

British Telecommunications plc



SPECIFICATION LN 550

FOR

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

Scope

The following describes and details the requirements for contractors working on the BT Underground Duct Network.

This document is meant to be used by appropriately trained and competent personnel who have good experience of working below and under ground.

Authority

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Change Requests

Document Change Requests (DCR) should be carried out in accordance with ISIS QMS/GQU/A090. Document Change Requests should be forwarded using form GQU/003 to the Specification Authority above.

It should be noted that authorised changes will, in most cases, necessitate a revision to the contractual agreement between BT Supply Chain Solutions and the Contractors, which will require additional time before implementation.

General

1. Issue 1 suffixes the first issue of a specification section. When a specification section is re-issued the issue number is advanced sequentially.
2. Except when a specification is completely rewritten, a star in the margin adjacent to the main clause number indicates an amendment. A vertical line in the margin indicates the particular portion(s) amended.
3. When a specific issue of a supplementary specification is not quoted then the latest issue of that specification shall be followed.
4. Queries relating to this specification sections should be directed to the specification authority indicated above. Enquires regarding the contracts themselves should be directed to BT Supply Chain Solutions.

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FOR
UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

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SPECIFICATION LN 550 - 1

**UNDERGROUND DUCT LAYING AND ASSOCIATED
WORKS**

PART 1 DEFINITIONS

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101. General. Definitions in the Contract and the several schedules thereto unless the content otherwise requires:

102. Definitions

Anchor Eye: See Plug Pressure Anchor Eye.
Anchor Iron: A steel hoop fixed to structural concrete used for attaching shackles when pulling in cables.
Anchors, Rope: See Duct Seal Rope Anchor. An item associated with Duct Seal 1 that is used to securely attach a Draw Rope left within a duct, behind a Duct Seal.
Barrier, Constructed: In respect of installing prefabricated jointboxes JB23 & 26. Defined Kerb, Crash Barriers, Bollards.
Barrier Natural: In respect of installing prefabricated jointboxes JB23 & 26. Ditch, Sharp Angled Embankment, Tree
Bends Duct: PVC duct shaped to allow a radius bend of PVC duct.
Bolts Foundation Indent: (Bolts FI) Galvanised Steel bolts set in structural concrete to support CBWT.
Box Security: A steel box fixed to a frame and cover to prevent unauthorised access to a BT chamber.
Brush: A cylindrical brush used for cleaning the duct bore. 95mm diameter used for Duct 54; 57mm diameter used for Duct 56; 108mm diameter used for Duct 70.
BSI: British Standards Institution documents. Where reference is made to a document the most up to date version is implied. Documents may also refer to EN, a European Standard
Cabinets Cross Connection: (CCC) Street furniture to house BT equipment.
Cable Bearer: Steel brackets fitted to CBWT and used to support cables.
Cable Bracket Wall Type: (CBWT) Galvanised steel channel fitted to the wall of a chamber to support cable bearers.
Cable Chambers and Trenches: A chamber associated with a building where BT equipment is connected by duct. (also Exchange Cable Chamber)
Cap Ends: Cable joint sleeve with enclosed end
Capping: Protective casing supplied by BT to protect exposed cables from damage.
CIP: Cast iron pipe or duct
Compound 16A: BT material used to seal ducts and conduits.
Compound 21: BT material for sealing joints in PVC duct.
Concrete: Materials, supplied and installed in accordance with best practices described in the relevant British and European Standards, that also meet the minimum requirements of this specification
Cultivated Ground: Ground on customers premises or agricultural land that is planted or grass that is maintained or cut annually
Drawing Folder No.1: Drawings supplied by BT, which describe the product requirements for the installation of underground ductwork, construction of jointing chambers and associated works.
Draw Rope: A BT specified rope, left in a duct to assist future cabling operations.
Drill Sizes : The drill size in accordance with BS 5621
Dry Packaged Cementitious Mixes: Cementitious mixes conforming to BS 5838
D-Side: From Primary Cross Connection Points (PCP) where typically un-pressurised, grease filled, 10pr unit cables are fed to a customer.

Duct Types: The various types of currently installed and obsolete duct that may be encountered during installation and repair works.
Duct Seal: A fitting on the end of a duct entry used to prevent the ingress of Gas, Water or Vermin into a structure.
Duct Seal 1: An inflatable product used to seal duct. Available as Types A; B and C.
Duct Seal 2: An electrical heat shrink used to effect a duct seal
Duct Seal Rise: A silicon based material applied with application gun. Particularly recommended in congested ducts where Duct Seal 1 is not suitable.
Duct Seal Rope Anchor: An item associated with Duct Seal 1 that is used to securely attach a rope left within a duct, behind a Duct Seal.
Earth Free From Stones: An excavated material with maximum aggregate size 14mm, that acts as “Surround to Apparatus” defined in Part 2, clause 210, of this specification.
E-Side: From Primary Cross Connection Point to Exchange.
Earthenware Duct: Clay Pipe (EWD), Self Aligning Clay Duct (SAD).
EWD: Clay Pipe or Self Aligning Duct
Floor screed: A cement render made with 3 parts sharp sand and 1 part cement mix, to provide a smooth incline to the floor, sloping to the chamber sump.
Foaming: When a Resin which has not set, or has come into contact with water, or becomes contaminated, takes on an unnatural appearance.
Grating Sump: Grille or Grating cover for the chamber sump.
Hardstanding:
(i) A concrete plinth around a frame and cover in soft surfaces to enable a mechanical cover lifter to be used safely to remove the cover/s.
(ii) A concrete plinth or HAUC CoP Footway Standard surface, in front of the doors of a cabinet, to provide a firm surface for safe access.
Holes Drilled: In accordance with the tolerances for the drill size.
Hooks and Bars: Associated equipment fixed to the manhole roof to enable the placing of an access ladder.
Jointboxes: Underground Chambers with a maximum depth of 1650mm, in the footway or carriageway, with access frames and covers forming the majority or entire top surface.
Jointing Chambers: BT underground structures, jointboxes or manholes, used as flexibility points for access to cables and joints in the network.
Keys Lifting: BT approved keys for lifting access covers from jointing chambers.
Keys Pillar: BT approved keys for opening Pillars or Cabinets.
Ladders MS: Galvanised mild steel ladders used on hooks and bars fitted to an underground manhole. In various sizes specifically for the internal heights of standard chambers.
Laitance: A scum on cement concrete or over-trowelled mortar.
Lead-in: The duct between a building and the first BT Jointing Chamber.
Manholes: Underground Chambers with a roof.
Markers Cable: BT issued item for identification of the position of buried cable.
NRSA 1991: Shall mean “New Roads and Street Works Act 1991”, including Regulations and Codes of Practice (COP) incorporated within the auspice of the Act, as applicable.
Otlan®: Optical Telecoms Infrastructure for the Access Network.
Pilot Hole: An excavation taken out during the execution of a duct work scheme in order to determine the position of the buried plant and/or conditions below the surface. The usual form of a Pilot Hole for a duct or cable trench is across the line of the trench. For the building or construction of a jointing chamber or cabinet etc. at any position

necessary to indicate clear space for the required excavation. For the demolition of any structure such as is necessary to expose any underground electric cable, or other services, that may be close to or incorporated in the structure.
Pins Cable Bearer: Steel pins used to fix Cable Bearers to CBWT.
Pins Connecting: Steel pins used to fix triangular chamber covers.
Plate Plant Protection: A security device fitted below the frame and cover within the structure of a footway jointing chamber.
Plug Duct: BT items for stopping ducts. Plug Duct 1A (Grey foam) for Duct 56; Plug 4B (Red) for socket end of Duct 54; Plug 4C (Yellow) for the spigot end of Duct 54.
Plug Pressure: Compressible Drain Plug for pressure testing or temporarily sealing duct, up to 30 days. BT item No.1 for Duct 54; No.3 for Duct 56, 36
Plugs Pressure, Anchor Eye: A fitting on the rear of a Plug Pressure to which a Draw Rope left in the duct can be securely attached.
Pressure Test, Duct: Where Lead-in duct are sealed and tested to 275 millibars.
Proving Bore: An inspection bore, at the centre line directly below the crown boards of a timber heading, the complete length of a heading, through which a CCTV camera is passed for a video recording of the condition of the concrete packing. It is formed by placing an inflatable tube of maximum length 10 metres, packing the concrete and removing the tube before the concrete has set.
Rag Mop: A suitable soft cleaning device to replace the standard duct cleaning brush where a duct with a radius bend of less than 3000mm has been used.
Resin Mortar: A three component compound option for installing Frames and covers to jointing chambers.
Resin No.14B: BT issue resin for use in CCC (Cabinet Cross Connection)
SAD: Self Aligning Duct, Clay Pipe.
Scabble: Preparation of a concrete surface to remove laitance, clean the surface and facilitate a good bond for new concrete.
Shaft: A vertical access aperture (a) to an underground manhole, (b) to a horizontal passage forming part of a manhole or, (c) to a tunnel constructed for the purpose of laying duct. In the case of (a) and (b) the shaft commences from a point 150mm for footway shafts and 290mm carriageway shafts, below the appropriate surface level down to the top of the manhole roof; in the case of (c), from the point at which the excavation commences to a point level with the top of the tunnel. The maximum depth of a standard shaft is 3000mm, measured from the top side of the manhole roof to the surface level which includes the Frame and Cover.
Shuttering: All formwork used in concrete construction.
Sideshaft: A horizontal passage providing remote access to a manhole. A standard sideshaft is 2 metres minimum height, 1 metre minimum width and no more than 10 metres length, from an entrance in the footway to a manhole in the carriageway. (CN 14951 refers.)
Slewing: Moving plant sideways, often associated with lowering.
Soft Surface: A surface that could, in normal conditions, be excavated by hand tools without mechanical aids of any kind and would be reinstated to its original condition. It includes, but is not limited to, all types of grass and any other surface without any foundation or metallised or other wearing surface, irrespective of its state of compaction.
Stanchion: A vertical support for Cable Brackets and cable support.
Standard Drawings and Specifications: Engineering Drawings and Technical Specifications describing items of work, and carrying a document number with a prefix "CN", "LN" or any other BT approved Specification notified to the contractor.
Steps Manhole No.1: Galvanised mild steel brackets set in structural concrete in the walls of manholes or jointboxes. Usually used during construction of chambers.

Steps Manhole No.2: Galvanised mild steel brackets bolted to the walls of manholes or jointboxes. Usually used on replacement or retrospective fitting of steps.
Sump: Recess formed in the floor of a jointing chamber used to pump waste water.
Surround to Apparatus: Materials used as surround to BT apparatus as defined in NRSWA Reinstatements Code of Practice S4.
Technical Approval Authority: (TAA) The Owners of this document, responsible for authorising and approving the Technical Specifications, Engineering Drawings and Practices associated with BT external underground civil engineering works, and any amendments to this specification. Openreach – Access Engineering & Innovation – In-Life unit (A.E.& I.), PP G05 Sidcup Tel Exch, 4 - 6 Station Road, Sidcup, Kent. DA15 7ED.
Technical Departure From Specification (TDFS) A change from the specification requirements that has been agreed with BT, to overcome a local difficulty.
Telephone Pole: A BT support or distribution pole for an overhead cable route
Timber Heading: A tunnel, greater than 1.8 metres in length, constructed with timber or timber and steel supports, in which ducts are placed and the voids filled with a damp mix concrete minimum Grade 16/20 using 5mm aggregate.
Trial Excavation: An excavation of an exploratory nature, as directed by BT, in order to determine the position of or to expose buried plant and/or determine conditions below the surface for any or all of the following: (a) planning a proposed ductwork scheme. (b) location and recording of buried plant.
Tunnel: A horizontal, or near horizontal, heading or passage, excavated below the surface for the purpose of laying ducts and associated works. Headings greater than 1.8 metres in length, under paving not removed.
Ventilation Pipe: (i) Where a sideshafted manhole has an internal height greater than the sideshaft, a pipe is placed from the highest point of a sideshafted chamber and inclined upward to a position in the access shaft to enable a gas test to be performed prior to entry. (ii) In an Exchange manhole a ventilation pipe is a horizontal pipe placed through the manhole wall to an adapted lamp standard to act as a chimney and to purge the chamber of gas and foul air.
Way: A single duct or one duct within a multiway duct formation.

103. QUICK REFERENCE GUIDE

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NIC

ISIS EPT/OHP/C022

CN and OTIAN ® Drawings

Drawing Folder No.1.

Guidelines on the Positioning and Colour Coding of Utilities Apparatus

2. British Standard Documents

BS Number	Reference Item
EN 124	Gully tops and manhole tops for vehicular and pedestrian areas. Design

	requirements, type testing, marking, quality control.
EN 197-4	Cement. Composition, specifications and conformity criteria for common cements.
EN 206	Concrete. Specification, performance, production and conformity.
410	Test Sieves.
EN 771	Specification for masonry units
EN 772	Methods of testing for masonry units.
EN 1052	Methods of test for masonry.
1881	Concrete Testing
EN 450	Part 1 - Fly ash for concrete. Definition, specifications and conformity criteria
EN 771	Specification for masonry units. Clay masonry units
4027	Specification for Sulphate Resisting cement
4449	Specification of Carbon Steel Bars for reinforcement of concrete
5400	Steel, concrete and composite bridges
ISO 5468	Rotary and rotary impact masonry drill bits with hard metal tips. Dimensions
5628	Use of masonry
5838	Dry Packaged Cementitious Mixes
6031	Code of Practice for Earth Works
6089	Concrete Testing
6164	Safety in Tunnelling in the construction industry
EN 15167	Ground Granulated Blast Furnace Slag for use in Concrete, Mortar and Grout. Definitions, Specifications and Conformity criteria
8110	Structural use of concrete
8500	Concrete. Complementary British Standard to BS EN 206-1.
8666	Specification for scheduling, dimensioning, bending and cutting of steel reinforcement for concrete.
EN 12350	Testing Fresh Concrete.
EN 12390	Testing Hardened Concrete.
EN 12620	Aggregates for concrete

3. Acts, Codes of Practice and Regulations including:

New Roads and Street Works Act 1991.

Highways and Utilities Committee Codes of Practice (NRSWA)

Street Works (Northern Ireland) Order 1995

Northern Ireland Road Authority and Utilities Committee Codes of Practice

SPECIFICATION LN 550 - 2

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

PART 2 MATERIALS

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201. SPECIFICATIONS

Where British Standards, or other specifications, are quoted these will be the current issues adopted by the British Standard Institution or other Authority. Where equivalent European standards, to those quoted, exist, then the European Standards must be adhered to insofar as they are deemed to apply.

All materials not otherwise specified shall be in accordance with the conditions above.

202. CEMENT

1) All cement used shall comply with the requirements of the following;

BS EN 197 Specification for Portland Cement

BS4027 Specification for sulphate-resisting Portland cement.

BS EN 450-1:2005+A1 Specification for Fly ash for concrete. Definition, specifications and conformity criteria.

BS5838-1 Specification for dry packaged cementitious mixes. Prepacked concrete mixes.

BS EN 998-2 Specification for mortar for masonry. Masonry mortar.

BS EN 15167-1 & 2 Ground granulated blast furnace slag for use in concrete, mortar and grout. Definitions, specifications and conformity criteria

- 2) The use of High Alumina (HA) cement shall not be permitted.
- 3) The contractor may employ rapid hardening Portland cement in lieu of ordinary Portland cement for his own convenience and acceleration of progress.
- 4) Cements of different types shall not be mixed one with another.
- 5) Where cement is kept on site it shall be stored according to BS EN 197.

203. REINFORCEMENT

1) All reinforcement shall comply with the requirements of BS4449 - Steel for Reinforcement of Concrete with the exception of plain round bar. For sizes up to and including 12mm in coil, plain round wire of Grade 25 MPa shall be to BS4482. BS EN10025-1 shall be used for larger sizes and dowel bar applications. BS EN 13877-3 is to be used for dowel bars for use in concrete pavements.

2) Unless otherwise specified all main reinforcement to be Type 2 with a specified characteristic strength of 500 N/mm². Secondary reinforcement to be plain round steel bars with a specified characteristic strength of 250 N/mm².

3) All reinforcement material supplied must be supported by test certificates, which certify compliance to BS4449.

4) All reinforcement steel scheduling, bending and cutting shall comply with the requirements of BS8666.

204. AGGREGATES.

- 1) All aggregates used shall comply with the requirements of BS EN12620 - Aggregates for concrete.
- 2) Course aggregate shall be in accordance with the requirements of BS EN12620 Table 2. Unless otherwise stated grading should be up to and including 20mm.
- 3) Fine aggregate shall be in accordance with the requirements of BS EN 12620 Table 4.
- 4) All aggregate supplied must be supported by supplier information as defined within sections 7, 8 & 9 of BS EN12620.

205. ADDITIVES

1) The use of additives in cement or concrete for works carried out exclusively under this Specification may only be employed in ready mixed concrete and guaranteed by the ready mix concrete supplier. Placing times must be adjusted to suit suppliers' recommendations.

Concrete additives may be considered for adverse weather conditions, especially for the construction of DSLAM and Stand-Off plinths. Suitable additives will facilitate the construction of plinths in cold temperature ranging between 5 degrees and -7 degrees. Additionally, the use of 'Frost Blankets' should also be considered for progressing construction work in these conditions.

Prior approval for the use of any additives in site mixed concrete must be obtained from the BT Technical Approval Authority.

206. CONCRETE

1) All concrete used shall comply with this specification and the requirements of:

BS EN206 - Part 1: Concrete. Specification, performance, production and conformity

BS8500 – Concrete

Where test results indicate that the concrete is non-compliant, the contractor may, at BT's discretion, be instructed to remove all non-compliant material and to replace it with material of suitable quality according to this specification.

2) (a) Unless otherwise specified all concrete used for the construction of Concrete Jointing Chambers shall be ready mixed to mix grade C35/45 as defined in BS8500 and BS EN206.

(b) For footway and carriageway jointboxes, site mixed concrete will be permitted.

3) Where the use of site mixed concrete is specified for Jointbox construction, as an allowed alternative to the preferred use of ready mix, it shall be of minimum grade C35/45. The minimum cement content shall be 380 kg/m³; the maximum aggregate size shall be 20mm; the maximum free water/cement ratio shall be 0.6 and slump limits shall be 50mm ± 25mm.

All site mixed concrete shall be mixed by machine.

Care must be taken prior to, during and after mixing to ensure that the concrete or mortar ingredients, collectively or separately, are not allowed to enter gullies or drains. All highway surfaces footway or carriageway should be protected from concrete staining.

