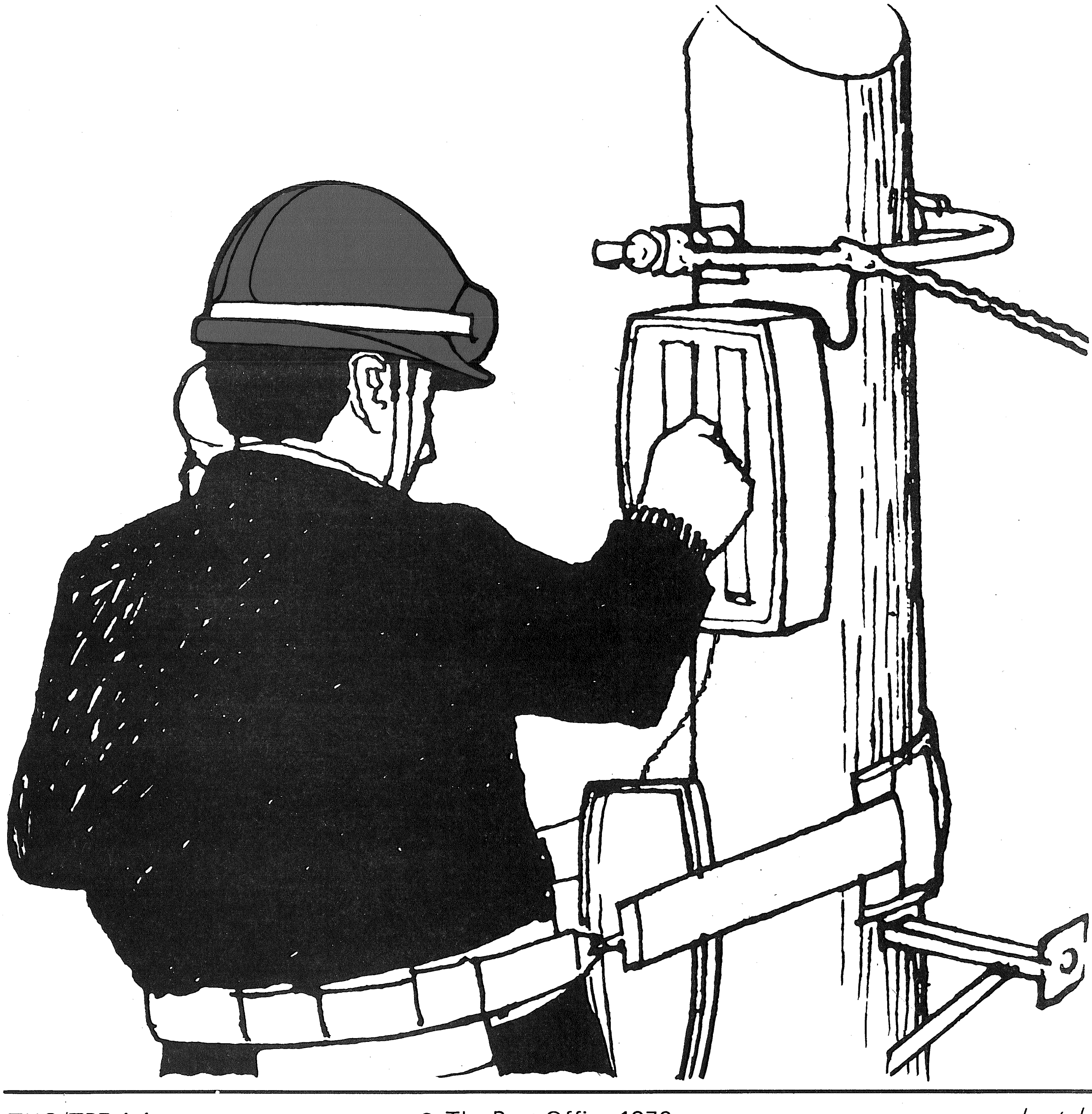
Post Office Telecommunications Educational Pamphlet EP Lines 1/8

Subscribers' Distribution



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Subscribers' Distribution

CONTENTS:

Introduction

This pamphlet describes the methods of providing a subscriber with a line, usually one pair of wires, to his local exchange. This interconnexion of lines via the local exchange is referred to as the local network and provides an exclusive link to the exchange, the only part of the complete network where the subscriber has this exclusiveness, in all other parts of the network he has to share access to routes with other subscribers. The only exception to this is a party line where, although the subscriber has an exclusive number on the exchange, he shares use of the line with another nearby subscriber (or party) without secrecy. Eventually it is anticipated that all subscribers will have an exclusive line but meanwhile experiments are taking place with a carrier system so that although subscribers may share a line as a transmission medium, they will have exclusive use of part of its bandwidth at all times without interfering with the other party.

Originally the line consisted of bare wires supported by poles, but even in the early days of telephony rapid growth of the system caused congestion and difficulty of running the wires in an orderly fashion in the centres of large towns and cities. This led to the adoption of cables installed in conduits or ducts beneath streets. Bare wires were retained in suburban and rural areas mainly because it was cheaper and better transmission, with equipment existing at the time, could be guaranteed over the longer distances. It was however more fault prone and the transmission performance of the line could be effected by inclement weather.

More recently with the event of higher performance telephones and exchange equipment bare wire distribution in the local network has been dispensed with, (that already existing being gradually replaced). The poles that supported these wires, if the routes are not to be diverted underground, were then used to support an aerial cable.

Earlier distribution cables had a lead sheath and were not entirely suitable for directly burying in the ground as there was always the possibility of corrosion and so were laid inducts. Some cables were buried, however, the lead sheath being wrapped in manufacture with a bitumen impregnated hessian serving and protected with a wire armouring similarly wrapped. With the introduction of polyethylene sheathed cables not only is the sheath chemical resistant it has a certain degree of resilience, hence the cable can be buried and where there is any possibility of damage the cable is provided with a wire armouring protected from corrosion by a polyethylene overlay.

The foregoing paragraphs refer to the line being required for the connexion of a telephone. Other services such as telex and datel make use of lines in the local network although connected to different equipment at the exchange.

Current practices are described but in the field much evidence will be seen of past practices, it not being economical to recover such plant until the end of its useful life is reached.

Distribution Scheme

In the design of a distribution cable scheme the factors that have to be considered are:-

(i) The line must be kept within specified transmission limits.

(ii) Spare capacity must be provided to enable an "on demand" service to be provided for anticipated future growth, but in such a manner that large quantities of plant are not left idle.

(iii) The provision of the network should be affected as economically as possible.

Transmission Limits

It is an international agreement that the local line provided for the connexion of a telephone should have a maximum loop resistance of 1000 ohms for d.c. signalling purposes and a maximum attenuation or loss of 10 decibels at a frequency of 1600 Herz. Coupled with agreed maximum limit of losses on the trunk network it enables a service to be of a specified standard between any two connected telephones anywhere in the world.

Local Exchange Area

Whilst the above limits can be comfortably contained by using heavy gauge conductors this is uneconomic as their cost would be greater, larger ducts to contain them would have to be used and more effort would be required to install them, than if smaller gauge conductors are used. As a 0.9 mm diameter copper conductor (the largest used in the local network) will give a length of line of 10 km with the maximum transmission limits this effectively governs the maximum exchange area size. The actual size of the area is frequently smaller because of other factors (eg. the density of telephones in the area, the exchange capacity).

Within an exchange area, the demand for telephone lines is constantly changing, buildings are built and demolished, businesses prosper or decline and people move homes, all of which reflects in the number of lines that are required. If a line is to be provided "on demand" lines must already be installed and lying idle awaiting this demand. Hence capital instead of earning revenue is tied up in idle plant. A compromise is reached so that the cabling scheme incorporates a degree of flexibility in that cabling nearer subscribers premises is installed to anticipate demand over a twenty year period and changes as the collective growth over a larger area is made, to main cables, which contain more lines and are consequently more expensive, nearer the exchange. The amount of cable to install is anticipated by means of planning forecasts made on information gained from various sources including local authorities, developers, and on the spot surveys.

The Primary Connexion Point Area

To provide the required flexibility in the cable scheme the exchange area is divided up into a number of smaller areas each of which is served from its centre by a primary connexion point (PCP). This point is in the form of a cast iron cabinet which is why the area is sometimes referred to as a cabinet area. Several of these PCPs are connected to a main cable to the exchange and to smaller distribution cables to the subscribers. A simple schematic concept of the distribution is shown in Fig. 1. Normally larger PCP areas are more economic than a number of smaller ones and in planning the requirements for the area this is bourne in mind.

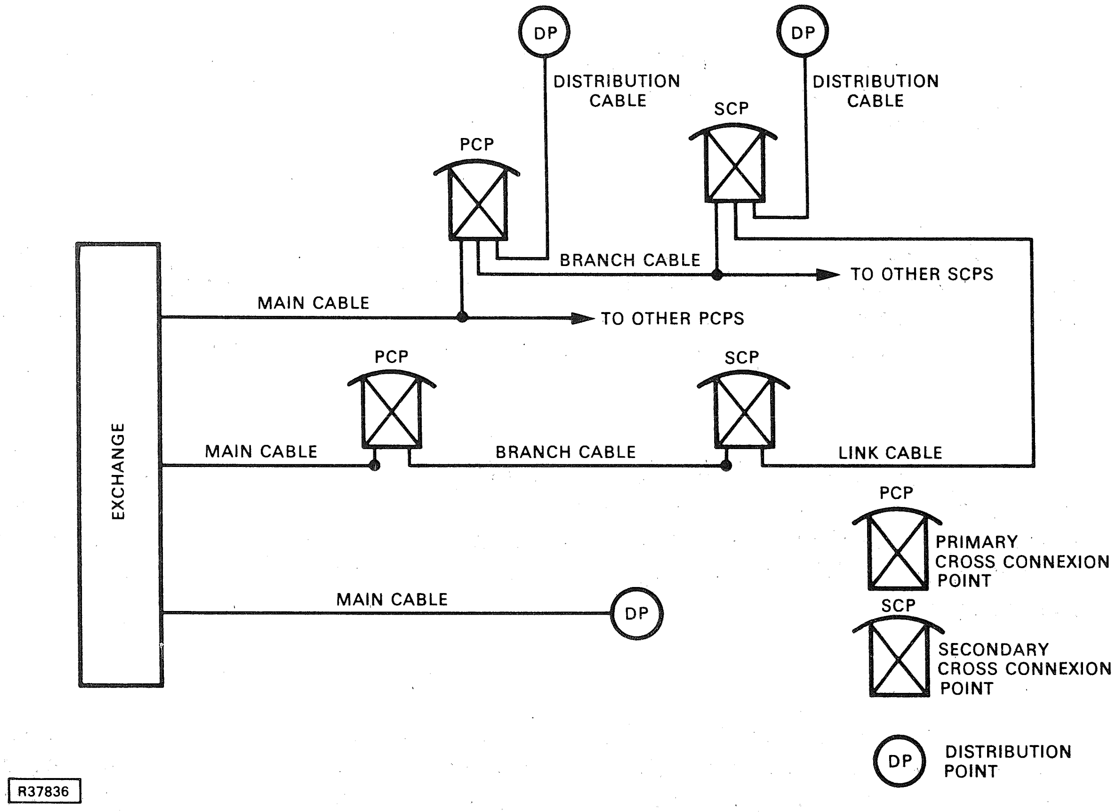


Fig. 1

Cross connexion is then made within the PCP between the main cable pairs and the distribution pairs. By this facility a subscribers line can be connected to any main cable pair terminated at the PCP.

It may be necessary because the area is large to have a further cabinet within the area connected to the first and known as a secondary connexion point (SCP). This caters for, for instance, a PCP area that has a scattered density but a more concentrated density in one part of the area somewhat remote from the PCP such as a housing estate. This enables further flexibility at the SCP. The SCP is a cabinet identical to that used for the PCP, although it is still possible to see in many areas a small concrete pillar with a detachable cover which serves the same purpose but in now obsolescent.

The PCP is connected to the SCP by a branch cable. Cables radiating from PCP and SCP terminate at distribution points (DPs). The DPs in turn radiate (usually) single wire pairs to serve each subscriber.

In a very low telephone density areas such as rural districts the cabinet method of distribution is not warranted and a method of running distribution is used instead.

If a subscriber requires a large number of lines it is more convenient to run part of a main cable direct to his premises. Flexibility within these pairs and lines within his premises can be provided by the installation of a terminal distribution board which serves the same purpose as a cabinet.

In extending the network endeavour is now made to convert any SCP into a PCP with its own area. Policy is to provide a PCP cabinet of sufficient size that will anticipate all future growth in its area, the aim being to save changing the cabinet at some future date and to reduce the amount of cable rearrangement.

