seal over the cable and both knurled sections of the connector. For SDMB4 use a 100mm length of Kit Sleeving Heat Shrinkable 3A for this purpose. Fit a new correctly rated Fuse Swivel to the Connector Swivel 22 mm 2A and attach the swivel to the eye connector as shown in Figure 3.

Figure 3 Cable Preparation



13 ***Lubricating Cable During Installation in Sub-duct***

13.1 **At the Drum End**

The recommended lubricant is Lubricant Cable 2A which should be applied at the cable drum end during cable installation.

Sub-duct Mono-bore 3A or 4, Connector Straight 2A has a third port which can be used to pump lubricant into the sub-duct during a cable installation operation. In order to use the connector for lubrication purposes remove the plug from the connector and replace it with the threaded tube supplied with the connector (see Appendix 1, Item 14) and proceed as follows:

Cut and bevel the end of the installed sub-duct taking care not to damage the pre-installed rope.

Pass the pre-installed rope through the Sub-duct Mono-bore, Connector Straight and fit one side of the connector to the end of the sub-duct as shown in Figure 4.

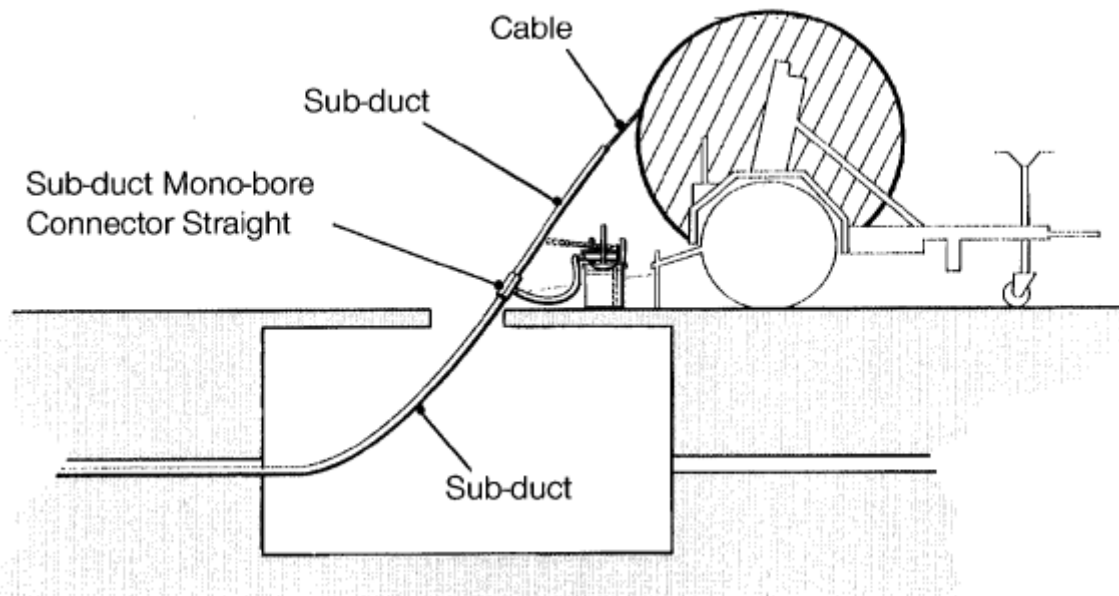
Cut and bevel the ends of a short piece of sub-duct to form a guide from the cable drum to the connector.

Pass the pre-installed rope from the connector through this short piece of sub-duct in readiness for connecting it to the swivel (see Section 12) and fit the end of the sub-duct into the connector as shown in Figure 4.

Connect the outlet hose from the Pump Lubricant 2A to the threaded tube on the connector as shown in Figure 4 and secure it using the clip provided with the pump.

As a guide, approximately 10 litres (2 gallons) of Lubricant Cable 2A should be used per 2000 metres of cable.

Figure 4 Lubrication at the Drum End During Cable Installation



13.2 At Intermediate Points

Where difficult routes are encountered, for example a route with several 90 degree bends and/or in cases where sub-duct has been set back and secured prior to cable installation, extra lubrication must be provided during cable installation.

If the winch rope is subjected to high pulling tensions during cable installation, the friction between the rope and the sub-duct can produce enough heat to melt the sub-duct and the rope. This usually occurs at the bends and can result in the rope welding itself to the sub-duct and finally breaking. Use of a lubricant during cable installation reduces the pulling tensions required. Lubrication during cable installation can be provided by fitting a Sub-duct Mono-bore, Connector Straight at a jointbox or a manhole preceding the bend as described below. More than one Sub-duct Mono-bore, Connector Straight may be fitted along the route, if necessary.

Cut the sub-duct square, just before the bend, on the drum side of the bend. Carefully pull out about a metre of the pre-installed rope out of the sub-duct and cut it at mid point ensuring that neither rope disappears down the sub-

duct. Using the connector, join the two ends of the sub-duct and the rope as described in the instructions supplied with the connector. Remove the plug from the connector and replace it with the threaded tube supplied with the connector. Do not throw away the plug.

Connect the outlet hose from the Pump Lubricant 2A to the threaded tube on the connector and secure it using the clip provided with the pump.

Lubricant may be pumped into the sub-duct when required. As a guide, operate the pump handle several times before beginning the pull and then once every 30 to 40 metres of the pull.

After the cable has been installed in the sub-duct, disconnect the pump hose from the threaded tube on the connector and replace the threaded tube with the original plug in each connector.

After installation ensure that the work site is clean and tidy and any lubricant spillages are thoroughly mopped up.

14 ***Cable Installation in Sub-duct***

14.1 **General**

Sub-duct Mono-bore 4 has a pre-installed rope which is weaker than the Rope Cabling 9 supplied in SDMB3 (see Appendix 3 for more information on the rope).

Paragraphs 14.3.1 and 14.3.2 describe two methods of recovering and storing the pre-installed rope during cable installation.

14.2 **Preparation at the Drum End**

Splice an eye on the end of the pre-installed rope in the sub-duct and connect it to the Connector Swivel 22 mm 2A and Connector CSM 2A as shown in Figure 3.

It may be helpful to mark the rope in some way (for example a small length of different coloured rope can be spliced through it) to indicate the proximity of the cable end. The appearance of the rope with the mark at the winch end will enable the winch operator to know that the installation operation is nearly complete.

14.3 **Preparation at the Winch End**

Where the length of the installed sub-duct is sufficient to reach the winch, it may not be necessary to fit Guides Rod Flexible 3 or 4 to guard the rope (ie when the sub-duct itself is acting as a cabling guide).

The cable is installed into the sub-duct using the pre-installed rope.

The length of the rope in the sub-duct can be more than 2000 metres. Because the take up reels on R and LCU and MCU have a limited storage capacity, one of the following two methods should be used to for recovering and storing the pre-installed rope during cable installation.

14.3.1 Using Reel Cabling Rope 1A (see Appendix 1, Item 15)

Fit an empty Reel Cabling Rope 1A on the take up reel spindle in the vehicle and winch in the normal way. Stop winching when the reel is full. Reverse the winch to release the tension in the rope. Unwind approximately 5 metres of rope from the reel. Cut the rope at the reel. Replace the full reel with an empty one and continue the process.

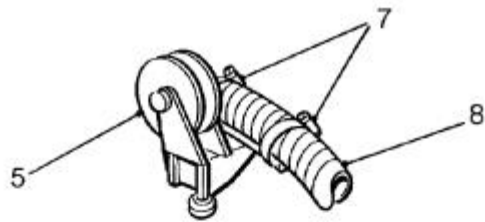
14.3.2 Using Kit Cabling 752A (Item Code 127172) with R and LC Unit

Fit the Kit Cabling in accordance with the instructions supplied with the kit. See Figure 5 for general layout. Stand a suitable bin at the corner of the vehicle.