Sand and aggregate, shall be stored separately on site. All other materials must be kept dry and free from any deleterious materials.

The standard of cleanliness of water for mixing is that it shall be fit for drinking.

Where a contractor intends to use site mixed concrete for the construction of carriageway and footway Jointboxes, an initial design **Certificate of Compliance** must be submitted to the BT Technical Approval Authority. This must be supported by strength Test Cube results, where the initial sample rate shall be 10 cubes tested at 28 days. Thereafter the rate of sampling shall be distributed through the production in accordance with Table 13 of BS EN206-1. Each sample shall consist of 2 cubes tested at 28 days. Compliance requirements shall be in accordance with BS8500: Part 2.

In addition to the sampling above, when required by BT, 2 Test Cubes or Test Cores shall be taken by the contractor and, at BT's discretion, shall be tested by a NAMAS approved testing authority. All testing shall be carried out in accordance with BS1881 and BS EN12350 - Testing Concrete. The contractor shall hold the Test Certificates for 12 months and make them available for audit or inspection by BT.

Where the integrity of a structure is impaired due to non-compliant materials the structure shall, at BT's discretion, be completely demolished and replaced.

4) Unless otherwise specified all concrete used for ancillary work shall be Grade 8/10 ready mixed to mix designation ST 2 as defined within Annex A of BS8500: Part 1. Tables A.9 and A.17.

5) Concrete used as surround to duct apparatus shall be a minimum Grade 16/20, with a nominal maximum 10mm aggregate size, in accordance with BS EN12620

207.

1) Paragraph Removed

208. BRICKS

1) Bricks shall be in accordance with BS EN771 & BS EN772 - Clay Bricks

2) Bricks shall be Class A or B Engineering Bricks in accordance with Table NA.6 of BS EN771-1. They shall be type FL in accordance with Table NA.5 of BS EN 771-1.

3) Bricks shall be marked in accordance with **ZA.3** of BS EN 771-1. The contractor must supply certification of compliance to BT

4) Bricks for the use of corbelling shall be Class A or B Engineering Bricks **but without holes or frogs.** (HA-104)

209. MASONRY & MORTAR

- 1) Unless otherwise specified materials and workmanship shall be in accordance with BS 5628 - Use of Masonry - Parts 1 and 3.
- 2) Mortar shall be as designated within BS 5628; Part 1,- Requirements for Mortar Table 1; Type (i)
- 3) Mortar for the use of placing or raising of frame and covers must be compliant with HA-104.

210. EARTH FREE FROM STONES

Material surround to duct apparatus:

- 1) A material which must be graded, pass a 14.0mm sieve and otherwise comply with the requirements of Appendix A1 of the Specification for Reinstatements of Openings in Highways, a Code of Practice under sections 71 and 130 of The New Roads and Street Works Act 1991.
- 2) Coarse aggregates that meet the criteria for (1) above and mainly retained on a 5mm BS410 test sieve, and in accordance with BS EN 12620.
- 3) Materials in Par 210.(1) & (2), shall be capable of being thoroughly compacted around and between, ducts of any type. In either case the material shall not cause damage to the ducts during compaction and backfilling, and shall not leave voids or form a watercourse.

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UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

PART 3 EXCAVATION

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- 311. TRENCHES FOR POLYETHYLENE CABLE**
- 312. TUNNELLING & TRENCHLESS EXCAVATION**
- 313. GROUND WATER LOWERING**

301. GENERAL

The Contractor shall excavate in the Highway, in strict accordance with the requirements of the New Roads and Street Works Act 1991, and, in accordance where applicable to BS 6031; (Code of Practice for Earth Works), in positions so directed in the Schedule of Works or other BT written instruction. Where the contractor objects in writing to the line of route, location of site or the work instruction, BT may at its absolute discretion: -

- a) Agree that the objection is valid and alter the line of route, or produce alternative proposals; or
- b) Refute the contractor's claim in writing - giving the reasons why they are not considered valid.

302. EXCAVATED MATERIAL

Excavated material shall be protected in accordance with the New Roads and Street Works Act 1991- Highways Authorities and Utilities Committee (HAUC) Specification for the Reinstatement of Opening in Highways. Unsuitable excavated material shall be removed from site and suitable backfill material shall be imported and reinstated as per the above specification.

303. EXCAVATIONS

1) Mechanical Excavation. Any mechanical excavator must be capable of allowing for, and, should be used in such a manner as to fulfil the requirements of segregation /separation of materials and width of trench obtainable by using manual excavation or, any other requirements of this Specification.

2) Excavation. Excavation shall be carried out in a controlled manner using equipment and methods appropriate for the task.

3) Excavation in the vicinity of trees. Special care must be taken when excavating in the proximity of trees to ensure that damage to primary roots or body of the tree does not occur. Hand excavation, wherever possible, is to be carried out in such locations. When the following guidelines cannot be followed, advice must be sought from the Local Authority Agricultural Officer and reference made to NJUG publication Volume 4 titled "Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees".

- i) **Cutting of Tree Roots,** roots of 25mm diameter or more should not be cut. (NJUG 4)

Where damage has been proved to be as a direct result of excavation or reinstatement works, the contractor shall bear all costs incurred for any remedial action required.

304. SILENCERS

The contractor shall comply with any national or local regulation or by-law, to ensure that equipment used during works is fitted with suitable silencing devices, which minimise and eliminate undue noise.

305. PROTECTION OF PAVINGS

The Contractor shall take all necessary steps to prevent damage or contamination to paving by his plant and equipment.

306. PILOT HOLES and TRIAL EXCAVATIONS

The Contractor shall excavate in positions as are necessary to meet the requirements defined in Part 1 of this Specification.

307. EXCAVATION SUPPORT

- 1) The excavation shall include all necessary timbering, sheet piling and shoring to maintain stability of the excavation.
- 2) The supports of an excavation shall be so designed and placed to prevent loss of any ground and to permit, wherever practicable, withdrawal of such supports and consolidation of the space occupied. Prior written agreement must be obtained from BT and formally recorded where the withdrawal of supports is considered impractical.
- 3) Existing mains and other services shall be adequately supported by temporary slinging or strutting or, by brick or concrete piers.

308. WIDTH of TRENCH

In no case shall the width of trench excavated be greater than is reasonably necessary for satisfactory execution of the work.

309. BT STANDARD DEPTHS

(i) Where the following depths are not achievable it is the contractors responsibility to ensure that compaction and reinstatement comply with the HAUC Specification for the Reinstatement of Openings in Highways and that bore clearances of the duct route are maintained allowing future cabling works to be carried out.

Ductwork depth of cover and positioning shall where possible, be compliant with the recommendation in the 'Streetworks UK / HAUC publication, [Volume 1; Streetworks UK Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus.](#)

For footway and verge locations the minimum depth of cover shall be minimum 250mm DoC as for Communication Apparatus.

For Carriageway locations the **minimum Carriageway Depth of Cover shall be 450mm.**

For some road categories this depth may require greater depths to comply with the NRSWA 'Specification for the Reinstatement of Openings in Highways', i.e. undertakers apparatus greater than 20mm external diameter will not be permitted within road, footway and cycletrack structures unless special circumstances exist, eg culverted watercourses, utility apparatus.

crossings to private houses; other crossings to be as carriageway.

(ii) Standard Chamber Shaft Depth

A vertical access man entry shaft to an underground chamber commences from a minimum point, 150mm for footway shafts and 290mm carriageway shafts, below the appropriate surface level down to the top of the manhole roof. The maximum depth of a standard shaft is 3000mm, measured from the top side of the manhole roof to the surface level including the Frame and Cover.

310. CHANGE of LEVEL

In passing from footway to carriageway and vice versa, or where ducts enter jointing chambers below standard depth, or in any other circumstances where it is necessary to change the level, the bottom of the trench shall rise or fall gradually. There should be no abrupt changes in level.

311. TRENCHES for POLYETHYLENE DUCT OR CABLE

1) Excavation for the laying of polyethylene cables direct in the ground shall be carried out by the Contractor at such positions as may be directed in a schedule of works.

2) The general condition detailed in Paragraphs. 301-313 of this Specification shall apply.

3) The trench may be "V" shaped provided that:

(a) The base of the trench is of sufficient width to accommodate the cable or cables, laid adjacent with no separation.

(b) It is of the required depth.

4) At points, detailed on the Schedule of Works, where a cable has to cross a boundary wall from a footway to a customer's garden or curtilage and is not possible to lay under the boundary wall, the Contractor shall core through the wall and insert a short length of suitable duct. Any void around the duct shall be packed with concrete and the ends of the duct well rounded to prevent the possibility of damage to the cable.

312. TUNNELLING and TRENCHLESS EXCAVATION

1) All tunnelling and Trenchless Excavation operations, shall be carried out in accordance with this specification, the BT Statement of Requirements, BS 6164, the contractor's Works Method Statements (and relevant Specifications) agreed by the TAA.

2) Where it is cost effective, practical, safe and appropriate, trenchless methods shall be used in accordance with [HA120/08](#) (guidance on the trenchless installation of services beneath motorways and trunk roads) and with the prior approval of the TAA. For example vibratory Mole Ploughing, Horizontal Directional Drilling, Narrow Trenching in excess of 60mm, Micro-Trenching and Percussion Molding (see 407.2). Close scrutiny of other utilities line plant drawings must be considered.

All tunnelling to be notified to the T.A.A.

313. GROUND WATER LOWERING

The Contractor shall take all reasonable measures to keep all excavations in dry condition and:

- (a) Supply all necessary equipment and temporary drainage as required.
- (b) Ensure that no fines, silt or other soils are drawn from the existing soil through the riser pipes in order to eliminate subsidence due to soil migration or shrinkage.
- (c) Provide settlement tanks where necessary before the water is pumped into the public sewer or drainage system. The Contractor must attain any prior approval necessary from the promoting authority for the discharge of water into their system.
- (d) All extracted water shall be properly disposed of.

SPECIFICATION LN 550 - 4

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

PART 4 DUCT AND CABLE LAYING

CONTENTS

401.	GENERAL
402.	PVC DUCT 54D
403.	PVC DUCT 56
403A	PVC DUCT 36
404.	STEEL DUCT 70
404A.	DUCT 78
405.	POLYETHYLENE DUCT 102
406.	DUCT SEAL
407.	POLYETHYLENE CABLE LAYING
408.	SLEWING AND/OR LOWERING OR RAISING OF DUCT
409.	REPAIRING DUCTS

401. GENERAL

1) Drawings and Specifications. All relevant Drawing and Specifications shall be included with the contract documents.

2) Line of Duct. The line of duct shall be kept as straight as possible.

3) Duct Formation. The duct formation shall be maintained between chambers and shall be either as specified for the type of duct concerned or as detailed on the Schedule of Work.

4) Laying of Ducts. Duct laying shall be done only in accordance with this Specification, or where this specification is in-applicable, upon written instructions issued by BT.

5) Duct Lead In's into Buildings. ALL DUCT LEADING INTO BT BUILDINGS & CUSTOMERS PREMISES SHALL BE SEALED AGAINST THE ENTRY OF GAS, WATER AND VERMIN INTO THE BUILDING / PREMISES.

6) Clearances from other services. All types of ducts and cables laid direct in the ground shall be kept well clear of gas or water mains, service pipes, sewers, subways, manholes, joint boxes or other plant belonging to other undertakers. At least 150mm clearance shall be given wherever possible. Where two sets of plant cross each other, the minimum vertical clearance shall be 150mm with gas mains and 50 mm in the case of other plant. Where the minimum separation cannot be achieved a BT approved separator may be used. In no case shall the clearance be less than 25mm.

7) Clearances from Electricity Supplies. Clearances of BT plant from electricity supplies shall be as follows: -

(a) As much clearance as is practicable shall be given to the bases of trolley wire standards, electric lamp standards, traffic signal posts and other similar plant. Where it is not practicable to provide a clearance of 150mm, a pre-cast slab, or a layer of grade 10 concrete not less than 50mm thick, shall be placed between the two sets of plant to provide a minimum tracking path of 75mm. For large masses of concrete, anti-crack mesh reinforcement may be necessary.

(b) High voltage single-core cables for electricity supply, electric tramway or electric railway systems, **EXCEEDING 1000 VOLTS**, shall have a standard minimum clearance of 450mm.

(c) High voltage multi-core cables for the same systems referred to in (b) above and **EXCEEDING 1000 VOLTS**, shall have a standard minimum clearance of 300mm. In difficult cases a reduced separation will be permitted, provided that where a separation of more than 150mm is impracticable, a pre-cast concrete slab or a layer of grade 10 concrete, not less than 50mm thick, shall be inserted between the two sets of plant. The concrete shall not be less than 50mm thick, have an overlap on each side and for the whole length where the clearance is 150mm or less, such that at every point the shortest path between the two sets of plant round the concrete shall exceed 200mm. For large masses of concrete, anti-crack mesh reinforcement may be necessary.

(d) Low voltage cables for supply systems **NOT EXCEEDING 1000 VOLTS**, shall have a standard minimum clearance of 50mm. Where difficulties arise, a reduced clearance down to 25mm will be permitted in which case the space between the two sets of plant shall be filled with a pre-cast slab, or a layer of concrete C10 not less than 25mm thick and of such width and length that at every point the shortest path between the two sets of plant, round the concrete, shall exceed 75mm.

8) Variation of Duct. If directed by BT the type of duct may be varied for the good and sufficient execution of the work.

9) Duct in Tunnel Where duct is laid in tunnel or carrier pipe, and placed by trenchless methods or cut and cover, all voids within the tunnel or carrier pipe and all spaces around the duct shall be completely filled with a well compacted damp mix Grade 16/20 concrete, unless otherwise specified.

When a Timber Heading is constructed, a CCTV inspection shall be made through the Proving Bore to establish the condition of the packing of the backfill concrete.

If required by BT, a 1:5 time lapse photography system shall be installed to monitor the working face or backfilling operation.

A video recording on VHS format shall be retained by BT. All voids and spaces around the duct shall be packed with concrete minimum grade 16/20.

10) Covering of Duct. Unless otherwise specified, all duct not laid in concrete shall be covered by a layer of "Earth, Free from Stones" and compacted in layers - providing a finished thickness of not less than 75mm. Any spaces between the duct and the sides of the trench shall be filled with well compacted "Earth, Free from Stones". Compaction shall be by hand or mechanical methods, to suit site conditions.

11) Rocky Soils. In rocky or stony soils, "Earth Free from Stones", shall be spread over the trench bottom and compacted to afford a bedding up to 75mm thick on which to lay the duct. In such cases extra excavation of the trench will be necessary to achieve the required depth of cover. Stones protruding more than 75mm from the bottom of the trench shall be removed. Compaction shall be by hand or mechanical methods, to suit site conditions.

12) Cleaning and Testing.

(a) Unless otherwise specified, the following test shall be carried out on **all** duct 54 runs which are not in the local distribution ("D") side, to verify that Duct Bend 54A and Duct Bend 54C have not been used (see 402.6). On completion of the duct line (including compaction of the backfill) between any two jointing chambers, or sites thereof, a BT approved cylindrical brush **followed by a uPVC mandrel (drawing CN15563)** shall both be passed once through each "way" - to test the duct 54 and to remove any foreign matter that may have entered. The size of the brush shall be as specified.

Unless otherwise specified, on completion of all other duct lines (including compaction of the backfill) between any two jointing chambers or sites thereof, a BT approved cylindrical brush shall be passed once through each "way" to test the duct and to remove any foreign matter that may have entered. The size of the brush shall be specified for the particular duct. Notwithstanding, BT reserves the right to demand a brush and metal mandrel test to verify any duct route.

(b) For details of the additional test required for ducts when the construction of a jointing chamber is deferred until after the completion of a section of duct, see paragraph 401(13) of this Specification.

(c) The Contractor shall supply the labour and equipment needed for the cleaning and testing operations.

(d) If the duct formation is not maintained between chambers or as directed in the schedule of works, or any defect is discovered during cleaning and testing operations BT shall be notified. Under normal circumstances, the contractor will be expected to make good the defect.

(e) If requested by BT, prior notice shall be given by the contractor to BT, to enable a BT representative to be present during the cleaning and testing operations.

(f) When any defect is discovered during the cleaning and testing operations BT shall be notified and if required by BT, the defect shall be rectified.

13) Deferred Jointing Chamber. When the building of a jointing chamber is deferred until after the completion of a section of duct, the last 2 metres of each "way" shall be tested by the contractor, on completion of the jointing chamber, by means of the brush specified for the particular duct. A

visual check shall first be made that no foreign matter or materials are likely to be pushed up the duct.

14) Plugs. A suitable plug may be inserted in the end of each "way" of a duct route to prevent the ingress of water and/or other foreign matter, until all work has been completed on that section and the length tested and accepted by BT.

For the socket end of Duct 54 Plug 4B (Red) shall be used.

For the spigot end of Duct 54 Plug 4C (Yellow) shall be used.

For both socket and spigot ends of Duct 56 Plug Duct 1A (Foam) shall be used.

15) Draw Rope. Unless otherwise specified a draw rope shall be threaded through and left in every "way" following duct laying operations and satisfactory tests. Jointing together lengths of draw rope to make up the necessary length between jointing chambers may be carried out as directed in accordance with Drawing CN 13207. Draw rope shall not be joined for the purpose of conserving lengths shorter than 50 metres.

16) Alignment Test of Disturbed Duct. When jointing chambers are provided on an existing duct route or when any disturbance takes place which may affect the alignment of the duct, a brush of the appropriate dimensions shall be drawn through each of the spare "ways" in a similar manner to that detailed in Par. 401 (13), and on completion of the test a draw rope shall be left in each spare "way".

17) Clearance from Electric-Tramways. When crossing under electric-tramways PVC Duct shall be used. In all cases there shall be a minimum cover from the surface to the uppermost duct of 900mm.

18) Expansion Joints. Where ducts pass through bridge decks, it may be required due to bridge construction methods, for the duct route to have expansion joint arrangements in place. With PVC ducts D54 & D56 this may be achieved using duct collars D54A / D56A, where compound 21 fixes one duct to the collar, with the second duct free to move within the collar.

Where duct 70 is used, there is no standard steel collar available, the expansion joint will become a non standard item and fabrication of a suitable collar will be submitted to BT (TAA) for approval.

19) Water Run Off. Where steel duct 70 is used, provision shall be made for adequate run off of aggressive fluids – e.g. from de-icing salts on bridge decks.

20) Paragraph removed (moved to 506.2(iv))

21) Marker Posts When required by BT, a marker Post or other suitable form of identification shall be placed to locate underground plant.

22) Additional Protection of Plant Where additional protection is required for ducts (e.g. during construction work in the vicinity), guidance is given in CN15565.