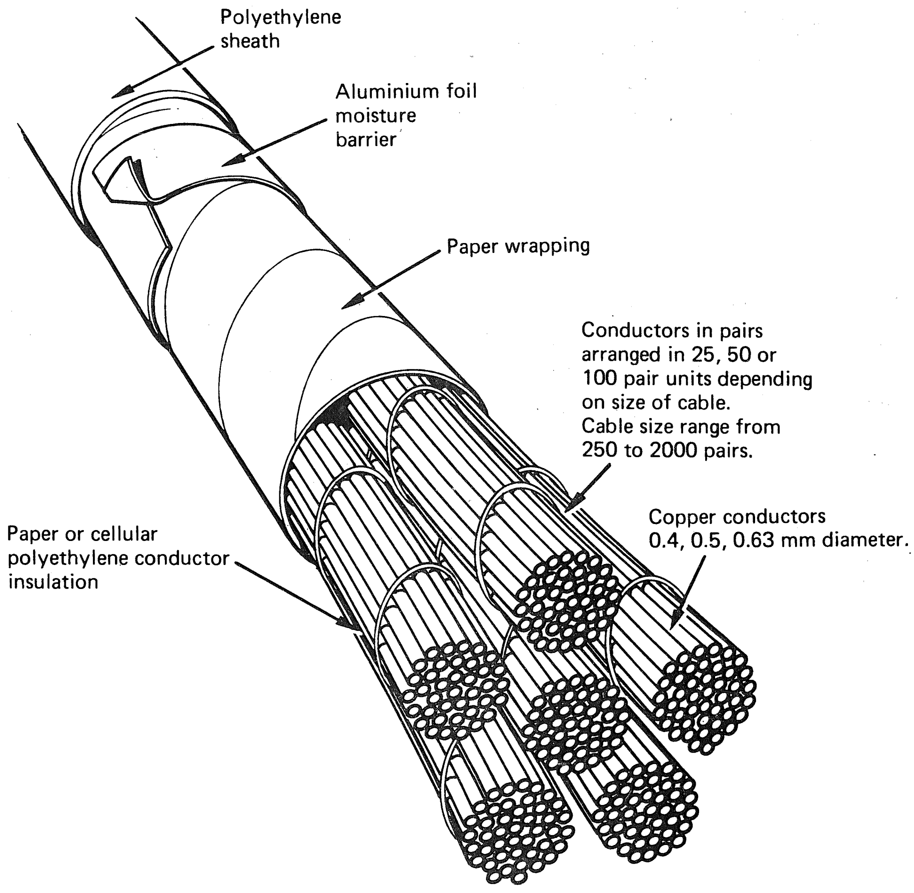
As some areas will see little growth, the earlier "cabinet and pillar" system will still be used for a considerable time into the future, for changes and recovery of the pillars will only be made where requirements demand it.

A schematic diagram showing several PCP areas is shown in Fig. 2 (appended). One PCP area is shown with an indication of the types of cable used, in Fig. a pictorial representation is shown of the connexion of a subscribers line to the exchange. The pole mounted distribution point is the usual method, this and other methods will now be shown in greater detail commencing with the types of cables used.

Main Cables

The main cables between the exchange and PCP are of the paper insulated unit twin type with copper conductors. More recently installed cables have cellular polyethylene insulation. The current policy is to introduce main cables having aluminium alloy conductors with cellular polyethylene insulation. The make up of a main cable is shown in Fig. 3.

As air forms part of the insulation of these cables, they are pressurized with dry air fed from the exchange. This prevents the ingress of water through small sheath and joint defects. Should the air pressure fall below a predetermined value because of a major sheath defect or damage, an alarm is given in the exchange so the fault can be traced and rectified.



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MAIN DISTRIBUTION CABLE

Fig. 3

Distribution Cables

These cables feed conductor pairs from the primary or secondary connexion point to distribution points. Their size ranges from 100 pair down to 2 pair having conductor sizes of 0.9, 0.7 and 0.5 mm, these being of copper or aluminium alloy with cellular polyethylene insulation. The pairs are arranged in layers in the same formation as a unit, or part of a unit, of a main cable.

The cables are directly buried in the ground, but may be installed in ducts. Where they could be prone to damage (eg. on a new housing estate) an armoured cable is laid.

Where aerial cabling is employed, the sheath is moulded in a figure eight formation to incorporate a suspension wire; alternatively, the normal cable is lashed to a suspension wire or an existing combined aerial cable. Due to continuous wind movement and flexing of the cable, copper conductors which will not be so rapidly affected as an aluminium alloy, are exclusively used.

Pressurization of cables in the local network is only applied to main cables as far as the PCP, so to reduce the fault liability of distribution cables the interstices between the insulated conductors are filled with a petroleum jelly compound. As the cable is rendered more impermeable the aluminium foil moisture barrier under the polyethylene sheathing is not required.

To reduce the number of different sizes of distribution cables they have rationalized to the types and sizes shown in Fig. 4 (appended).

Dropwires

Dropwires are used for distributing single pairs from a distribution point mounted on a pole to the subscribers premises as far as practicable in one length from the distribution box to the subscriber block terminal to which his telephone is attached. To render them as inconspicuous as possible thin steel wire is used with a thin copper coating. However, the transmission characteristics are such that a long line could have a low performance so its use is restricted to four spans between poles (about 280 m).

Three types of dropwires are currently being installed, and earlier types will be met in the field. These are shown together with their use in Fig. 5.

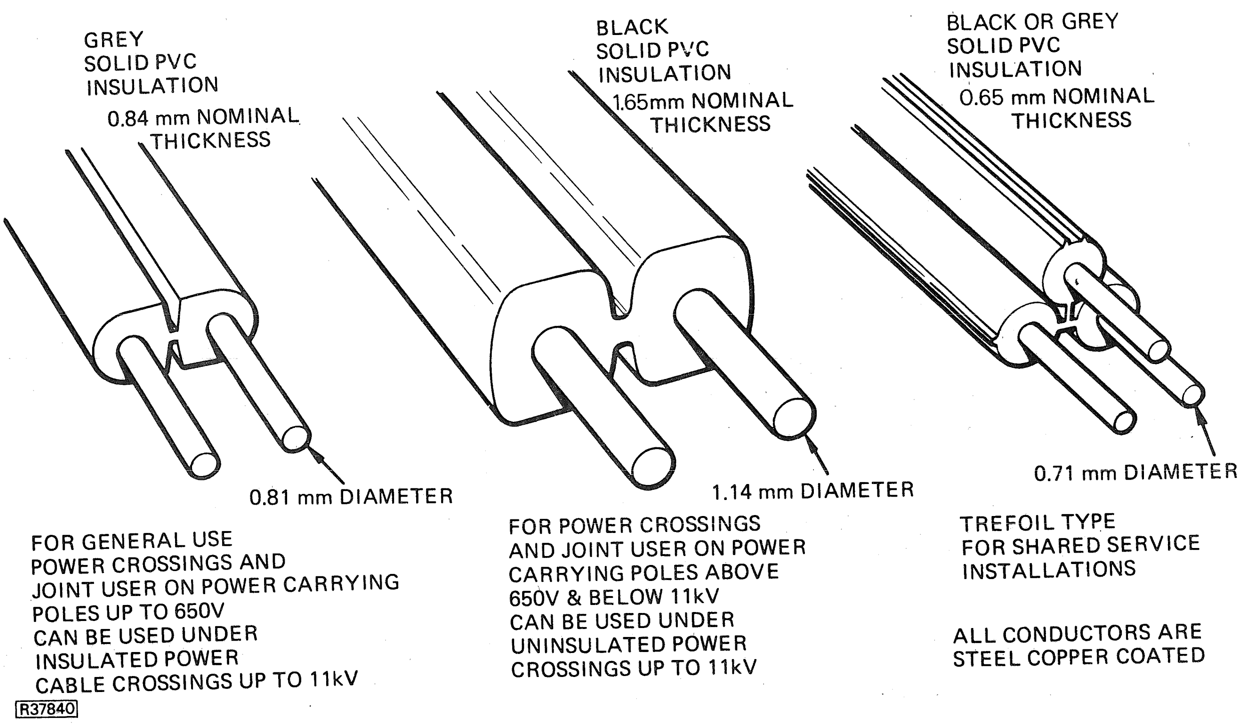


Fig. 5

Methods of Distribution

The method of distribution should be the most economical in capital and labour, having high reliability and ease of access for installation and maintenance. However, local circumstances, technical reasons (such as overhead high tension cables), and where applicable aesthetic considerations, will dictate the final method chosen. Wherever possible the standard method using a dropwire from a distribution pole is used as it is the cheapest to install. It is suitable for new estates but where a financial agreement is made with the developer an underground system can be laid.

Multi-storey residential blocks and business premises requiring a number of lines are normally served by an underground feed.

On existing estates and residential areas where extra lines are required distribution is by the method already existing eg. underground in duct, providing it is economic to do so.

All new underground distribution cable is directly buried wherever it is economic to provide at the outset sufficient plant to meet ultimate demand. On new housing estates and places where the cable could be damaged armoured cable is used. Armoured cable is also used where it is laid in a trench with other undertakers plant.

Ducting of distribution cables is now only made where

(a) The distribution cables follow the same route as main cables.

(b) Additional cables will be required in the future.

(c) At road crossings.

Standard Method

The BPO standard method of distribution is to run an underground distribution cable from the primary cross connexion point to terminate at a distribution point terminal box at the top of a pole. Dropwires are then led out from the box to radially serve individual subscribers. This is shown pictorially in Fig. 6 (appended).

The cabling arrangements at the foot of the pole will depend upon the type of cable and duct serving the DP. One of the following methods is used.

(i) Where buried polyethylene cable is employed, it is brought as close to the foot of the pole as possible - at normal depth - before bringing the cable to the surface. A bending radius of not less than 150 mm being used.

(ii) For cable diameters of not more than 16.5 mm diameter, the cable may be fed to the pole by means of polyethylene duct. To avoid cabling difficulties, the distance between the joint and the DP is kept within 22 m. The cable fixed to the lower part of the pole is protected by a length of steel capping. The junction of the duct and capping is covered with a steel bend connector.

(iii) For cables of up to 20 mm diameter, cast iron bends are used to feed the cable to the pole with an earthenware duct. Steel capping and bend connectors are used.

(iv) Cast iron bends of suitable size are used for all cables greater than 20 mm diameter. The steel capping used in conjunction with these cables is too large to be accommodated in a bend connector, the connector is therefore not fitted and the capping is positioned as close as possible to the top of the bend.

Figs. 7 and 8 illustrate the general arrangement at the foot of a pole for cables in polyethylene and self-aligning duct respectively.

