WORK PROCEDURE FOR SERVICE LAYING

Up to and including 63mm diameter at pressures up to and including 2 bar

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Title:	**Work Procedure for Service Laying - up to and including 63mm at pressures up to and including 2 bar**
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Foreword

This Work Procedure was approved by the Engineering Policy Manager, on 1st June 2013 for use throughout National Grid.

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Brief History

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Mandatory and non-mandatory requirements

In this document:

shall: indicates a mandatory requirement.

should: indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment shall be completed to show that the alternative method delivers the same, or better, level of protection.

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SECTION	AMENDMENTS (shown in Blue)
	INTRODUCTORY SECTIONS
4. Health & Safety at Work act 1974 4.2.2 Employees Duties	Addition to Employees Duties: Availability on site of Identification cards and Accreditation cards CHANGE - Additional Bullet point: • Have available Identification cards and where appropriate Accreditation cards. (See Appendix I)
4. Health & Safety at Work act 1974 4.2.3 Team Leader Ratio to Assistants and Trainees	Additional information provided for the ratio of operatives in a team: CHANGE - Additional paragraphs and bullet points • Provides guidance on the ratios of Team Leader and assistant / trainee o Team Leader 1 Assistants Min 1, Max 2 Trainee Max 1 • Provides description of Team Leader, Assistant & Trainee – GN02, GN01 etc. • Requirement to carry EUSR cards at all times
6. Safety & environment 6.1 General guide to Safe Working	Additional information regarding ground conditions in relation to Slips, Trips and Falls CHANGE - Additional bullet point included for Slips Trips and Falls i) that you review ground conditions to prevent Slips, Trips and falls especially during the winter months
6. Safety & environment 6.5 Personal Protective Equipment	Additional information included for eye and ear protection. CHANGE – A minimum requirement for PPE equipment for all personnel engaged on distribution work include reflective jackets, safety clothing and foot-wear and other task specific equipment **such as safety glasses or goggles, ear defenders etc** shall be deployed and used at all times. REMEMBER - SAFETY SPECTACLES ARE NOT A SUBSTITUTE FOR GOGGLES Loss of sight or Hearing Damage is not reversible – IT STAYS WITH YOU FOR LIFE
6. Safety & environment 6.8.1 Voltstick – General	Update of information for the Voltstick – CHANGE – New layout of information to bring in line with the information contained in NGUK/PR/EM/72
6. Safety & environment 6.8.2 Temporary continuity bonds	Additional information for the fitting of Temporary Continuity Bonds CHANGE - Expanded section to provide greater safety advice when fitting a Temporary Continuity Bond.
6. Safety & environment 6.8.3.1 The bonding connection:	Additional information provided for the correct installation of the Cross Bonding Connection. CHANGE - Shall be: • On the consumer's side of the meter on the outlet pipe work. • As close as practicable to the meter before any branch in the installation pipe. • In a position where it can be visually observed with a warning label. • A mechanically and electrically sound connection that is not subject to corrosion (i.e. not exposed to the weather) and is made using a BS 951 compliant earth clamp; • In a position on the installation pipe, depending on the meter position, as follows: o For internal meter installations the bonding connection shall be within a maximum of 600mm of the meter outlet. o For meters in outside meter boxes/housing the bonding connection should be preferably inside the building and as near as practicable to the point of entry of the installation pipe work into the building. Alternatively, the connection may be made within the box/housing, but it is essential