23) Intercepting Occupied Ducts Any duct containing cables shall be cut using a tool especially designed not to damage the cables within. e.g. the Fein Multimaster, Vibratory Saw, or approved equivalent.

402. PVC DUCT 54D

1) General. Duct 54D is manufactured from Unplasticised Polyvinyl Chloride (PVC-U). It is supplied in lengths of 6.0m and 1.5m, has an internal diameter of 90mm and a nominal wall thickness of 3.25 mm. Each duct length has a tapered socket at one end that will accept the barrel of the duct.

Collar Duct 54A* 200mm in length, are also available for use with short lengths of duct which have no socket. Spigot and Socket markers are shown for maximum and minimum insertion of duct.

***Collars Duct 54A shall not be used for duct lead-in track referred to in Par 407 (3) or for the section of lead-in within the curtilage of a building.**

2) Trench. The trench shall be excavated to the required width and depth, to allow a minimum of 25mm between the sides of the duct and the sides of the trench and allow the trench bottom to be free from stones, level and well compacted. The duct shall be laid at standard depths (Part 3 refers) unless otherwise specified.

3) Formations. Duct 54D may be laid as a single duct or in multiway formation as follows: -

- (a) Up to and including 9 ways in rectangular formation.
- (b) Over 9 ways in rectangular formation with concrete surround.

4) Laying and Jointing.

(a) Singleway;

(i) The open starting end of the trench shall be blanked off with a board or boards, to act as an anvil against which the duct can be driven home.

(ii) The duct shall be laid on the trench bottom, the spigot end and the inside of the socket of the ducts to be jointed shall be thoroughly cleaned.

(iii) The spigots and sockets of Duct 54D are so designed that, taking into account all manufacturing tolerances, the spigot will start to engage with the socket between 1/3 and 2/3 the socket depth. Two spigot markings are provided on the duct to show the maximum and minimum insertion depths. The minimum marking must be level with, or inside the socket. In most cases of satisfactory engagement, due to manufacturing tolerances, the maximum spigot marking shall still be visible at the socket end.

(iv) When jointing short lengths of duct together with a Collar Duct 54A both spigot ends and the inside of the Collar shall be thoroughly cleaned. The spigot ends should be given a liberal coating of Compound No.21 and then fitted into the Collar so that they butt together at the midpoint.

(b) Multiway up to and including 9 ways;

(i) The preparatory work and jointing shall be as outlined in Par. 402 (2) & (4) (a) (i) & (ii) of this Specification.

(ii) The first layer of ducts shall be laid on the prepared trench bottom so that their outer surfaces touch each other and a minimum gap of 75mm remains between the outside of the ducts and the sides of the trench, or trench timbering where used. Wooden stakes or an approved alternative shall be driven into the ground at 3 metre intervals along the trench to keep the ducts in the correct position. "Earth, Free from Stones", shall be placed to fill the spaces between the ducts and the next layer of duct when the latter is bedded down. The second and subsequent layers of duct shall be

laid between the wooden stakes so that they are vertically above and then bedded down to touch the ducts in the layer below, the spaces between the ducts being filled in the same way with "Earth, Free from Stones".

(iii) At approximately 5 metres from the jointing chamber at each end of the track, the duct formation shall open out to provide a gap between each duct, both vertically and horizontally, of 25mm using Spacers, Duct 2. Over this 5 metre section all spaces between the ducts and the trench wall shall be filled with well compacted "Earth, Free from Stones" as well as all spaces between the ducts.

(c) Multiway over 9 ways, Drawing CN 10686 refers

(i) The preparatory work and jointing shall be as outlined in Par. 402 (2) & (4) (a) (i) & (ii), of this Specification.

(ii) The first layer of duct shall be laid on the prepared trench bottom so that their outer surfaces touch each other and a minimum gap of 75mm remains between the outside ducts and the sides of the trench, or trench timbering where used. To maintain the duct formation, when required or directed by BT, wooden stakes or mild steel bars, of the required length, shall be driven into the ground at 3.0 metre intervals along the trench. The second and subsequent layers of duct shall be laid between the mild steel bars so that they are vertically above and touching the ducts below. The joints shall be staggered so that no joint touches any other joint. On completion of the assembly of the duct nest, the apparatus surround shall be filled with concrete of minimum Grade 16/20.

(iii) Where the total number of layers of duct in any one formation exceeds 8 and the number of ducts in each layer exceeds 2 the following shall apply. Between the two layers of duct, midway, or approximately midway, from the top and bottom of the duct nest, an intermediate layer of reinforced concrete, 75 mm in depth and with 12mm mild steel reinforcing bars conforming to the layout of reinforcing in the top cover detailed in Drawing CN 10686, shall be placed across the duct nest. The additional reinforcing required by this sub-paragraph shall not be required in the 5 metre sections detailed in sub-paragraphs (iv) and (v) below.

(iv) At approximately 5 metres from the jointing chambers at each end of the track, the duct formation shall open out to provide a gap between each duct, both vertically and horizontally, of 25mm. Banks of Spacers, Duct 2 shall be placed at 325mm and 1325mm from the jointing chamber wall to provide this spacing. Each spacer bank shall enclose all the ducts except those in the bottom layer on which the spacer bank shall rest. Where sub-paragraph (iii) applies, the 75 mm intermediate

layer shall be reduced over the 5 metre sections to provide the required 25 mm spacing at the jointing chambers.

(v) Where the total number of layers of duct exceeds three, concreting of spaced formations shall be in stages such that the number of layers of duct laid and concreted at each stage shall not exceed three. The concrete shall be brought to a level that shall not interfere with the laying of subsequent layers of duct and spacers.

(vi) Concrete made with Rapid Hardening Portland cement may be used. The concrete shall be evenly placed around the duct to give a finished minimum thickness of 75mm on both sides and to a depth of 130 mm above the top layer of ducts. Care must be taken to ensure that each batch, as it is placed, is properly compacted without creating unbalanced side thrust against the ducts. Each batch shall be vibrated, the poker shall be lowered into the concrete between the wall of the trench and the outside of the duct nest and shall not touch the duct. In spaced formation sections care must be

taken to ensure that the gaps between the ducts are properly filled with concrete of minimum Grade 16/20.

(vii) With formations of four or more ducts wide, mild steel reinforcing bars conforming to Drawing CN 10686 shall be placed and wired in position before placing concrete over the uppermost ducts of the completed nest.

(viii) In the case of column entry manholes, the duct formation shall open out to enter the manhole as shown on the appropriate manhole drawing and at right angles of the entry wall. The distance over which the transformation is made shall be no greater than is necessary to satisfy the 5 metres minimum bending radius for Duct 54D. The ducts shall be secured in position during concreting either with Spacers, Duct 2 and Spacers, Duct 3 built up to the required centres or by reinforcing rods which may be encased in the concrete.

5) Alternative Method of Jointing & Laying.

(i) Provided space permits, Duct 54D may be jointed above ground and fed into the trench from one end.

(ii) The Contractor may, with BT's agreement, use BT approved Moleploughing equipment and techniques, in grass or unmade ground, dependent upon the nature of the sub-soil, position of other services, access to line of route and the depth at which the duct is laid.

6) Bends and Duct Tees. Duct 54D is sufficiently flexible to provide a minimum bending radius of 5 metres. Tighter bends should not be attempted with straight lengths of duct otherwise kinking of the duct may result.

When required by BT, a pre-formed Bends Duct 54 (5180mm radius, 10° with socket and spigot ends); Bends Duct 54A (457mm radius, 90° with socket and spigot ends); Bends Duct 54B (2685mm radius, 18° with socket and spigot ends), Bends Duct 54C (700mm radius, 22° with socket and spigot ends) or a Duct Tee 54/56 shall be connected into the track.

Bends Duct 54A shall only be used for a vertical transition from a route to the surface.

Bends Duct 54C shall only be used on D-side routes.

Bends Duct, 54A and 54C, are for use on local distribution to the customer only, they shall not be used on Main or Trunk routes on the E-side of the network.

The following limitations are placed on the use of Duct Bend 54C in the D side of the network:

- (a) For Duct 54 runs over 60m, no Duct Bends 54C may be used
- (b) For Duct 54 runs between 40m and 60m, a maximum of 2 Duct Bends 54C may be used
- (c) For Duct 54 runs under 40m long, a maximum of 4 Duct Bends 54C may be used
- (d) Four Duct Bends 54C may only be connected simultaneously to form a large 90 degree bend in section lengths less than 20m.

Where these limits cannot be met, consideration should be given to the introduction of a chamber or termination point, and the approval of the local BT Representative must be obtained.

7) Backfill.

(a) Backfilling of trenches where Duct 54D has been laid shall be carried out in accordance with Part 6 of this Specification.

(b) Where Duct 54D has been laid any end shuttering and trench supporting timber, if used, shall be removed not less than 12 hours after the concrete has been placed. Backfilling of the trench, in accordance with Part 6 of this Specification, shall not be carried out until a further 48 hours have elapsed.

8) Cleaning and Testing.

(a) The cylindrical cleaning brush shall be 95mm in diameter and when compressed not less than 83mm in diameter

(b) When a section of Duct 54D track contains a pre-formed bend with a radius of less than 3000mm, the cleaning shall be carried out with a suitable rag mop.

(c) When required by BT, prior notice shall be given by the contractor, to enable the BT representative to be present while cleaning and testing operations are in progress.

403. PVC DUCT 56

1) General. Duct 56 is manufactured from Unplasticised Polyvinyl Chloride (PVC-U). It is supplied in 3.0 metre lengths, has an internal diameter of 49mm and a nominal wall thickness of 2.5mm. Each duct length has a tapered socket formed at one end, which will accept the normal barrel of the duct. Collar Duct 56A, in 150mm lengths, may be used to join lengths of duct 56 that have no socket. Spigot and Socket markers are shown for max and min insertion of duct

2) Trench. As per Par. 402(2); (4) (a) and (b).

3) Laying and Jointing.

The spigots and sockets of Duct 56 are so designed that, taking into account all manufacturing tolerances, the spigot will start to engage with the socket between 1/3 and 2/3 the socket depth. Two spigot markings are provided on the duct to show the maximum and minimum insertion depths. The minimum marking must be level with, or inside the socket. In most cases of satisfactory engagement, due to manufacturing tolerances, the maximum spigot marking shall still be visible at the socket end.

4) Bends and Duct Tees. Duct 56 is sufficiently flexible to provide a minimum bending radius of 9.5 metres. Tighter bends should not be attempted with straight lengths of duct otherwise kinking of the duct may result. Bend, Duct 56 (350 mm radius, 90° with socket each end) and Bend, Duct 56A (Duct Tee 56/56, 622 mm radius, 90° with socket and spigot ends) are supplied for use when required by BT. Bend, Duct, 56B (350mm radius, 90° socket and spigot ends) are only for

connecting to Duct Tees 54/56 and 56/56. Duct Connecting 54D/56 used to connect Duct 54D to Duct 56.

Duct laid to a Telegraph Pole shall be positioned against the pole with no gap, cut 25-50mm above ground level and **not** placed under the engraved pole marking (3m Mark) to ensure that subsequent trunking/capping does not obscure the pole markings.

5) Backfill. Backfilling of the trench shall be carried out in accordance with Part 6 of this Specification.

6) Cleaning and Testing.

- (a) The cylindrical cleaning brush shall be 57 mm in diameter and when compressed not less than 43mm in diameter.
- (b) When a section of Duct 56 contains a pre-formed bend, the cleaning shall be carried out with a suitable rag mop.
- (c) Branch sections of Duct 56 connected to the main track with a Duct Tee 54/56 and 56/56 shall be cleaned prior to connection.

403A. PVC DUCT 36

1) General. Duct 36 is manufactured from Unplasticised Polyvinyl Chloride (PVC-U). It is supplied in 3.0 metre lengths, has an internal diameter of 49mm and a nominal wall thickness of 2.5mm. Each duct length has a tapered socket formed at one end, which will accept the normal barrel of the duct. Spigot and Socket markers are shown for max and min insertion of duct. The principle use of this duct is to facilitate the feeding of power cables to NGA cabinets. The colouring of this duct is **Black** to follow current NJUG guidelines for electricity use duct.

Note: some power companies specify RED duct. Where this occurs supplies should be sourced from BT duct supplier

2) Trench. As per Par. 402(2); (4)(a).

3) Laying and Jointing.

The spigots and sockets of Duct 36 are so designed that, taking into account all manufacturing tolerances, the spigot will start to engage with the socket between 1/3 and 2/3 the socket depth. Two spigot markings are provided on the duct to show the maximum and minimum insertion depths. The minimum marking must be level with, or inside the socket. In most cases of satisfactory engagement, due to manufacturing tolerances, the maximum spigot marking shall still be visible at the socket end.

4) Bends.

Duct 36A is sufficiently flexible to provide a minimum bending radius of 9.5 metres. Tighter bends should not be attempted with straight lengths of duct otherwise kinking of the duct may result. Bend, Duct 36A (350 mm radius, 90° with socket each end) are supplied for use when power and earthing cables to NGA FTTC cabinets

5) Backfill. Backfilling of the trench shall be carried out in accordance with Part 6 of this Specification.

6) Cleaning and Testing.

(b) When a section of Duct 36 contains a pre-formed bend, the cleaning shall be carried out with a suitable rag mop.

404. STEEL DUCT 70

1) Paragraph Removed Duct 70 no longer available replaced by Duct 78 (see par 404A)

404A Duct 78

Duct 70 has become very difficult to procure. AE&I have worked with our duct supplier to design an alternative known as Duct 78, made from High Density Polyethylene but having all the protective characteristics of Duct 70 whilst offering improvements such as reduction in weight (3.14kg per metre) and having a bend radius of 1.5m.

Duct 78 is to be used in the same applications as Duct 70, these being shallow duct burial and used for bridge crossings. It is made from HDPE and has an external diameter of 110mm and internal diameter of 90mm and comes in nominal 6m lengths (I/C 057841) with additional 0.15m for collar. It also has a ring mark 100mm from the end of the spigot to allow for 50mm expansion/contraction when externally mounted on bridges. See figures 1 and 2 for spigot/socket arrangements.

As it is made from High Density Polyethylene there is no need to pull Duct 54 through it as was required with Duct 70.

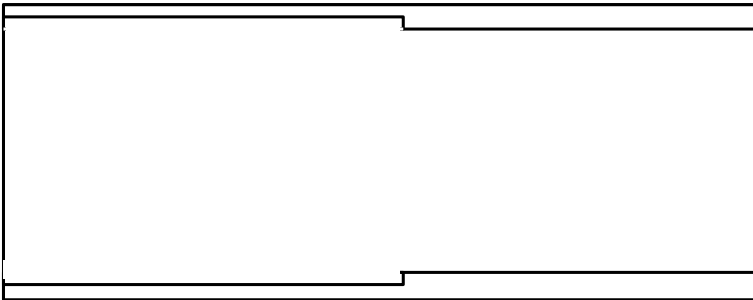


Fig 1 Socket design

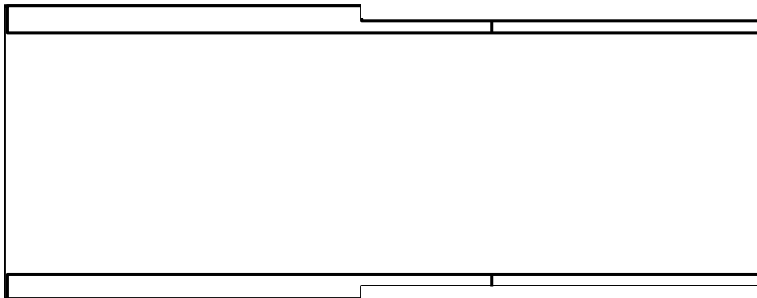


Fig 2 Spigot design

There is a Duct 78 – Duct 54 double socket adaptor available for connecting Duct 78 to Duct 54. (I/C 057843)

Also a 100m coil of Duct 78 is available for trenchless applications. (I/C 057842)

All of these items will be available from August 2010.

Bridging Culverts may be spanned with up to 4m of Duct 78, unsupported at the mid span. For greater lengths, consideration should be made for a steel service pipe with duct liners, supported on concrete piers either side on embankments.

405. POLYETHYLENE DUCT 102

1) General. Duct 102 is polyethylene duct. It is supplied in 150 metre coils and has a nominal internal diameter of 27mm. Duct 102 is used for leads-in to customers' premises, under pavements, gardens and parks, and, in certain circumstances as directed by BT, for leading up to Distribution Points.

2) Trench. as per Par 402(2).

3) Laying and Jointing. As the duct is laid in the trench it shall be kept straight by placing a quantity of "Earth, Free From Stones", on the duct at regular intervals. The duct shall be laid without joints.

4) Bends. The duct is flexible, but, to avoid cabling difficulties, bends in the line of route shall not be less than 500mm radius. Where it is necessary to lead the duct up a pole or wall, a Bend, Duct 102 (350mm radius, 90° with a socket at each end) shall be used.

5) Backfill.

(a) All spaces around and above the duct shall be filled and well compacted with "earth, free from stones", to a thickness of not less than 75 mm above the duct, unless otherwise specified.

(b) Backfilling shall be carried out in accordance with Section 6 of this Specification, in so far as it applies.

6) Cleaning and Testing. Duct 102 is laid without any joints and therefore cleaning and testing to obtain a clear bore is not normally required.

406. DUCT SEAL

1) General.

(a) Where a Duct Seal is provided to a new structure in accordance with CN10836, the first 1.5 metres of Duct 54D leading into a structure, will be included in the construction of the structure. The remaining lead-in duct shall then be connected to the 'starter' duct and laid to the next jointing chamber.

(b) Alternatively, when directed by BT, specified individual holes, may be 'Core Drilled' in the wall at minimum 150mm centres. Each length of duct shall be assembled and sealed into the holes.

(c) Breakthrough into customer's premises shall be performed according to CN15507, good engineering practices and in compliance with any wayleave condition or specification or works instruction issued by BT.

(d) When a duct seal is provided all ducts shall be sealed within the structure, to prevent the ingress of water between the outside of the duct and the structure and the ingress of gas, water and vermin through the duct.

e) When an in-situ duct seal is disturbed and cannot be resealed using the existing materials, then the end shall be cleaned out and the appropriate Duct Seal and associated accessories shall be used to complete the seal.

2) Installation

(a) The template for the duct end shall be positioned on the inner wall of the cable chamber/trench, reinforced and braced as necessary to ensure that it will remain flat and in position during the subsequent operations.