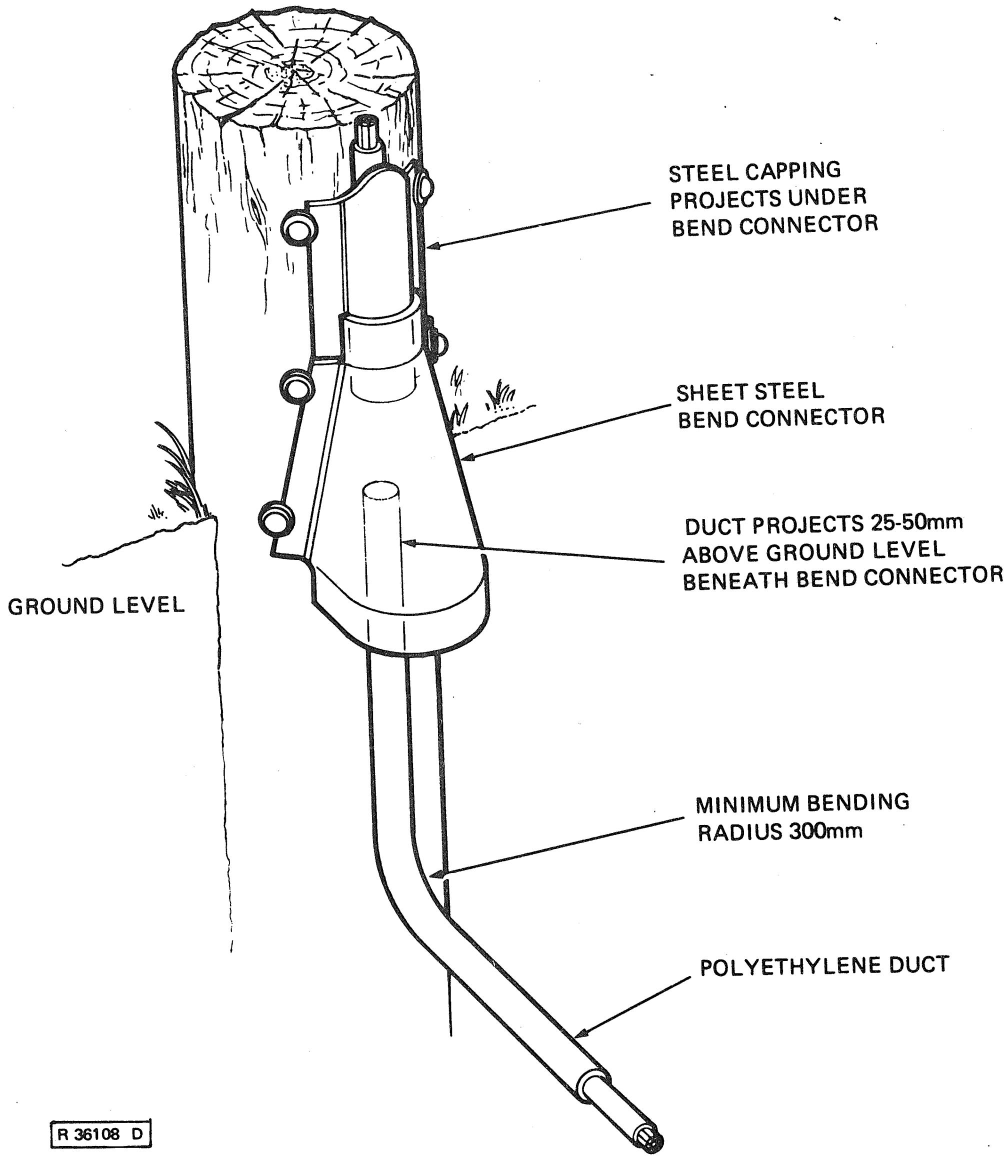


Fig. 7

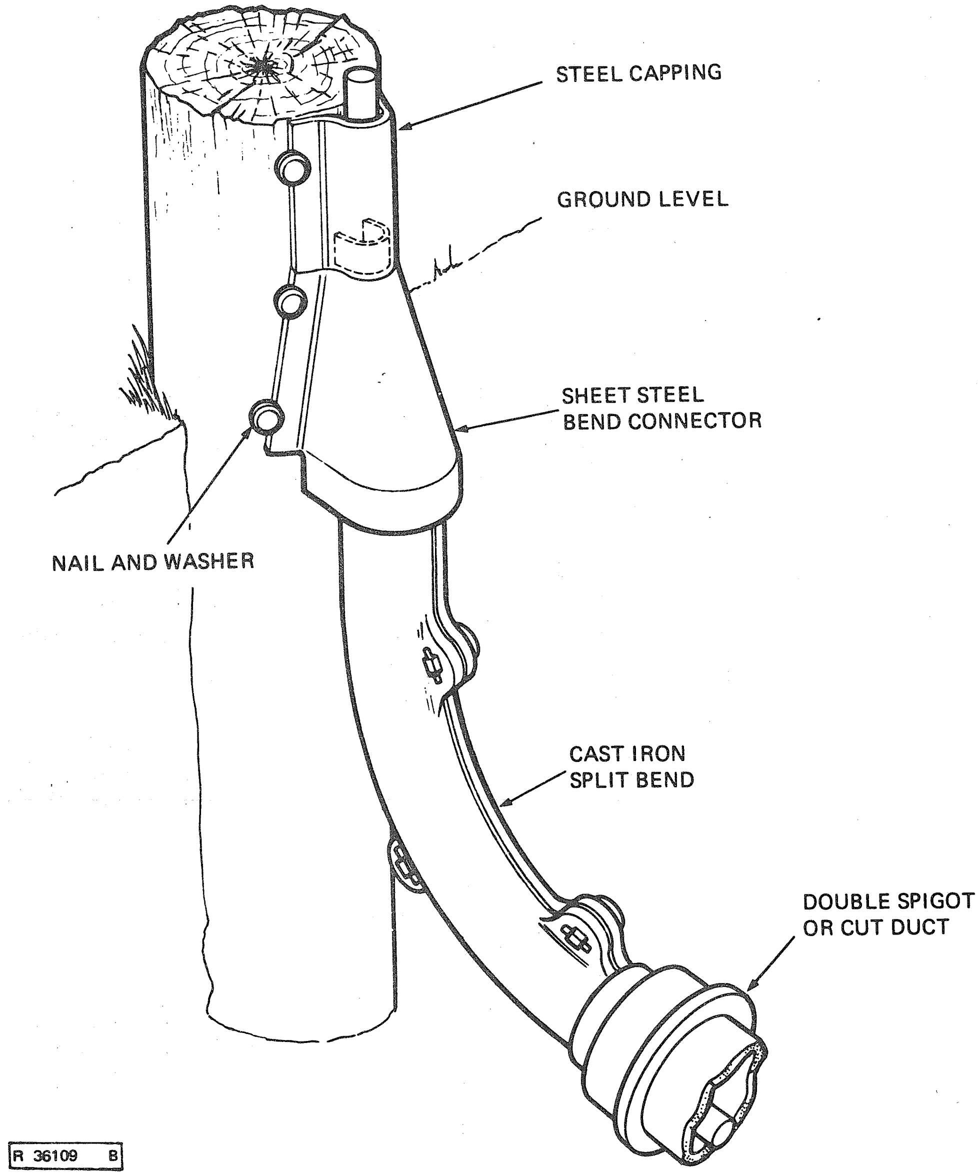


Fig. 8

The cable is cleated up the pole and terminated in a terminal box. This is shown with cover removed in Fig. 9 (appended), and is affixed to the pole with wood screws.

The cable is taken up the centre channel and the polyethylene outer sheath removed. The insulation is not removed from individual wires, they are placed in holes in the connexion strip and the grub screws are so designed that they split the insulation and make contact with the conductor and secure it. The dropwires are secured similarly, entering the block via holes either side of the cable entry and led up the outer channels to the required terminals. The one piece cover is a wedge fit and is provided with a retaining cord to the block to prevent it being mislaid. After completion of any work on these block terminals, a silicon damp proofing solution is applied to the interior by means of an aerosol spray.

Aluminium conductors cannot be fed directly to the block as the grub screw clamping is not suitable, so 100 mm copper tails have to be provided joined with a crimped connector (shown in Fig. 9).

Individual dropwires that lead to a subscriber's premises are led out of the terminal box to be secured to a pole head ring by a helical clamp. The arrangement is shown in Fig. 10.

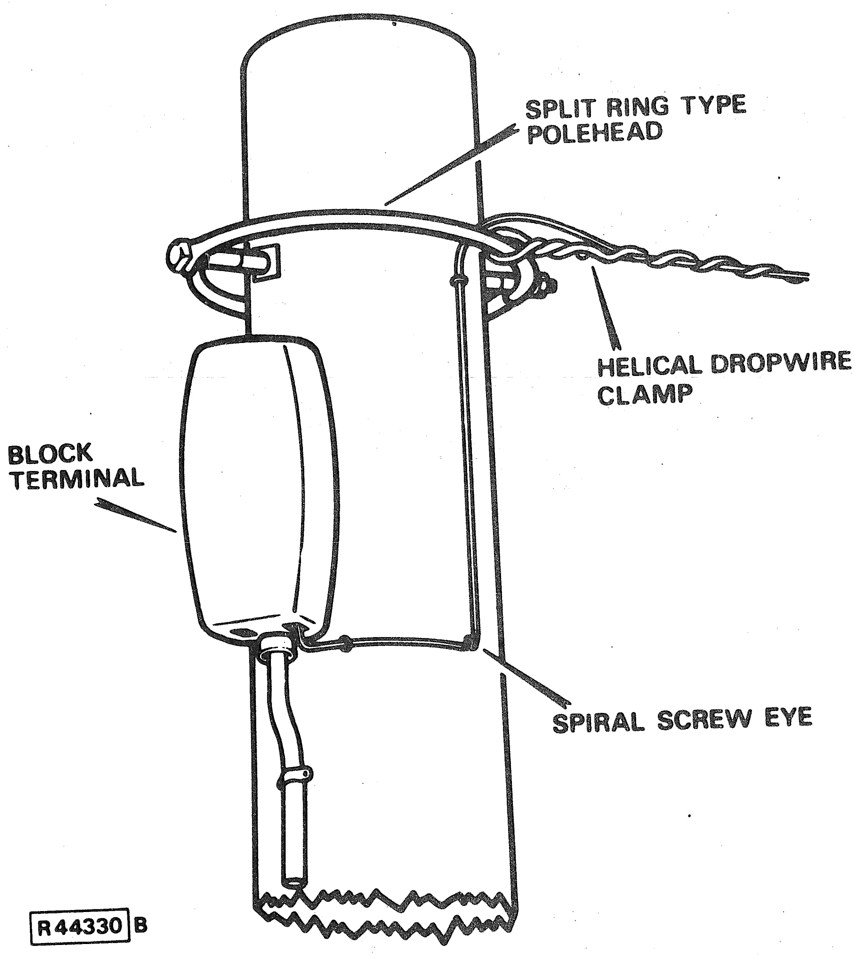


Fig. 10

The pole head consists of two half-rings of 12 mm round galvanized mild steel, secured to the pole by an arm-bolt which carries spacing washers of suitable length to correctly position the pole head.

The dropwire clamp consists of a PVC coated steel wire bent over to form a loop and its tails formed into a helix. There are two types they are shown in Fig. 11, the difference being that the clamp for the lighter gauge dropwires (a) has one of its pair of tails short.

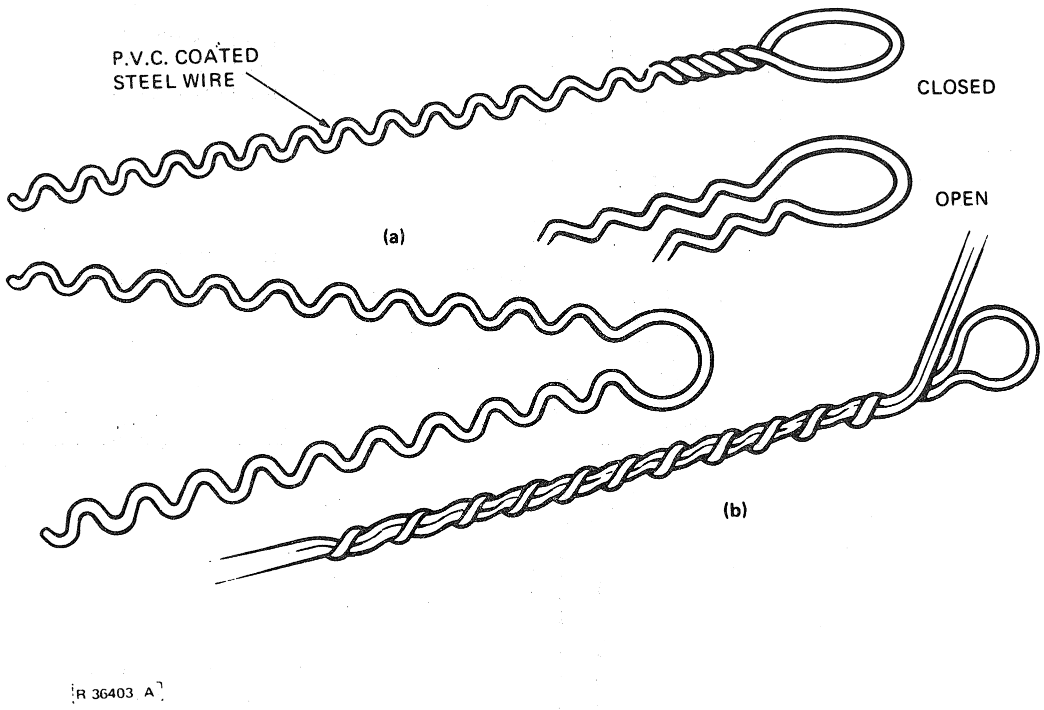


Fig. 11

The loop of the clamp is placed round the pole ring and the tails twisted together. The dropwires is then twisted round the helix of the tails as shown in Fig. 11.

The dropwire is secured at the subscriber's premises by means of a second clamp as illustrated in Fig. 12. This is attached to the building by means of a bracket consisting of a small flat plate to which is welded a D-shaped ring. The dropwire is run, without a break, to the terminal block in the subscriber's premises and is secured to the building by means of cable fixing nails on masonry and wiring cleats on woodwork.

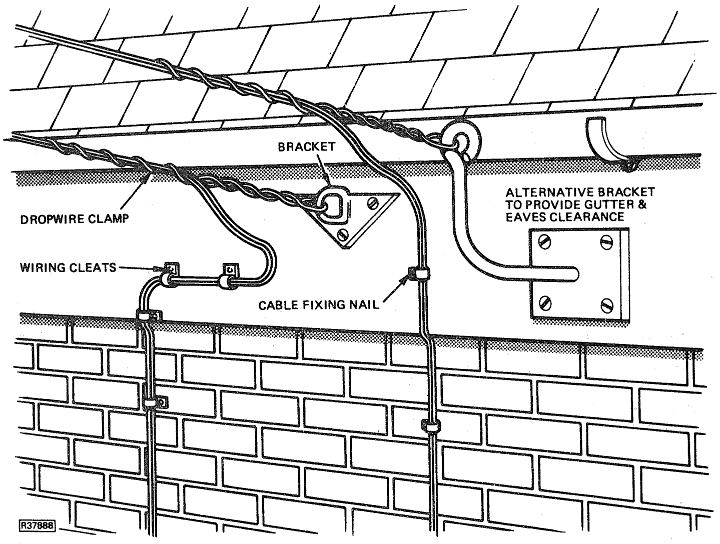


Fig. 12

Tensioning is usually by hand (220 N), but in a difficult situation eg. where the heavier dropwire is being used, ratchet and tongs may be required. The greatest span with either cable is 68 m.

Where it is necessary to join the dropwire not in the tensioned span, eg. for renewals, a small polyethylene connexion block with two brass inserts and captive screws is used. Its slip on cover is also made of polyethylene. If more than one pair of wires is required along the route, an aerial cable of appropriate size and not dropwire is used.

Some distribution poles are required to be earthed and are fitted with an earth wire. Earthing is required where:-

(i) A signalling earth is required. This is usually for shared service lines and a triple dropwire (Fig. 5) is used.

(ii) Pole top protection from high voltages such as lightning is provided. A terminal block with protectors (Fig. 9) is fitted in place of the standard terminal block.

(iii) If an aerial distribution cable has been used and the suspension wire is required to be earthed.

Underground

Various methods of providing underground telephone lines to buildings is shown in Fig. 13, (appended). For new housing estates there are two basic underground distribution methods, the radial and the frontage tee.

With the radial distribution method the service cables are laid from the house to the footway and thence along the footway to a common point where they are jointed to the distribution cable. The method is shown schematically in Fig. 14.