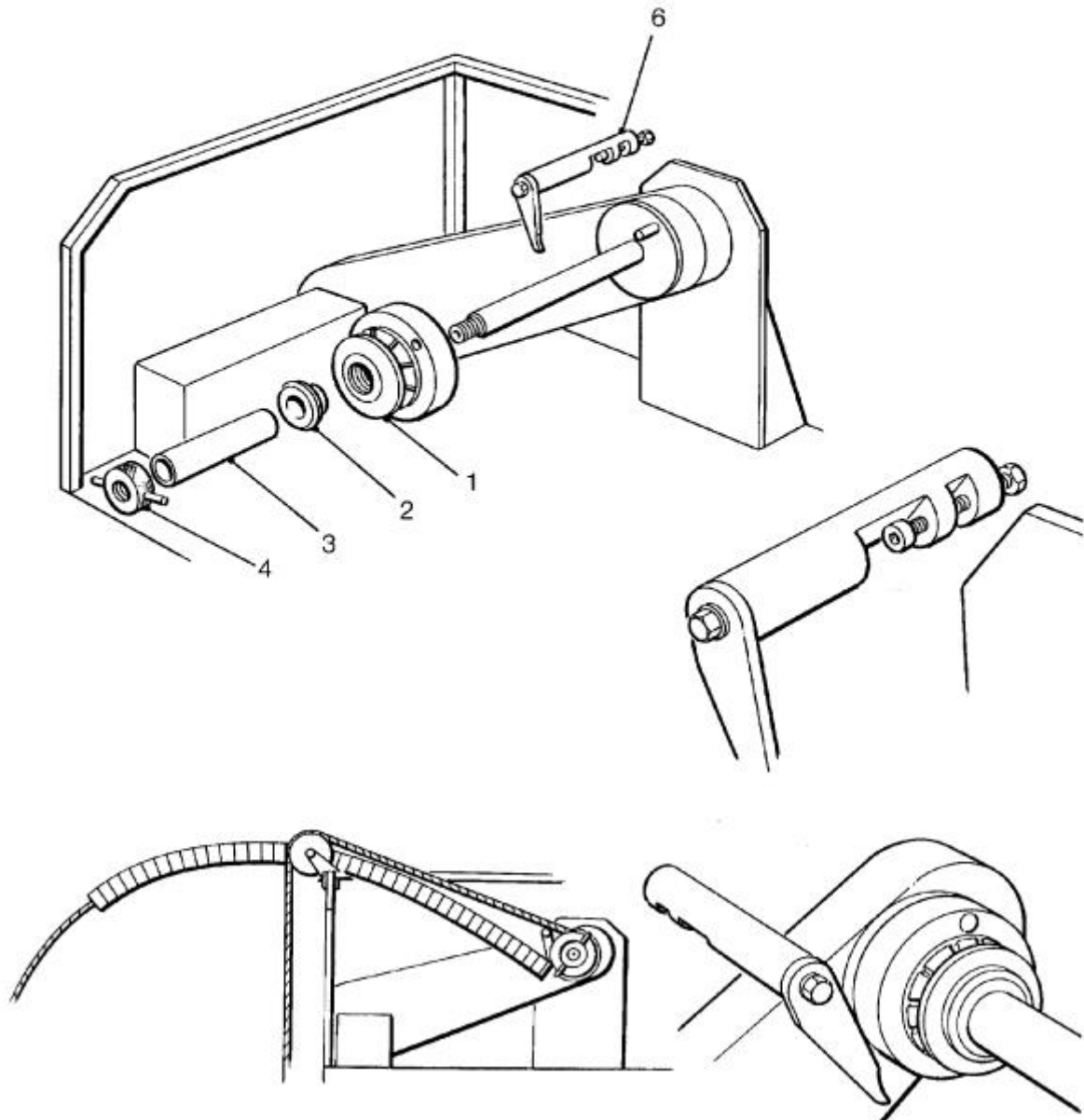
Take the rope from the winch capstan and pass it over the pulley, around the take up cleat and through the flexible tube.

Operate the winch. The rope will be stripped from the cleat automatically. As the rope feeds off, guide the rope into the bin. (More than one bin may be required depending on the length of the rope and the size of the bin.)

Figure 5 Kit Cabling752A



- 1 Take up cleat
- 2 Hub support
- 3 Tube
- 4 Knurled securing nut
- 5 Pulley assembly
- 6 Stripper support arm
- 7 Worm drive clips
- 8 Flexible tube



15 *Provision of Cable Jointing Length*

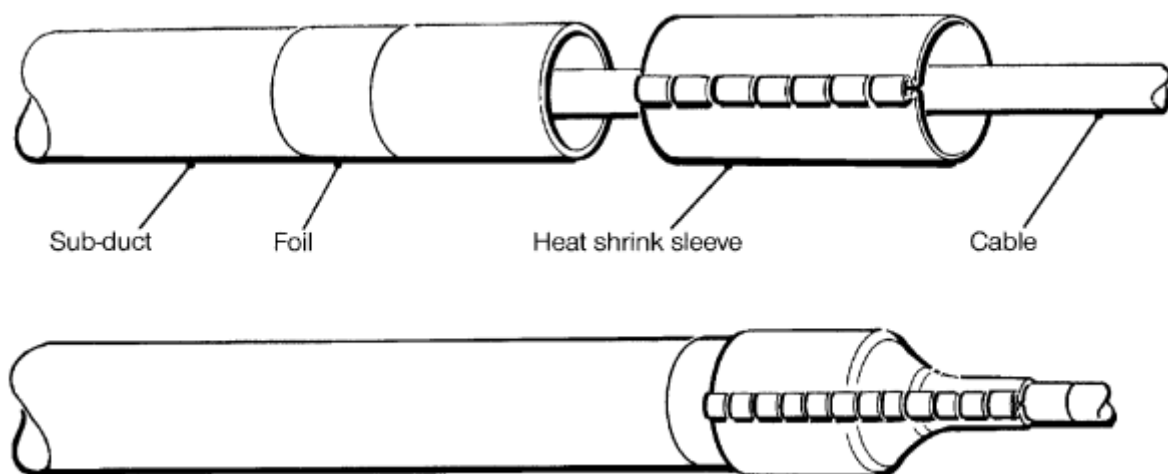
Jointing lengths of cable can be provided in the normal way. However if there is insufficient length of the installed sub-duct protruding beyond the main duct, the jointing length can be provided by pulling the cable through a suitable length of sub-duct jointed to the original sub-duct.

16 *Sub-duct to Cable Seal After Cable Installation*

After the cable installation is completed, seal the ends of the sub-duct to the cable using **Kit Sleevng Heatshrinkable 5** as shown in Figure 6. The kit is supplied complete with fitting instructions.

After the cable has been placed inside the sub-duct, ensure that the work site is clean and tidy and any lubricant spillages are thoroughly mopped up.

Figure 6 Sub-duct/cable Sealing



17 *Additional Tools*

Appendix 1, Item 16 describes a vice which may be used inside the vehicle while preparing the end of the cable prior to installation in sub-duct. Item 17 describes a longitudinal cutter which may be used to split the sub-duct lengthways. Item 18 describes a fid for use when splicing the ropes.

18 *References*

EPT/UGP/E031 Cabling in Duct Manual Index

EPT/UGP/E031 Cabling in Duct - Safety and Reference Documents

EPT/ANS/A003 Cable Support and Protection

19 *Appendix 1*

Stores and equipment required for Sub-duct Mono-bore and Cable Installation.

19.1 **Item 1 Sub-duct Mono-bore**

Description:

A high density polyethylene pipe containing a pre-installed rope.

Sub-duct Mono-bore 3A contains a reusable rope (Rope Cabling 9).

Sub-duct Mono-bore 4 rope is not recommended for re-use as a cabling rope.

Sub-duct Mono-bore 3A

Internal Diameter 29 mm.

