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## **SERIES 400**

### **DUCTWORK IN TRENCHES**

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**417 Addition of Swept Tees to Cabled Ducts**

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**401 General**

- 1 Immediately following the excavation of the trench, the ducts shall be laid and jointed on the duct bed. Ducts shall be laid so that each one is in contact with the bed throughout the length of its barrel.
- 2 Duct pipes shall be handled, transported, stored (including any temporary storage) and installed in accordance with the manufacturer's instructions, in compliance with any requirements of the street authority, and in compliance with this Specification and the Drawings included in the Contract.

**402 Transportation, Handling and Storage of Ducts**

**Transportation of Ducts**

- 1 The methods of transportation, handling and storage of ducts adopted by the Contractor, shall be chosen so as to minimise the possibility of damage to the ducts, although the liability for the same always rests with the Contractor.
- 2 Ducts should be transported as close to the Site on flatbed lorries, whose beds shall be clean, with no sharp objects such as nails.
- 3 Large diameter ducts should be loaded before small diameter ducts. Do not allow ducts to overhang vehicle by more than 1 metre. Spigot and socket ducts should be stacked allowing the sockets to protrude and be placed at alternate ends of each layer. This will reduce loading of the sockets and ensure the duct is supported throughout its entire length.

**Handling of Ducts**

- 4 Ducts should be packed in moulded box pallets, which shall be sufficiently robust to protect the ducts during handling, transit. The packaging should be designed for on/off loading of pallets, at the manufacturer's premises and at the Site, or any interim stockholding location used by the Contractor. The design of the packaging shall also take into account the variety of suitable Contractor's Equipment which might be used in all on/off loading operations.
- 5 Ducts packed in moulded box pallets should ideally be layered so that sockets are grouped at one end per layer, the socket-end being alternated per layer.

**Storage of Ducts**

- 6 Duct box pallets shall be stored on level ground, which should be free of stones and any sharp objects. Duct box pallets should be stored on flat ground, sufficiently firm to support duct and lifting equipment, with a maximum height of 3 pallets or 3 metres, whichever is the smaller.
- 7 The storage area shall have been pre-checked by the Contractor as being suitable for storage. Any loose ducts shall be supported along their complete length, with timber batons and side supports used at appropriate centres.
- 8 Where the Contractor wishes to temporarily store ducts and duct fittings on the street, he shall seek approval from both the street authority and the Engineer. Any such temporary store locations shall be discretely located, in a manner which does not:-

- (i) affect the stability of any excavation, especially any excavation left open overnight;
  - (ii) affect the stability of, or limit the access to, any adjacent property;
  - (iii) impair traffic flow of vehicles, or the passing of pedestrians;
  - (iv) cause contamination to ducts and duct materials, or to the existing surfaces of the street - the use of suitable plastic sheeting may be required by the street authority or the Engineer.
- 9 Temporary store areas shall be considered as open excavations, in terms of signing and guarding.
- 10 Ducts and duct fittings shall be protected to avoid any contamination and excessive exposure to moisture. Where ducts and duct fittings are likely to be stored in an exposed environment for periods in excess of 2 months, they shall be covered with a suitable tarpaulin-type sheet, approved by the Engineer, sufficient to negate the effects of extended exposure to ultra-violet light.
- 11 Each duct shall be carefully examined immediately prior to laying and any damaged or defective ducts shall be marked in a conspicuous manner and removed from the site.

#### **403 Position of Ducts Relative to Other Undertakers' Apparatus and Plant**

- 1 At all times where possible, ducts to be laid in the ground shall be kept well clear of all of other undertakers' apparatus and plant, which, for the purposes of the Contract shall be deemed to include all pipelines, cables, chambers and components of telecommunications, gas, water supply and disposal, whether surface water or foul, street lighting, electrical and other networks operated by a street authority or undertaker as defined in the New Roads and Street Works Act 1991.
- 2 The clearances to be achieved where practicable for all new and diversionary Works shall be as follows: -
- Telecommunications - a minimum clearance of 50mm both laterally and vertically
- Gas - a minimum clearance of 250mm both laterally and vertically.
- Water Supply - a minimum clearance of 250mm both laterally and vertically
- Water Disposal - a minimum clearance of 100mm both laterally and vertically, for both surface water and foul water;
- Street lighting - a minimum clearance of 300mm shall be provided to the ducting or directly buried cables.
- Electrical Networks
- (i) Single-core or multi-core high voltage cables for electricity supplies, electric railway, light rail or tramway systems exceeding 1000 volts shall have a minimum lateral clearance of 300mm and a minimum vertical clearance of 450mm, with no exceptions.
  - (ii) Low voltage cables for electricity supply systems not exceeding 1000 volts shall have a minimum clearance of 300mm between the cable, or cables, and the duct, both laterally and vertically.
- Other Networks Operated by a Street Authority - a minimum clearance of 300mm both laterally and vertically shall be provided between cable or electrical based networks including traffic signal, other traffic control and traffic communications systems.
- Where Works are required to existing ducts then the clearances noted above may be relaxed by up to 150mm but only upon the written approval of the Engineer.