	that the bonding cable does not interfere with the integrity of the box/housing and the sealing of any sleeve.
6. Safety & environment 6.8.3.2 Unsafe Earth connections to gas supply pipes.	Additional safety advice provided regarding the Continuity Bond Connection CHANGE – If the bond connection is affixed to the gas service, (upstream of the meter) work shall cease and the consumer advised that a possible electrical fault exists and the installation needs to be checked by a competent electrical contractor. *Inclusion of supporting diagram* Further work on the installation shall only be carried out following verification by either the competent electrical contractor or local electricity company that it is safe to do so.
6. Safety & environment 6.8.3.3 Alteration to main equipotential bonding	Addition of a new paragraph to provide instruction on the alteration of the main equipotential bonding CHANGE - Alteration work shall only be undertaken by an electrically competent person who has been specifically trained and assessed by an appropriate organisation as competent. Electrical earth continuity shall be maintained at all times.
6. Safety & environment 6.8.3.4 Requirements following permanent removal of gas meter	Addition of information regarding the requirements following the permanent removal of a gas meter - CHANGE - Where a meter is to be permanently removed it may be necessary to fit a permanent bond before removing the temporary continuity bond. A permanent bond is required across the meter installation if the meter has been permanently removed, and • The gas service is made of either steel or is PE inside a steel carrier which extends into the ground; and • The distance between the two ends of pipework remaining is less than 2m when the meter has been removed. A permanent bond will not be required if there is already an insulating joint fitted or the existing pipework is permanently connected mechanically and electrically by a metallic fitting, i.e. a steel meter bracket……Con't in Document
6. Safety & environment 6.8.3.5 Main equipotential bonding further information	Addition of information provided for equipotential bonding. CHANGE - The purpose of equipotential bonding is to ensure that all metallic services within the premises remain at the same electrical potential and therefore minimise the risk of electrical shock and are robustly connected to the electrical earthing system. In multi-occupancy premises, main equipotential bonding will usually have been fitted either within each of the individual premises or at the base of the riser system. Where electricity supplies are of the protective multiple earth (PME) type it is a legal requirement that metallic pipes entering these premises are bonded to the electrical supply earth.
6. Safety & environment 6.8.4 Electrical insulation joints	Additional paragraphs included to provide further guidance for the use of Electrical insulation joints. CHANGE - Care shall be taken that such joints are not compromised by the use of temporary continuity bonds during work activities. Electrical insulation joints are only fitted to metallic pipe work which could become an electrical conductor. PE service pipe does not require any insulation joint provision as the PE pipe already has electrical insulating properties. Electrical insulation joints are commonly used on multiple steel service risers feeding flats Temporary Continuity bonds shall not be connected to the body of insulation joints.
6. Safety & environment 6.8.7 Maintaining Electrical Continuity Following Replacement of Domestic	Inclusion of new process to enable the removal of the Temporary Continuity Bond following a service replacement and where the meter is not connected and commissioned at the same time CHANGE - It is essential that electrical safety in our customer's premises is maintained whilst

Metallic Services	undertaking the replacement of metallic gas services by dead insertion or Serviflex. To ensure this a Temporary Continuity Bond (TCB) is fitted across the gas meter installation prior to removal of the gas meter to allow the replacement of the gas service and this TCB remains installed until the gas meter is refitted. This requires service layers, who have been deemed competent in the removal of gas meters, to leave their TCBs connected until the gas meter is refitted by a competent meter worker. This is causing a logistical issue in returning the TCBs back to the service layers for future service replacement work. To resolve this issue a sealed ¾" Female BS746 x ¾" Male BS746 adaptor fitting (see Figure 3a below) can be installed on the outlet of a ¾" Emergency Control Valve (ECV) ……Con't in Document

6. Safety & environment 6.8.8 – PE Pipe used as Electric Cable Duct	Additional information provided with regard to the use of yellow PE pipe as an electrical conduit. CHANGE - Third parties will use yellow PE pipe as electrical conduit and not consider the risk this will pose to National Grid and its contractors. Key points to Remember: Be vigilant and never assume always 'Stop Take A Minute'. • Always use the CAT-GENNY in all modes including power socket Plug Connectors and the Genny Signal Clamp where possible, as these can induce a signal in cables running in conduits in/outside a property. Always use your voltstick – it may not show the presence of a cable in a pipe but will indicate fault current on metal sleeves / pipework…… Con't in Document
13 Service Laying Decision Flow Charts 13 .1 Procedure Text for Service Lay Methods Step 2: Consumer or Developer Contact:	Additional Bullet point included regarding customers pets. CHANGE - • Confirm if any pets are on site and that they are safely secured during the work.