Outside Diameter 37 mm

Supply Length 1800 metres

Rope: Rope Cabling 9 Spliced Breaking Strength 10.5 kN

Rope Diameter 7 to 10 mm

Sub-duct Mono-bore 4

Internal Diameter 26 mm.

Outside Diameter 32 mm

Supply Length 2000 metres

Rope: Spliced Breaking Strength 6.7 kN

Rope Diameter 7 to 10 mm

Obtainable From:

BT/Materials Department.

Engineering Stores Catalogue Description:

Sub-duct Mono-bore 3A

Sub-duct Mono-bore 4

Item Code:

095095

075196

19.2 **Item 2 Sub-duct Mono-bore 3A Cutter Circumferential 1A**

Function and Description

To cut both Sub-duct Mono-bore 3A and 4 around its circumference so as not to damage the rope or the cable inside the sub-duct. This tool is similar to a standard pipe cutter with two roller guides and a cutting blade. Supplied in a plastic box with one spare blade and a pin punch to change the blade.

Obtainable From: BT/Materials Department.

Engineering Stores Catalogue Description:

Sub-duct Mono-bore Cutter Circumferential 1A

Item Code:

127433

Remarks:

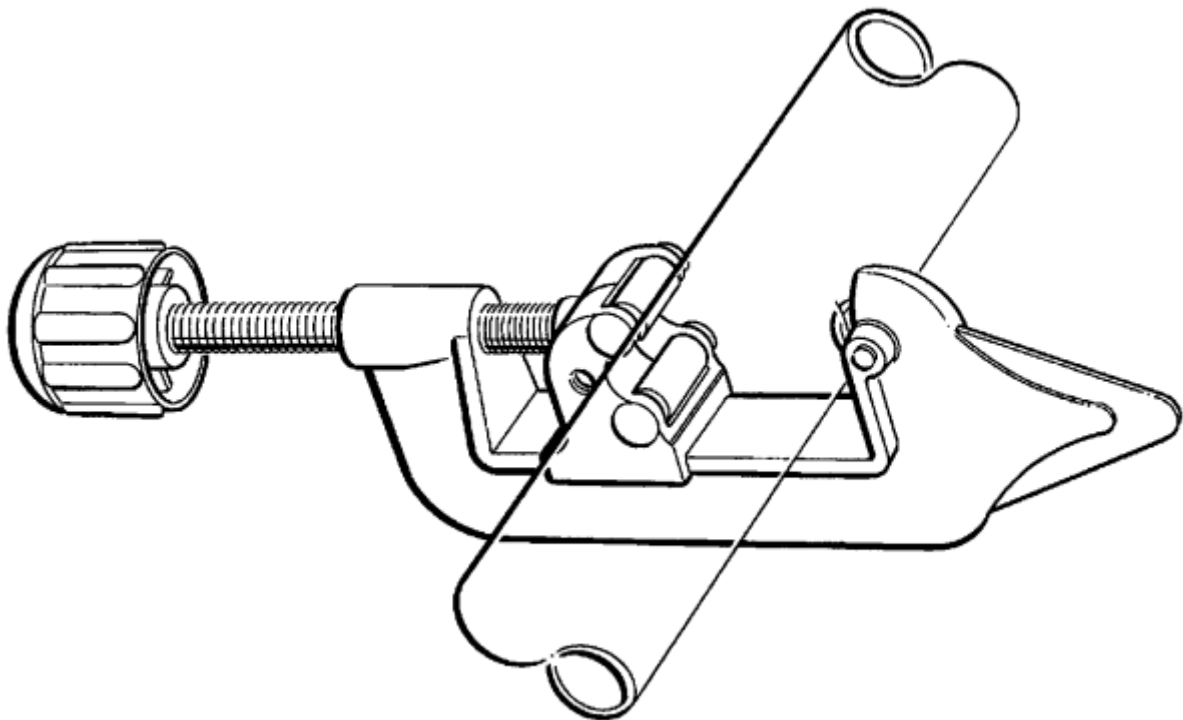
Spare blades are available for the cutter in a pack containing 10 blades from Materials Department.

Engineering Stores Catalogue Description:

Sub-duct Mono-bore 3A, Cutter Circumferential 1A, Blades

Item Code:

127434



IMPORTANT – It is recommended that protective eyewear is worn whilst cutting Sub duct Mono-bore. There may be an increased risk of the duct springing back towards the face if the duct is under physical tension or slightly bent due to congestion in the joint box it is located.

In very cold conditions the Sub duct Mono-bore may be harder and more brittle than usual which could result in it splintering.

Wearing protective eyewear may help to prevent eye injury in the event of the duct springing back towards the face or duct end splintering

19.3 Item 3 Sub-duct Mono-bore, Plug Rope 1A

Function and Description:

Prevents the loss of pre-installed rope inside the sub-duct. The plug fits into the end of the sub-duct and has an eye for securing the pre-installed rope. Supplied in quantities of 10 per pack.

Note: SDMB4 Plug Rope 1A also acts as a seal.

Obtainable From:

BT Materials Department

Engineering Stores Catalogue Description:

Item Code:

Sub-duct Mono-bore 3A, Plug Rope 1A

073152

Sub-duct Mono-bore 4, Plug Rope 1A

129331

19.4 Item 4 Sub-duct Mono-bore, Grip Threaded 1A

Function and Description:

Provides a means of attaching the cabling rope to the sub-duct. The grip has a threaded body which screws into the end of the sub-duct and has an eye at each end. The eye at the narrow end provides a means of anchoring the pre-installed rope and the eye at the other end is used for attaching the winch rope.

Obtainable From:

BT/Materials Department

Engineering Stores Catalogue Description:

Item Code:

Sub-duct Mono-bore 3A, Grip Threaded 1A

127411

Sub-duct Mono-bore 4, Grip Threaded 1A

129323

19.5 Item 5 Sub-duct Mono-bore 3A, Clamp 15A

Function and Description:

To hold Sub-duct Mono-bore 3A when screwing the threaded grip (Item 4) into the end of the sub-duct. Consists of two blocks which fit round the sub-duct and two bars with threaded ends to tighten the clamp round the sub-duct. One of the bars can be replaced with a threaded knob when working in confined spaces.

Obtainable From:

BT/Materials Department

Engineering Stores Catalogue Description:

Item Code:

Sub-duct Mono-bore 3A Clamp 15A

127418

19.6 Item 6 Sub-duct Mono-bore 3A, Tommy Bar 1A

Function and Description:

To provide a means of turning the grip (Item 4) when screwing it into the end of the sub-duct. Consists of a bar with a fixed knob at the end and a removable knob at the other end. The bar fits into the eye of the grip for both sub duct types.