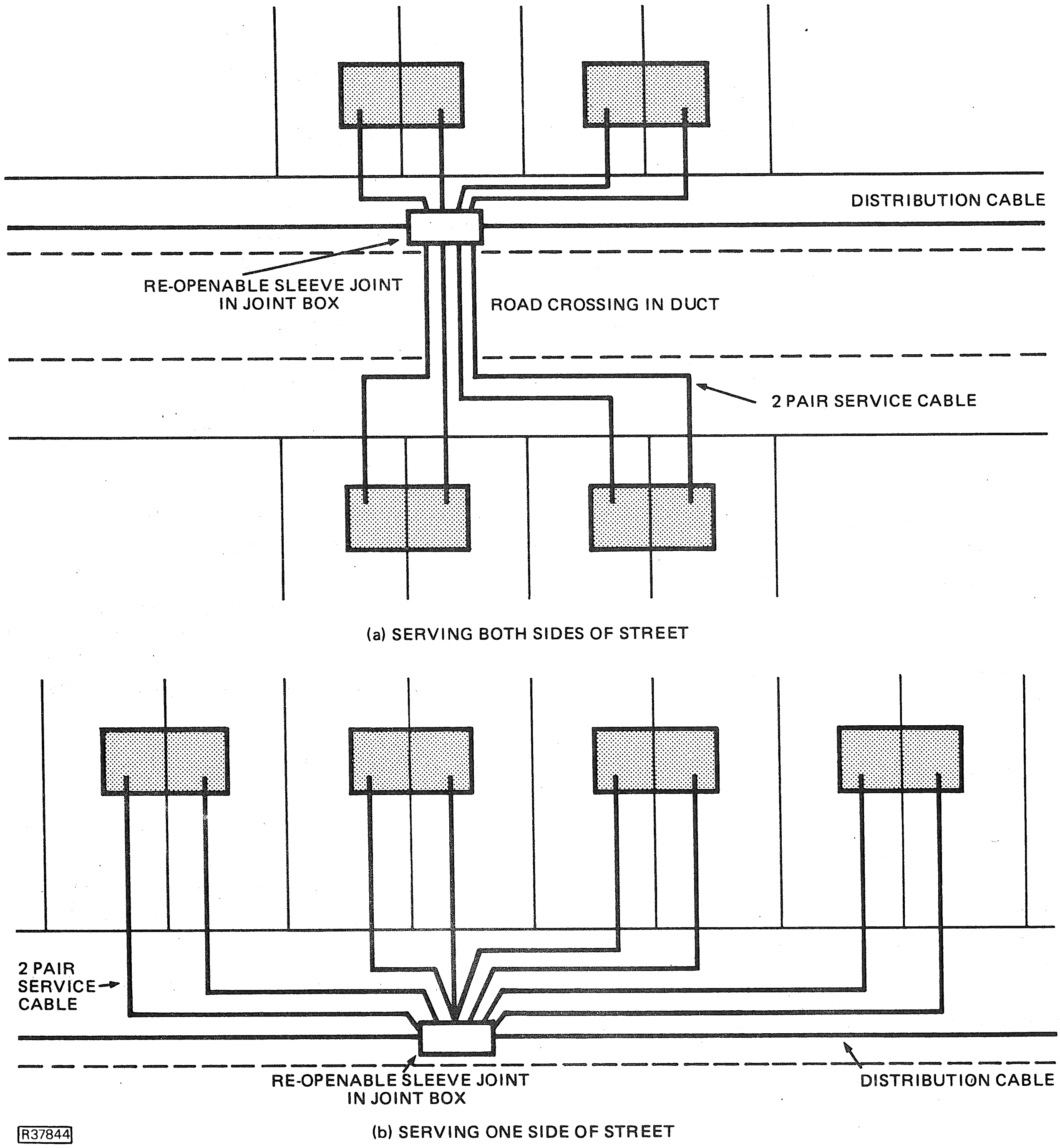


Fig. 14

If it is a new estate where endeavour is made to lay the cable before building operations start and in situations where damage could occur the buried cable is armoured.

As an alternative to the distribution joint Fig. 15 a jointing post is used. This consists of a metal channel to which is welded a top and a facing sheet at a position just above and below the ground line. An aluminium cover is secured by a triangular headed bolt. The post is shown in Fig. 16.

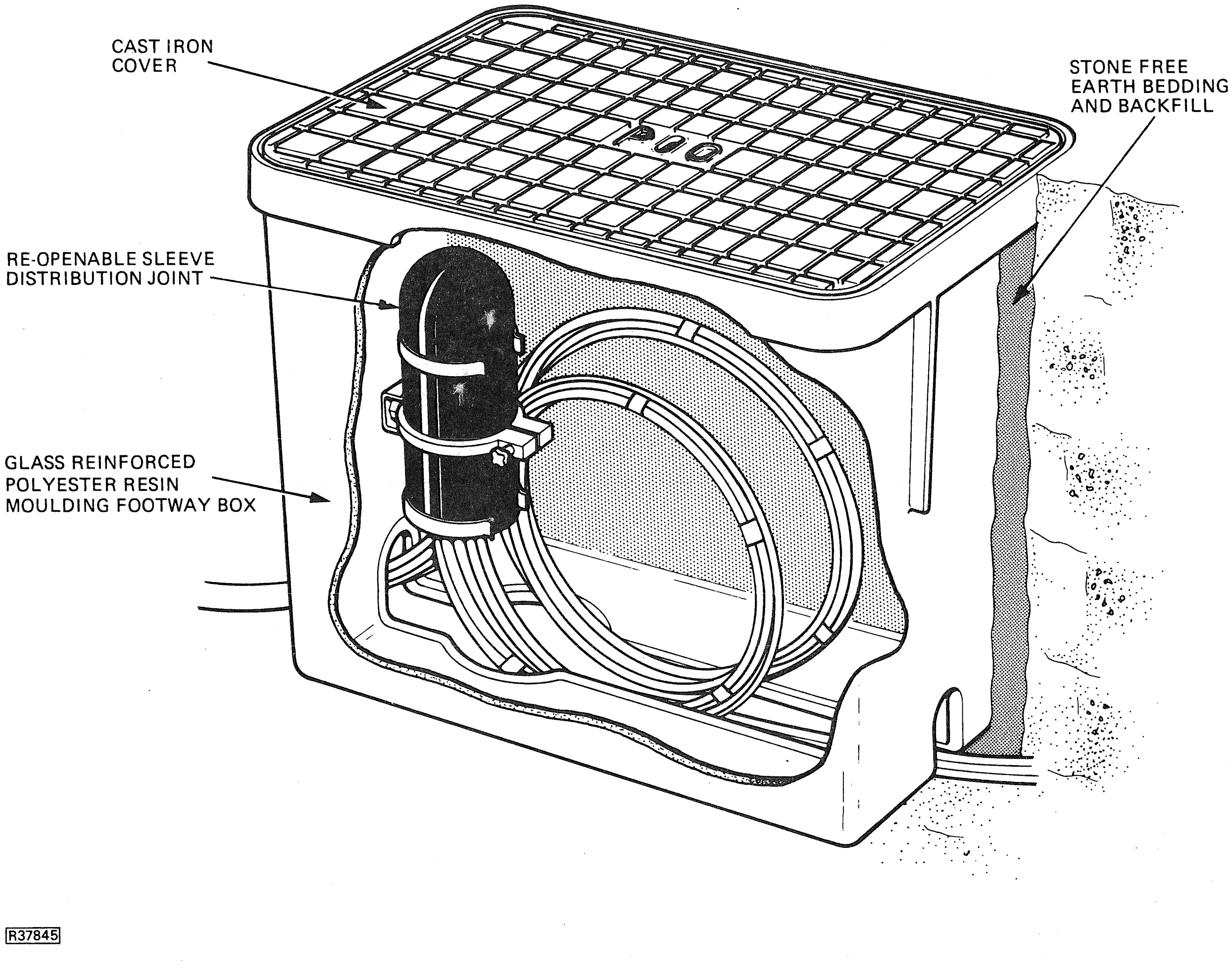


Fig. 15

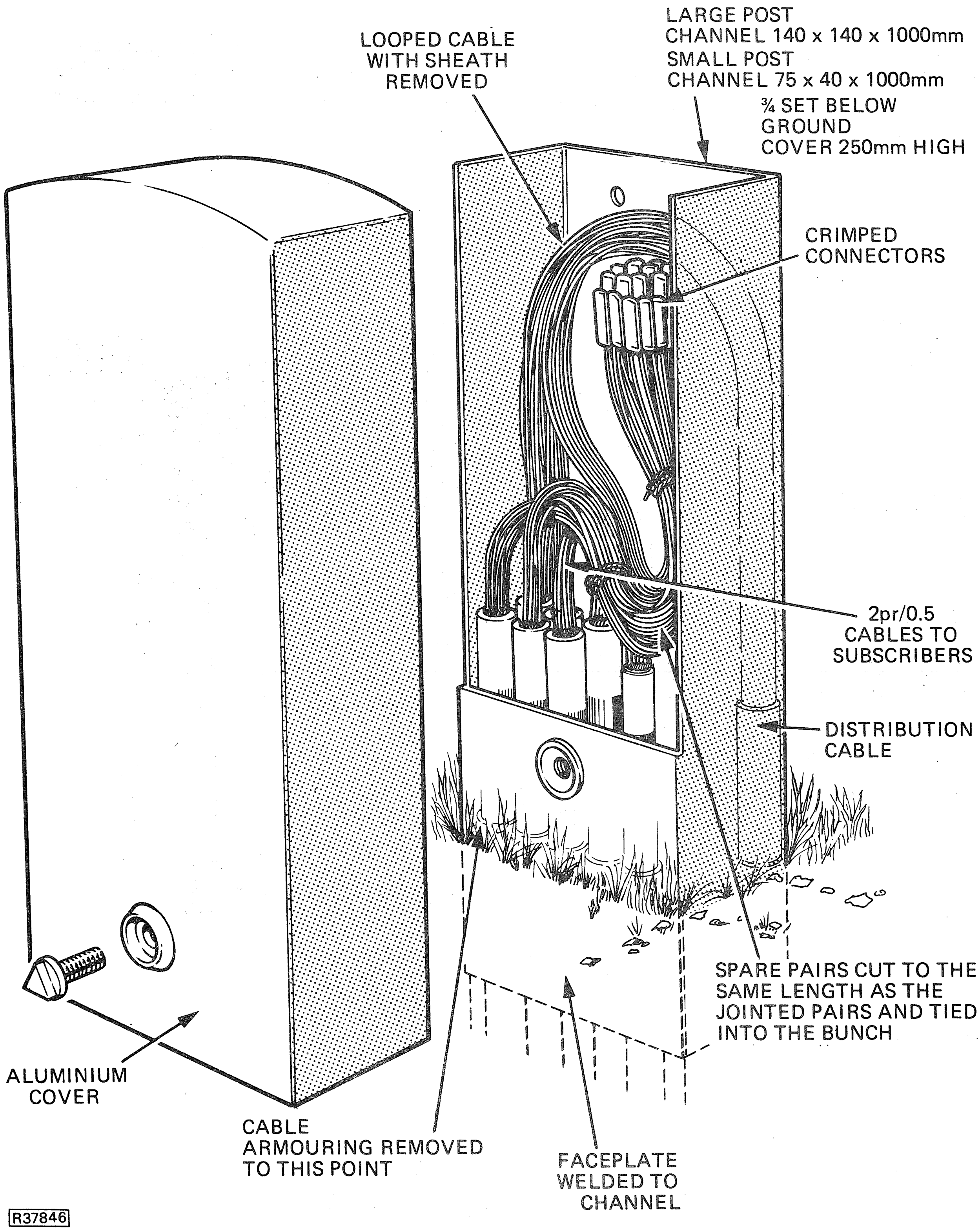


Fig. 16

Where the radiating cables have to cross a road they are laid in a duct, and where directly buried cables are lead into a joint box a short length of duct may be required.

The teeing system has the distribution cable running under the footway but at each point a service lead is required to a premises, a tee joint is inserted, Fig. 17. Because the system requires a larger number of joints it is more expensive to install and has a greater fault liability so it is only installed where there are practical reasons that it should be laid in preference to the radial system.

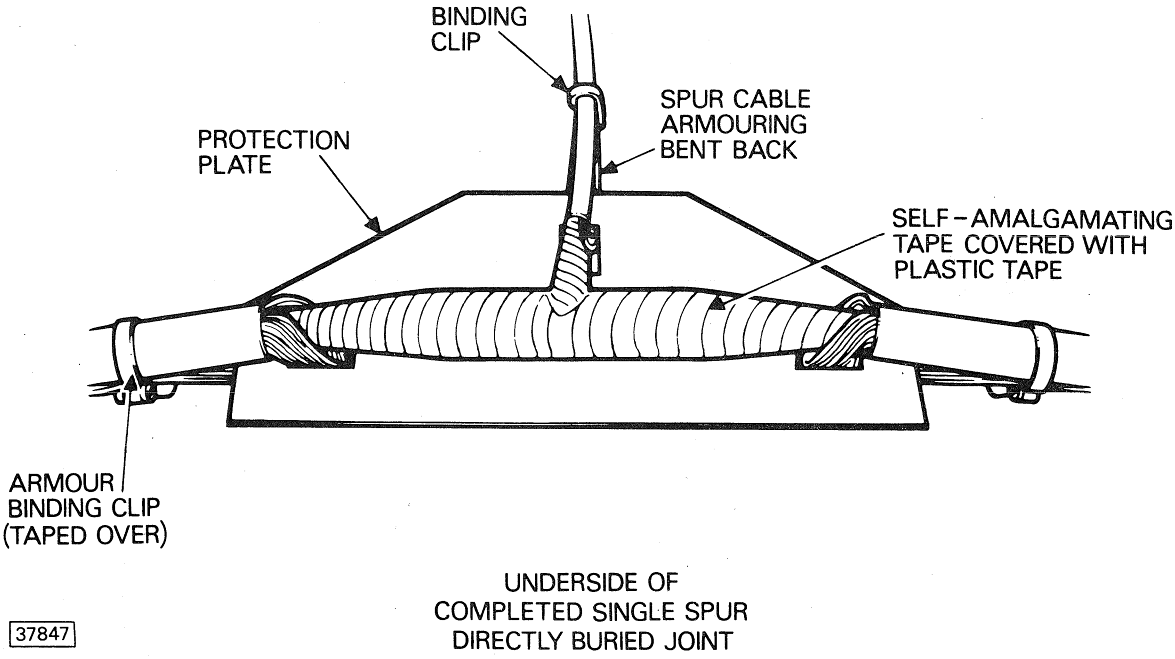


Fig. 17

Where the cable, and earth lead if required, is brought into the house a conduit is provided, and is laid a short distance outside the house through the outer wall and up through the ground floor. The conduit is embedded in any flooring concrete and concealed by plaster where it rises, in a convenient position in an inner wall, terminating at a connexion box. This is shown in Fig. 18.