(b) As the ducts are fixed to the template they shall be temporarily supported to prevent damage to the duct or duct joint. The Contractor shall ensure that all ducts are parallel and, except for an

angled lead-in, at right angles to the templates and so maintained during the subsequent concreting operations.

(c) For multiway duct installed to an existing structure, the lead-in duct outside of the structure shall be spaced and Concrete ST 2, with maximum 10mm aggregate, shall then be carefully placed to completely fill the interstices of the duct nest and to provide a minimum cover of 150mm on the top and sides of the duct. Steel reinforcement shall be supplied at the top.

(d) For new structures par 406 (1) applies.

(e) When at least 2 days have elapsed after placing the concrete, the front template shall be removed and the concrete examined. Small voids shall be filled and rendered flush with the existing face providing they do not extend beyond two adjacent ducts or do not exceed 50mm in depth. If larger voids than this exist, the concrete will be regarded as substandard and must be completely removed and replaced.

3) Lead-in Track

(a) All lead-in sections between a building and the first chamber in the BT network shall be gas tight and watertight, and irrespective of the number of ways, shall be laid in accordance with this specification, terminating with duct flush with the inside face of the jointing chamber.

(b) The spigot end of the duct shall be thoroughly cleaned. Compound No.21 shall be liberally applied to the full circumference of the outside 100mm length of the spigot. The spigot shall then be correctly fitted into the socket. Surplus adhesive shall be wiped around the spigot end to form a sealing fillet.

Note: When using Compound 21 care should be taken to ensure that working areas are adequately ventilated. Naked Flames should not be used under any circumstances, and No Smoking is allowed.

4) Pressure Testing of adhesive joined ducts. Pressure testing of the ductways into BT Buildings, and elsewhere if called for, shall be carried out in the following manner prior to concreting.

After the last joint has been completed in each way of the duct track (or section of the track where backfilling is carried out in stages), a pressure plug shall be inserted at each end and tightened, care being taken to avoid over tightening the pressure plug which could over stress the end of the duct.

Not less than 10 minutes after making any adhesive joint on a ductway to be placed under test, an air pressure of 275 millibars (4 p.s.i) shall then be applied to each duct under test. When a mechanical compressor is used for the pressure test, a suitable relief valve shall be fitted to ensure that 4 p.s.i is not exceeded. If, after 30 minutes a loss in pressure is recorded, the fault shall be located and any remaining pressure released from the duct. The leak shall be sealed. After a further 10 minutes the pressure shall be re-applied to check that a satisfactory repair has been effected.

Once it has been confirmed that the ductway is free from leaks, the pressure must be released and the pressure plugs removed. It should be noted that under no circumstances should any attempt be made to remove pressure plugs from a ductway that is under pressure. Where a lead-in is to be constructed and is to connect to existing starter ducts, the starter ducts shall be pressure tested prior to constructing the lead-in. The subsequent pressure testing of the lead-in will include re-pressurising the starter ducts.

5) Sealing. On completion of the cleaning and testing of the lead-in duct route and acceptance by BT, a rope shall be inserted and secured in each bore with sufficient surplus to enable future cabling operations. The rope shall be attached to the Duct Seal Rope Anchor or the Plug Pressure Anchor Eye.

Under no circumstances shall a rope be fitted through a duct seal.

Each ductway shall then be sealed as specified in the Job Pack, in the following manner:-

ITEM	USE
Plug Pressure 1	Sealing uncabled Duct 54 for up to 30 days Sealing uncabled duct entries in Cabinets, permanently
Plug Pressure 3	Sealing uncabled Duct 56 for up to 30 days
Plug Duct 4B and 4C	Uncabled Duct 54, temporarily stopped with PVC cap to prevent ingress of debris.
Duct Seal 1A	Duct 54 uncabled Bores, or Duct 54 with one cable less than 40mm diameter, or two or more cables with a bundle diameter less than 40mm (this option also requires an Insert 1A)
Duct Seal 1B	Duct 54 with one cable greater than 40mm diameter, or two or more cables with a bundle diameter greater than 40mm. (this option also requires an Insert 1A)
Duct Seal 1C	Duct 56 uncabled Bore Or Duct 56 with one cable Or Duct 56 with two cables (this option also requires an Insert 1B)
RISE Duct Seal Kit	All Duct Lead-ins, usually where multiple cable entries make sealing difficult. To be used only when standard duct sealing as above is not possible.

6) Sealing of Conduits and Pipes. Unless otherwise required by a further specification or drawing, ducts, conduits and pipes into customers' premises, call offices, kiosks, cabinets, posts etc., shall be sealed at the end within the structure or customers' premises as follows: -

- (a) The duct shall be sealed in a similar manner to that detailed in Par. 407 (5).
- (b) Where a cabled duct enters a cabinet Resin Pack 14 shall be used.
- (c) Where an uncabled duct enters a cabinet, Plug Pressure 1, Plug Duct 4B or 4C or, Resin Pack 14 shall be used.
- (d) Smaller conduits and pipes shall be sealed by pressing a clean rag into the aperture and facing off with a layer of Compound 16A. A 25 mm depth of rag and a 10mm depth of compound shall be used.

407. DUCT / CABLE LAYING DIRECT IN GROUND

1) Polyethylene Duct or Cable

(a) The cable will be supplied by BT.

(b) The drum shall be set up at static positions and the cable drawn off and laid into the trench. Alternatively, the drum may be set up on a mobile vehicle or trailer and the cable paid off along the trench. The method employed is dependent upon the circumstances, obstructions and access to the trench.

(c) In rocky or stony soils, "Earth, Free From Stones", rammed to form a 50 mm layer both below and above the cable shall be provided as directed by BT.

(d) A variety of armoured copper and fibre cables are available for installation direct-in-ground. Due to their robust design, they can be installed as a duct equivalent, no further support and protection is required.

2) Moleploughing. The Contractor may, with BT's agreement and in accordance with LW251, use BT accepted Moleploughing equipment and techniques, in grass or unmade ground, dependent upon the nature of the sub-soil, position of other services, access to line of route and the depth at which the cable is laid.

3) Horizontal Directional Drilling

The Contractor may, with BT's agreement and in accordance with LW252, use BT accepted drilling equipment, to provide point-to-point duct or cable connections between two Jointing Chambers, dependent on sub-surface conditions.

4) Micro-Trenching

The Contractor may, with BT's agreement and in accordance with LW253, use BT accepted slot cutting equipment to provide a <60mm slot and install a suitable duct or cable, within the bound layer of the carriageway or footway.

5) Percussion Moling

The Contractor may, with BT's agreement and in accordance with LW254, use BT accepted moling equipment to provide a connection between two joints, within a 'thrust pit' and a 'receiving pit', over an agreed distance.

6) Narrow Trenching (>60mm width)

The Contractor may, with BT's agreement, use BT accepted narrow trenching equipment to provide a >60mm slot and install a suitable duct or cable, below the bound layer of the carriageway or footway. This technique should be used in accordance with SROH standards and consideration to Alternative Reinstatement Materials (ARMs) should be given. An overview of this technique in the footway is available online and a specification standard is in development with Transport Scotland. This is a non-standard service and should be considered in appropriate situations.

7) Machine Trenching

A range of proprietary trenching machines are available for providing small trench in the soft verges, supporting the installation of small diameter, armoured cables and Openreach Duct 54 (up to 100mm diameter). They are suitable for verges of >0.5m width where mole ploughing may have

been considered, but using large equipment is not practical. This is a non-standard service and should be considered in appropriate situations.

8) Auger Boring

The use of pit mounted, horizontal drilling equipment should be considered. This technique has been adopted by many utilities for distances up to 120m. An Openreach Specification LW260 is available which provides a service level description of this technology. This is a non-standard service and should be considered in appropriate situations.

7) Terminating Points. A sufficient length of cable for terminating purposes will be coiled, and the coil shall either be buried in the ground or fastened to a pole or wall, as directed by BT. In the latter case, the cable coil shall be fastened at a point above a length of steel or PVC Capping or Polyethylene Duct. Where Capping, Polyethylene Duct or cable is fixed to a wall, the wall shall be plugged to take the fixings.

8) Capping. Capping, in various lengths, together with Connector Bend 4 and associated fixings will be fitted by the Contractor in positions determined by BT.

9) Joint Marker. A Marker Cable, will be installed by the Contractor at each buried joint or terminating point, as directed by BT.

408. SLEWING AND/OR LOWERING OR RAISING OF DUCT

1) Excavation.

(a) The size of the excavation for slewing and/or lowering or raising a duct line shall be of a size only of that is practicable to carry out the work.

(b) 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 for a distance that is just sufficient to allow access for carrying out the excavation.

(c) 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 in the form of a strongback being firmly lashed on it.

2) Strongback.

(a) The strongback shall be lashed to the duct line, with both ends of each duct firmly held, using separate lashings or a continuous rope. The lashings shall be tightened, by driving wedges between the ducts and the strongback.

(b) Any forces that 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 strongback lashed to it. Such forces shall be applied at points whose spacing is sufficiently close to keep the bending of the duct line and strongback between the points to a negligible amount.

3) Suspension. When the duct line is to be lowered, the complete length shall be suspended from suitable beams or tripods and/or approved winching devices spanning the excavation. When the duct line is to be slewed whilst suspended in this way, the suspending ropes shall be fastened to sling poles resting on the supporting beams and running parallel to the duct line and strongback, and free to move across the beams. All suspending ropes shall be so arranged that the duct line can be raised or lowered as required, smoothly and continuously, and can be tied off firmly at any stage.

4) Slewing Only. When the duct line is to be slewed only, it may be moved without suspending it, provided that:-

(a) The surface across which the duct line is to be slid shall be reasonably level and regular, made so if necessary by setting boards in the surface.

(b) For self-aligning duct, grooves shall be cut across the surface in positions to allow the socket of each duct to remain in a groove throughout its movement.

(c) The strongback shall be firmly lashed to the side of the duct line.

(d) The moving force shall be applied to the strongback by rope, jack or other method to allow the duct line to be moved smoothly and without jerking.

(e) In the final position of the duct line the holes for the sockets of self-aligning duct shall be made large enough to allow access to the underside of each joint for the purpose of making the seal. Such holes shall be subsequently filled with cement mortar.

5) Movement. The slewing and/or lowering of the duct line shall be carried out by making a succession of very small movements of the duct line, each made progressively along the effected length. The curvature of the duct line at any intermediate stage between the initial and final positions shall not exceed the deviation limits laid down for laying new duct of the same type. Where no information is available a maximum deviation of 1:50 is permissible.

6) Trench Bottom. Prior to finally placing the duct, the trench bottom shall be prepared in the same way as is specified for duct laying. The holes for self-aligning duct collars shall not be taken out until the duct line is sufficiently near its required position in order to ensure accurate location.

7) Irregularities. After the duct line has been finally lowered into its required position and the strongback has been removed, any slight irregularities in the general line of the ducts shall be corrected.

8) Pulled Joints. Where, following slewing and/or lowering or raising operations, a duct joint or joints have pulled apart, short lengths of ordinary or split duct may be inserted in the duct line and satisfactory joints effected.

9) Inspection. After all operations are completed, including the repair of the duct where necessary, the joints of all ducts shall be inspected to ensure that they are forming an effective seal. Any defects shall be made good.

10) Testing. All spare bores of the duct line shall be rodded and roped and/or cleaned and tested as specified for the particular duct concerned.

409) REPAIRING DUCTS

All duct shall be repaired using the appropriate BT items listed below. Debris shall be removed from the effected area, ensuring that there are no sharp edges or burrs that may cause damage to in-situ cables or during future cabling operations.

TYPE OF DUCT	ITEMS TO BE USED	BT ITEM CODE

Duct 56 Nominal bore 49mm	Duct 56 split, 3 metre lengths, and straps cabling fixing 10A.	095086
Self Aligning Duct (SAD) 11 Nominal bore 76mm (3 inch) NB. The repaired bore will be reduced to 67mm.	Duct Repair Kit No.2A	095089
	Duct 59A split supplied in 3 metre lengths.	095088
Duct 54, 54D & 55 Nominal Bore 90mm SAD 5, 6, 7, 8, 9 & 10. Duct 15, 16 Nominal Bore 92mm (3 ^{5/8} inch) NB. The repaired bore will be reduced to 82mm.	Duct Repair Kit 3A Duct 54D split, supplied in 3 metre lengths.	095051 095039
SAD 12 Duct 57 Both of nominal bore 102mm NB. The repaired bore will be reduced to 92mm.	Duct Repair Kit 4A Duct 57 split, supplied in 3 metre lengths.	095090 095087
Duct Bends	Duct Bend cut longitudinally on site Straps Cable Fixing 10A Strip Duct fitted longitudinally	as required 094979

When a duct repair is to be performed on SAD or Earthenware duct, the damaged duct must be cut back to a clean square edge or the spigot and socket ends, to enable the repair kit to be installed.

410 Flexible Footway Ducting

The provision of a flexible duct solution may be acceptable between a street cabinet and its serving jointbox, only where congestion is an issue and installing multiple sections of Duct 54 or 56 is not practical. Flexible ducting must **not** be used on sections between jointing chambers.

Any alternative ducting must be sourced from the Openreach approved supplier; Emtelle UK Ltd, Hawick, Haughhead, Roxburghshire, TD9 8LF. The Specification Authority shall be advised of the duct specification in advance of installation. All footway flexible ducts shall meet BS EN 61386-24, category 450N, normal duty impact.

SPECIFICATION LN 550 - 5
UNDERGROUND DUCT LAYING AND ASSOCIATED
WORKS

PART 5 JOINTING CHAMBERS

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501. GENERAL

Jointing Chambers shall conform to the standard drawing(s) and/or other drawing(s), as specified, unless Par. 504, Variations applies.

To enable access for future Pole Testing, a Brickwork, Concrete or JMF Series of Modular Jointing Chambers should be sited a minimum distance of 300mm from a Telephone Pole. Prefabricated boxes other than Brickwork, Concrete or Modular construction shall be sited a minimum distance of 1000mm from the pole.

The frame and cover of a jointing chamber shall be installed flush and level with the surrounding ground. The construction tolerance between the levels of the fixed feature and immediately adjacent surfaces shall not exceed +/- 6mm. All covers shall be located so that they may be removed safely with BT standard equipment.

502. TYPES of JOINTING CHAMBERS

1) The more commonly used standard types of manholes, access shaft, cabling shaft and sideshaft, with their code references, are as follows:-

CODE MANHOLE	CHAMBER INTERNAL DIMENSIONS in mm					CN DRAWING NUMBER
	Length	Width	Floor	Walls	Roof	
MRX401	1800	1200	200	200	200	CN14931
MRX402*	3500	1200	200	200	200	CN14932
MRX404	2400	1200	200	200	200	CN14933
MRX405*	4000	1650	200	200	200	CN14934
MRX410*	3100	1700	250	235	235	CN14935
MRX411*	4900	2300	250	250	250	CN14936
MRX412*	3700	2800	250	240	240	CN14937
MRX413*	3700	2000	250	240	240	CN14938
MRX509	2400	1700	200	200	200	CN14939
MRX510*	2900	2300	250	235	235	CN14940
MRX511*	3700	2700	250	235	235	CN14941
MRX512*	3400	3400	250	235	235	CN14942
MRX513*	3400	2400	250	235	235	CN14943
MRX607	2480	2150	200	200	200	CN14944
MRX608*	3800	2700	235	235	235	CN14945
MRX610*	4700	3700	250	235	250	CN14946
MRX611*	3700	3400	250	235	235	CN14947
MRX612*	5000	2500	250	250	250	CN14948
MRX613*	3800	2450	250	235	230	CN14949
MRX810*	4400	2100	250	235	235	CN14950
SIDESHAFT	10000	1000	200	200	200	CN14951
Access and Cabling Shaft	max 3000 max	610				CN 1153

* These manholes have a range of internal heights.

It is the contractors responsibility to ensure their operatives are in possession of the latest version of drawings issued by BT.

- 2) (i) **The Standard Sideshaft** on CN14951 is detailed for 4 metres length and can be amended to a maximum of 10 metres.
- (ii) **When a manhole and sideshaft are linked** the floor of the manhole and the floor of the sideshaft shall be nominally at the same level but there shall be a fall to the sump in the sideshaft.
- (iii) **The internal height of the sideshaft** is 2000mm, and the internal height of a manhole may be greater. Where the height of the manhole exceeds the height of the sideshaft a straight ventilation pipe shall be placed through the manhole wall, 50mm from the underside of the roof of the manhole, to the entrance shaft of the sideshaft, above the level of the manhole roof. The ventilation pipe shall be a steel duct of 100mm minimum internal diameter. (BT Duct No.70 is suitable.) There shall be a minimum fall in the duct of 1:40 from the shaft to the manhole.
- (iv) **Access between the manhole and sideshaft** shall not be obstructed. A minimum clear space of 2000mm headroom and 1000mm wide unobstructed walkway is required between the manhole and the entrance shaft of the sideshaft.

3) **The standard types of joint boxes** with their code references are as follows: -

(i) **Concrete joint boxes:**

Item	Drawing Number	Reinforced Concrete Code	Drawing Number	Unreinforced Concrete Code
Carriageway				
No.4	CN15644	JRC4 [#]	N/A	
No.11	CN14159	JRCX11 [#]	N/A	
No.12	CN14160	JRCX12 [#]	N/A	
No.14	CN14161	JRCX14 [#]	N/A	
Footway				
No.102	N/A		CN14979	JUF102 [#]
No.104	N/A		CN14980	JUF104 [#]
No.106	CN14981	JRF106 [#]	N/A	
No.110	CN14982	JRF110 [#]	N/A	
No.111	CN14983	JRF111 [#]	N/A	

[#] These joint boxes have a range of internal depths.

(ii) **Brickwork joint boxes:**

Item	Drawing Number	Code
Footway		
No. 102	CN14979	JBF102 [#]
No. 104	CN14980	JBF104 [#]
No. 106	CN14981	JBF106 [#]
No. 110	CN14982	JBF110 [#]
No. 111	CN14983	JBF111 [#]
Carriageway (for Newsites only)		
No. 3N	CN15648	JBC3N
No.4	CN15644	JBC4

[#] These jointboxes have a range of internal depths.

Footway joint boxes (both brickwork & concrete) now require holes to be drilled in them for possible future installation of MOBRA OTIAN equipment. The location of these holes are shown on the appropriate drawings.

Footway joint boxes (both brickwork & concrete) Where there is evidence or significant risk of vehicles using a soft verge e.g. as an undertaking area opposite a T-Junction, a passing point on a narrow road or a parking area, it will be necessary to install a Carriageway Chamber, Frame & Cover.