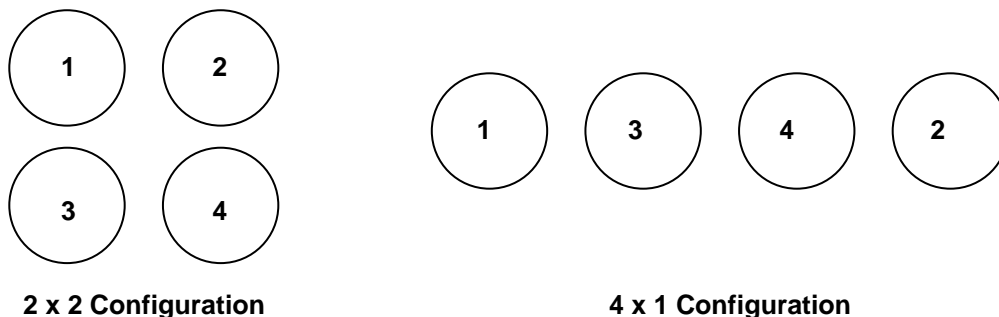
- 3 Separation clearances particularly at proposed existing chambers shall be locally increased to ensure the above minimum clearances are to the outer dimension of existing pipe joints, such as spigot-to-socket, external jointing bands/collars, flanges, adapters and the like.  
  
Where preferred minimum clearances are indicated, these should be adopted at proposed existing chambers
- 4 Multi-way ducts shall not be laid both above and below a lateral crossing of any other undertakers' apparatus and plant, i.e. a 4-way ductline shall not be laid two-over and two-under.
- 5 In the absence of information relating to the ownership of apparatus and plant revealed during excavation operations and subsequent to all reasonable efforts being made by the Contractor to determine the ownership of such apparatus and plant, ducts shall be laid with a minimum clearance of 150mm, both laterally and vertically.
- 6 Where necessary, the Engineer may order special protection measures where the minimum clearances to other undertakers' apparatus and plant cannot be achieved. These may include C10/20 concrete as plant protection.

#### 404 Laying and Jointing of Ducts

- 1 Laying and jointing of ducts shall generally be in accordance with the following sub-clauses:-
  - (i) Before assembly, one to another, ducts shall be examined for damage. The joint surfaces (i.e. socket and spigot) and components of each duct shall be carefully wiped clean. Prior to assembly, check that the duct ends are square to the axis of the duct and free from burrs and other imperfections.
  - (ii) A batten shall be erected against the spigot end of the first length of duct, to act as an anvil against which successive ducts may be driven to ensure firm assembly of socket and spigot, as each duct section is added.
  - (iii) The joint ends are to be wiped clean and mated, the spigot end tapped home with a hammer to the penetration mark. Excessive force will not be used whilst tapping the spigot home and the remote socket shall be protected with a wooden batten.
  - (iv) Joints in any ducts shall not be made with plastic solvent, unless instructed by the Engineer to provide a watertight joint in UPVC ducts.
  - (v) Ducts already laid shall be checked and cleared of stones, soil and other extraneous matter, prior to subsequent jointing. Ducts shall be jointed so that no silt, grit, grout or concrete surround is able to enter the duct. Ducts with push-fit joints shall have a register to ensure that the pipe is fully pushed into the joint.
  - (vi) At jointing chambers, the ducts shall be positioned so that they are flush with the inside wall of the chamber, or set-into the wall to enhance future cable installation. Care shall be exercised to ensure that the duct retains its circular cross-section. Inside pre-formed chambers only, proprietary Pre-formed plastic bell mouths shall be fixed to the ends of the ducts to assist the ease of future cable installation. To enable these bell mouths to be fitted, ducts may project into the chamber, up to a maximum of 25mm.