13 Service Laying Decision Flow Charts 13 .1 Procedure Text for Service Lay Methods Step 3: Personal Safety	Additional information regarding the dangers of entering derelict or unoccupied buildings. CHANGE - • Be particularly observant if working near or entering a derelict or unoccupied building ▪ Do not enter Buildings which appear unused or derelict unless absolutely necessary. Carry out a detailed inspection for all hazards – take note of any warning signs and fencing…… Con't in Document
13 Service Laying Decision Flow Charts 13 .1 Procedure Text for Service Lay Methods Step 3: Personal Safety	Additional bullet point regarding assessing the possible dangers associated with entering cellars. CHANGE - • Adequately risk assess before entering Cellars - Before entering cellars always refer to your training and the information contained within NGUK/PR/EM/72 (National Grid Gas Operational procedures for dealing with gas escapes and other emergencies) and the Hazards and Precautions Book – (Cellars on page 126)

CHAPTER A SERVICE CONNECTIONS

SECTION	Amendments (CHANGE - shown in Blue)
A1 Polyethylene Service Connections A1.1 General Requirements	Additional information provided for the fusion of joints and application of squeeze offs below -5°C or above -5°C. CHANGE – Bullet Point 18 - Precautions when fusion jointing at air temperatures at or below -5°C or above -5°C where wind chill is severe: Under such extreme conditions it shall be necessary to raise the temperature of the air surrounding the fusion joint location above –5°C. For electrofusion it may be sufficient to form a sheltered area using available barriers and/or operating within the trench. Pipe, newly exposed, will generally be at ground temperature and above –5°C. To help reduce the risks in these occasions, buried below ground pipe should not be exposed until necessary…….. Con't in document…….. Bullet point 19 - Squeeze off shall only be carried out on pipe that is at or above 0°C.* • Prior to squeezing off PE pipe in cold weather conditions, it is advisable to check the pipe surface temperature using a temperature indicator. Excavating and leaving pipe exposed overnight shall be avoided when low temperatures are predicted. Where the pipe has to be excavated, consider covering with soil, sand, or sand bags to reduce impact of being left exposed and unprotected from the cold temperatures……..Con't in Document
A1 Polyethylene Service Connections **A1.2** Electrofusion Process	Additional information provided for the Marking of new PE Electrofusion and Butt Fusion Joints. CHANGE - Marking of PE electrofusion joints when service laying Operatives undertaking butt fusion and electrofusion joints on PE pipes (including the fusion of top tees and branch saddles on mains but excluding all other PE joints on gas services up to and including 63mm diameter) shall mark the adjacent pipe with the following minimum information: o Direct Labour - Payroll No. or Contract Partner - EUSR No. o Date of construction using DD / MM / YY BEST PRACTICE Mark the heating and cooling times on the PE main with a marker pen adjacent to the fitting rather than trying to struggle to read the details off the fitting when it is clamped in position on the main in the excavation. During service laying work where a number of joints are made by the same Operative in the same excavation on the same day the above markings only need to be marked up once either on the parent pipe or service pipe for all electrofusion joints completed that day by that Operative.
A1 Polyethylene Service Connections **A1.2.1** Electrofusion Tapping Tee preparation	Additional paragraph provided regarding the condition and calibration of Top loading tools. CHANGE – Bullet Point 2 Top loading tools shall be in good working order and within calibration date. They shall be inspected immediately prior to every use to check they are undamaged in any way and fit for purpose, i.e. no worn straps, no bent frame, swivel base in good working order etc. and tool within calibration date. If a top loading tool becomes defective, it shall not be used and withdrawn from use. The tool shall be rechecked to ensure it is within the defined calibration interval and any other maintenance/rectification work carried out prior to returning into service or alternatively be disposed of.