Obtainable From:

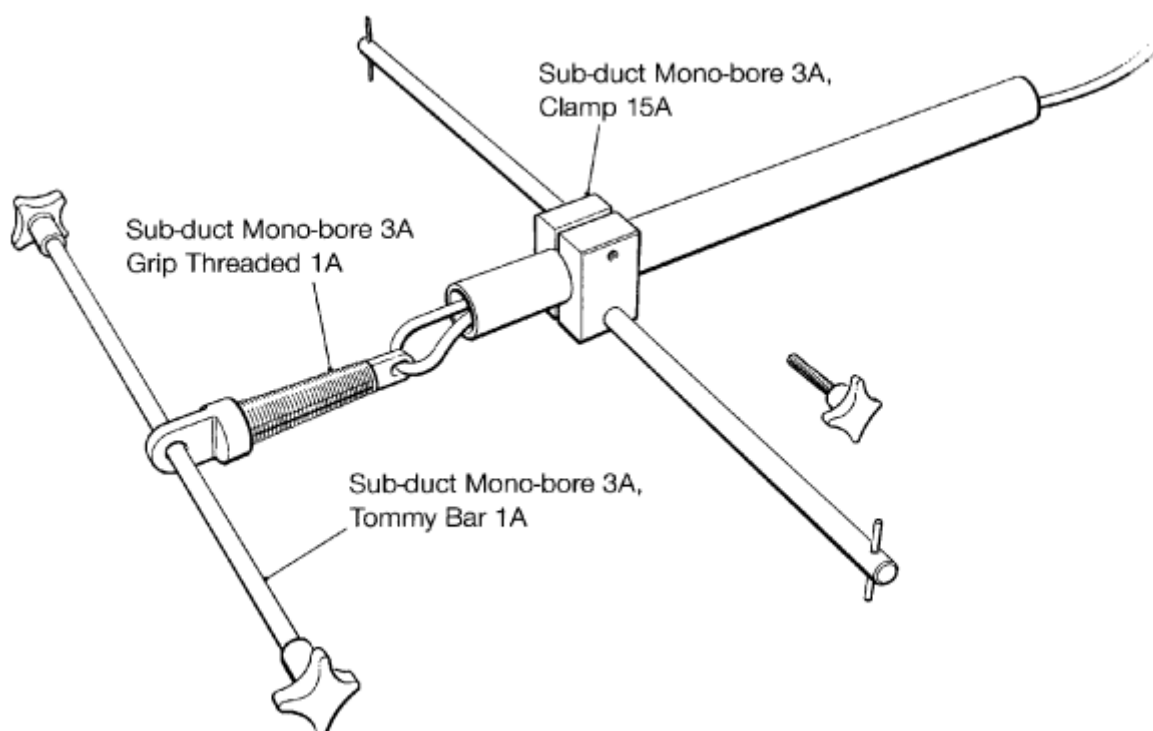
BT/Materials Department

Engineering Stores Catalogue Description:

Sub-duct Mono-bore 3A, Tommy Bar 1A

Item code:

127428



19.7 Item 7 Connector Swivel Sub-duct (Non-Fused) Local Purchase

Function and Description

To remove twist from the winch rope during sub-duct installation. Fitted between the winch rope and the sub-duct.

Obtainable from

Integral Ltd
South Bank Road

Middlesbrough
Cleveland
TS3 8AY
Tel 01642 231 902

Supplier's Catalogue description:

Connector Swivel Sub-duct (Non-Fused) - Lewis.

19.8 Item 8 Pump Lubricant 2A**Function and Description:**

For applying Lubricant Cable 2A to the sub-duct or the cable during installation. Consists of a pump mounted on a plate which fits directly on the lubricant container. A 5 metre length of clear plastic hose is supplied fitted to the pump.

Obtainable From:

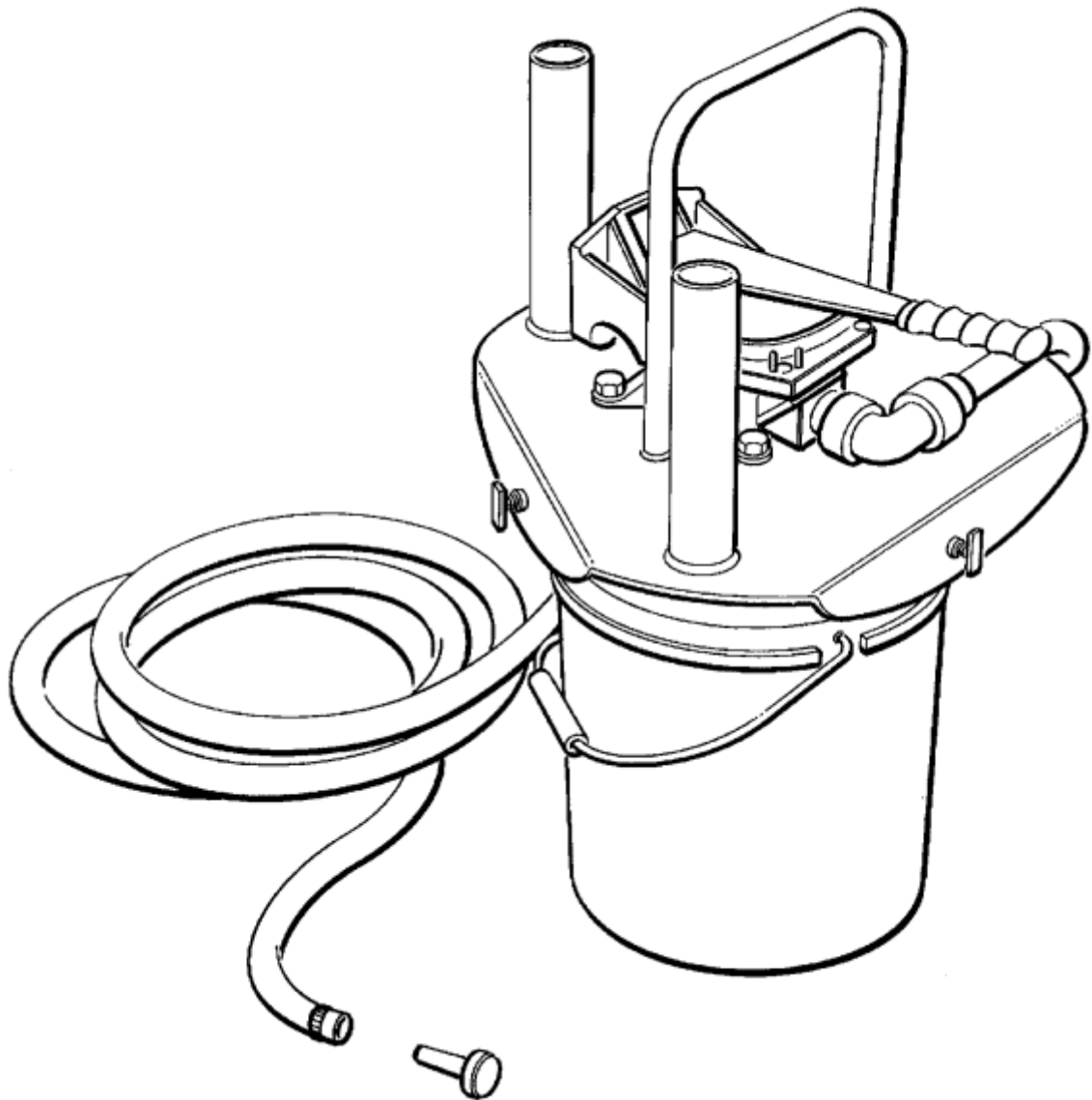
BT/Materials Department

Engineering Stores Catalogue Description:

Pump Lubricant 2A

Item Code:

127388



19.9 Item 9 Turning Wheel Sub-duct (Local Purchase)

Function:

For changing direction of sub-duct (where necessary) as it is pulled through a manhole.

General Information:

None of the wheels supplied with the current Guides Cabling 12, 13A, 14 or 16 are large enough for the purpose. Turning Wheel Sub-duct is a large wheel with an outside diameter of approximately 720 mm (28 inches) which must be used with Guides Cabling 16A - Fittings and Support set which must be ordered separately from the Engineering Stores Catalogue. The ordering information for the wheel is as follows:

Obtainable from:

Sainsbury (Precision Engineers) Ltd
Folgate Road
Lyngate Industrial Estate
North Walsham
NORFOLK NR28 0AJ
Tel: 01692 500036

Manufacturer's Catalogue Description:

Turning Wheel Sub-duct and Axle to suit manufactured to the following BT Drawings:

CN 12247 Issue A

CN 12248 Sheet 1

CN 12248 Sheet 2

BT Specification TL 476

19.10 Item 10 Puller Chain (Local Purchase)

Function and Description:

For setting back sub-duct in manholes, where necessary. Use Grip Cable Terylene (Item Code 126671) for gripping the sub-duct and attaching the to the chain puller.