- (vii) Ducts may be shortened by cutting fresh spigot ends. Sockets must be used wherever possible. Cutting will be carried out in a manner approved by the duct manufacturer, with a suitable tool square to the axis of the duct, with the inside of the duct bevelled to form a slight bell mouth. Prior to assembly, care will be exercised to ensure that the cut edge of a duct is free from burrs or other imperfections.
- (vii) Should the Engineer approve the joining of short lengths of duct, or where a joint between 2 spigots has to be effected, a proprietary collar must be used. The collar shall be at least 200mm long of the same material as the duct with an inside diameter such that it will just slip over the duct shall be used. The spigots should be cut vertically such that they almost meet inside the collar.
- (viii) All ducts are to be bedded, haunched and surrounded by fine fill materials complying with Water Industry Specification (WIS) No. 4-08-02 as amended November 2008, with a nominal maximum particle size of 6mm. Compaction of the fine fill material shall be in accordance with Clause 603 of the Specification.
- (ix) The completion of the bedding, haunching and surrounding of the ducts is to be carried out immediately after jointing. The bed, haunch and surround shall be brought up equally on all sides of the ducts ensuring that it is in contact with the underside of the duct barrel and be carefully compacted in layers not exceeding 150 mm thickness ensuring full compaction next to the trench walls. Ducts shall be maintained to line and level during the bedding, haunching and surrounding operations.
- (x) In multiple duct situations, the duct shall be laid so that the spigot end is always in the same direction.
- (xi) For multi-layer ducts, the first layer of ducts shall be laid on the prepared trench bottom so that their outer surfaces are 25mm apart and a minimum gap of 25mm remains between the outside ducts and the sides of the trench. Fine fill surround material shall be placed and compacted to fill the spaces around the ducts and as bedding for the next layer of ducts. The second and subsequent layers of duct shall be laid so that they are vertically above and then surrounded with similar fine fill surround material and compacted in the same manner.
- (xii) As required by Site conditions, or as directed by the Engineer, at approximately 5 metres from the jointing chamber at each end of the track, the duct formation may open out and adjust in configuration to suit restricted or difficult openings in chambers.
- (xii) In order to negotiate bends and natural hazards, wherever possible the springing/flexure of straight duct section through its natural curvature, should be used without inducing stressing in the duct by kinking, crimping, or local collapse. A maximum of two slow 22.5° or four slow 11.25° bends (long-radius) shall be permitted in any length between jointing chambers, but not adjacent so as to otherwise make a larger angle (i.e. up to 45°). Any deviation from this will only be permitted at the discretion and prior written authority of the Engineer.  
  
The use of 45° and 90° bends between jointing chambers is not permitted. Such bends shall be required between a cabinet base and its associated chamber and the 90 degree bends at the ends of Laterals.
- (xiv) Any variation of duct formation and/or depth shall only be carried out after the agreement of the Engineer.

- (xv) In instances where 4-way duct is required to splay from conventional 2x2 configuration to 4x1 configuration (4 ducts in one layer), the two top ducts of the 2x2 configuration shall splay to either side of the lower two ducts.



- (xvi) Until such time as individual ducted sections are completed between successive jointing chambers, all temporary duct-ends shall have their entrances blanked off with appropriate size plastic caps or expanding plugs when advance of the ducted trench is temporarily stopped. This shall minimise the likelihood of deposits such as stones, soil and other extraneous matter, entering the ducts.

#### 405 Lateral Duct Termination Points Under Local Build Network Construction

- 1 The Contractor will be provided with information with respect to the location of lateral duct termination points. Strictly within the street (i.e. public highway) or unless the Engineer confirms that the necessary private wayleave has been obtained, lateral ducts shall be connected to Termination Boxes, next to the property boundary to enable subsequent cable installation work to be carried out without re-excavating the footway.
- 2 In positioning termination boxes, the Contractor shall ensure that the box is as practically close to the building wall or boundary as is possible, but ensuring that the surround reinstatement to the termination box is sufficient to maintain the integrity of the street and provide sufficient structural protection to the box itself.
- 3 The surface level of the Termination Box will be set flush with the surface of the footway or carriageway as applicable. In verges, grassed areas or unmade ground, the Termination Boxes will be set flush with the general surface level.
- 4 In certain circumstances it may not be possible to terminate rising lateral duct as close to buildings walls as required. In these instances the Engineer shall be informed.