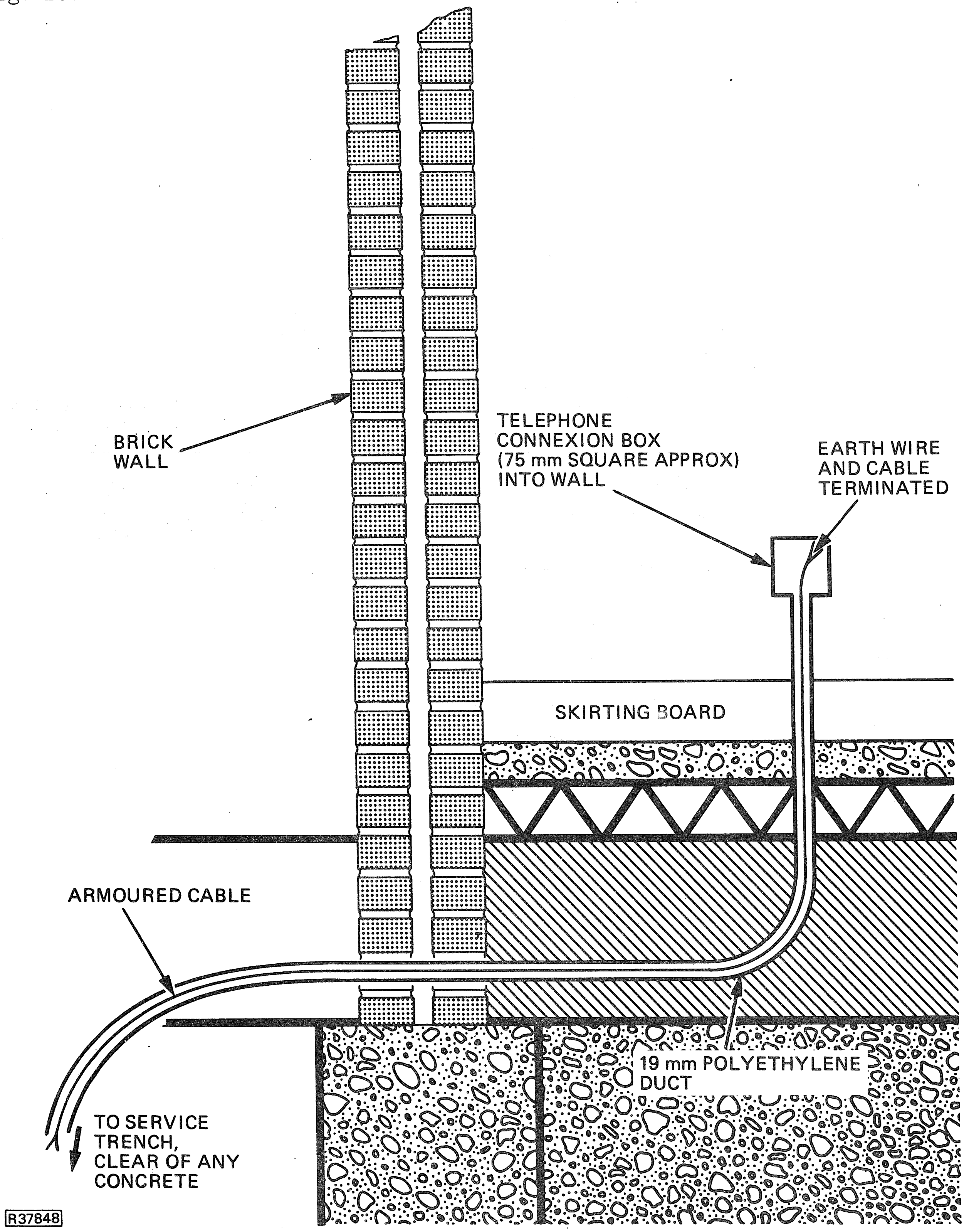


Fig. 18

A method of continuous cabling with surface teeing is sometimes used on terraced properties. The cable is run along the front of the houses with a tee joint for a feed at each house. The cable is concealed as much as possible by a suitable architectural feature such as eaves or hung tiling.

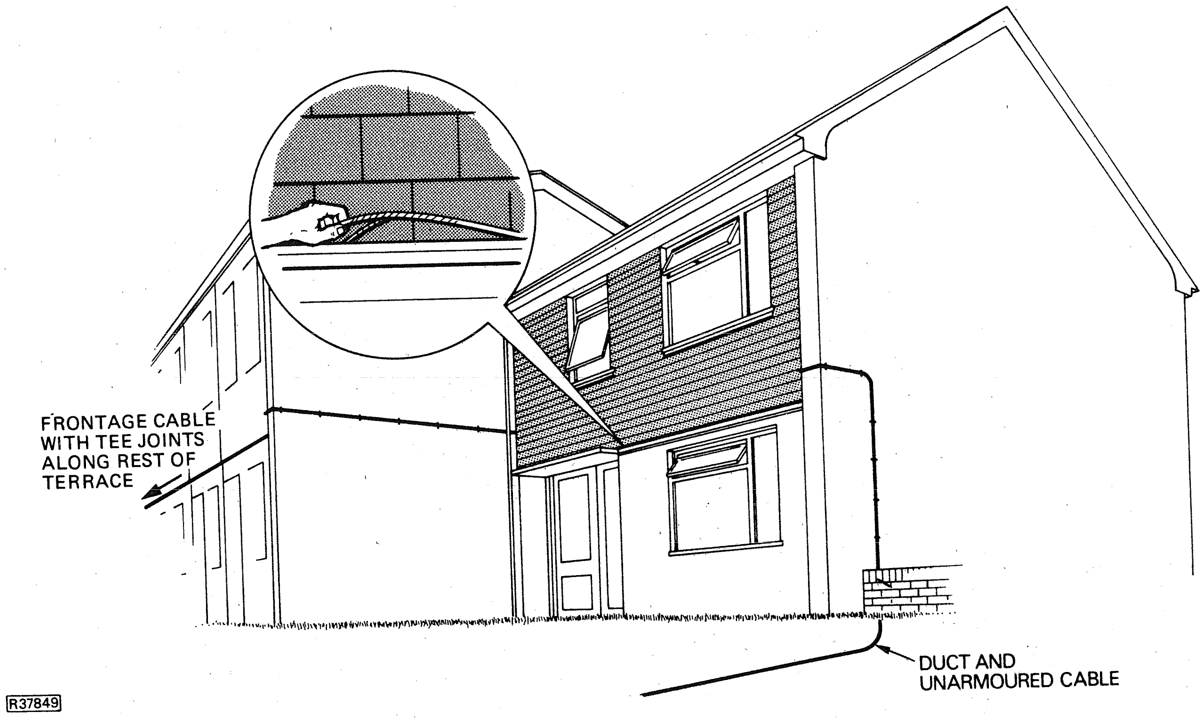


Fig. 19

It is possible for this to be installed under the ground floor of the properties in a single duct with a tee at each house but an underfloor radial system allows a more ready access to the cables. An individual duct to each dwelling, or alternatively a through duct, is provided under the floors with a suitable access box in each dwelling; a conduit connects this point with the telephone outlet position, Fig. 20.

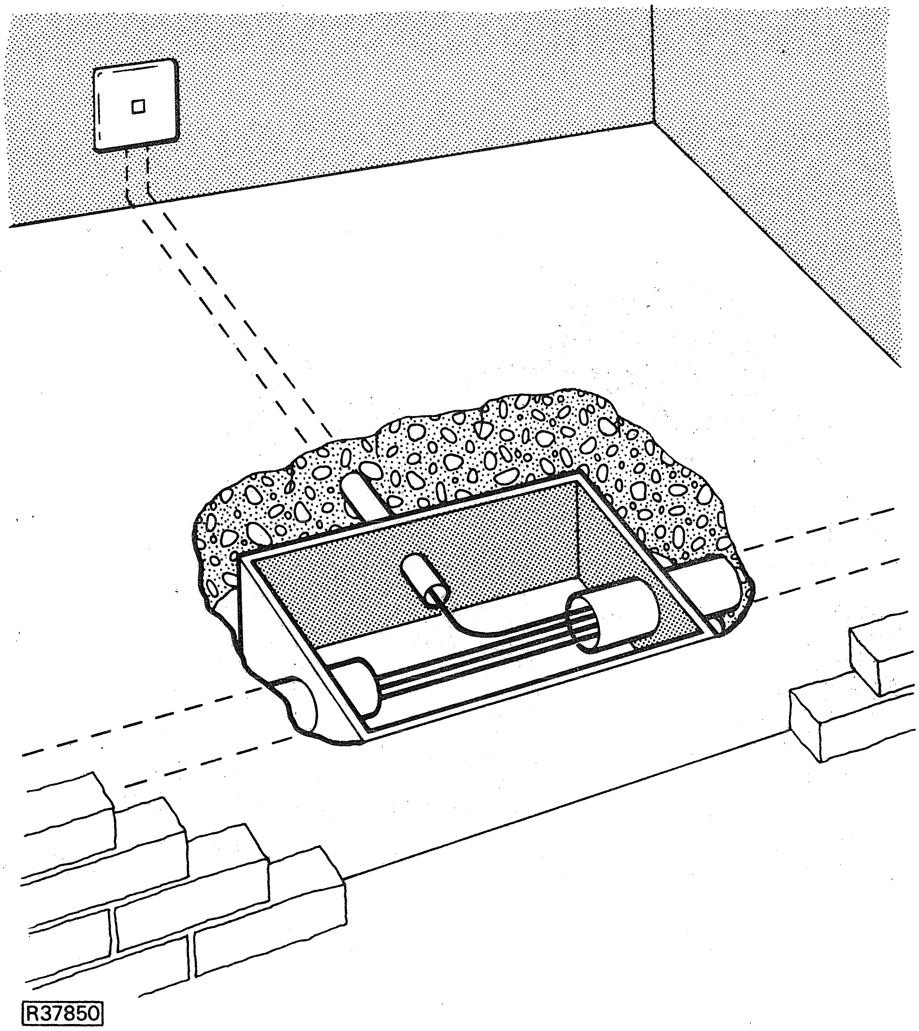


Fig. 20

Radial leads from each point are terminated in a jointing point located in or against the wall at the end of the terrace. The ducting is set in the flooring concrete where there are solid floors or where there are suspended floors, underneath them provided no fire regulations preclude this. This of course must be done before the houses are built. The disadvantage is that a covenant must be drawn up so that access can be gained for maintenance purposes, even so, there is no guarantee of ready access.

In the radial and teeing system there are obvious advantages in laying cable before houses are built and in these circumstances the armoured cable may be laid by means of a moleplough before the builder places plant and materials on the site to hinder the progress of the moleplough. The ends of the service cables to the houses are looped and attached to a wooden post at the footpath boundary until the houses are built and the cable run in.

Expense can be shared by placing the telephone cables in a common trench alongside other services such as electric cables and water pipes.

For the full effectiveness of this, a close liason with other undertakers and the builder must be maintained, but the possibility of damage to cables and pulled joints during building operations, is ever present.

Moleploughing the cable is the cheapest method of laying the distribution cable but where circumstances do not permit this a mechanical trench digger is used. Hand digging is only done as a last resort at it is much more expensive requiring more time and labour.

The relative merits of the various methods of providing service just described, on housing estates can be summarised by the following table.

TABLE 1

Distribution Method	Relative Capital Cost	Service Reliability	Maintenance Accessibility	Extent of Developers Contribution
Overhead	1.0 × O/H	Good	Good	Nil
Underground Radial	1.7 × O/H	Good	Good	Average
Underfloor	1.3 × O/H	Very Good	Good	Very large
Frontage Tee	2.0 × O/H	Fair	Poor	Average
Continuous Cable	1.5 × O/H	Good	Fair	Small

From this it is possible to compare how much more expensive installing underground distribution is compared to the standard overhead method; in the case of the frontage tee method the relative capital cost is double.

Table 2 summarizes the recommended distribution methods for various types of housing. As in Table 1 it assumes that a financial agreement is reached with the developer to defray the extra costs of putting the line underground.

TABLE 2

Type of Housing	Recommended Distribution Methods
Terraced	Underfloor, Continuous cable, Radial
Semi-detached	Radial, Frontage tee
Detached	Radial, Frontage tee
Flats/Mainsonettes	Radial, Frontage tee Continuous cable
Multi-Storey Flats	Service to each flat from a vertical riser by underfloor duct or conduit

Large office blocks and similar properties are usually fed directly from a cabinet with a distribution terminal board serving as the distribution point. In all probability the cable would be in duct to enable any future rearrangements such as larger cables to be provided. In very large blocks a form of distribution frame with tag blocks serves to distribute lines in the building (usually via terminal boards) and the frame can provide flexibility in the same way as a PCP cabinet. As there is a large number of lines the PCP is dispensed with and main cable pairs fed direct to the building distribution frame.

Aerial Cabling

This method is used where distribution cables are strung between poles, the cables having an integral suspension strand (Fig. 4) or may be lashed with wire to a suspension strand.

The cable can be run to one or several distribution poles where dropwires radiate to serve surrounding properties. Usually, because the aerial cable is in a rural area with a scattered service to provide for, a method of running distribution is used where one or two dropwires are taken out of a special joint. The method is shown in Fig. 21.