A2 Inserted PE In Metallic Main A2.1 General Requirements	Text included in previously un-texted section of the document – Inserted PE in Metallic Main CHANGE – There are a number of precautions to be taken in to account when preparing for a connection to a metallic main: 1. The metallic main may have a PE main inserted within it. (unknown and not show on drawings) 2. The metallic main may contain a thin wall plastic 'mains bursting' liner sleeve with a live PE main inside
A2 Inserted PE In Metallic Main A2.2 Unknown PE main inside metallic main	Text included in previously un-texted section of the document – Inserted PE in Metallic Main CHANGE - There is the potential for unknown PE mains to be inserted in metallic mains therefore this should always be a consideration when drilling a metallic main. Drilling through the metallic main and damaging the PE contained within has the potential to have serious consequences to life and property. Actions required to prevent an occurrence …….Con't in Document
A2 Inserted PE In Metallic Main A2.3 Service Connection to Lined PE Installed by Pipe Bursting	Additional sub-section included for Lined PE installed by Pipe Bursting CHANGE - It is possible without suitable precautions being taken to mistake a Liner Sleeve for the actual inserted PE and fuse the service mains tee directly to the sleeve. These Liners are know to discolour and can resemble the colour of PE. Liner sleeve pipe was used on 'mains-bursting' operations in some areas, (typically during the 1980's), but was discontinued. Liner sleeve pipe may be of different colours, ochre (yellow-brown) a green colour was also used and of different diameters (110mm and 140mm diameters are known to have been in use). Actions required to prevent an occurrence……Con't in Document
A3 – Metallic Mains – Service Connections A3.1 General Requirements	Additional Bullet point regarding the use of SDR13.6 63mm pipe when connecting to metallic top tees. CHANGE – Bullet Point 11 **63mm SDR13.6 service off-takes** - 63mm SDR13.6 PE pipe has a slightly larger bore that 63mm SDR11 PE pipe. As a consequence it shall not be used to connect directly to mechanical fittings such as the Crane and George Fischer 63mm mechanical top tees and coupler. A short length (tail) of 63mm SDR11 pipe shall be joined to the 63mm SDR13.6 PE coil using a 63mm Coupler and used to connect to a mechanical fitting.
A3 – Metallic Mains – Service Connections A3.1.1 Ductile & Steel Mains	Information on the action to be taken if a Ductile Iron Medium Pressure main is discovered within 30m of a building. CHANGE - **Previous Pipe Replacement Policies, i.e. Ductile Iron Medium Pressure, ABC20 requirements, etc.** National Grid Gas's predecessor company was required by the HSE to cease conveying gas at Medium Pressure in iron pipes within 30 metres of buildings by the 30th April 2003. Such pipes were decommissioned, replaced or down-rated to low pressure in accordance with this HSE requirement. The programme was completed to schedule, however, due to new build encroachment or wrong asset information operational personnel may still come across such pipes. The following action shall be taken to ensure these pipes are identified and dealt with. *Includes:-* • *Action by Operatives* • *Action by Line Management* (First Line Manager / Supervisor)

A3 – Metallic Mains – Service Connections A3.2.3 Testing & Drilling	Change to the required test pressure for Tee-Set drilling equipment from 350mbar to 100mbar CHANGE - New paragraph included: For the drilling of Low Pressure mains an air test at a pressure of 100mbar shall be applied prior to undertaking the drilling operation For the drilling of mains above low pressure an air test at a pressure of 1.5 times the maximum operating pressure in the main shall be applied prior to undertaking the drilling operation.