Carriageway jointbox JBC3N is a brick based chamber designed for use in **Newsite locations only**, where kerblines are not clearly defined or where vehicular traffic is likely to exceed 5mph. The chamber does not come in variable depths

(iii) **Prefabricated joint boxes:**

Item	Drawing Number and installation procedure	Code
Footway		
No. 23	CN10941	JB 23
No. 26	CN13917	JB 26

It is permissible to drill holes in the side of the JB23 and JB26 chambers for new build. The Jointbox 23 and 26 may have a single 50mm hole in each sides for a Duct 56 side entry (the JB26 has pre-formed duct entry points for drilling)

Joint Box 23: is a small prefabricated footway jointbox. It is supplied with its own exclusive frame and cover conforming to BS EN124 category A15. Due to both the frame and cover classification and the box construction the chamber should only be installed in footways or grass verges where there is no vehicular access, accessible by pedestrians or pedal cyclist only. i.e. at least 600mm from a '**constructed barrier**' or natural barrier.

Definition of a constructed barrier is a defined kerb, crash barrier, bollards etc.

Definition of a natural barrier is a ditch or sharp angled embankment where the box is above carriageway level.

Exceptionally where there is no continuous barrier, they may be installed near a pole within 1.5 metre to the side or any distance behind, but **not** in between the pole and carriageway.

It is not permissible to cut the sides or the base of a Joint Box 23 to facilitate installation around shallow duct or other buried services. Only in these circumstances, the permissible solution is to use one or two Modular 102 Joint Box Rings set on a Type 1 Granular Sub Base Bed or equivalent, fitted with a Footway 102 cover or the standard brick / concrete JBF102 / JUF102. This shall be installed in accordance with Supplier Guide SAL/01 on CANDID.

Joint Box 26: is a small prefabricated footway jointbox. Although the chamber utilises a BS EN124 category B125 frame and cover suitable for light vehicular use up to 5mph, the box construction is such that the chamber should only be installed in footways or grass verges where there is no vehicular access, accessible by pedestrians or pedal cyclist only. i.e. at least 600mm from a ‘constructed barrier’ or natural barrier.

Definition of a constructed barrier is a defined kerb, crash barrier, bollards etc.

Definition of a natural barrier is a ditch or sharp angled embankment where the box is above carriageway level.

Exceptionally where there is no continuous barrier, they may be installed near a pole within 1.5 metre to the side or any distance behind, but **not** in between the pole and carriageway

Duct entries to the box are made via “preformed duct entries”. Where duct 56 is to be brought into the box, a suitable size duct entry should be drilled out within the defined preformed duct entries. A designated slot in the floor is provided and can be removed to facilitate the installation over in-situ cables or ducts. On no account shall the box be modified, or further holes be made into it.

For the installation of new duct into a JB26, the duct may protrude a 10 - 25mm into the chamber. (No Tolerance)

In paved surfaces or grass or unmade surfaces the voids behind the footway Jointbox Nos. 23 and 26 shall be filled with Earth Free from Stones or graded granular material and well compacted or concrete ST 2.

In soft ground the chamber foundations to be well compacted and made level. Where soft soil is not prevalent, any large jagged boulders, brick or stone to be removed, replaced with compacted Type 1 GSB.

It is not permissible to cut the sides or the base of a Joint Box 26 to facilitate installation around shallow duct or other shallow buried services. The permissible solution are to use two Modular 102 Joint Box Rings set on a Type 1 Granular Sub Base Bed or equivalent, fitted with a Footway 102 cover or the standard brick / concrete JBF102 / JUF102.

(iv) **Modular joint boxes:**

Item	Drawing Number and installation procedure	Drawing No.	Code
Footway			
No. 101	see JMF 101 section below	????	JMF101
No. 102	see JMF 102 section below	CN14979-03	JMF 102
No. 104	see JMF 104 section below	CN14980-05	JMF 104
No. 106	see JMF 106 section below	CN14981-04	JMF 106
No. 110	see JMF 110 section below	CN14982-04	JMF 110

These joint boxes have a range of internal depths dependent on the number of rings used.

The JMF series of footway joint boxes can be used similarly as their brick and concrete counterparts. This includes footways, grassed and pedestrian areas which may include occasional slow moving vehicular traffic. (Up to 5mph)

Drawing specification CN14982S04 Rev B should be used for the installation of the JMF 110 chamber. The Cubis Industries [installation guide](#) is available online.

The **JMF101** is an alternative, small jointing chamber used to provide access to buried joints in the soft verge, supplied with a frame & cover. It is often built as a shallow chamber where the JB23 or JB26 are too deep. The JMF101 may also be used in the footway where congestion is an issue but full depth and a concrete base can still be provided. This is a non-standard build but uses the same build principle of the standard modular chamber range. Installation instructions are available from the supplier, Cubis Industries Ltd.

Where there is evidence or significant risk of vehicles using a soft verge e.g. as an undertaking area opposite a T-Junction, a passing point on a narrow road or a parking area, it will be necessary to install a Carriageway Chamber, Frame & Cover.

Details of the Jointbox Modular Footway 102, 104, 106 and 110 are available via CANDID.

503. DRAWINGS

Drawings supplied by BT for the construction of jointing chambers and associated works are included in the Drawing Folder No.1.

Where there is a conflict between the drawing and this specification, this specification shall take precedence.

504. VARIATION

1) Bespoke Engineered Structures

- a) **Modified Chambers.** Any chamber that is modified such that the materials, design or dimensions are not in accordance with this specification, the relevant standard CN Drawing for that chamber and the tolerances in CN15456, shall be bespoke. All bespoke engineered structures shall require authorisation from BT TAA, or their nominee and shall be agreed with the Work Originator for the structure.
- b) **Side Shafted Chambers.** Standard chambers with side shafts shall be bespoke engineered and will require approval from the BT TAA. Where the chamber roof has a greater internal height than the side shaft, a gas ventilation pipe shall be installed between the chamber and the entrance shaft. The ventilation pipe shall be positioned 50mm under the roof of the chamber and shall have an incline up to the entrance shaft. The ventilation pipe shall be Steel Duct 70 whilst stock last, or its replacement Duct 78. In the entrance shaft a notice shall be fixed stating “VENTILATION PIPE DO NOT CABLE”
- c) **Multi-tier chambers.** All chambers with more than one floor level shall be bespoke engineered, subject to the requirements for modified chambers in (a) above. Each floor level shall be guarded against a fall with a suitable safety barrier and spring assisted gate closure. CN10850 / CN10851.

Between the surface level and each tier, provision shall be made for a personnel entrance shaft and a separate cabling shaft CN1153.

Reference to CN2727 Plates Caution No 19 to be placed in access shaft below frame and cover.

The floors of the tiers shall be constructed to prevent water flowing over the intermediate entrance shafts and to allow the water to flow to a drainpipe in one corner of the higher tier.

Cabling risers shall be provided to enable cables to pass between the floors. The cable risers shall be constructed with a kicker, to prevent water flowing between the tiers

2) Obstructions

The presence of unforeseen obstructions in the ground, or adverse ground conditions, may necessitate the construction of a type of jointing chamber, other than that specified, or a modification of one or more of the dimensions stipulated on the relevant drawings which would exceed the tolerances in CN15456. In these circumstances the Contractor shall apply for a Technical Departure From Specification (TDFS). The Contractor shall not carry out modifications without the prior approval of BT.

3) Unreinforced joint box floors

The contractor may at his discretion use a C32/40 dry mix concrete to construct the unreinforced concrete floor of a jointbox. The surface of the floor at handover to BT shall have a flat smooth surface with no trips or depressions greater than 5mm. Where the surface is uneven a 10mm screed of 3:1 sharp sand and cement shall be laid to remove depressions or trip hazards.

505. PROTECTION of CABLES and ASSOCIATED EQUIPMENT

During the cutting of duct entries into an existing structure, or during the demolition or building of jointing chambers, the Contractor shall take all reasonable measures to protect cables and associated equipment. Such measures shall include any or all of the following requirements-

- (a) **All movement of cables** shall be carried out in a controlled manner such that all cables are evenly supported throughout their length.
- (b) **For access into and out of manhole excavations** a ladder shall be provided by the Contractor. Under no circumstances may cables, joints and equipment be used for climbing, standing or sitting on.
- (c) **Sufficient pumping capacity** shall be made available and operated to ensure that when cables are removed from their bearers they shall not be immersed in water at any time.

The responsibility of keeping cables and joints dry will pass to BT, when BT commences checking and/or testing the cables.

- (d) **All cables shall be protected** at duct entries by shielding as necessary against mechanical damage.
- (e) **During demolition of the roof of a manhole**, the Contractor shall erect a deck of timber between the cables and the roof of the manhole, to protect BT plant.
- (f) **Contractors plant or materials** shall not be supported on cables or associated equipment at any time.

(g) **On Completion** all cables shall be left adequately supported on the new ironwork.

506. DUCT ENTRIES

1) Clearance of Ducts

Ducts shall enter Manholes as shown on the relevant drawings or as directed by BT. Unless otherwise required by the drawings or by BT, the ducts shall enter a manhole at such depths that will ensure a minimum clearance of 350 mm above the floor, 450 mm below the roof and 100mm from any adjacent wall.

Where a new chamber is being constructed a minimum clearance of 230mm must be allowed from an Anchor Iron. Where a duct enters an existing chamber a minimum of 300mm must be allowed. When these minimum clearances cannot be achieved the Anchor Iron must be removed.

Ducts shall enter jointboxes as shown on the relevant drawings or as directed by BT. Unless otherwise required by the drawings or by BT, the ducts shall enter the Joint box a minimum 150mm above the floor, and 75mm from any adjacent wall.

Existing earthenware duct shall be extended into a new chamber with the appropriate Kits repair and split duct.

Existing PVC duct shall be extended into a new chamber with an appropriate PVC duct.

2) Duct Entries Into Existing Structures

i) General - existing structures, such as Jointing Chambers, Telephone Exchanges, Repeater Stations or any other building shall have all new duct entries cut by core drilling techniques only. Where the duct enters the chamber the finish shall be flush and smooth. The gap around the duct shall be filled for the full depth of the wall with cement grout, cement mortar or, suitable mastic or silicone, with no protrusions that may cause damage to cables.

ii) Position of Entry - shall be as specified in a schedule of work or relevant drawing. Any departure from this position must be agreed with BT prior to the commencement of work. Where practicable the structural reinforcement shall not be cut or exposed. If steel bars are cut or exposed they shall be treated with a rust inhibitor.

iii) Protection - the Contractor shall protect BT cables and/or equipment, prior to drilling operations.

iv) Highly Secure External Above Ground Lead In Where requested in the local Works Instruction or by the local BT Representative, a 40mm bore steel tube with a 45° bend [Duct Secure Entry 1A (item code 075870)] shall be used to provide a highly secure, external above ground lead in as detailed in CN 15561. Method Statement to be provided by Contractor.

3) Duct Entries Into New Structures

The concrete or brickwork around all ducts where they enter jointing chambers shall be carefully flushed up and where necessary, rendered in cement mortar or a proprietary silicone sealant. Where the duct enters the chamber the duct shall enter flush with the wall, the finish shall be smooth, with no protrusions that may cause damage to cables.

507. JOINTING CHAMBER FITTINGS

i) **Cable Bearers, Ladders, Steps** and other fittings shall be fixed according to the relevant drawings or in such other positions as BT may direct.

ii) **Anchor Irons**, shall be buried to the underside of the depth plate, in the structural concrete of walls and floors. Floor screed shall be wiped away to expose the entire top side of the depth plate.

Where an anchor iron is fitted the concrete shall be a minimum of C32/40 and the slab shall be reinforced according to the relevant structure drawing.

508. IRON and STEELWORK

1) **All iron and steelwork**, except as in Par. 508(2), supplied by the Contractor and which has not been galvanised by an approved method, shall be free from mill scale and treated with a suitable preservative after delivery, and two coats of an approved bituminous paint after fixing.

2) **Any ungalvanised iron or steel** which is to be embedded in concrete shall be free from soil, oil, loose rust, loose mill scale, snow, ice, grease or any other substance which can be shown to adversely affect the steel or concrete chemically, or reduce the bond. Normal handling prior to embedding in the concrete is usually sufficient for the removal of loose rust and scale from reinforcement.

3) **All reinforcement in the floor, walls, roof and shaft** shall be secured together by means of approved ties, sufficient to prevent displacement of the reinforcement during the placing and compaction of the concrete.

Where the construction drawing indicates straight bars forming a mesh, a preformed mesh may be used. Extreme care must be taken to prevent damage, when a mesh is placed around existing cables. When a mesh has to be cut to accommodate existing duct or cable the aperture shall be trimmed.

509. RECOVERED MATERIAL

After all works to BT jointing chambers, any recovered serviceable fittings shall be delivered to a nominated BT site, or disposed of as instructed by BT.

510. SUMP

Where a sump is provided, the floor shall have a slight fall thereto. The grating shall be located squarely over the sump, adequately fitted and easily removable, from a pre-formed recess in the floor or floor screed, in the position indicated on the relevant drawing. Where the drawing shows a square sump, a circular sump of 230mm internal diameter ± 5 mm, may be constructed at the contractors discretion.

The sump in a jointing chamber shall have a depth of 70mm \pm 10mm.

511. CONCRETING

1) Low Temperatures – concrete for jointing chambers or cabinets shall not be mixed, or placed, when the **concrete temperature** is below **5°C**. The recommendations of BS8110 Part 1, clause 6.2.4 shall be followed and further guidance may be found in BS8500-1 Annex A.11.1

Where the **air temperature** is likely to fall below **5°C** the Contractor shall provide a method statement signed off by a suitably qualified person, detailing the materials, placing and curing methods, to be agreed by the TAA.

When concrete has already been placed, and the air temperature **unexpectedly** falls below **5°C** at any time during the period before removal of shuttering, the concrete shall be protected from freezing. The period of time that the temperatures remains below **5°C** shall be added to the minimum periods quoted in Par.518 of this Specification.

2) Drying. Concrete, when placed and if subject to rapid drying out by sun and/or wind, shall be protected to prevent it becoming dry during the minimum curing period.

3) Handling, from the mixer to the workplace must, whatever method is adopted, ensure that the mix remains cohesive and that segregation does not occur.

4) Placing, of concrete must be carried out in a manner such that the concrete is deposited as close as practicable to its final position. The use of chutes or tremmie pipes must be adopted throughout the placing process to ensure that segregation does not occur.

- i) Concrete must be placed in even layers and must not be moved into position with the poker or vibrator.
- ii) Layer thickness must be compatible with the tools and methods to remove entrapped air, each layer must be thoroughly compacted before the placing of the next layer.
- iii) Formwork must be filled with concrete in such manner as to avoid the formation of cold joints.

512. JOINTS IN CONCRETE

1) Construction joints shall be provided where shown on the relative construction drawing or modified according to written agreement according to Paragraph 504. A minimum of 12 hours shall elapse between the construction stages thus indicated. The construction joint shall be effected by lightly wire brushing the existing concrete surface to remove the laitance and expose the aggregate, then cleaning and wetting before the new concrete is cast. The use of jack hammers or picks to scabble away the existing surface is not permitted. Such construction joints shall be sited at least

150mm from any anchor iron position. Where a construction joint is shown on a drawing at floor level, a kicker may be constructed at the contractors' discretion.

2) Concrete walls shall be completed in one operation, whenever possible. Where this is not practicable construction joints shall be made after the existing concrete has set but not hardened, the joint being cleaned with a stiff brush to remove the laitance to expose, but not disturb, the larger aggregate.

513. WET SITUATIONS

In wet situations the Contractor must implement such methods as are necessary to prevent damage to freshly placed concrete or mortar and to ensure a correctly constructed jointing chamber.

514. COMPACTION and TAMPING of CONCRETE

In the construction of concrete or reinforced concrete jointing chambers, the concrete shall be thoroughly worked and tamped into all parts of the moulds or forms and around the reinforcement. Care shall be taken not to disturb reinforcement steel during compaction.

Compaction of all concrete slabs shall be performed until a dense solid mass without voids is obtained, to meet the requirements for strength and durability.

Unreinforced concrete floor slabs may be compacted by hand tamping methods. All unreinforced concrete wall slabs shall be compacted by the use of a poker type vibrator.

Reinforced concrete slabs of jointing chambers shall be by the use of a poker type vibrator.

515. SHUTTERING

1) Timber shuttering shall not be left in the road structure. Where it is impractical to remove timber shuttering after the completion of excavation works, the timber shall be cut off below the road structure and removed. Only suitably treated timber may be left in, below the road structure,

2) Subject to compliance with the drawings as regards dimensions, the Contractor shall be at liberty to adopt any arrangement he may think fit for the make-up of the shuttering, it being understood that on completion of the chamber, the whole of the internal shuttering material shall be removed.

3) In all cases the shuttering used shall be of such dimensions, and so constructed, as to remain rigid and unyielding to weight and vibration during the laying and tamping of the concrete. No shaking or jarring shall be permitted during setting.

4) Proprietary spacers shall be placed at 0.6 metre maximum centres, to ensure the minimum cover shown on the relevant construction drawing, is maintained from the shuttering, prior to and during, the placing of concrete.

5) Design, size and general arrangement of the chamber shall be in accordance with the appropriate drawing, suitably modified by the following variations:-

i) Plastic sheeting, 1000 or 1200 gauge shall be positioned between the excavation or rear shuttering and the concrete of the jointing chamber. It shall also be placed over the roof before commencing the back-fill. Where the floor of the excavation has been well compacted and a blinding placed to prevent the contamination of the structural concrete, there is no requirement for the Plastic sheet to be laid on the floor.

ii) Duct entries into a jointing chamber shall, when required by BT, be fitted with a Duct Seal.

6) The contractor must ensure that no soil or other deleterious material is allowed to collect between the inner faces of the internal and external shuttering or contaminate the structural concrete. Where this has been shown to occur the contractor will be responsible for the complete renewal of the structure. Repair of the affected area will not be accepted.

516. CHAMBERS RESISTANT TO SULPHATE ATTACK

Where concrete is exposed to sulphate attack reference to Table A.15 of BS8500: Part 1 indicates the allowable cement combinations to be adopted within the concrete mix. Irrespective of which option is adopted no relaxation on the required concrete strength will be accepted.

Note: Under no circumstances shall High Alumina cement be used.

517. CONCRETE QUALITY and FINISH

1) **All concrete** used for the construction of Manhole Jointing Chambers shall be ready mixed Grade C32/40, in accordance with Table 7 BS8500: Part 2, except where the quality of concrete is detailed on the construction drawing. For Carriageway and Footway Jointboxes the use of site mix concrete in accordance with Part 2 of this specification is allowed.