Obtainable from:

Tirfor Limited
Old Lane
Halfway
Sheffield S19 5GZ
Tel: 0114 2482266

Contact: Sales Department

Manufacturer's Catalogue Description and Part No:

Bravo Ratchet Hoist fitted with a 6 metre length of chain. Tested and certified for 1.5 tonnes SWL. Part No: BTB 89002 1.5/6

19.11 Item 11 Sub-duct Mono-bore Chamfering Tool

Function and Description:

This is a dual purpose tool which chamfers both the outside and inside edge of the sub-duct in a single operation. The chamfer on the outside edge prevents damage to the 'O' rings while fitting a straight connector to the sub-duct and the chamfer on the inside edge prevents the swivel connector catching on the sharp edge inside the sub-duct during cable installation.

Obtainable From:

BT/Materials Department

Engineering Stores Catalogue Description:

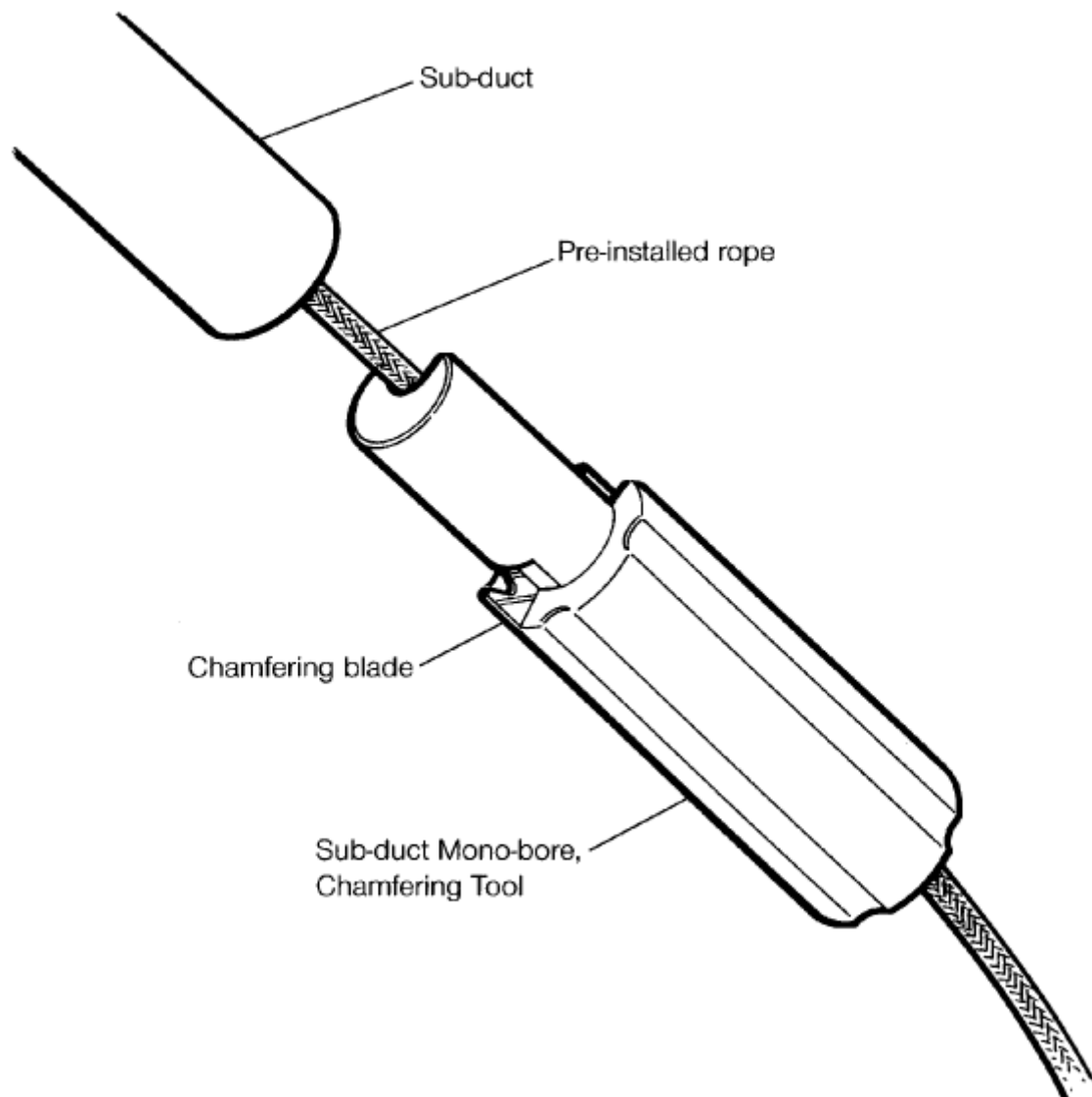
Sub-duct Mono-bore 3A, Chamfering Tool 2A

Sub-duct Mono-bore 4, Chamfer Tool 1

Item Code:

127586

129319

**19.12 Item 12 Connector CSM 2A****Function and Description:**

Provides means of gripping the steel central strength member of an optical fibre cable prior to cable installation in the sub-duct. The connector has an outside diameter of 20 mm. One end of the connector houses Collets CSM which grip the central strength member and the other end has an eye for

attaching to Connector Swivel 22 mm 2A (see Figure 3). The Collets CSM must be requisitioned separately. Please refer to the Engineering Stores Catalogue for details.

Obtainable From:

BT/Materials Department

Engineering Stores Catalogue Description:

Connector CSM 2A

Item Code:

127427

19.13 Item 13 Connector Swivel 22 mm 2A

Function and Description:

To remove twist from the pre-installed rope during cable installation in the sub-duct. This connector houses Fuse Swivel to prevent excessive tension being applied to the cable or sub-duct during installation. The connector must be used with Connector CSM 2A (see Figure 3). The Fuse Swivel must be requisitioned separately.

Obtainable From:

BT/Materials Department

Engineering Stores Catalogue Description:

Connector Swivel 22 mm 2A

Item Code

127404

Fuse Swivel details:

Title	Item Code	Rating (kN)
Fuse Swivel 5A	127889	5

19.14 Item 14 Sub-duct Mono-bore, Connector Straight

Function and Description:

This is a dual purpose connector used for providing an access for pumping lubricant into the sub-duct during cable installation and joining two sub-ducts together (see Item 11). The connector is similar to a straight plastic compression waste fitting with an additional port for pumping lubricant into the sub-duct during cable installation. The connector is supplied with a blanking plug fitted in the lubricating port which should be removed and replaced with the threaded tube supplied with the connector. Connect the hose of the lubricating pump to the threaded tube. After the cable installation operation, remove the threaded tube from the connector and replace it with the original blanking plug.

The connector is supplied complete with fitting instructions.