#### Guidance on the Positioning of the Termination Box

- 5 General guidance on the positioning of the Termination Box location for different situations is as follows:-

(i) General Considerations

Generally, for houses and small businesses, swept tees should be sited at the back of the footway, on the boundary of the property to be served. The tee should be positioned, if appropriate, in order to give the shortest route to the lounge or living room, subject to surface difficulty. Where the entire frontage of a property is of a hard surface (tarmac/decorative blocks) the Termination Box should be positioned to one extreme of the property boundary. This will allow the customer cable to be clipped along a wall or to be buried along one edge of

the property, therefore requiring only one cut and minimal excavation of any hard surface.

Wherever possible the Termination Box should be positioned at a location that enables installation on the customer's property through predominantly soft material (unmade ground/grass/flower border). On no account should the Termination Box be positioned so as to be central to a driveway, vehicular access, or other pathway

(ii) Single Dwellings - Terraced or Semi-detached houses

A single Termination Box can be shared by two properties, providing no obstructions are present at the property boundaries, such as buttress wall pillars, telegraph poles and the like. Where an obstruction is present each property will require its own Termination Box, positioned in line with the General Considerations mentioned above.

(iii) Detached Properties

More often, a single Termination Box per property positioned in line with the General Consideration will be required.

(iv) Low Rise Flats/Large Businesses/Schools

Termination Boxes should be positioned on an individual basis according to local site conditions. Termination Boxes swept tee should be positioned to take full advantage of any soft ground should further construction be required at some future date.

(v) Commercial Properties – Shops (Usually with a plate glass frontage)

These premises may have a flat or storage area above the shop. In order to provide service to both the shop and the above premises it is necessary to position the Termination Box between adjoining properties. Under no circumstances should the Termination Box be located in the middle of the shop frontage, or under any plate glass frontage.

#### **406 Marker Tape**

- 1 Under Local Build Network Construction, 200mm wide non-degradable polyethylene marker tape shall be laid on all duct routes. The marker tape will be laid in the Type 1 sub-base within the last layer to be compacted.
- 2 Under National Trunk Network Construction 200mm wide non-degradable polyethylene marker tape containing an integral metal strip will be laid on all duct runs. The tape shall be of a high visibility colour and be marked with 75mm high bold black lettering "Virgin Media Telecommunications Fibre Optic Duct". The marker tape will be laid in the Type 1 sub-base within the last layer to be compacted.
- 3 Marker tape will not be required where foam concrete is utilised.

#### **407 Anchoring of Ducts when using Foam Concrete Backfill**

- 1 The ducts shall be spaced and anchored to maintain the position of the ducts within the trench during the foam concrete backfilling.

- 2 Ducts shall be secured at 1m centres along the trench unless agreed otherwise by the Engineer. The standard means of support shall be 50mm square pegs driven into the base of the trench with the ducts secured using plastic ties or thick adhesive tape. Alternative methods of support must be approved by the Engineer.

#### 408 Additional Protection Measures for Shallow Ducts

##### Protection Boards

- 1 Where directed by the Engineer to lay ducts at depths less than the minimum indicated in Clause 311 of the Specification, 10mm thick (minimum) STOKBORD™ cable protection covers shall be placed directly on top of the compacted fine fill material surrounding/overlaying the ducts, prior to backfilling and reinstatement operations. This protection method shall be adopted for any surface area.
- 2 STOKBORD™ cable protection covers are manufactured by Messrs. Centriforce of Liverpool.

##### Other Protection Measures

- 3 In areas of significant risk the Engineer may order separate protection measures should be taken to protect the duct route. These may include:-
  - (i) protection concrete of strength C20/20, to different thicknesses;
  - (ii) protection concrete of strength C20/20, to different thicknesses, reinforced with layer(s) of A393 steel fabric reinforcement complying with BS 4483;
  - (iii) steel plate of different thicknesses (6mm minimum);
  - (iv) steel ducts of sufficient diameter to allow the normal trench ducts to be sleeved inside.
- 4 In certain instances, the Engineer combinations of the above protection measures.

#### 409 Slewing and/or Lowering of Ducts

- 1 Where lowering only is necessary the duct line shall be suspended and the required excavation taken out down the side and under the duct line. When this method is impracticable the duct line shall be slewed and raised or lowered temporarily as required by the Engineer for a distance, which is just sufficient to allow access for carrying out the excavation.
- 2 With the exception of making slight adjustments to the duct line after slewing and lowering, the duct line shall not be moved in any way without adequate reinforcement firmly secured to the duct line, as approved by the Engineer.
- 3 Any forces which it is necessary to apply to the duct line to move it in any way shall be applied not directly to the duct line but to the secured reinforcement. Such forces shall be applied at points whose spacing is sufficiently close to minimise the bending of the duct line.
- 4 When the duct line is to be slewed only, it may be moved without suspending it, provided that:-
  - (i) The surface across which the duct line is to be slid shall be reasonably level and regular, to the approval of the Engineer.