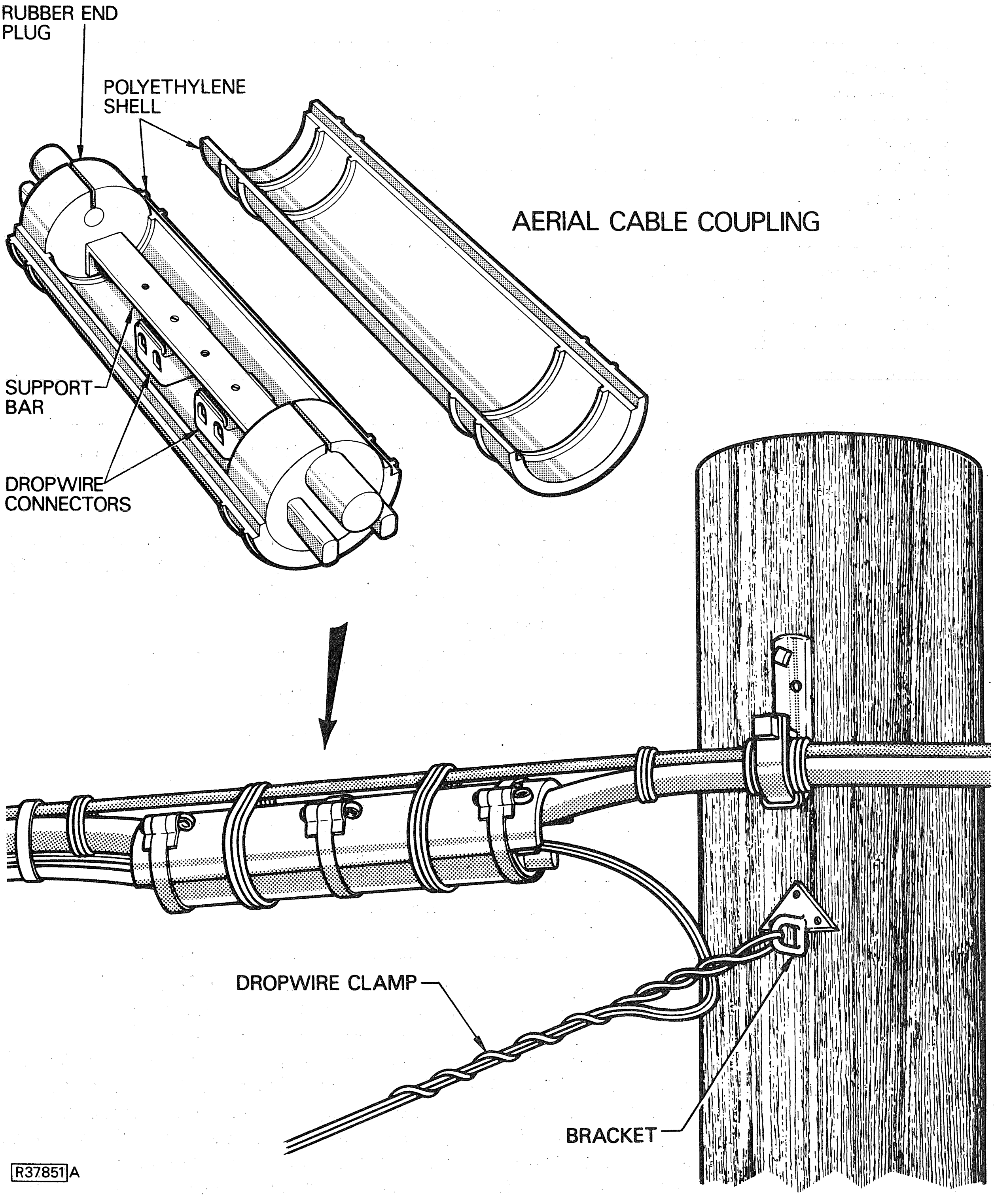


Fig. 21

Fig. 22 shows the method of bringing an aerial cable to a building for it to be run down the wall to a suitable entry.

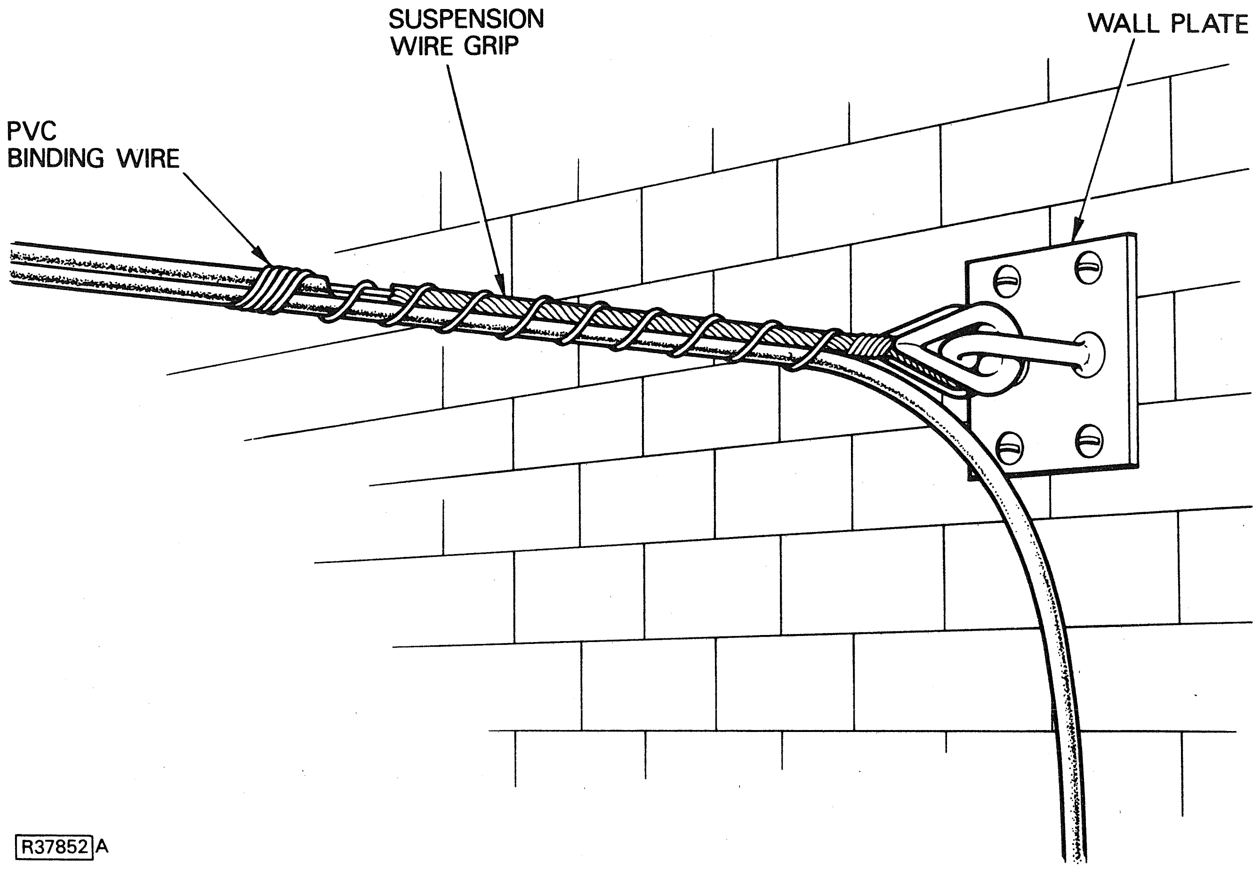


Fig. 22

This method of cabling is also suitable for distribution in a factory complex and similar premises, the cabling being used to connect extension telephones.

Duct Sealing

It is a safety precaution to prevent the entry of escaped gas and water that all ducts entering buildings are sealed. Duct entry to a PCP cabinet is similarly sealed. The seal also prevents entry of vermin.

END

References

Associated Eductional Pamphlets which contain further details of subject matter in this pamphlet are:-

EP Lines 1/7	Aerial Cabling
EP Lines 2/4	Ducts
EP Lines 2/8	Audio Cables
EP Lines 2/6	Cable Laying
EP Lines 2/9	Audio Cable Jointing
EP Lines 3/3	Surveys for New Lines

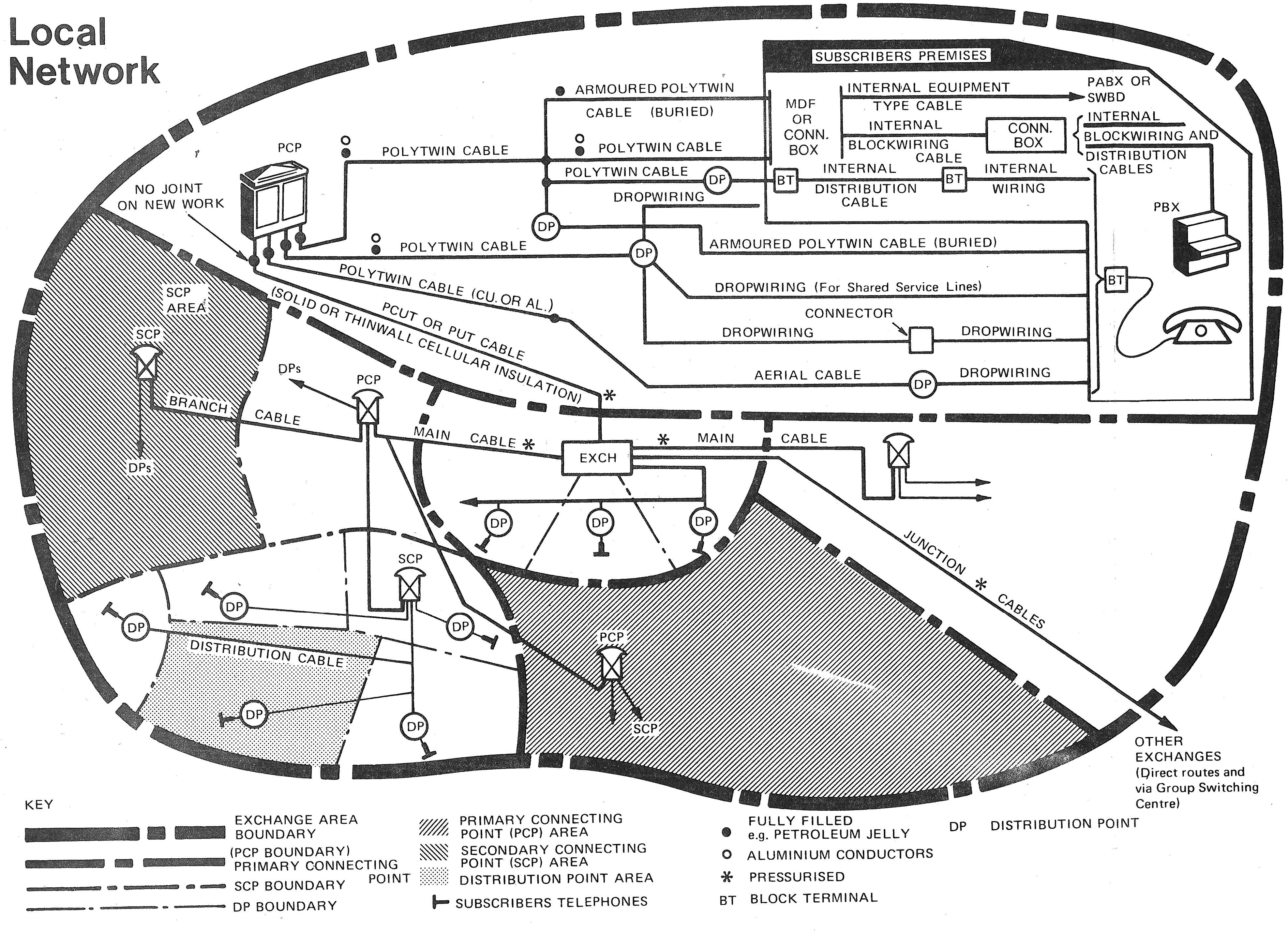
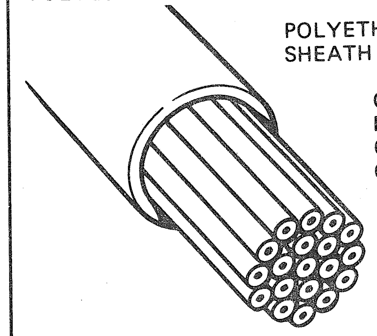
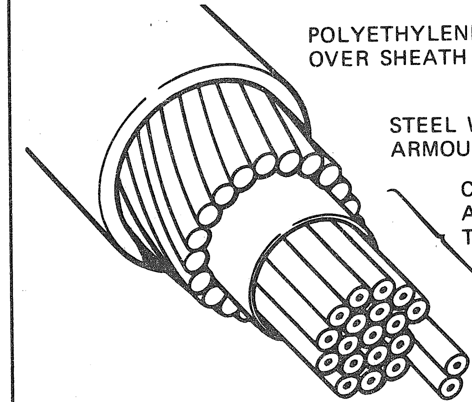