A4 Service Transfers A4.1 General Requirements	Additional information provided for • Squeeze off settings for SDR13.6 PE • Identification of Muntz Barwell imperial pipe CHANGE - . **8** **Squeeze off Settings** The appropriate settings for squeeze off tooling shall be used. With SDR13.6 pipe the following settings shall be used o For 63mm SDR13.6, 55mm SDR11 stops should be used. If these are not available, then 90mm SDR17.6 stops may be used. o For 75mm SDR13.6, 63mm SDR11 stops shall be used. **9** A suitable mechanical reinforcement clamp, centralised over the pinch points with squeeze off tape applied, shall be permanently fitted to all 2" diameter (Imperial size) PE pipe following squeeze off. Once fitted, "Squeeze off applied" marker tape shall also be fitted over the clamp. If there is any doubt as to whether the PE pipe is metric (63mm) or imperial (2") a suitable mechanical reinforcement clamp shall be fitted. This is necessary in order to reduce the risk of an escape from slow crack growth from inside the pipe wall to outside. **10** Where identified Muntz Barwell (M&B) imperial size service pipe should be totally re-laid i.e. repairs or service transfers shall not be carried out on this material (see description below)
A4 Service Transfers A4.1.1 How to Identify Muntz Barwell imperial pipe	Addition of sub-section to assist in the identification of Muntz Barwell imperial pipe – CHANGE The material was laid in service pipe sizes (½" to 2") in the NW in the early 1970s and is limited to imperial sizes only. The M&B material was originally yellow and gradually turns green prior to turning black in certain ground conditions. Some have "Muntz" indented lettering on the pipe.
A4 Service Transfers A4.3 Use of 32mm x 20mm Electrofusion Service Tapping Tee	Addition of a new section for the use of 32mm x 20mm Electrofusion Service Tapping Tees CHANGE - A 32mm x 20mm Tapping Tee has been introduced in to UK Distribution for use on Low and Medium Pressure systems up to and including 2Bar. This tee can be used on single domestic connections with a requirement of up to 3scmh, facilitate 32mm PE live transfers and facilitate the installation of a 32mm equal tee off an existing 32mm pipe by using the tee for bypass connections together with squeeze off tools, thereby eliminating the need to disrupt downstream customers. Prior to use approval shall be sought from your First Line Manager to check pressure loss across the proposed pipe installation. The following conditions shall apply to the use of this tapping tee: …….Con't in Document

A4 Service Transfers A4.1 General Requirements	Paragraph included with regard to the application of a reinforcement clamp following the squeeze off of 2" imperial PE pipe. CHANGE - A suitable mechanical reinforcement clamp, centralised over the pinch points with squeeze off tape applied, shall be permanently fitted to all 2" diameter (imperial size) PE pipe following squeeze off. Once fitted, "squeeze off applied" marker tape shall also be fitted over the clamp. If there is any doubt as to whether the PE pipe is metric (63mm) or imperial (2") a suitable mechanical reinforcement clamp shall be fitted. This is necessary in order to reduce the risk of an escape from slow crack growth from inside the pipe wall to outside.

A4 Service Transfers A4.1 General Requirements	Additional information when squeezing off SDR13.6 CHANGE - **Squeeze off Settings** The appropriate settings for squeeze off tooling shall be used. With SDR13.6 pipe the following settings shall be used: - For 63mm SDR13.6, 55mm SDR11 stops should be used. If these are not available, then 90mm SDR17.6 stops may be used. - For 75mm SDR13.6, 63mm SDR11 stops shall be used.
A5 Service Alterations - PE A5.1 General Requirements	Paragraph included with regard to the application of a reinforcement clamp following the squeeze off of 2" imperial PE pipe. CHANGE - A suitable mechanical reinforcement clamp, centralised over the pinch points with squeeze off tape applied, shall be permanently fitted to all 2" diameter (imperial size) pe pipe following squeeze off. Once fitted, "squeeze off applied" marker tape shall also be fitted over the clamp. If there is any doubt as to whether the pe pipe is metric (63mm) or imperial (2") a suitable mechanical reinforcement clamp shall be fitted. This is necessary in order to reduce the risk of an escape from slow crack growth from inside the pipe wall to outside.
A5 Service Alterations - PE A5.1 General Requirements	Additional information when squeezing off SDR13.6 CHANGE - **Squeeze off Settings** The appropriate settings for squeeze off tooling shall be used. With SDR13.6 pipe the following settings shall be used - For 63mm SDR13.6, 55mm SDR11 stops should be used. If these are not available, then 90mm SDR17.6 stops may be used - For 75mm SDR13.6, 63mm SDR11 stops shall be used

A6 Service Cut Off's A6.3.3 Cut Metallic Service Remote From The Mains Connections	Addition to the following paragraph. CHANGE - 1. If the service pipe is to be cut off remote from the mains connection point using the LSI technique then refer to Figure A37b and follow the normal LSI procedure with exceptions: Exceptions can be found within the document.