- (ii) The moving force shall be applied to the secured reinforcement by rope, jack or other method approved by the Engineer, in order to allow the duct line to be moved smoothly.
- 5 The slewing and/or lowering of the duct line shall be carried out by making a succession of incremental movements of the duct line, each made progressively and applied equally along the affected length. The curvature of the duct line at any intermediate stage between the initial and final positions shall not exceed the curvature limits new ducts of the same type.
- 6 Prior to finally placing the duct, the trench bottom shall be prepared in the same manner as is required for the laying of new ducts.
- 7 Where, following slewing and/or lowering (or raising operations), a duct joint or joints have pulled apart, short lengths of ordinary or manufactured split duct may be inserted in the duct line and satisfactory joints effected as directed by the Engineer.

#### **410 Upgrading of Ducts**

- 1 Where upgrading of ducts is necessary the duct line shall be suspended and the required excavation taken out down the side and under the duct line. When this method is impracticable the duct line shall be slewed and raised or lowered temporarily as required by the Engineer for a distance which is just sufficient to allow access for carrying out the excavation and upgrading operations.
- 2 The requirements of Clauses 409(2) to 409(7) of the Specification shall equally apply to the upgrading of ducts.

#### **411 Duct Cleaning and Proving**

- 1 Before responsibility for any duct section is assumed by the Engineer, or accepted as ready for cabling operations, the section will be subjected to a series of test procedures. These will normally be carried out in the presence of the Engineer.
- 2 To ensure that laid ducts are free from deposits such as stones, soil and other extraneous matter, a suitable brush and mandrel or approved duct testing device shall be pulled through newly completed duct lines. To avoid scouring of the duct, the mandrel shall follow the brush. Details of the duct brush and mandrels are shown on the Drawings. The mandrel shall have a diameter 95% of the internal diameter of the duct, and shall be supplied by the Contractor.
- 3 Where lateral duct connections have been constructed on the duct section to be tested, All 56mm/63mm lateral ducts shall be rodded from the Termination Box. This will confirm the correct direction of the swept 'T', and push any deposits into the main duct. The subsequent brushing and proving of the main ducts should be in a direction which is against the sweep of the property connections. This should reduce the chance of such deposits entering or re-entering the 54/63mm lateral ducts.
- 4 Any duct section, which fails to be successfully cleaned and proved at the first visit, will be recorded and subsequently rectified by the Contractor and the complete section, subjected to a retest.
- 5 Upon the successful completion of the test procedures, the Engineer will sign off the duct section as acceptable.
- 6 Ducts may be roped as part of this procedure.

#### **412 Jetting of Ducts**

- 1 Where either of the duct cleaning and proving methods fail to clear existing un-cabled ducts, high pressure water may be used to clean and clear empty ducts of deposits such as stones, soil and other extraneous matter. It should not be used where cables exist in the duct nor should it be used if the duct is found or suspected to be damaged either before or during cleaning, unless expressly agreed in writing by the Engineer.

#### **413 Draw Ropes**

- 1 On completion of all duct and duct associated works, draw ropes shall be left in each main route duct, to facilitate future cable installations. Draw ropes shall be of polypropylene of 5.5KN minimum breaking load. Ropes should be of unbroken length and adequately tied off to the Engineer's approval.
- 2 Draw ropes may be pulled through as part of the Duct Cleaning and Proving operations, or alternatively by using sectional solid rods (typically drainage rods) or flexible one-piece rods ('Cobras').

#### **414 Standard Practice for Cutting of HDPE & UPVC Ducts and Sub-Ducts**

##### **General**

- 1 Whenever it is necessary to enter an existing duct or sub-duct, for emergency maintenance, jointing chamber construction or any other reason, the practices covered in this clause MUST be followed.
- 2 The Contractor must note that there is no "fool proof" method for carrying out this operation, therefore extreme care must be taken at every stage if damage to cables and working circuits is to be avoided.
- 3 The Contractor must never assume that any duct or sub duct is empty. It is important to recognise that duct formations can change between jointing chambers and assumptions must not be made about the orientation of plant at the proposed point of entry into the duct.
- 4 Prior to cutting any duct, the existence of any sub-ducts and cables must be established by opening adjacent jointing chambers to ascertain the physical presence of all plant.
- 5 When making saw cuts at angles less than 90 degrees to the duct wall, extreme care should be taken, particularly when starting the cut, to safeguard against the blade slipping along the surface of the duct. To prevent this, where possible, the free hand should be positioned behind the saw blade. Persons assisting with the operation should position their hands where they will not be at risk.
- 6 In the absence of sub-duct(s) or cable(s) in a primary duct, any draw rope which may be present must be kept intact during the cutting process.