2) **Where ready mixed concrete** is used BT will require to see and retain a copy of the delivery certificate supplied with the concrete.

3) **Where site mixed concrete** is used the contractor shall supply a certificate of compliance according to Part 2; Par. 206 (3), of this Specification.

4) **When directed by BT two Test Cubes** will be taken from **any concrete used for jointing chamber construction, otherwise 2 cubes shall be taken from every 20m³ or 20 batches**. For all manhole construction it is expected mandatory test cubes are taken on all builds. The equipment necessary for the making of the test cubes shall be provided by the Contractor. The cubes shall be tested by a Testing Laboratory approved by BT and the Contractor shall supply a copy of test report to BT within 14 days of the cubes being tested. Work will not normally be delayed for the result of any test to be ascertained. The making, curing and testing of all cubes of concrete for compressive strength tests shall be in accordance with BS EN 12390, Parts 1, 3 and 7 and the results shall satisfy the following tables:-

Type of cement used		
Age of concrete	Portland and Sulphate Resisting	Rapid Hardening
7 days	25 N/mm ² minimum	34 N/mm ² minimum
28 days	40 N/mm ² minimum	40 N/mm ² minimum

5) **Test cores** may be required, whether test cubes have been taken or not. BT may, as a result of inspection or tests, require cores to be taken and tested in accordance with BS 6089 and BS EN12504 Part 1. The cores shall be examined and tested, by an independent NAMAS or **UKAS** approved testing authority / laboratory and the estimated in-situ strength ascertained. The Contractor shall provide BT with a copy of the test report as soon as it is available and, if this indicates that the quality of the concrete in the structure is unsatisfactory, the jointing chamber shall be demolished and replaced with a new structure. The core drilled hole shall be made good with cement mortar.

6) **On completion of a manhole** the floor shall be rendered with a screed of 3 parts sharp sand and 1 part cement in accordance with the relevant drawing. The walls of concrete jointing chambers shall have a smooth finish; any slight cavities exposed when the shuttering is removed shall be made good with cement mortar, and any projections removed.

Note: UNDER NO CIRCUMSTANCES SHALL THE WALLS BE COATED WITH CEMENT OR CEMENT SAND WASH TO ENABLE CONCEALMENT OF POOR WORKMANSHIP.

518. CONCRETE CURING TIMES

The **minimum concrete strength or curing periods** after completion of any construction or modification work using cement mortar or concrete, which must elapse before:-

- (a) **the shuttering** of jointing chambers is removed.
- (b) **the restoration** of paving or surfaces may be commenced

traffic is allowed to pass are as follows:-

FOR MANHOLES AND JOINT BOXES BUILT IN THE CARRIAGEWAY			
Type of cement	(a) to removal of shuttering	(b) before commencing the restoration of carriageway	(c) before allowing passage of traffic
Portland, Portland Blast Furnace Sulphate Resisting	5 days or 20N/mm ²	7 days or 25N/mm ²	7 days or 25N/mm ²
Rapid Hardening Portland	2 days or 20N/mm ²	3 days or 25N/mm ²	3 days or 25N/mm ²

FOR MANHOLES BUILT IN THE FOOTWAY			
Type of cement	(a) to removal of shuttering	(b) before commencing the restoration of footway	(c) before allowing passage of traffic
Portland Portland Blast Furnace Sulphate Resisting	5 days or 20N/mm ²	5 days or 20N/mm ²	7 days or 25N/mm ²
Rapid Hardening Portland	2 days or 20N/mm ²	2 days or 20N/mm ²	3 days or 25N/mm ²

FOR JOINT BOXES BUILT IN THE FOOTWAY	
Portland, Portland Blast Furnace, Sulphate Resisting, Rapid Hardening Portland	Shuttering shall not be struck in less than 24 hours or 10N/mm ²

519. PAINTING of MANHOLES

On completion of all construction works, in the case of all manholes, the shaft and underside of the roof and the top third of the manhole walls shall be cleaned and the surface prepared to be coated with a water resistant, non-toxic, white reflective coating, approved or specified by BT at the time of tendering. Mixing and application of the material shall be strictly in accordance with the Manufacturers' instructions.

Note: Suitable materials are listed in Part 5 Appendix A of this specification.

If a contractor wishes to use any other compliant white reflective material a certificate of compliance shall be submitted to the TAA, for approval.

520. BRICKWORK CHAMBERS

1) Concrete in Brickwork Chambers

Unless otherwise specified Grade **C35/45** Concrete shall be used for the floors of all brickwork jointing chambers. When there is an Anchor Iron in the floor the floor must be allowed to set for at least 12 hours before commencing brickwork.

2) Brickwork

All brickwork shall be constructed with a 10mm joint thickness of cement mortar and shall be of English Bond with the exception of 102.5 mm brickwork (BS EN 772) which shall be of Stretcher Bond. The inside of all brickwork shall be flush jointed.

In a Brickwork JB102 a dispensation allows the joint thickness of alternate levels in the end wall to be nominally 20mm each end.

Test cube made from cement mortar used for the construction of jointboxes shall have a minimum strength of 16N/mm² after 28 days. The chamber shall not be opened to footway traffic until the cement mortar has achieved strength of 10N/mm²

Any requirement to corball brickwork, the bricks must be Class B Engineering bricks. The bricks shall be without holes or frogs. (HA-104)

521. FRAMES and COVERS

1) Frames and Covers Footway Type 'C' to BS EN 124 class B 125

Frames and Covers Footway Type 'C' to BS EN 124 class B 125				
Type of Frame and Cover	Used for Jointing Chambers	Dimensions of openings	No. of covers	Item Code
No.2	Type 102 & JB 26	725mm x 255mm	1	075874
No.4	Type 104	915mm x 455mm	1	075875
No.5	Manhole Shaft	610mm x 610mm	1	075876
No.6	Type 106	1310mm x 610mm	2	075877

No.10	Type 110	2315mm x 737mm	3	075878
No.11	Type 111	1690mm x 710mm	3	075879

Jointbox No. 23 has its own unique cover, and the box itself is the frame.

Precinct Frames and Covers shall be installed when required by BT and directed by the schedule of works. Block pavings shall be installed according to manufacturers' instructions.

See Paragraph 6 for installation of footway frames and covers.

**2) Frames and Covers Carriageway (Nos. 1, 2, 3 and 4; double triangular type.)
to BS EN124 Class D400 including Lockable**

Frames and Covers Carriageway (Nos. 1, 2, 3 and 4; double triangular type.) to BS EN124 Class D400				
Type of Frame and Cover	Used for Jointing Chambers	Dimensions of openings	No. of covers	Item Code
No.1F	All carriageway manholes and Newsites JCB3N	610 mm x 610 mm	2	057243
No.2F	JRCX12	1220 mm x 685 mm	4	057244
No.3F	JRCX11 and JRCX14	1830 mm x 685mm	6	057245
No.4F	JRC4 and JBC4	915 mm x 445 mm	2	057246

Note: Cover Connecting Pins must be fitted during the installation of triangular covers.
See Paragraph 7 for installation of carriageway frames and covers.

Frames and Covers Carriageway (Nos. 1, 2, 3 and 4; double triangular type.) to BS EN124 Class D400 LOCKABLE				
Type of Frame and Cover	Used for Jointing Chambers	Dimensions of openings	No. of covers	Item Code
No.1F	All carriageway manholes and Newsites JCB3N	610 mm x 610 mm	2	057247
No.2F	JRCX12	1220 mm x 685 mm	4	057248
No.3F	JRCX11 and JRCX14	1830 mm x 685mm	6	057249
No.4F	JRC4 and JBC4	915 mm x 445 mm	2	057250

Note: Cover Connecting Pins must be fitted during the installation of triangular covers.
See Paragraph 7 for installation of carriageway frames and covers.

3) Footway Lockable Frames and Covers.

When required by BT, and specified within the schedule of work, Manholes and Jointing chambers shall be fitted with Lockable Frames and Covers. Alternatively with Footway chambers you may fit

Plates Plant Protection (PPP) High Security, Enhanced Security (JUF & JBF 102/104) or Adjustable Enhanced Security (JRF&JBF 106/110/111).

Frames and Covers Footway Type 'C' Lockable to BS EN 124 class B 125				
Type of Frame and Cover	Used for Jointing Chambers	Dimensions of openings	No. of covers	Item Code
No.2	Type 102 & JB 26	725mm x 255mm	1	049830
No.4	Type 104	915mm x 455mm	1	049831
No.5	Manhole Shaft	610mm x 610mm	1	049832
No.6	Type 106	1310mm x 610mm	2	049833
No.10	Type 110	2315mm x 737mm	3	049834
No.11	Type 111	1690mm x 710mm	3	049835
Key Security 1A (Lockable F&C)				054834

The following tables identify the relevant CN Drawings and the number of Padlocks Special Security, plus the items needed to provide the security cover.

Footway Frame and Cover	CN Drawing(s)
No.2 PPP High Security (2 x Padlocks)	13713 & 13714
No.4 PPP High Security (2 x Padlocks)	13808 & 13809
No.6 PPP High Security (2 x Padlocks)	13893 & 13894
No.10 PPP High Security (2 x Padlocks)	11817 & 11818
No.11 PPP High Security (2 x Padlocks)	11819 & 11820
No.2 PPP Enhanced Security (1 x Padlock)	N/A
No.4 PPP Enhanced Security (1 x Padlock)	N/A
No.6 PPP Enhanced Security Adjustable (1 x Padlock)	CN15706
No.10A PPP Enhanced Security Adjustable (1 x Padlock)	CN15707
No.10B PPP Enhanced Security Adjustable (1 x Padlock)	CN15708
No.11 PPP Enhanced Security Adjustable (1 x Padlock)	CN15709

Drawing CN 15013 gives installation details for Plate Plant Protection.

Carriageway Frame and Cover	BT Item Code of Frame and Cover
No.1 (2 x Padlocks)	095140
No.2 (4 x Padlocks)	095141
No.3 (6 x Padlocks)	095142
No.4 (1 x Padlock)	TBC
Padlock Special Security	129260

When a Frame and Cover Carriageway No.1 is used the frame shall, whenever practicable, be installed so that the lockable inserts are positioned either side of the ladder or steps. Where due to site circumstances this is not practicable a TDFS will be permitted.

4) Weights of Frames and Covers

The tables below show approximate total weights of frames and covers. At all times safe lifting equipment and practices must be employed, and the use of mechanical lifting aids should be considered.

Carriageway Frame and Cover	Total Weight
Carriageway No. 1	206 kg
Carriageway No. 2	395 kg
Carriageway No. 3	567 kg

Carriageway No. 4

120 kg

Footway Frame and Cover, Type 'C' to BS EN 124	Total Weight
Footway No.2	38 kg
Footway No.4	72 kg
Footway No.5	66 kg
Footway No.6	133 kg
Footway No.10	276 kg
Footway No.11	198 kg

Footway Frame and Cover, Type 'C' Lockable to BS EN 124	Total Weight
Footway No.2	42 kg
Footway No.4	76 kg
Footway No.5	70 kg
Footway No.6	137 kg
Footway No.10	280 kg
Footway No.11	202 kg

The weights for the lockable footway F/Cs are for guidance only. To be confirmed at later date.

5) Concrete Surround

(i) **In carriageways** of flint, gravel, macadam, unsurfaced or other similar paving, the frame of a jointing chamber cover shall have a 150mm Grade C32/40 Concrete Apron surround, to the depth of the frame. Opening to traffic shall be subject to Par. 518 in respect of the surrounding reinstatement.

(ii) Where the carriageway has a concrete in-situ surface, a surround of concrete will be required around the frame of the jointing chamber cover.

(iii) **For carriageway covers in grass or soft or unmade surfaces**, to enable the safe removal of covers by mechanical means, a concrete surround shall be constructed around the frame, according to CN15353.

(iv) **For single course (102mm) brickwork and modular footway chambers (except JB23 & JB26) in grass or soft or unmade surfaces**, the frame shall be surrounded with a strip of minimum Grade C25/30 concrete to the full depth of the frame. This concrete surround shall be 50mm wide or extend to the outer edge of the chamber walls whichever is less.

(v) **For all other footway covers in grass or soft or unmade surfaces**, the frame shall be surrounded with a 100 mm wide strip of minimum Grade C25/30 concrete, to the full depth of the frame, finished level with the top edge of the frame and the outside edge finished straight and parallel to the frame.

(vi) **In all other situations**, no fillet is allowed around the frame.

(vii) Fillets around Modular Chambers in soft ground, where there is only a 65mm supporting structure below the frame. The concrete surround may be a 'chamfer screed' of sharp sand from the top outside edge of the frame to the outside edge of the supporting structure.

6) Installation of Standard Footway Frames and Covers

Footway Frames & Covers shall be bedded on a cement mortar mix. It is recommended that contractors use only quality and compliant materials as guarantee requirements will be enforced.

7) Installation of Standard Carriageway Frames and Covers.

Any materials compliant with HA104. It is recommended that contractors use only quality and compliant materials as guarantee requirements will be enforced.

Note: Cover Connecting Pins must be fitted prior to the installation of triangular covers.

8) Reinstatement of the carriageway and footway shall be commenced, in accordance with the relevant reinstatement specification, (see Part 6), after the minimum curing period for the frame bedding mortar material and the period from Par 518 (b) & (c) of this specification, have elapsed.

9) Opening to Traffic. Before opening to pedestrian or vehicular traffic the following conditions must be met:

a) The seatings of the Frame and Cover(s) shall be clean and the covers shall fit firmly, flush and level within the Frame. The covers shall not rock or foul any existing removable grids or the sides of the shaft or joint box walls.

b) If there is evidence of rocking or fouling, the cover shall be removed and remedial action taken to correctly fit the cover. The site shall not be left unguarded until the covers are correctly seated within the frame, in a manner acceptable to BT.

c) The minimum criteria of par 518 (c) and par 521 (6) and (7) shall apply.

10) Preparation and Changing the level of Existing Jointing Chambers - shall be in accordance with Part 9 of this specification.

11) Lifting Tools for BT covers

- For Footway covers, use Keys Joint Box No 5
- For Carriageway covers, use Lifter Manhole Cover No 4A.
- In exceptional cases, after on site risk assessments have been carried out and the appropriate precautions taken, T keys may be used for Carriageway covers.

N.B. BT does not supply keys or lifting tools, but they can be purchased from:

T W Engineering
 Angular House
 Eagle Road
 Quarry Hill Industrial Park
 Ilkeston
 Derbyshire
 DE7 4RB
 Tel 0115 932 3223

522. CABINET CROSS-CONNECTIONS

1) Excavation for Base

(i) **Excavations** of the size shown on Drawing CN 1464 suitable for the requisite cabinet cross-connection base shall be made in the positions indicated by BT.

(ii) **The bottom of each excavation** shall be well compacted.

(iii) **Removal of the existing cabinet** shall be carried out in a controlled manner such that any disturbance to the customer circuits are minimised. The frame, jumpering and ducted cables shall be protected at all times.

2) Provision of Base

(i) **Template** - a template shall be provided by the Contractor and used to register accurately the positions of the Bends Duct No. 54A and Bolts F.I. No. 1 and their position relative to the footway surface. The bends shall be so placed to give the required depth of cover on the duct leaving the Cabinet (Part 3 refers) to project 30 mm above the proposed base. Any surplus duct shall be cut off and removed after the base has been placed and the periods given in Par.522 (2)(ii) have elapsed. The foundation bolts shall be fixed in the template so that they are set vertically in the base and to project 40 mm above the proposed base.

The concrete plinth construction for street cabinets may maybe aided by the use of polymer templates such as “Poly lids” from permashutter. These are available for PCP No.7, and full range of DSLAMs. Whilst developed as an alternative to the Resin Pack 6 floor sealant, they also provide an accurate template for plinth construction and accurate duct alignment.

Where Cabinets are installed on sloping ground, it may be necessary for part of the base to be above ground, in order to fully open the Cabinet doors.

(ii) **Concreting** - prior to concreting, the ends of the PVC duct bends shall be sealed with plugs (Part 4 refers). Grade C32/40 Ready Mix or site mixed concrete shall be used for the base and shall be placed round the PVC duct bends and carefully levelled at a depth of 75 mm below the surface of the ground or paving, as measured at the centre of the base. The minimum period, after the completion of concreting, which must elapse before the Cabinet is erected, shall be as follows: -

Type of Cement Used	Period
Portland and Sulphate Resisting	12 hours
Rapid Hardening	8 hours

Where there is a risk of the bolts or fittings being disturbed or the stability of the cabinet is affected, the minimum period above shall be 24 hours unless the cabinet can be suitably braced and protected from disturbance.

(iii) Extending the Cabinet Base

Where the base of an existing cabinet is to be extended the adjoining surface of the in-situ concrete shall be scabbled by hand tools. The new template shall be positioned to align the duct entries and fixing bolts according to CN 1464. To facilitate standard left to right numbering for PCP Strips, any extensions if conditions allow are to be placed to the right of the existing cabinet base.

(iv) Additional Duct Entries to Cabinets (Cabinet expansions)

To facilitate standard left to right numbering for PCP Strips, new ducts must wherever possible, be brought in on the right hand side of the Cabinet, adjacent to the current last Duct entry unless otherwise indicated by the Works Originator. Where site circumstances prevent this, a non-auto TDFS must be obtained from the Works Originator for a Non Standard entry.

3) Erection of Cabinet**(i) Erection**

(a) Prior to the erection of the Cabinet, the surface of the concrete base shall be thoroughly cleaned and a bed of cement mortar shall be laid to a depth of 13 mm over that part of the surface on which the base flange will rest. The Cabinet internal walls shall be cleaned to a height of 40 mm from the base of the Cabinet to remove all rust, loose paint or materials. The Cabinet shall then be set on the cement mortar in a truly vertical position and secured by the foundation bolts. The cement mortar shall now be struck off in line with the internal surface of the Cabinet; on the outside the mortar shall be trowelled to form a fillet around the flange to assist in the shedding of water.

(b) When the mortar has set the Cabinet walls shall be cleaned and dried to a height of 40 mm from the concrete. When there is no surface water on the concrete surface inside the Cabinet, it shall be brushed to remove any dust and foreign matter. The appropriate number of Resin Packs shall then be mixed and poured on to the floor of the Cabinet and a good seal formed around the ducts and the Cabinet walls to a depth of 20mm \pm 5mm. (See Part 7 regarding Safety Issues).

If *foaming* occurs the Resin shall be removed and the process in (a) and (b) above shall be repeated.

(ii) **Backfilling of the excavation** shall proceed in accordance with Part 6 of this Specification.