CHAPTER B SERVICE LAYING TECHNIQUES

B1. Service Laying Techniques - General Requirements B1.1 Pressure Requirements	Addition information regarding the use of 32mm Service pipe for New Services. CHANGE - For new lay services Note: All new services pipes shall be laid in 32mm diameter other than under these circumstances: a. where a redundant pipe is found and utilised (in accordance with pressure loss calculations) b. where the reduction of 32mm PE to 25mm PE is deemed necessary at the termination end to allow for the use of a smaller PVC Preformed Bend (black bend) – restrictions due to footings, drains etc. c. where the reduction of 32mm PE to 25mm PE is deemed necessary at the termination end to allow for the use of a 25mm Corbelled meter box fitting d. Where agreed by the First Line Manager

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SECTION	Amendments (CHANGE - shown in **Blue**)
B1.1 Pressure Requirements	Additional information for the use of a found redundant steel service for New service installation. CHANGE – **For existing properties**, check to ensure that no existing service pipe exists. If any other gas service is identified, it should be checked for gas and confirmed to be dead or live. Where ***found to be live and the service needs*** to be cut off, this should be carried out in accordance with Chapter A6 Service Cut Offs. Where the service is confirmed to be dead consideration should be given to utilising the redundant pipe for dead insertion provided the following requirements are adhered to: Note: All new services pipes where the redundant pipe is NOT utilised shall be laid in 32mm diameter
B1.1 Pressure Requirements	Addition to the Pressure Loss Table B3 for 32 kWh / 3 scmh CHANGE - Table now includes pressure loss over Given Length for 17.5mm PE. Note: 17.5mm is restricted to 8m and 32kWh / 3 scmh therefore this diameter does not appear in Table B3a
B1.1 Pressure Requirements	Addition of Pressure Loss Table for 64 kWh CHANGE - **Table B3a: Pressure Loss over Given Length and Diameter** (Based on 64 kWh / 6scmh for existing Supplies)
B1.2 Site Requirements	Alteration to the Bullet Point from 2bar and above to above 2 bar. CHANGE – Bullet Point 1 An Operational Manager shall be contacted to authorise the work before using equipment within 3 m of gas plant operating at above 2bar.
B1.2 Site Requirements	Additional information provide for the replacement of dual services CHANGE - For replacement of dual services and provided the service design complies with the requirements of this document, (refer to Note 3 below), existing dual services may be replaced by a dual service laid in both the public AND private land. Examples are shown below in Figure B1. Notes: • For replacement of services, preference should always be given to using the host pipe as a carrier, inserted with a new pipe. • In order to maximise this practice it is permissible to increase the diameter of the individual aspects of the service pipes at the outlet of the 'T' connection in the private to that inserted in the host pipe. • The maximum permissible pressure loss for replacement of a Low Pressure service is 5 mbar. This permissible pressure loss is calculated by subtracting the system design minimum pressure at the ECV – which is 19mbar from the source pressure available at the main. If the pressure in the main is less than 24mbar, i.e. 22mbar, then the permissible pressure loss allowed is only 3 mbar (22 – 19 = 3). • The pressure loss on the dual aspect of the service shall be calculated using 64 kWh / 6 scmh and then each individual service pipes shall be calculated using 32 kWh / 3 scmh unless larger flow rates have been identified. Refer to Tables B3 and B3a. IF THE PROPERTY OWNER OBJECTS TO THIS PRACTICE THEN THE REPLACEMENT SERVICE SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH FIGURE B2.