##### **Suitable Cutting Tools**

- 7 The use of tools fitted with depth limiting devices is preferred. Cutting existing ducts may also be safely undertaken using tools from a conventional tool kit, provided all the precautions set out in this clause are satisfied and all the procedures are followed carefully.
- 8 Tools for cutting uPVC and HDPE single and twinwall ducts should include:

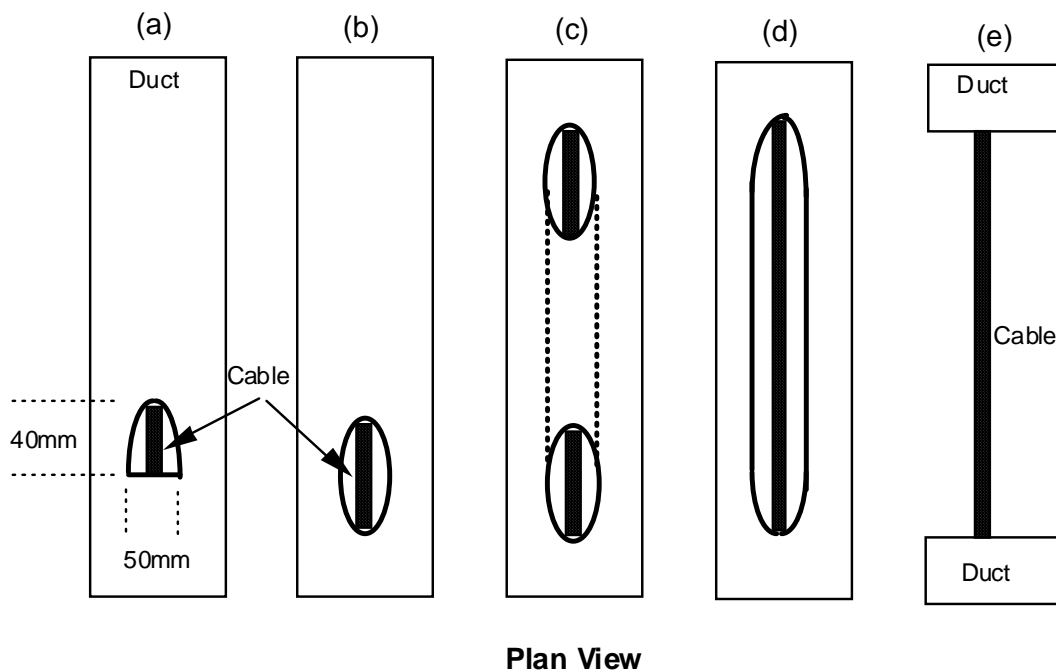
- i) Handsaw
- ii) Padsaw
- iii) Tension saw

9 Tools for cutting small bore ducts, mini ducts and sub-ducts should include:

- i) Circumferential cutter with depth limiter
- ii) Sub-duct cutting tool (Kabelmantelshnieder)
- iii) Sub-duct chamfer tool

#### Procedure for Cutting Ducts.

10 Having taken note of the precautions detailed in sub-clauses 1-9 above, the existing duct line should be exposed for a length sufficient to gain access around the duct(s) to be cut. In the case of a multiway formation, wedges should be carefully inserted between the ducts to create working space.



**Figure 4/1 – Cutting of Ducts**

11 Referring to Diagram 4/1:  
Step 1 - The first cut. See (a) in the Figure 4/1.

It is essential that the depth of this first cut is limited to the wall thickness of the duct and that extreme care is taken whilst starting this observation hole. Using a small hand saw, the first transverse and vertical cuts should be made across the top of the duct.

For a nominal 90mm internal diameter uPVC or HDPE twin wall duct, the cut should be such that it measures no more than 50mm circumferentially around the top of the duct. Twin wall ducts should be cut in the corrugation. When a nominal internal diameter 50mm duct is to be cut, the length of this first cut should be approximately 25mm.