Local Network
SUBSCRIBERS PREMISES
ARMOURED POLYTWIN CABLE (BURIED)
MDF OR CONN. BOX
INTERNAL EQUIPMENT TYPE CABLE
PABX OR SWBD
INTERNAL BLOCKWIRING CABLE
CONN. BOX
INTERNAL BLOCKWIRING AND DISTRIBUTION CABLES
PCP
POLYTWIN CABLE
POLYTWIN CABLE
POLYTWIN CABLE
DP
BT
INTERNAL DISTRIBUTION CABLE
BT
INTERNAL WIRING
NO JOINT ON NEW WORK
DROPWIRING
DP
PBX
POLYTWIN CABLE
DP
ARMOURED POLYTWIN CABLE (BURIED)
POLYTWIN CABLE (CU. OR AL.)
DROPWIRING (For Shared Service Lines)
BT
SCP AREA
(SOLID OR THINWALL CELLULAR INSULATION)
PCUT OR PUT CABLE
CONNECTOR
DROPWIRING
DROPWIRING
SCP
AERIAL CABLE
DP
DROPWIRING
DPs
PCP
BRANCH CABLE
MAIN CABLE
EXCH
MAIN CABLE
DPs
DP
DP
DP
JUNCTION CABLES
SCP
DP
DP
DP
DISTRIBUTION CABLE
PCP
DP
DP
SCP
OTHER EXCHANGES (Direct routes and via Group Switching Centre)
KEY
EXCHANGE AREA BOUNDARY
(PCP BOUNDARY) PRIMARY CONNECTING POINT
SCP BOUNDARY
DP BOUNDARY
PRIMARY CONNECTING POINT (PCP) AREA
SECONDARY CONNECTING POINT (SCP) AREA
DISTRIBUTION POINT AREA
SUBSCRIBERS TELEPHONES
FULLY FILLED e.g. PETROLEUM JELLY
ALUMINIUM CONDUCTORS
PRESSURISED
BT BLOCK TERMINAL
DP DISTRIBUTION POINT
R37837

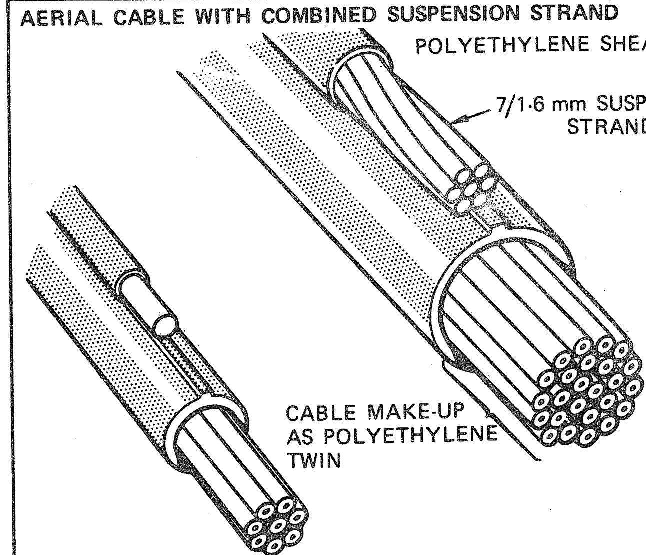
Fig. 2

DISTRIBUTION CABLES

CABLE TYPE	CONDUCTOR DIAMETER AND MATERIAL 0.5Al	 0.7Al	 0.5Cu	 0.63Cu	 0.9Cu
	PAIR SIZE				
POLYETHYLENE TWIN	– 5 10 20 50 100	– 5 10 20 50 100	– 5 10 20 50 100	– – – – – –	2 5 10 20 50 100
POLYETHYLENE TWIN ARMOURED	– – – – – –	– – – – – –	2 5 10 20 50 100	– – – – – –	2 5 – – – –
AERIAL CABLE WITH COMBINED SUSPENSION STRAND	– – – – –	– – – – –	– 10 20 50 100	5 10 20 50 –	5 10 20 50 –







R37839

Fig. 4

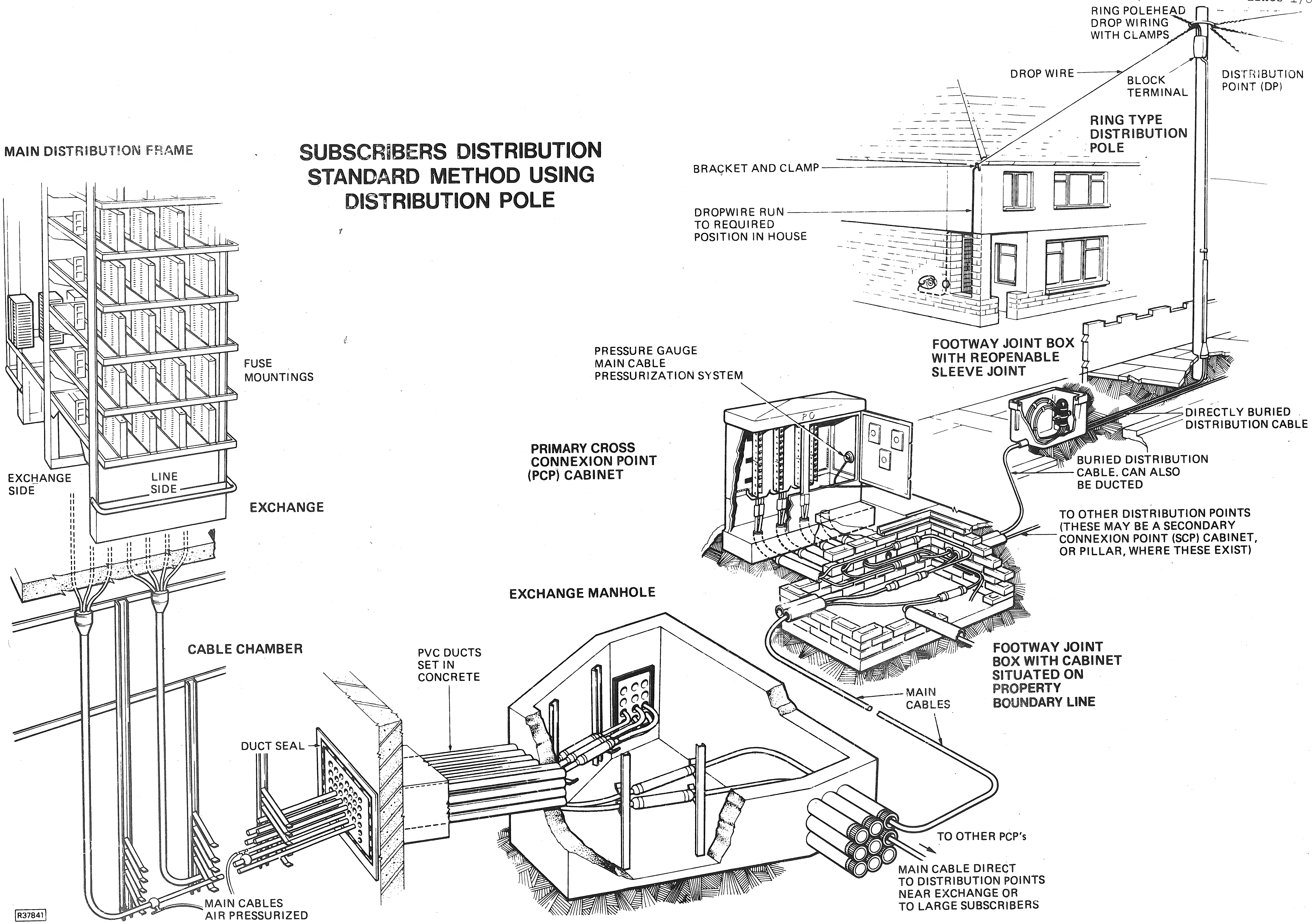
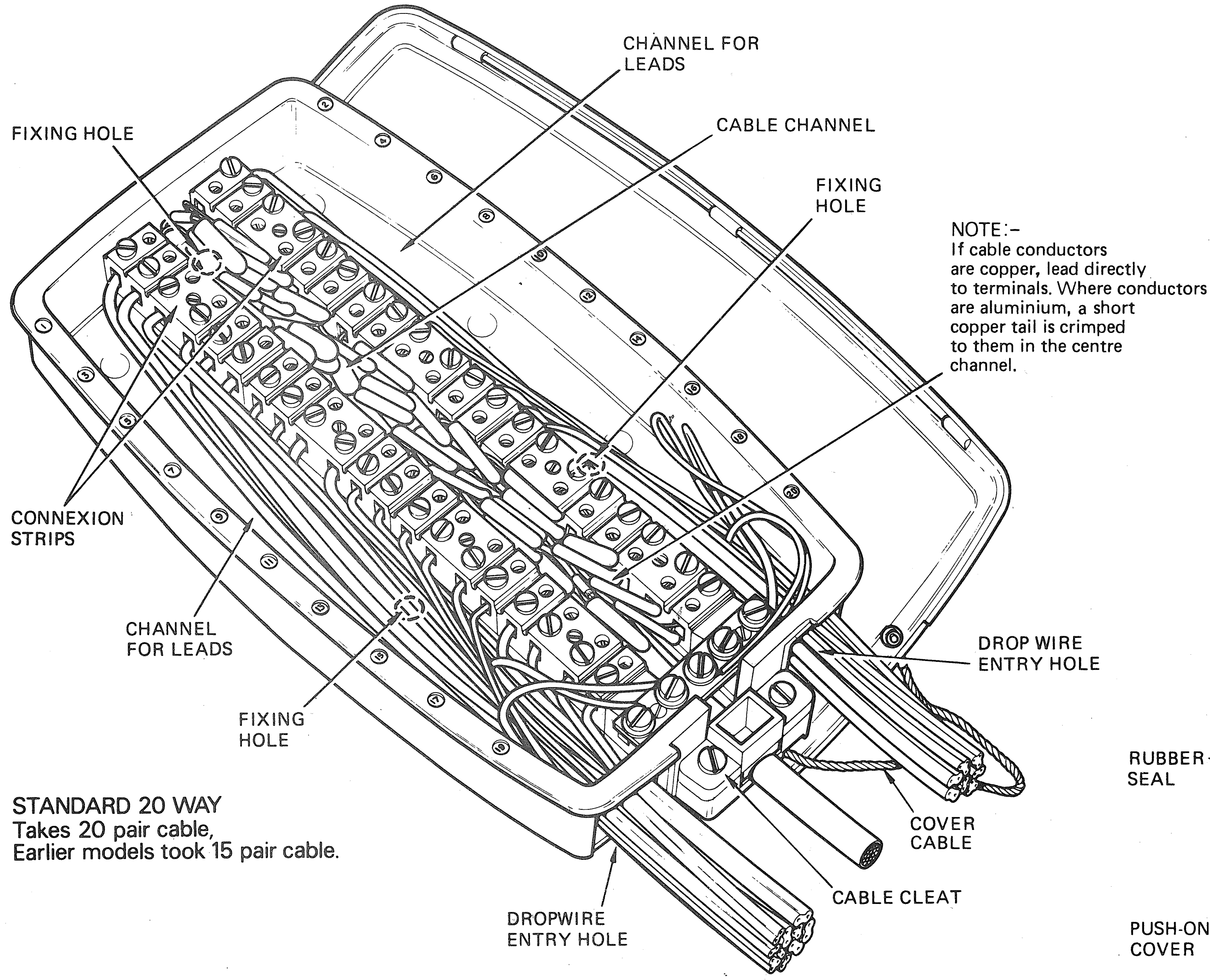
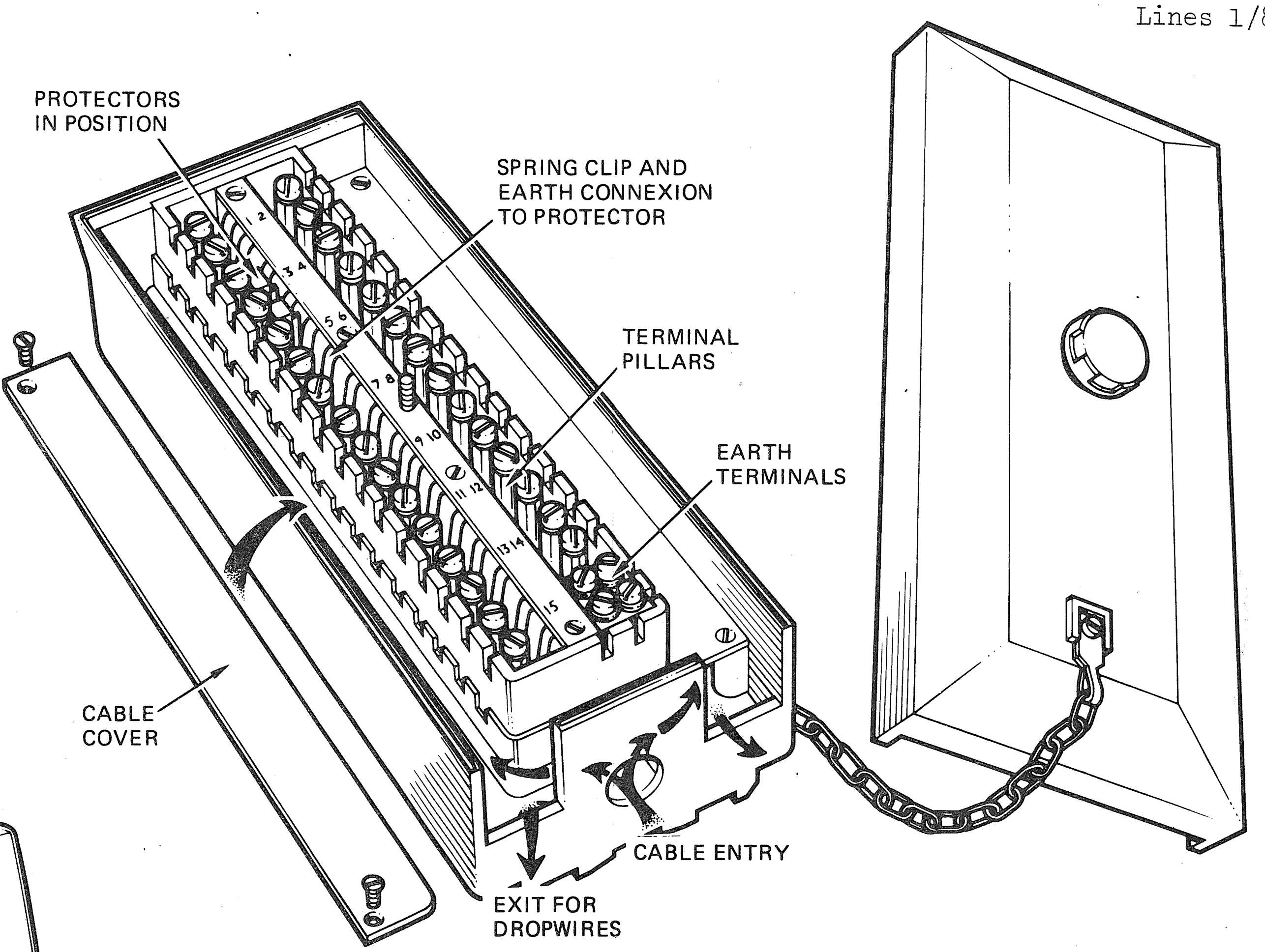