Obtainable From:

BT/Materials Department

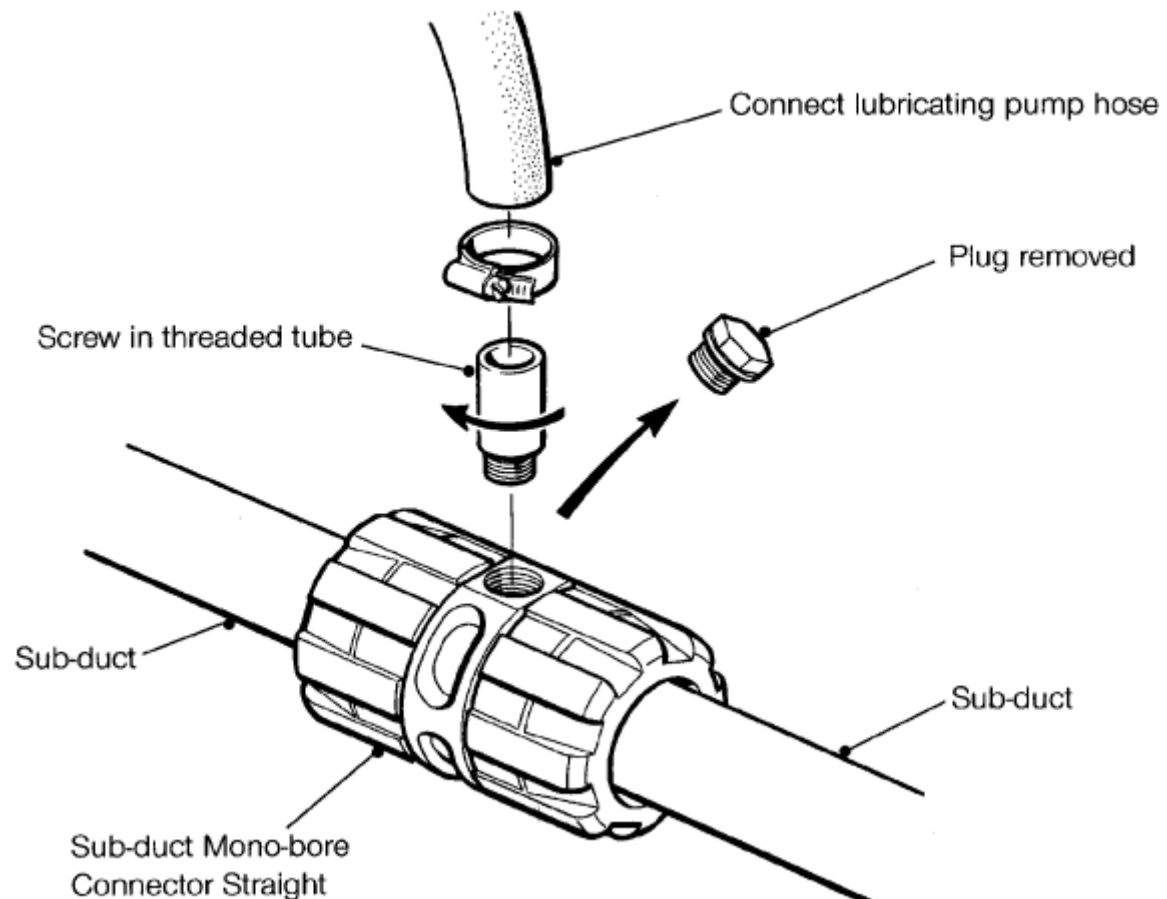
Engineering Stores Catalogue Description:**Item Code**

Sub-duct Mono-bore 3A, Connector Straight 2A

095104

Sub-duct Mono-bore 4, Connector Straight 1

075195

**19.15 Item 15 Reel Cabling Rope 1A****Function and Description:**

Empty wooden drum for reeling and storing the recovered pre-installed rope (Rope Cabling 9) during cable installation operation.

Obtainable From:

BT/Materials Department

Engineering Stores Catalogue Description:**Item Code**

Reel Cabling Rope 1A

127439

19.16 Item 16 Vice Table Parallel 3 Inch**Function and Description:**

To hold the cable while preparing the end etc. The vice can be clamped in any convenient position inside the vehicle and can be rotated to suit the job. Can also be used outside the vehicle.

Obtainable From:

BT/Materials Department

Engineering Stores Catalogue Description:

Vice Table Parallel 3 inch with soft jaws.

Item Code

127347

19.17 Item 17 Cutter Longitudinal 1A

Function and Description:

Required when there is a need to remove a section of sub-duct at an intermediate point after cable installation has been completed.

Steps to be followed:

1. Mark the section of sub-duct to be removed.
2. Use Cutter Circumferential 1A to cut through the first mark on the sub-duct, taking care not to damage the cable on the inside.
 - ◆ **Caution:** To avoid any possibility of damaging the cable adjust the depth of blade on Cutter Longitudinal 1A to the wall thickness of the sub-duct.
3. Insert the blade into the gap in the sub-duct and cut along to the second mark.
4. Repeat above step to make a second parallel cut 25 mm from the first cut.
5. Make a circumferential cut at the second mark.
6. Remove the cut sections to access the cable.

Note: It is easier to make a number of short longitudinal cuts (eg 600 mm) than one long cut.

Obtainable From:

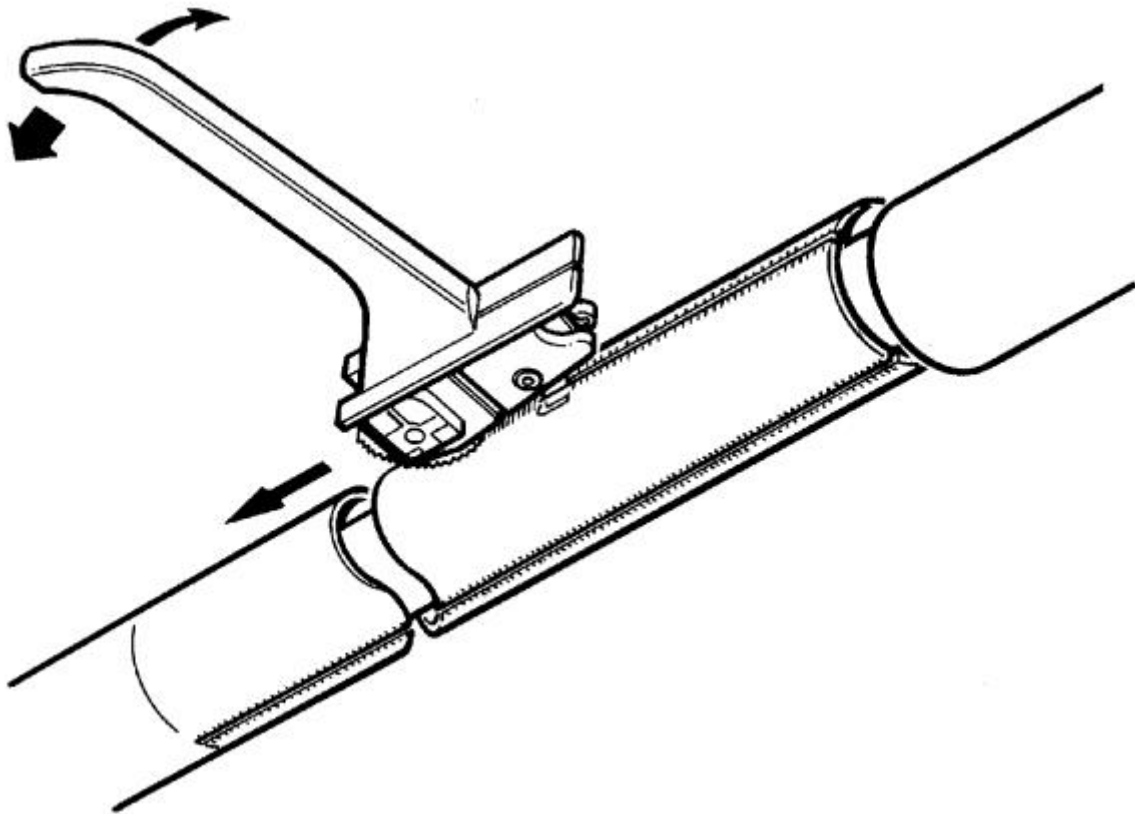
BT/Materials Department

Engineering Stores Catalogue Description:

Cutter Longitudinal 1A.

Item Code

127420



19.18 Item 18 Swedish Fid for Splicing Rope (Local Purchase)

Function and Description:

Provides a means of splicing pre-installed rope when fitting the plug or jointing sub-ducts.

Obtainable From:

Marlow Ropes Ltd
Diplocks Way
Hailsham
East Sussex BN27 3JS
Tel: 01323 847234

Manufacturer's Catalogue Description:

Small Swedish Fid.

Remarks: It is not recommended that these fids are purchased from local retailers as a poor quality fid will pick up the inner core of the rope and thus reduce the strength of the splice.