(iii) **Sealing ducts entering Cabinets.** On completion of works to erect the cabinet the empty Ducts entering the cabinet shall be sealed according to Par 406 of this specification and cabled duct shall be sealed using Resin Pack No.14.

(iv) **Hardstand in front of cabinet** doors to be provided with a suitable HAUC CoP Footway Standard surface to provide a firm surface for safe access.

4) Key

A "Key Pillar" or "Key Cabinet" or individual key, obtainable from BT, is required to open all types of Cabinets Cross-Connection. On completion of works the doors of the cabinet shall be shut and locked, and the key returned to BT.

5) Stand-off cabinets**Excavation for Base**

(i) Excavations of the size shown on Drawing CN 1464(s8) is suitable for the requisite stand-off base and shall be made in the positions indicated. Drilling templates, available from the manufacturer, should be used to accurately align the Mk2 Stand-Off cabinets during installation.

Note: the Mk2 Stand-off has a 'non concrete plinth option', whereby a Permasoil stabilised backfill can be used to form the base (See Section 4.8 for the PeraSoil stabilised backfill option in EPT/UGP/B098 - Stand Off Cabinet Installation)

523. FTTC CABINET**1) Excavation for Base**

- (i) **Excavations** of the size shown on Drawing series CN15647 suitable for the requisite FTTC base shall be made in the positions indicated by BT.
- (ii) **The bottom of each excavation** shall be well compacted.

2) Provision of Base

- (i) **Template** - a template shall be provided by the Contractor and used to register accurately the positions of the Duct 36, Bends Duct No. 54A, Bends Duct 36B and Bolts F.I. No. 1 and their position relative to the footway surface. The bends shall be so placed to give the required depth of cover on the duct leaving the Cabinet (Part 3 refers) to project 30 mm above the proposed base. Any surplus duct shall be cut off and removed after the base has been placed and the periods given in Par.522 (2)(ii) have elapsed. The foundation bolts shall be fixed in the template so that they are set vertically in the base and to project 40 mm above the proposed base.

Note The Duct 36 depth of cover shall comply with Streetworks UK/NJUG documentation Volume 1, recommended DOC for electricity ducts.

An earth rods must be installed through the hole provided for the purpose on the passive side of cabinet before the root and cabinet are installed. All plinths must be provided measured and certificated with an earth value of 18 Ohms or less at point of construction.

Threaded earth rods need a minimum 25mm of rod above duct for the nut and washer connection. If thread needs to be removed (when unable to drive any deeper) a minimum 40mm of rod above the duct is needed for an earth clamp connection.

Where Cabinets are installed on sloping ground, it may be necessary for part of the base to be above ground, in order to fully open the Cabinet doors.

- (ii) **Concreting** - prior to concreting, the ends of the PVC duct bends shall be sealed with plugs (Part 4 refers). Grade C32/40 Ready Mix or site mixed concrete shall be used for the base and shall be placed round the PVC duct bends and carefully levelled at a depth of 100 mm below the surface of the ground or paving, as measured at the centre of the base. The minimum period, after the completion of concreting, which must elapse before the Cabinet is erected, shall be as follows: -

Type of Cement Used	Period
Portland and Sulphate Resisting	3 Days

3) Erection of Cabinet**(i) Erection**

- (a) Prior to the erection of the Cabinet, the surface of the concrete base shall be thoroughly cleaned and a bed of cement mortar shall be laid to a depth of 13 mm over that part of the surface on which the root flange will rest. The Cabinet internal walls shall be cleaned to a height of 40 mm from the base of the Cabinet to remove all rust, loose paint or materials. The Cabinet shall then be set on the cement mortar in a truly vertical position and secured by the foundation bolts. The cement mortar shall now be struck off in line with the internal surface of the Cabinet; on the outside the mortar shall be trowelled to form a fillet around the flange to assist in the shedding of water.

(b) When the mortar has set the Cabinet walls shall be cleaned and dried to a height of 40 mm from the concrete. When there is no surface water on the concrete surface inside the Cabinet, it shall be brushed to remove any dust and foreign matter. The appropriate number of Resin Packs to facilitate a depth of 20mm shall then be mixed and poured on to the floor of the Cabinet and a good seal formed around the ducts and the Cabinet walls to a depth of 20mm ± 5mm. (See Part 7 regarding Safety Issues).

If *foaming* occurs the Resin shall be removed and the process in (a) and (b) above shall be repeated.

(ii) **Backfilling of the excavation** shall proceed in accordance with Part 6 of this Specification.

(iii) **Sealing ducts entering Cabinets.** On completion of works to erect the cabinet the empty Ducts entering the cabinet shall be sealed according to Par 406 of this specification and cabled duct shall be sealed using Resin Pack No.14.

(iv) **Hardstand in front of cabinet** doors to be provided with a suitable HAUC CoP Footway Standard surface to provide a firm surface for safe access. To include likewise a firm surface to side entry power door areas, **but not** forming extension of cabinet front facing access doors. See CN15725.

FTTC User Manual is available in both the Bookstore and for Contractors on the Candid Web Site.

Bookstore:

http://documents.intra.bt.com/bookstore/isis/ept/i_eptans/lansa042/@Generic_BookView

Candid Site : (EPT/ANS/A042)

http://accesscontracts.extra.bt.com/documentlibrary/documents/isis/ept/ans/new_default.htm

JOINTING CHAMBERS

Appendix A

List of materials for use in BT Underground Jointing Chambers (Par 519 refers):

1) BASF MasterSeal 588 supplied by:

BASF Construction Chemicals (UK) Ltd.
Earl Road
Cheadle Hulme
SK8 6QG Cheadle, Cheshire
P.O. Box 4

Phone +44 161 485 6222
Telefax +44 161 486 0891
E-Mail enquiriesuk@basf.com

Product details:

[MasterSeal 588 data Sheet](#)

SPECIFICATION LN 550 - 6

**UNDERGROUND DUCT LAYING AND ASSOCIATED
WORKS**

PART 6 - REINSTATEMENT OF HIGHWAYS

CONTENTS

- 601. GENERAL**
- 602. COMPACTION**
- 603. FRAME and COVER SEALING**
- 604. OBLIGATIONS**

601. GENERAL

The Contractor shall execute the interim and permanent reinstatement in accordance with the provisions of The New Roads and Street Works Act 1991 and associated HAUC Specification for the Reinstatement of Openings in Highways.

In problematic locations where it is difficult to achieve a good reinstatement around carriageway covers (e.g where the quality of the road is poor), liquid mastic asphalt may be used, with the prior approval of BT and the Highway Authority.

To confirm quality of reinstatement, BT may instruct the taking of core samples.

602. COMPACTION

- 1) The periods of time between the placing of concrete and the commencement of backfilling shall be in accordance with Sections 4 and 5 of this Specification, and must be strictly followed.
- 2) All spaces outside the walls of jointing chambers, shall be carefully filled in with granular material or concrete and compacted, care being taken to ensure that compaction does not disturb recently completed work.
- 3) All duct installed by open cut and cover methods and not laid in concrete shall be covered by a layer of "Earth Free From Stones", in accordance with Part 4, and compacted to a thickness of not less than 75mm.

603. FRAME and COVER SEALING

Prior to reinstatement in a bituminous surface, the outside of any BT Frames shall be cleaned of all loose material and primed with an approved edge sealant. Edge Sealant should not be used for Overbanding.

604. OBLIGATIONS

Whatever method is used, the filling-in and restoration of Streets shall comply with the obligations imposed on BT by the New Roads and Streets Works Act 1991 or in Northern Ireland by the Street Works Northern Ireland Order 1995.

SPECIFICATION LN 550 - 7

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

PART 7 SAFETY PRECAUTIONS

CONTENTS

- 701. GENERAL**
- 702. COMPOUND NO 21 AND METHYLATED SPIRITS**
- 703. RESIN PACKS**
- 704. Paragraph removed**

701. GENERAL

(a) Ducts, pipes and cables existing in the ground shall not be diverted either by levering or otherwise. They shall not be allowed to rest upon, other than as a temporary means of support, or be incorporated into any BT structure or duct unless instructed to do so by a BT representative. BT duct or cabling shall not be allowed to rest upon other existing duct, pipes and cables.

(b) Paraffin lamps shall not be used within the vicinity of any excavation or structure. Only Battery operated lamps are permissible in such circumstances.

(c) Smoking is not permitted as per the par above.

(d) Where it is proposed that LASER (Light Amplification by Stimulated Emission of Radiation) equipment is to be used in connection with any work to this specification, BT must be informed in advance of work commencing.

702. COMPOUND No 21 and METHYLATED SPIRITS

When using or working with either of these materials, care should be taken to ensure that working areas are adequately ventilated. Naked flames should not be used under any circumstances, this to include smoking.

703. RESIN PACKS

When mixing or using Resin Packs, the manufacturers instructions must be followed and

(a) Barrier cream should be applied to the hands and forearms if exposed.

(b) Disposable gloves shall be worn.

(c) After use, all soiled containers, waste and gloves are to be correctly disposed of.

(d) The Resin shall always be mixed in a well ventilated place.

| (e) Safety Goggles and dust masks should be used during mixing of materials.

704. Paragraph Removed

SPECIFICATION LN 550 - 8

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

PART 8 DESIGN CRITERIA FOR MANHOLES

CONTENTS

801. SPECIFICATIONS.

802. DESIGN CRITERIA.

801. SPECIFICATIONS.

Where British Standards, or other specifications, are quoted these will be current issues adopted by the British Standard Institution or relevant Authority. Where equivalent European Standards, to those quoted, exist, then the European Standards must be adhered to insofar as they are deemed to apply.

802. DESIGN CRITERIA.**1) Design Standards**

The structures are to be designed in accordance with the following;

BS 4449	-	- Steel for reinforcement of concrete
BS 5400	Part 1	- General Statement.
BS 5400	Part 2	- Specification for loads.
BS 5400	Part 4	- Code of Practice for design of concrete bridges.
BS 8110	Part 1	- Structural Use of Concrete - Code of Practice for design and construction.

Department of Transport Standards

BD 15/92 - General principles - use of BS 5400 Part 1.

BD 24/92 - Design of concrete bridges - Use of BS 5400 Part 4.

BD 31/01 - Buried concrete box type structures. (Excluding clauses 5.5 and 5.6).

BD 37/01 - Loads for highway bridges.

2) Live Loading

Full HA loading, to BS5400: Part 2 as revised and amended by

Department of Transport Standard BD37/01 - Loads for Highway Bridges - must be applied.

45 Units of HB loading, to BS5400: Part 2 and as defined by Department of Transport Standard BD 37/01 - Loads for highway Bridges - must be applied.

3) Span and Articulation arrangements.

All Roof, Wall and Floor arrangements must be single way spanning.

All Roof to Wall connections are to be fixed. Pinned connections are not accepted.

4) Concrete

The Characteristic strength of concrete f_{cu} is 45N/mm^2 . minimum. Where in situ conditions require the use of higher Characteristic strength concrete approval must be obtained from the Openreach, Access Engineering In-Life unit.

The minimum thickness of Roof, Wall and Floor slab units shall be 200mm.

5) Reinforcement

All main tension reinforcement must be Type 2 to BS4449 with a specified characteristic strength (f_y) of 500 N/mm^2 .

All main tension reinforcement shall have a minimum diameter of 16mm and be spaced at 150mm across centres. Where the bars occur on the internal faces of the structure they shall be located in a square grid format and extend the full length and breadth of the Roof, Wall and Floor slab units.

All external faces of the structures Roof, Wall and Floor slabs shall have secondary reinforcement, in addition to tension reinforcement in place, located in a square grid format extending the full length and breadth of the Roof, Wall and Floor slab units. In locations where tension reinforcement provides a suitable square grid then the requirement for secondary reinforcement can be waived. All secondary reinforcement shall be plain round steel bars to BS4482, BS EN 10025-1 or BS EN 13877-3 (ref. item 203.reinforcement, para.1) with a specified characteristic strength (f_y) of 250 N/mm²., have a minimum diameter of 8mm and be spaced at 300mm across centres.

All bar shape codes to refer to BS 8666, Specification for scheduling, dimensioning, bending and cutting of steel reinforcement for concrete.

6) Water table

Where exact information is not available the water table shall be assumed to occur at 1.0m below existing ground level.

7) Buried depth

For the purposes of analysis the structure should be designed for buried depths of 300mm and the actual in-situ or planned depths.

The maximum buried depth to the top of the roof level (inclusive of the frame and cover), for any structure, must not exceed 3.0m.

8) Internal height.

The maximum internal height of the structure is to be 2.7m. and the minimum internal height is to be 2.0m. Any deviation from this requirement must be approved by the Openreach, Access Engineering In-Life unit.

Where in-situ parameters are not compatible to the above requirement then the use of a two tier, or multi-tier, structure should be considered. Prior to the design of any multi-tier structure approval must be obtained from the Open reach, Access Engineering In-Life unit.

9) Design Calculations and Drawings.

Each non-standard structure must be supported by design calculations and construction drawings.

Design calculations must be approved by a Chartered Civil or Structural Engineer, who is a member of the British Institution of Civil or Structural Engineers or other professional body recognised by the Institutions, and has sign off responsibility for the company.

Each non-standard structure must have a general arrangement drawing supported by reinforcement detail drawings to ensure construction is carried out in accordance with the requirements of the design calculations. The general arrangement drawing must clearly indicate the positions of all duct entry points, cable bearers, sump, and anchor irons, manhole steps and manhole entry point. A typical example of a general arrangement drawing is shown on drawing CN14103.

The access shaft to the chamber is to be in accordance with drawing CN1153.

10) Submissions.

One copy of all design calculations and two prints of all drawings must be submitted to:

Underground Networks Group (TAA)
Openreach – Access Engineering & Innovation
Post Point G05
Sidcup Tel Exch
4 – 6 Station Road
Sidcup
Kent
DA15 7ED

Phone No. 020 8302 6632
Fax No. 020 8302 6798

SPECIFICATION LN 550 - 9

UNDERGROUND DUCT LAYING AND ASSOCIATED

WORKS

PART 9 RE-LEVELLING OF FRAMES AND COVERS IN THE FOOTWAY AND CARRIAGEWAY

CONTENTS

- 901. GENERAL
- 902. TESTING FOR GAS
- 903. TESTING FOR WATER
- 904. INSPECTION OF FRAMES AND COVER/S
- 905. RE-LEVELLING FRAMES AND COVERS - FOOTWAY
- 906. RE-LEVELLING FRAMES AND COVERS – CARRIAGEWAY
- 907. Paragraph Removed
- 908. SECURITY
- 909. REINSTATEMENT

901. GENERAL

- 1) This specification describes the methods to be used for re-levelling frames and covers in the footway and carriageway. The work shall include the re-bedding or extending of the chamber/shaft of up to two courses of engineering brickwork or the placement of slip bricks or tiles to achieve the correct surface level.
- 2) For types and weights of BT Frames and Covers, footway and carriageway refer to Part 521 of this specification.

902. TESTING FOR GAS

The contractor shall take all necessary steps to ensure that the jointing chamber is free from unsafe and flammable gases before commencing work. If gas is discovered then the cover is to be carefully replaced and no further work is to take place. The matter must be reported immediately to BT Gas Reporting on 0800 212458. If unobtainable, the matter shall be reported to Transco on 0800 111999. All other necessary and /or appropriate action shall be taken.

903. TESTING FOR WATER

In the event of a waterlogged chamber needing to be pumped out, the Contractor shall carry out a water test prior to pumping - to ensure that the water has not become contaminated. Where pollutants or contaminants are found, appropriate action shall be taken to remove the water and/ or material in a careful, responsible and environmentally friendly manner. The material shall not, under any circumstances, be pumped into the public drainage system or waterways.

In testing and removing water in BT chambers the Contractor shall adhere strictly to the Environment Agency's Pollution Prevention Guidance 20, ([PPG20](#)). The Authority is not authorised to carry out testing and pumping of water in chambers other than in accordance with this guidance.

904. INSPECTION OF FRAMES AND COVERS

- a) If the existing frame and cover/s is not fit for re-levelling then they shall be replaced by the appropriate BT standard item.
- b) Where a frame and cover/s is unsuitable and the replacement item is larger than the existing chamber (walls or shaft) refer to drawing CN 1750.
- c) If the original frame and cover is to be reused all covers must be marked so that when replaced they occupy the same position in the frame that they occupied before the removal.

905. RE-LEVELLING OF FRAMES AND COVERS - FOOTWAY

- 1) An area around the existing frame shall be excavated to dimensions that will allow adequate space for materials and compaction tools used for the final reinstatement see Part 6 of this Specification. During excavation care shall be taken not to damage the chamber walls or shaft. The cover shall be removed and prepared for reuse if applicable.

Once the cover/s and cross piece/s are removed, the frame shall be removed from the chamber. If the frame and covers are suitable for re-use it shall be prepared for reuse by removing all the old bedding material, debris and rust. All existing bedding material shall be removed from the uppermost surfaces of the chamber (walls or shaft) to leave a clean dry surface.

All brickwork or concrete on which the frame is to be bedded must be sound and if necessary removed, re-bedded or re-pointed.

2) If the change in level is less than 50mm then either;

a) A suitable bed of mortar shall be trowelled around the uppermost surface of the chamber (walls or shaft) and the frame tamped and bedded on the mortar so the frame is level with the surface. All voids under the frame shall be filled with mortar and any excess mortar shall be neatly trowelled and struck off in line with the inside of the frame.

b) Bed the frame in position level with the final footway surface. All voids under the frame shall be filled with mortar and any excess mortar shall be neatly trowelled and struck off in line with the inside of the frame. Remove packing pieces and fully fill voids with mortar.

3) If the change in level is greater than 50mm, then suitable propriety and purpose made packing material or dry bricks to increase the chamber (walls or shaft) height must be considered.

4) If the new level is less than the existing surface then a course/s of brick may have to be removed using non percussive methods. If the chamber is of concrete construction non percussive methods must be adopted. If any steel reinforcement is encountered then the exposed steel must be cut and treated with a suitable rust inhibitor.

Where there is a difference between the width of chamber wall i.e. 150mm concrete and 215mm brick, the entire width of the wall will require building up to the required level. When using bricks on thinner concrete walls the brick will require cutting with saw or chisel. This may make it better placing a concrete ring beam instead of bricks. The frame must not be bedded on a just a single course 102.5mm of brick unless the constructed chamber itself is single course i.e. JBF102 or JBF104 chambers.

The local BT representative must be contacted with regards to what reduced levels are acceptable for both brick and concrete chambers.