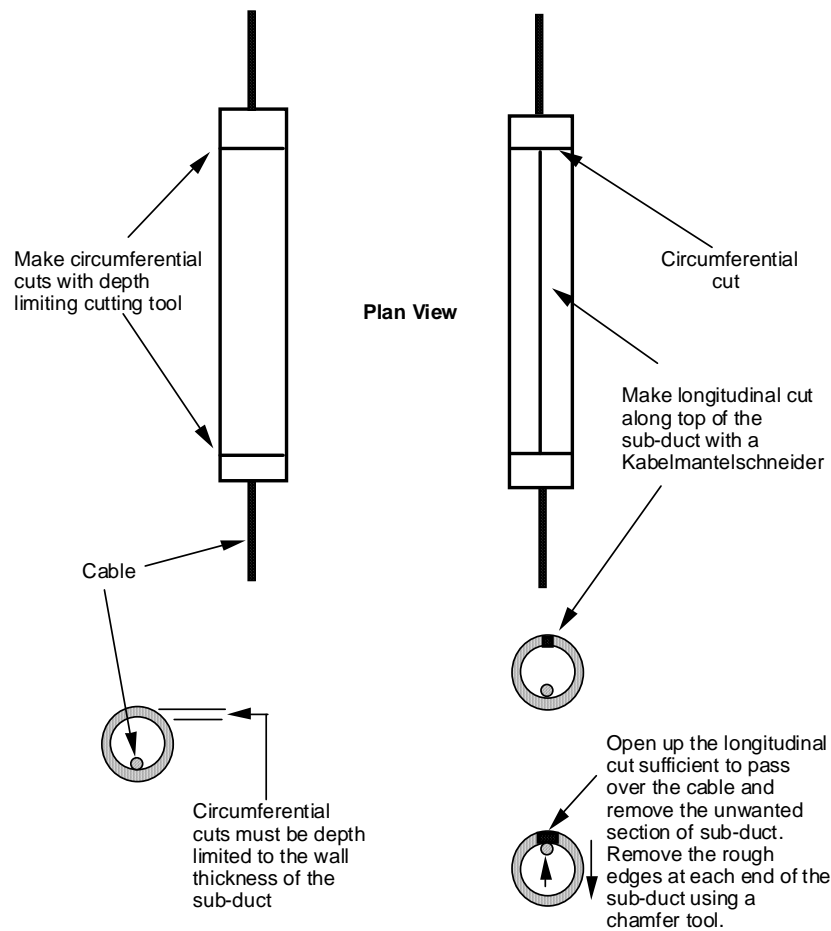
12 Step 2 - Create an observation hole. See (b) in the Figure 4/1.

Make a second cut starting approximately 40mm from and towards the first cut in order to make a small observation hole in the top of the duct. Determine the number and location of any cables, sub-duct and draw ropes and if any are located near the top of the duct, protect or carefully reposition them clear of subsequent cutting operations.

- 13**     Step 3 - Enlarge the observation hole. See (b) in the Figure 4/1. Repeat the procedure as a "mirror image" of Step 2 to make an elongated slot.
- 14**     Step 4 - Make a second observation. See (c) in the Figure 4/1. Repeat Steps 1 - 3 to make a similar opening at the other end of the duct section to be removed.
- 15**     Step 5 - Remove the duct between the observation holes. See (d) in the Figure 4/1. Longitudinally cut out the section of duct between the two slots **taking extreme care** to protect any existing cables, sub-duct or draw ropes at all times throughout the operation.
- 16**     Step 6 - Removal of duct section. See (e) in the Figure 4/1. **Taking extreme care not to cause any damage** or marking of existing cables, sub-ducts or draw ropes - transversely cut through the duct to the full extent of its wall thickness at each end of the duct and remove the unwanted section.
- 17**     Step 7 - Removal of burrs.  
Remove any burrs and debris from the duct ends.

#### **Procedure for cutting Sub-ducts**

- 18**     Whenever cutting a sub-duct, it should be taken for granted that it contains either a cable or cabling rope.
- 19**     It is essential that the depth of this first cut is limited to the wall thickness of the duct and that extreme care is taken to limit the depth of the cutter. As a general rule, the wall thickness of the sub-duct is approximately 2mm.