SUBSCRIBERS DISTRIBUTION STANDARD METHOD USING DISTRIBUTION POLE
MAIN DISTRIBUTION FRAME
FUSE MOUNTINGS
EXCHANGE SIDE
LINE SIDE
EXCHANGE
CABLE CHAMBER
DUCT SEAL
PVC DUCTS SET IN CONCRETE
MAIN CABLES AIR PRESSURIZED
R37841
EXCHANGE MANHOLE
PRIMARY CROSS CONNEXION POINT (PCP) CABINET
PRESSURE GAUGE MAIN CABLE PRESSURIZATION SYSTEM
PO
FOOTWAY JOINT BOX WITH REOPENABLE SLEEVE JOINT
DIRECTLY BURIED DISTRIBUTION CABLE
BURIED DISTRIBUTION CABLE. CAN ALSO BE DUCTED
TO OTHER DISTRIBUTION POINTS (THESE MAY BE A SECONDARY CONNEXION POINT (SCP) CABINET, OR PILLAR, WHERE THESE EXIST)
FOOTWAY JOINT BOX WITH CABINET SITUATED ON PROPERTY BOUNDARY LINE
MAIN CABLES
TO OTHER PCP's
MAIN CABLE DIRECT TO DISTRIBUTION POINTS NEAR EXCHANGE OR TO LARGE SUBSCRIBERS
RING POLEHEAD DROP WIRING WITH CLAMPS
DROP WIRE
BLOCK TERMINAL
DISTRIBUTION POINT (DP)
RING TYPE DISTRIBUTION POLE
BRACKET AND CLAMP
DROPWIRE RUN TO REQUIRED POSITION IN HOUSE

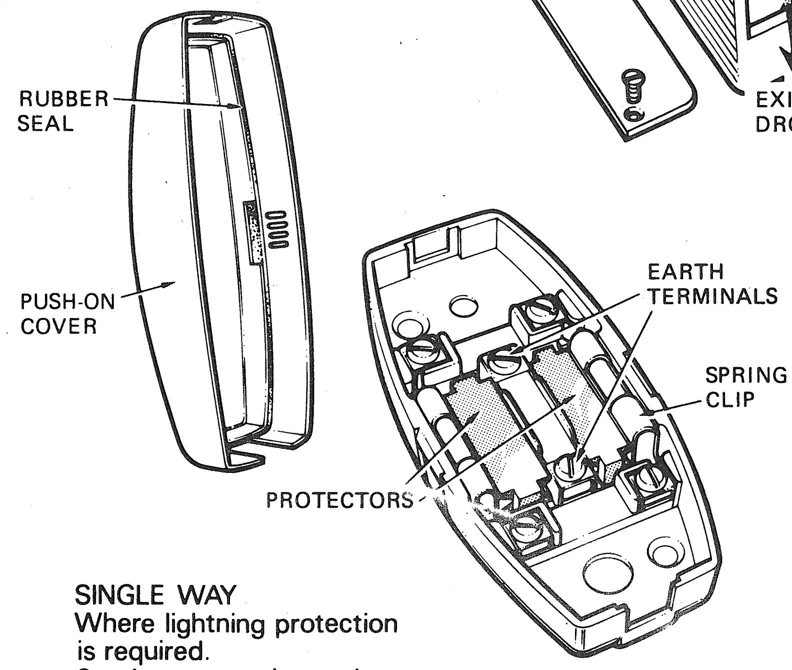
Fig. 6



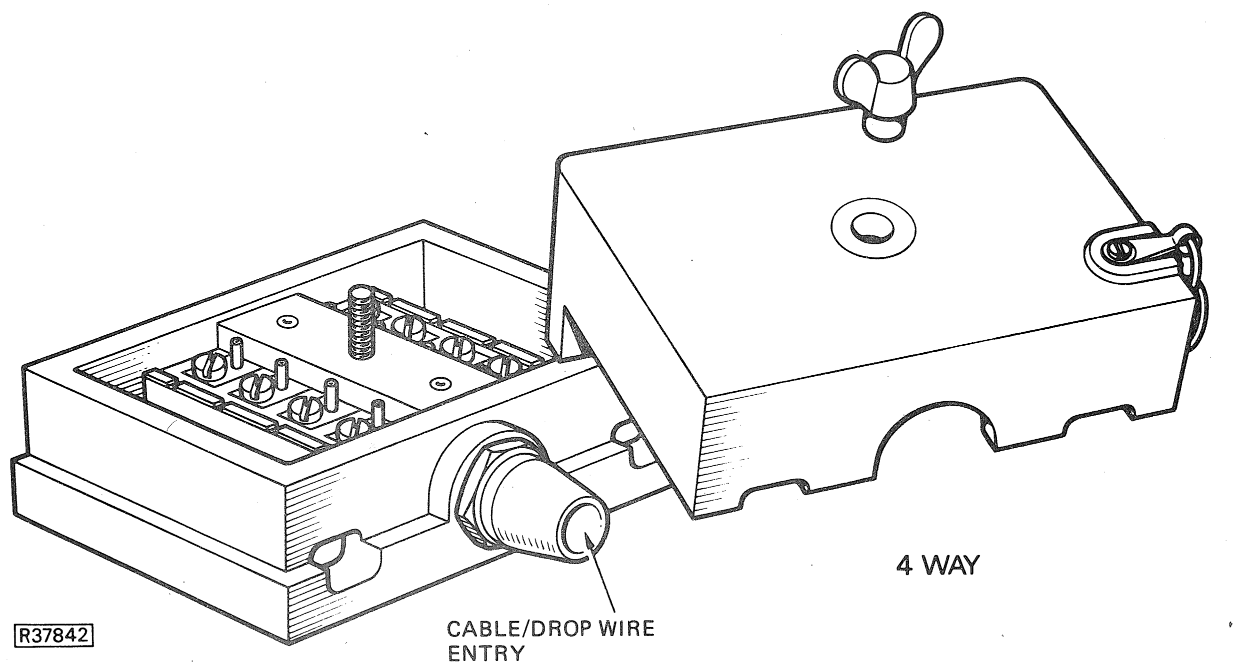
STANDARD 20 WAY
Takes 20 pair cable,
Earlier models took 15 pair cable.



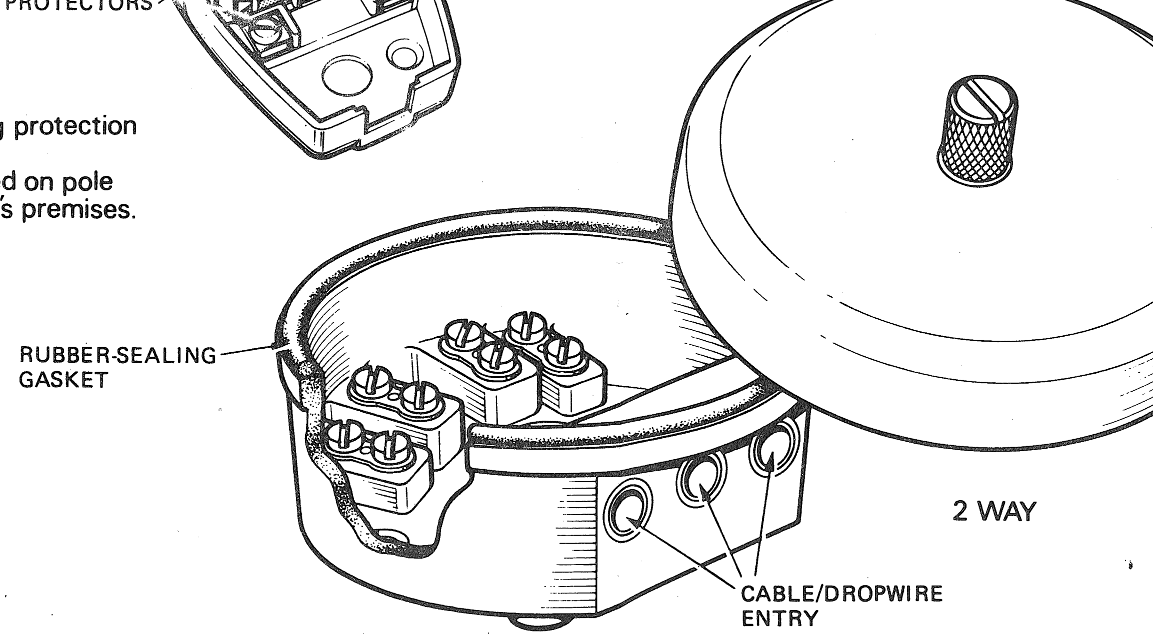
15 WAY
Where lightning protection is required.



SINGLE WAY
Where lightning protection is required.
Can be mounted on pole or in subscriber's premises.



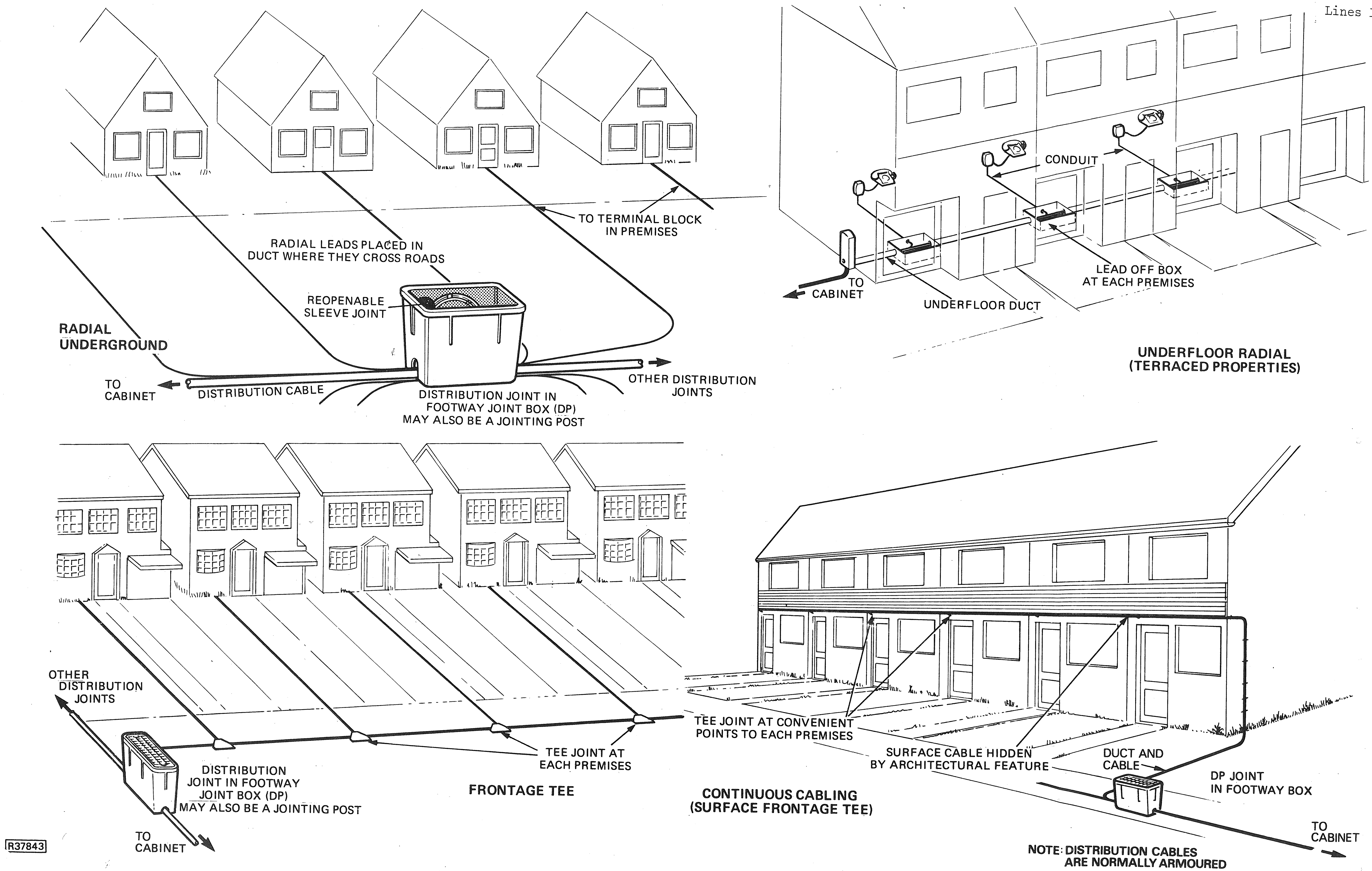
4 WAY



2 WAY

POLE MOUNTED TERMINAL BLOCKS

Fig. 9



DISTRIBUTION METHODS

Fig. 13