In all eventualities the placing of the cover/s shall not take place until 12 hours have elapsed if cement mortar is used. If a rapid cure bedding material has been used, covers can be placed in accordance with the manufacturers recommendations.

On completion the cross piece/s shall be replaced and the cover/s shall fit firmly in the frame and not rock. If the covers rock corrective action is required to ensure the cover is free from debris and bedding material. A rocking cover is a safety hazard to pedestrians and will not be accepted by BT

906 RE-LEVELLING OF FRAMES AND COVERS - CARRIAGEWAY

1) Carriageway Bedding Material;

- a) All Mortar & Bedding material used to support the frame, shall be compliant with Design Manual for Roads and Bridges HA104/09 Section 6, and shall be used in conjunction with the manufacturers' recommendations
- b) The Mortar & Bedding material shall be prepared using powered, mechanical mixing equipment, in accordance with the suppliers recommendations.
- c) A Mortar bead shall be applied to the inside gap between the frame and chamber, to provide an inner seal. The Bedding material shall be pourable and applied to the underside and surrounding areas of the frame, up the 'bedding indicator' marking on the carriageway frame.
- d) The Contract shall provide a detailed 'Method Statement' for the preparation and application of the bedding materials and general Re-levelling of Carriageway Frames & Covers.
- e) The Contractor shall provide and maintain an 'Approved Materials List' detailing BBA HAPAS Certificates and suitable applications. 'Provisional Approval' may be granted to materials with a supporting 'plan for BBA Certification'.

2) Materials; Only approved materials shall be used.

- a) Bricks and mortar as per Part 2 of this specification
- b) Bedding materials compliant with HA 104.

3) Requirements

If the original Frame and cover are to be re-used all covers shall be marked so that when replaced they occupy the same position within the frame as before their removal. The cover shall be removed and prepared for reuse if applicable by removing all the old bedding material, debris and surface corrosion.

An area around the existing frame shall be excavated to dimensions that will allow adequate space for materials and compaction tools used for the final reinstatement see Part 6 of this Specification. During excavation care shall be taken not to damage the chamber walls or shaft.

All existing bedding material shall be removed from the uppermost surfaces of the chamber (walls or shaft) to leave a clean dry surface, a minimum 165mm below the carriageway level by cutting back or building up as described in part 905 of this specification. The gap between the frame and chamber shall be typically 12 mm – 50 mm. The finished surface must be free from debris and any deposits that are detrimental to the bedding material.

Where there is a difference between the width of chamber wall i.e. 150mm concrete and 215mm brick, the entire width of the wall will still require building up to the required level. When using bricks on thinner concrete walls the brick will require cutting with saw or chisel. This may make it better placing a concrete ring beam instead of bricks.

If the new level is less than the existing surface then a course/s of brick or the required level of concrete may have to be removed using non percussive methods. If any steel reinforcement is encountered then the exposed steel must be cut and treated with a suitable rust inhibitor.

If the covers rock corrective action is required to ensure the cover is free from debris and bedding material. A rocking cover will not be accepted by BT.

Note: Cover Connecting Pins must be fitted prior to the installation of triangular covers.

The latest range of carriageway frames & covers from Saint Gobain are supplied with InstallPlus levelling system as described in the installation guide.

4) High Friction Carriageway Covers

The first option should be the renewal of the carriageway frame & cover with consideration to installing the Saint-Gobain 'Griptop' option, available on special order for the CW1, 2 & 3 range. In exceptional circumstances and with approval of the TAA, an existing carriageway cover may have a high friction coating applied whilst in situ. Proprietary materials such as Safetrack or equivalents may be considered where the installation present a unique set of problems.

907. Paragraph Removed

908. SECURITY

- 1) For CN Drawings refer to part 521 of this Specification
- 2) To enhance security against the unauthorised entry of BT chambers, when Lockable Frames and Covers are renewed, relevelled or replaced, the Frame shall be bedded on the shaft or chamber, with Bedding compliant with HA104.

909. REINSTATEMENT

- 1) Where products compliant with HA104 have been used, for levelling or re-levelling Frames and Covers, the reinstatement can commence in conjunction with the manufacturers recommendations..
- 2) Prior to reinstatement in a bituminous surface, the outside of the frame shall be primed with an approved edge sealant.
- 3) Reinstatement shall be in accordance with Part 6 of this Specification.

910. CARRIAGEWAY REPAIRS

For repairs around the carriageway frame, proprietary high performance reinstatement materials may be used, especially for high impact installations where the frame & cover service life is challenged by traffic loading (i.e. articulated lorries), high traffic volumes and the position of the chamber in the wheel-line”.

SPECIFICATION LN 550 - 10

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

PART 10 – TOOLS, PLANT AND EQUIPMENT

CONTENTS

1001. UNIQUE BT ARTICLES REQUIRED BY THE CONTRACTOR

1001. Unique BT Articles Required by the Contractor.

The articles named in the following list may be required: -

Anchor Irons for Jointing Chambers Bends, Duct Bolts, No. 37 and 38 Bolts, Foundation Indented (FI) Boxes, Joint, No. 23 and 26 Brackets, CN 14051, CN 14071 or CN 14089 Brackets, Joint Box Brushes Cylindrical for cleaning ducts Cabinets, Cross-Connection Cabinets NGA Cable Brackets / Bearers / Pins Locking Cable, Protected and Unprotected Capping, Steel or PVC Clips Binding Collars, Duct Compound No. 14B Compound No. 16A Compound No. 21 Connectors, Bend Couplings, all types Draw Rope No. 1	Ducts, PVC, Steel and Polyethylene or other types as specified and associated fittings Duct Seal 1A & 1B, 1C & Rise Seal Frames and Covers for Jointing Chambers - all types Gratings, Sump Keys, Joint Box Key, Lifting, for Manhole Covers Keys, Pillar/Cabinet Ladders, MS with Hooks and Bar Markers, Cable No. 2 Nails, Bonding Posts, Marking Plugs Duct 1A & 4B & 4C Plugs Pressure 1 & 3 Spacers, Duct, Nos. 2 and 3 Steps, Manhole Strips, Binding Tape, Plastic, Adhesive Washers, No. 19
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SPECIFICATION LN 550 - 11

UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS

PART 11 - JOINTING CHAMBER REFURBISHMENT

CONTENTS

11.1. GENERAL

11.2. SAFETY

11.3. STEPS MANHOLE

11.4. CABLE BEARERS WALL TYPE

11.5. OTIAN EQUIPMENT

11.6. LADDER, HOOKS AND BAR

11.7. WARNING SIGNS

11.8. BT STORE ITEMS

11.1. GENERAL

This specification details the requirements for the retrospective fitting or refurbishment of Jointing Chamber furniture and the fitting of Otian equipment, fixtures and Warning Signs.

11.2. SAFETY

- a) All work shall be carried out safely according to the current terms and conditions of NIC and Part 7 of this Specification and in accordance with BT's minimum requirements for Confined Spaces Working and working in Radon affected manholes.
- b) Where work involves drilling into a structure, appropriate precautions shall be made to ensure no other plant or services will be encountered, additionally tests shall be made to ensure any structural reinforcing steel bars are avoided.
- c) Where a step has been omitted and is to be fitted retrospectively, the step shall be fitted in accordance with the relevant CN Drawing or BT works instruction.
- d) Where a defective step is to be cut away and repositioned, it should be fitted immediately above the original step or according to the relevant CN Drawing or BT works instruction.
- e) Where due to site conditions the new position is greater than 25mm from the position designated by BT, the works shall be stopped until a Technical Departure From Specification (TDFS) has been agreed with BT.
- f) Any step fitted more than 25mm from the designated position or the position agreed with BT may be considered to be defective and may be removed.
- g) Steps shall be fitted true and level and shall be fixed according to the relevant CN Drawing. Any step that is not fitted correctly shall be considered defective and shall be removed.

11.3. STEPS MANHOLE

1) Step Removal. If an existing step is to be cut away or removed this should be carried out by the use of an angle grinder or other safe method. ***A flame shall not be used to cut a galvanised step.*** The step shall be cut flush with the wall. On completion no sharp edges, burrs or projections shall be left.

2) Step Replacement. A Step Manhole No 1 or 2 may be fitted as the replacement step in a manhole shaft or access chamber shaft, or within any jointing chamber.

3) Fitting a Step Manhole No 1.

Where a step has been omitted, a Step No.1 may be fitted or, at the contractors discretion, a Step No. 2 may be fitted.

To accommodate the legs of the new Step No.1, two 30mm diameter holes shall be drilled with a good masonry drill bit. The step shall be offered to the holes so that the front lug is flush with the

surface of the wall. It is acceptable to remove the far upstand of the Step if the Step proves difficult to place in the 30mm-drilled hole.

A mortar or resin mortar of 45 Nm strength shall be placed into the full depth of the holes, and the step shall then be driven into position without causing damage to the step.

The front lug shall be flush with the surface of the wall and the face of the wall made good around the legs of the step with the material used.

If mortar is used, the mortar shall be allowed to cure for a minimum of 12 hours before the step is used, for Resin Mortar a curing time of 2 hours must elapse.

4) Fitting a Step Manhole No 2.

The Step shall be fitted to the wall in the position shown on the relevant CN Drawing or alternative position agreed with BT.

A secure fitting must be achieved using Bolts Expansion 1A placed through all the fixing holes in each step. To achieve a secure fixing each bolt requires a clean and precise hole 13mm in diameter, drilled 65mm deep. The hole must be drilled into reinforced concrete or brickwork, and not into the mortar.

5) Tolerance

On completion the Step No.1 or 2 shall be true and level to ± 5 mm at the tip and in the position designated by the drawing for the chamber.

11.4. CABLE BEARERS WALL TYPE

- 1) The Cable Bearer type specified in the works instruction shall be used.
- 2) Removal of an existing Bolt Foundation shall be carried out by the use of an angle grinder to cut out the Bolt. On completion no sharp edges, burrs or projections shall be left.
- 3) Fixture of a new or replacement Cable Bearer shall be in the position designated in the relevant CN Drawing or works instruction. Each Cable Bearer shall be fixed on the wall of the chamber using two Bolts Expansion 1a. Each bolt shall be fitted to the wall in a clean hole 13mm in diameter, drilled 65mm deep.

11.5. OTIAN EQUIPMENT

All fixtures are to be fitted according to the relevant OTIAN drawing.

11.6. LADDER, HOOKS and BAR

1) Ladders Steel

Where required the ladder shall be replaced with the following, specified, standard sizes; 2150mm, 2300mm, 2400mm, 2600mm and 3750mm. Intermediate sizes can be obtained by cutting a longer ladder to suit the local requirement. On completion all sharp edges, burrs and projections shall be removed.

2) Ladder Hook Removal

To fit a replacement hook, the existing shall first be cut away or removed this should be carried out by the use of an angle grinder. The Hook shall be cut flush with the wall. On completion all sharp edges, burrs and projections shall be removed.

3) Ladder Hook Replacement

The position where the hooks are to be placed shall be marked ensuring that any reinforcing bars shall not be encountered. A hole 35mm diameter and 100mm in depth shall be made with masonry drill bit, or similar.

A propriety grout or resin materials of at least 45Nm shall be placed into the hole and the hook driven into the hole. On completion the face of the hole shall be made good with the same material and allowed to cure for 2 hours before the ladder bar and ladder are placed.

4) Ladder Bar

When 2 hours have elapsed the ladder bar and ladder shall be replaced.

11.7. WARNING SIGNS

- a) Any warning sign that requires to be fitted, e.g. “Exchange Manhole Ventilation” or “Multi-Level Manhole” will be specified by the works originator and issued locally.
- b) Signs must be placed in a position that will allow any person entering the chamber visible sight of the sign when removing the access cover. (i.e. at the top of the shaft above the ladder or steps, immediately below the frame and cover.)
- c) A 5mm masonry drill bit shall be used to make the appropriate fixing holes, and the sign shall be secured to the structure with masonry rawl plugs and galvanised screws.

11.8. BT STORE ITEMS

Step Manhole No1	(item code 072136)	CN 1168
Step Manhole No2	(item code 073132)	CN 14168
Bolt Expansion 1A	(item code 071906)	
Ladders Steel	(item code 094911-19)	CN1161
Bar for Ladder Steel	(item code 100041)	CN1161
Hook for Ladder Steel	(item code 100425)	CN1161.

Note: A Ladders Steel is issued with two hooks and bar, but Ladder hooks and bar can be ordered separately.

SPECIFICATION LN 550 - 12**UNDERGROUND DUCT LAYING AND ASSOCIATED WORKS**

PART 12 EXCAVATION & REINSTATEMENT TO FACILITATE A POLE EXAMINATION

CONTENTS

12.1. GENERAL

12.2. SAFETY

12.3. POLE EXAMINATION

12.4. EXCAVATION

12.5. EXCAVATED MATERIALS

12.6. REINSTATEMENT

12.1. GENERAL

1) This specification details the requirements for excavation around Poles that will enable a BT Pole Examiner to undertake a below ground-level Pole Examination, and the subsequent permanent reinstatement.

2) The Contractor shall excavate in the Highway, in strict accordance within the requirements of the NRSWA 1991, and in accordance where applicable to BS6031; (CoP for Earthworks), in positions so directed by the schedule of works.

3a) England & Wales

All works are deemed to be excavation in the highway and now require correct noticing.

(b) Scotland & N Ireland

All work is deemed to be “Minor Works Without Excavation”, and will not need noticing unless undertaken in a traffic sensitive situation.

4) Approved Permanent Cold-Lay Materials (PCMs) should be considered for use as a surface material where applicable.

12.2. SAFETY

1) All work shall be carried out safely according to the current terms and conditions of the contract document NIC and this Specification.

2) Excavation **SHALL NOT** be undertaken unless a General Pole Examination to BT ISIS instruction EPT/OHP/C022 has been carried out prior to the work by the Contractor.

3) Excavation **SHALL NOT** be undertaken around any Pole marked ‘D’. (Red aluminium label with embossed D.)

4) Excavation **SHALL NOT** be undertaken around any Pole where;

- a) the 3 metre mark on that Pole is more than 1.8 metres above ground level
- b) a 3 metre mark is not visible on the Pole

Where these situations arise, the Contractor shall seek further instructions from the local BT representative.

12.3. POLE EXAMINATION

1) Prior to any work, the Contractor shall carry out a pole examination to BT [ISIS EPT/OHP/CO22](#). If any factors indicate that excavation around the pole may cause a hazard, or otherwise endanger the structural integrity of the pole, the excavation should not proceed and the matter shall be reported to the BT representative. The pole examination shall be conducted by a competent person who has attended a BT, or applicable, training course for pole examination.

12.4. EXCAVATION

1) Excavation

All excavation shall be carried out in a controlled manner. Prior to this, all necessary tests for avoidance of underground services shall be carried out, using equipment and methods that are appropriate for the task.

2) Damage to Pole

Any damage to the pole, during excavation or reinstatement, must be dealt with according to BT ISIS instruction [EPT/OPH/C022](#).

3) Dimensions

An excavation shall be made around the pole, 300mm in depth and a minimum 200mm from the outer circumference of the Pole.

4) Obstructions

Where obstructions do not allow for the dimensions above to be excavated, the maximum achievable shall be excavated. Where two thirds (2/3) excavation around the pole cannot be achieved, no excavation shall commence until the contractor has contacted the local BT representative for further instructions.

5) Mechanical Aids

Wherever reasonably practicable, hand digging techniques shall be adopted. Where mechanical aids are required to break out the top surface, care must be taken to ensure the Pole is not damaged.

12.5. EXCAVATED MATERIAL

1) Excavated Material

All excavated material shall be re-used except for:

- a) The top surface material that is classified as surfaced, i.e. metalled, concrete or bound by bitumen.
- b) Materials that contain particles greater than 37.5mm nominal size or that are classified as Class E backfill materials as per Appendix 1 of the HAUC Specification for the Reinstatement of Openings in Highways.
- c) Materials with the incorrect moisture content that can not be adequately compacted.

2) Materials for Re- Use

All excavated materials that are to be re-used shall be segregated and protected from undue drying, wetting or contamination.

3) Waste Excavated Material

All waste material shall be disposed of appropriately. It is anticipated that all waste material will be “inert” and not “hazardous”. However where materials are deemed to be hazardous they shall be disposed of in a competent, professional and environmentally responsible manner.

12.6. REINSTATEMENT

1) Reinstatement

All reinstatement shall be “permanent” on the first visit and in accordance with the HAUC Specification for the Reinstatement of Openings in Highways.

2) Backfill Material

Where excavated materials are to be re-used, they shall comply with part 12.5 of this Specification and be replaced in the sequence that they were excavated.

Backfill compaction to HAUC Specification for the Reinstatement of Openings in Highways..

If the materials excavated cannot be replaced for any reason, then imported materials that closely match the excavated materials shall be used providing they comply with part 12.5 of this specification and the HAUC Specification for the Reinstatement of Openings in Highways.

Imported Granular materials shall not be used unless they match the existing surround.

3) Surface Reinstatement

The top surface shall match the existing surface and be reinstated in accordance with the HAUC Specification for the Reinstatement of Openings in Highways, specifications S.6, S.7, S.8 and S.9.

A bitumen-based edge sealant shall be applied to the vertical edges of the existing surface.

Hand tamping or proprietary vibrators shall be used for compaction. Where proprietary vibrators are used, care must be taken to ensure the Pole is not damaged.

4) Approved Permanent Cold-Lay Materials

Only approved wearing course PCM's shall be used as a permanent wearing course reinstatement material.

LN550 CHANGE RECORD

Issue	Date	Details of Change	Author
A	01/09/97	Specification revised and new Parts added.	J.H Verona

2	23/02/01	Specification revised and new Parts added. Paragraphs that have been amended are indicated by a vertical line on the left hand side of the paragraph.	J. Brown
3	30/11/03	Specification revised and new Parts added. Paragraphs that have been amended are indicated by a vertical line on the left hand side of the paragraph.	A. Ogundiya
4	12/01/04	Minor revisions to Specification.	A. Ogundiya
5	05/04/04	Changes to duct proving test in Section 401	A. Ogundiya
6	16/12/04	Changes to sections 502, 522 & 905 for Mod JB104 and supplier details	A. Ogundiya
7	30/11/07	Change of Author	D. Cusselle
8	12/01/11	Amendments due to document review.	D. Cusselle
9	?	?	?
10	3/04/12	Section 404A added – AEI/AEC/B001 (Duct 78) integrated. DCC52PD (Old 1381)	P Downes
11	20/02/15	Various amendments covering Carriageway Frame/Cover Re-Levelling and Trenchless Technology see 906.1 and 407.1	C.Morrell