20 *Appendix 2*

20.1 **Splicing methods for Pre-installed Rope**

20.1.1 **Introduction**

The pre-installed rope in Sub-duct Mono-bore 3A, titled Rope Cabling 9, is primarily designed to install cable in the sub-duct. The recovered rope can then be reused as a standard cabling rope. The rope in the sub-duct may be from a number of different manufacturers and have different methods of splicing. The splicing method to be used is identified by the colour of the rope. Both the eye splice and the butt splice can be made in any of these ropes using the methods described below.

20.1.2 **Splicing Methods**

Whilst six tucks, using any suitable tool as a fid, will splice any of these ropes, such a splice will not normally achieve the full potential of the rope and may slip. Different rope manufacturers have developed particular splices to suit their ropes and gain maximum performance from the rope. You are strongly advised to follow the correct splicing method as described below.

Orange, Orange/ Green or Green Rope

The rope end is tucked through the middle of the rope.

The splicing methods for both eye and butt splices are described in detail below:

20.1.3 **Eye Splice**

Step 1 - For all ropes

Tightly wrap Tape Plastic Adhesive 25 mm around the rope near the end and cut the rope off at the tape to form a neat end. Ensure that any damaged end section of the rope is cut away during this process.

Step 2 - For all ropes

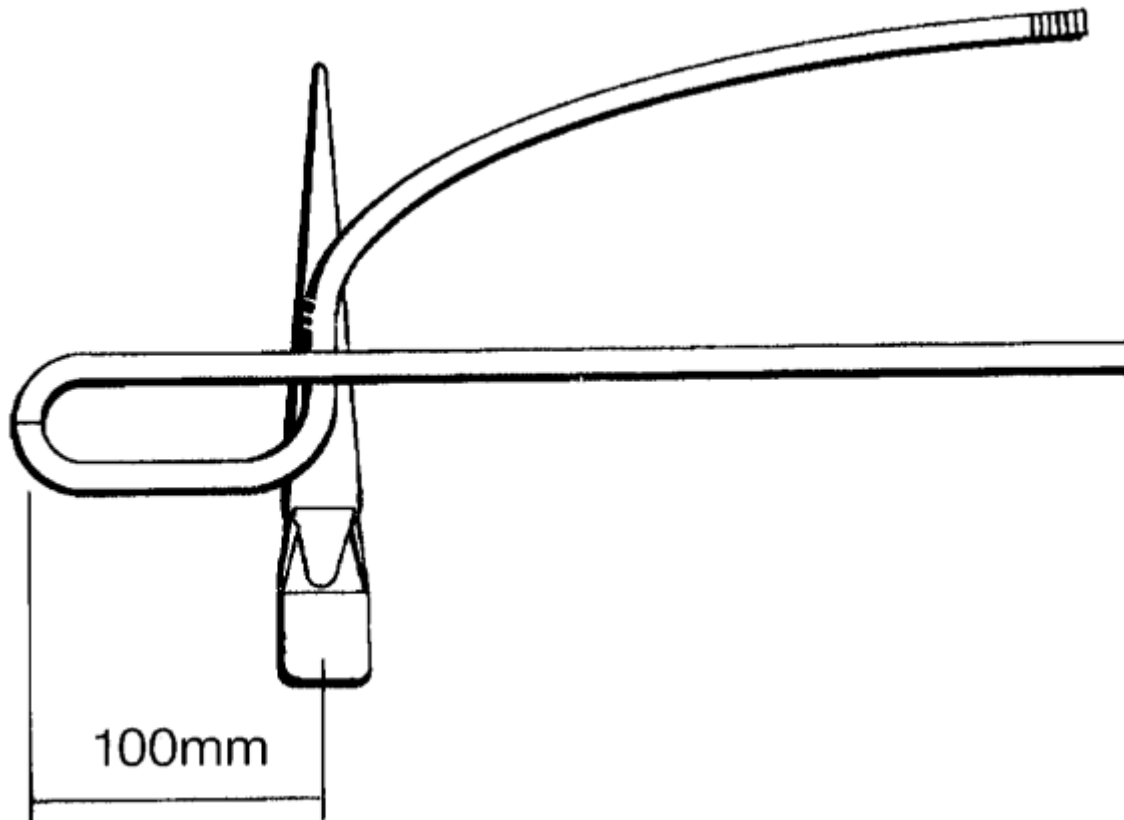
Lightly abrade the surface on the first 500 mm length of the rope tail with Emery Cloth, 100 grade (local purchase).

Step 3 - For all ropes

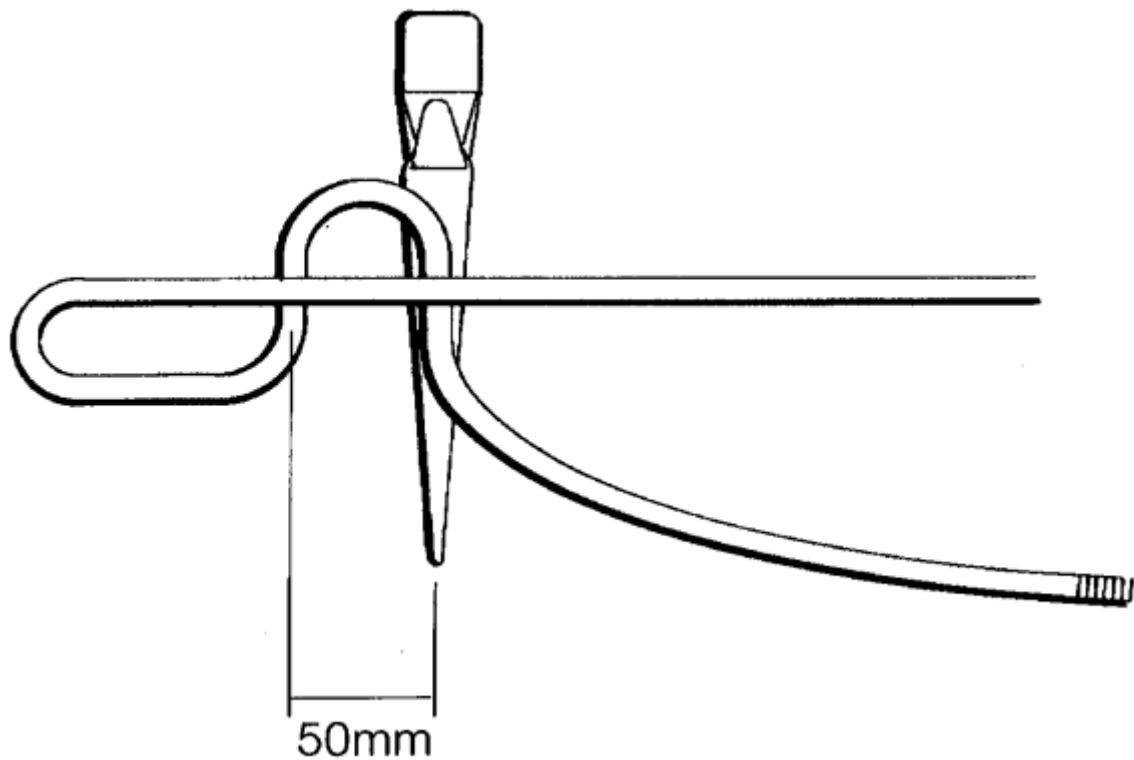
Using a Small (170 mm) Swedish Fid (see Appendix 1, Item 19) insert the tip of the fid through the CENTRE of the rope a distance of 600 mm from the end. Try to disturb the inner core as little as possible and try not to pull strands through.