**Diagram 4/2 – Cutting of Sub-Ducts.**

- 20** Referring to Diagram 4/2 :  
Step 1 - The first circumferential cut.  
Using a circumferential cutter appropriately depth limited, make the first transverse cut of the sub-duct until separation has been made.
- 21** Step 2 - The second circumferential cut.  
Repeat the same the same procedure as described in Step 1 after which the section of sub-duct to be removed is free to move about the cable or cabling rope contained in it.
- 22** Step 3 - Longitudinal cut.  
Adjust the setting on the cutting tool (Kabelmantelshneider) to the appropriate wall thickness of the sub-duct and make a longitudinal cut along the full section to be removed.
- 23** Step 4 - Removal of sub-duct section.  
Taking great care not to cause damage to any existing cable or cabling rope, part the duct and ease it over the existing cable to remove the unwanted section of sub-duct.
- 24** Step 5 - Removal of burrs.  
Finally, remove any debris and **using a chamfering tool only** (appropriate for the size of sub-duct being cut) chamfer both ends of the sub-duct. This operation is essential to prevent damage during any subsequent cabling operations and for the successful fitting of a connector.

#### **415 Sealing Ducts Within Buildings**

- 1 When a duct is connected to an existing duct entering a building, the Contractor will be responsible for making a gas and watertight seal within the building. The Contractor shall notify the Engineer as soon as such a connection is made so that the seal can be inspected immediately.
- 2 The method to be used will follow standard practices and shall be by one of the methods noted below:
  - Glands, caulking and sealing mastic, where the mastic is self supporting and non setting such as Densoseal 16A.
  - Proprietary inflatable bag system such as T-Dux or RadSeal systems installed in strict accordance with the manufacturers instructions.
  - Approved proprietary sealant system such as the CDS Sealing Systems RISE duct seal installed in strict accordance with the manufacturers instructions

#### **416 Duct Repairs**

##### **General**

- 1 Whenever it is necessary to repair or replace a section of existing duct the practices noted in this Clause must be followed.
- 2 Where existing ducts have been damaged on site then they must be cut back to an undamaged section of duct in strict accordance with the practices noted in Clause 414 above. All cuts must be perpendicular to the duct wall.
- 3 All split duct and duct repair kits that are used to facilitate a repair to existing ducts must be proprietary fittings manufactured for this purpose. The Contractor is not permitted to alter ordinary duct to create either split duct or any form of duct repair kit.

##### **Duct Repair Kits**

- 4 Where duct repair kits are required to affect a repair they shall only be used in strict accordance with the manufacturers instructions.
- 5 Duct repair kits must be used to provide a spigot joint to enable the connection of existing and new/replacement duct where it is not possible to use an existing joint. The two halves of the split collar section should be assembled around any existing cables and correctly aligned ensuring that the tongue and groove fittings interlock, thus ensuring a good fit. When connecting the split collar section to the existing duct the appropriate duct liners should be used in the existing duct to ensure that the split collar fits snugly into the duct.

##### **Split Duct**

- 6 Split duct shall be of the correct size and colour to match the existing ducts as closely as possible. Where split duct is cut to length the duct ends must be perpendicular to the duct walls and free from any burrs.
- 7 The two halves of the duct should be assembled around any existing cables and correctly aligned ensuring that the tongue and groove fittings interlock, thus ensuring a good fit. The tongue and groove should be interlocked for the full length of the duct section. The two halves must be secured using suitable cable ties at no more than one metre centres; however each section of split duct shall have a minimum of three cable ties (one placed at each end and one centrally).
- 8 Split duct must be used in conjunction with duct repair kits to provide spigot joints at each end.

#### **417 Addition of Swept Tees to Cabled Ducts**

- 1** Whenever it is necessary to add a new swept tee into a section of existing duct the practices noted in this Clause must be followed.
- 2** The provision of a new swept tee to an existing cabled duct must only be undertaken by using proprietary fittings manufactured for this purpose. The Contractor is not permitted to alter ordinary swept tee fittings to create any form of split swept tee.
- 3** In order to accommodate the new swept tee a length of the existing duct must be cut out in strict accordance with the practices noted in Clause 414 above. It is not acceptable for the Contractor just to cut a hole in the duct wall; a complete section of duct must be removed. All cuts must be perpendicular to the duct wall and the duct must be free from burrs.
- 4** The two halves of the split swept tee should be assembled around any existing cables and correctly aligned ensuring that the tongue and groove fittings interlock, thus ensuring a good fit. The tongue and groove should be interlocked for the full length of the duct section. The two halves must be secured using a minimum of three cable ties, one on each duct branch. The split swept tee fitting must fully connect to the existing duct and the new lateral duct.