Step 4 - For all ropes

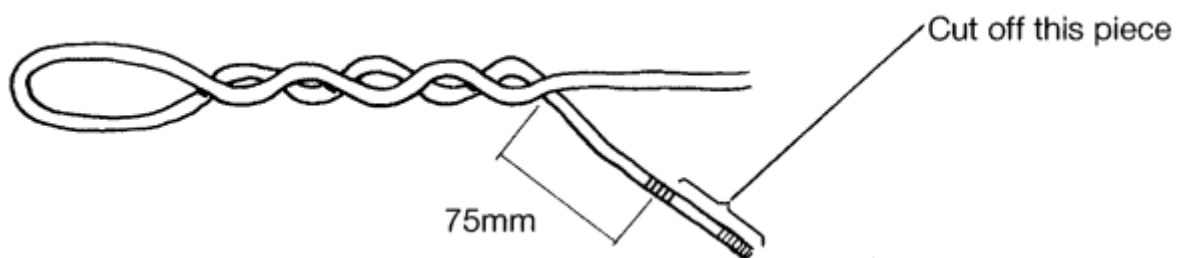
Push the fig through the rope until there is sufficient room to pass the rope tail through in the groove of the fig. Pull the tail completely through until an eye of 100 mm is formed as shown below.

**Step 5 - For all ropes**

Repeat this tucking procedure backwards and forwards through the cover of the rope at 50 mm intervals, until 6 tucks have been made. Work the tail through such that the splice is symmetrical.

**Step 6 - For all ropes**

Tape the tail of the rope 75 mm from the last tuck, and cut off the excess rope at this point. LEAVE A TAIL OF 75 mm.

**Step 7 - For all ropes**

Behind the last tuck and the tail of the rope with tape as shown below.



20.1.4 Butt Splice

Step 1 - For all ropes

Prepare the ends of both ropes and abrade them as for the eye splice in steps 1 and 2 of Section 4.

Step 2 - For all ropes

As described in Step 3 of the instructions for the eye splice (Section 4), pass the fid through one of the ropes, 400 mm from the end and pass the end of the other rope through for 400 mm.



Step 3 - For all ropes

Complete 6 tucks as described for the eye splices above, in one direction, and repeat the procedure with the second tail in the opposite direction. The completed splice is shown above.

Step 4 - For all ropes

Trim and tape the ends as described for the eye splice.

21 *Appendix 3*

21.1 Pre - installed Reuse for Cabling in Duct

21.1.1 Introduction

Sub-duct Mono-bore 3A has a pre-installed rope which can be recovered during cable installation operation in the sub-duct and reused for general cabling.

The presence of silicone in the sub-duct and additional use of Lubricant Cable 2A during cable installation provides a very low friction path for the cable

during installation which enables long length cabling in sub-duct. However the rope recovered from the sub-duct is often extremely slippery and may only be suitable for reuse in general cabling for short lengths and low pulling tensions.

21.1.2 Description

Sub-duct	Rope diameter	Colour	Spliced Breaking Load kN	Notes:
SDMB 3A	7 - 10mm	Typically orange Could be any colour other than green	10.9	May be re-used
SDMB 4	7 - 10mm	Green or with green fleck	6.7	Strength is only comparable with Drawrope 1

The ropes consist of a core of polyester to provide strength, and a woven polyethylene cover to provide the low friction exterior required for cabling long lengths in sub-duct. The cover also acts to hold together the loose central core, and enables splices to be made in the rope. The outer cover is neither strong nor abrasion resistant, and this is expected to limit the life of the rope when used for normal cabling work.

The ropes may be from a number of different manufacturers and may have slightly different methods of splicing. The splicing method to be used is identified by the colour of the rope. Both eye and butt splices can be made in any of these ropes using the methods described in Appendix 2.

21.1.3 Safety Precautions

1. See EPT/UGP/E036, Appendix 1 for guidance on hand tailing cabling ropes.
2. Ensure that correct cabling practices as described in the 'Cabling in Duct Manual' (Index - ETP/UGP/E031) are used.
3. Ensure that the correct rope guarding procedures are used; incorrect guarding may result in injury to staff or members of the public.
4. All tension must be removed from the cabling rope before attempting to add turns to the capstan.
5. If re-reeling the rope keep the speed of the take up reel to a controllable level. Do not feed the rope through your hands.
6. Take all necessary precautions when handling the rope to prevent any lubricant getting on your hands etc.

21.1.4 Recovering and Re-reeling the Rope

Paragraphs 14 describes the two methods of recovering the rope during cable installation operation.

If a reel is used to recover the rope, use Reel Cabling Rope 1A. This is a standard cabling rope reel with a flange diameter of 480 mm designed for use with all self tailing cabling winches eg R and LCU, MCU and LC and JU. At least 250 metres of Rope Cabling 9 can be accommodated on such a reel.

Caution: Empty Drawrope reels are too weak and must not be used for recovering these ropes.

If the rope is recovered from the sub-duct into bins using a Kit Cabling 752A it should be prepared for reuse by transferring it onto Reels Cabling Rope 1A as soon as possible. This may be done using the take up reel facilities of one of the cabling units. The bin should be placed on the ground a short distance from the rear of the vehicle so that tangles can be spotted and the winch stopped before the tangle reaches the vehicle. The rope will feed smoothly from the bin and should be fed through one of the turning sheaves, around the winch capstan and up to the take up reel in the normal manner. Sufficient turns should be put on the winch capstan to ensure that the rope winds smoothly and firmly onto the take-up reel. Whilst carrying out this operation keep the speed of the take up reel to a controlled level.

Keep all personnel clear of the moving rope at all times. Do not feed the rope through your (or anyone else's) hands.

21.1.5 Reusing Pre-installed Subduct Cabling Ropes

Stands Rope will accept the Reel Cabling Rope 1A and these may be used for dispensing the rope.

The method of jointing the rope is by a quick splice method. Due to the different constructions available from different manufacturers, the correct splicing method will vary from rope to rope. In order to ensure that the method of splicing can be recognised the ropes are colour coded according to the method to be used, and the correct methods are described in Appendix 2. Most manufacturers require a 6 tuck splice, but extra tucks will not do any harm.

Both eye and butt splices can be made in the ropes. Butt splices are normally used to join two lengths of rope. Eye splices are normally used to join the rope to the swivel or cabling grip. (Ropes can be joined together with two eye splices if it is more convenient, for example if the end of one rope to be joined already has an eye splice in it.)

Sections of rope can be joined to achieve any required length. Both eye and butt splices will normally pass over the winch systems, but any rope jam

which does occur should be dealt with in the normal way for the winch in use. (See the operating instructions for the winch being used.)

When the take up reel becomes full, stop winching and reverse the winch until the rope is slack. Wind the take up reel back for three turns, and tape and cut the rope at the drum. Replace the take up reel with an empty one and attach the rope to the reel in the normal manner. Take up slack and continue winching.

Before making a new splice cut back the rope beyond any damaged or disturbed section (the rope will have been weakened). Any undisturbed splice can be satisfactorily reused, but it should be checked to see if it has been damaged. Any damaged splice should be remade, and any loose splice 'tails' should be retaped.

It is important when preparing the splices that any 'tail' is kept to the correct length of 75 mm. A long tail may jam on the winch capstan even though it has been taped, a short tail may pull through and weaken the splice. Follow the correct splicing instructions detailed in Appendix 2.

Remember that this rope is not very abrasion resistant. Extra effort to ensure good rope guiding practice will extend its life.

Some ropes may be pre-lubricated for use within the sub-duct, and lubricant may be left on or impregnated into the rope. A significant number of extra turns may be needed on the capstan to achieve the maximum pull these ropes are capable of. Extra turns should be put on to the capstan using the standard method for the cabling unit being used.

Caution: ALL TENSION SHOULD BE REMOVED FROM THE CABLING ROPE AND THE CAPSTAN STOPPED BEFORE ADDING ROPE TURNS TO THE CAPSTAN.
--

Do not overfill the capstan such that turns are likely to spill off the end of the capstan.

END OF DOCUMENT