B3 INSERTION	Details the requirements for service insertion CHANGE - This section outlines requirements for service insertion from: • the mains connection to the point of termination in the garden o Minimum of 2 metres from building if using mechanical compression fittings o No distance restriction if using electrofusion fittings only (see Figure B3 below) • or at the internal meter position. Replacement to the meter position shall also be undertaken in accordance with Chapter D.
B3 Insertion B3.1 General Requirements	Addition of Table B7a – CHANGE - Table B7a – Maximum Insertion Diameters and Foam Travel
B3 Insertion B3.2 Dead Insertion B3.2.1 Preparation for Dead Service Insertion	Addition to the following paragraph. CHANGE – Excavations for dead service insertion should be made at the connection point of main or minimum of 2 metres from property when using mechanical compression fittings (there is no restriction on distance if using electrofusion fittings) for insertion back to the meter position only. (figure B1a & B1b).

B3 Insertion B3.3 SERVIFLEX (DEAD SERVICE INSERTION – GARDEN TO METER ONLY)	Additional note on the use of Serviflex if discovered during an alteration to a service. CHANGE - NOTE: if at a later date an alteration to the service is required the inserted Serviflex shall not form part of the alteration and shall be abandoned.
B3 Insertion B3.3 Serviflex (Dead Service Insertion – Garden to Meter)	Addition to the following paragraph when using Serviflex. CHANGE - The service disconnection/insertion point should be a minimum of 2m from the building when using mechanical compression fittings (there is no restriction on distance if using electrofusion fittings).
B3 Insertion B3.4 LIVE SERVICE INSERTION – GARDEN TO MAIN	Addition to the following Bullet Point CHANGE - Live service insertion (lsi) should only be undertaken on domestic properties. The point of insertion should be a minimum of 2m from the building when using mechanical compression fittings (there is no restriction on distance if using electrofusion fittings
B4 Impact Moling (Soil Displacement Hammer 75mm diameter and below) B4.1.4 Use Of The Soil Displacement Hammer	Removal of Pre-Moling Checklist from this part of the document. CHANGE - Additions - On completion of the identification of underground plant, a thorough assessment *(including the use of the Pre-Moling checklist – See Appendix J of this document, alternatively use the S&E Document Search site)*

CHAPTER C. SERVICE VALVES

SECTION	Amendments (CHANGE - shown in **Blue**)
C2. Emergency Control Valves (ECV) C.2.3 Piggy-Backing Of Emergency Control Valves (Ecvs) C 2.3.1 Control Valves with BS 21 (BSP) outlet thread	**Section included for the use of 'Piggy Backing of ECVs – BS21 outlet.** **CHANGE-** The following is applicable to screwed Low Pressure ECVs up to and including 2" diameter with BS 21 (BSP) outlet thread as an alternative to the exchange of the existing ECV through conventional means of service isolation or using an ECV exchange kit as described in Appendix P of T/PR/EM/74. **Note:** Do not apply to existing ECVs with a BS746 washered outlet. **Definition:** Piggybacking is the installation a new ECV directly after an existing ECV – refer to Figures C2a and C2b. The use of this technique will be classified as a permanent repair technique. **Installation Method:** When using the piggyback technique the following requirements shall be observed: 1. Complete an onsite assessment which as a minimum takes into account the following: a. the condition of the existing service standpipe/lateral pipework, following examination for corrosion, particularly at floor/wall entry, if this is deemed significant the service shall be replaced immediately. b. location of the ECV to confirm that there is: i. Enough access to complete the piggyback operation, remake meter inlet pipework, and ii. Future access by the consumer is not impeded
C2. Emergency Control Valves (ECV) C.2.3 Piggy-Backing Of Emergency Control Valves (Ecvs) C 2.3.2 Control Valves with BS 746 outlet thread	**Section included for the use of 'Piggy Backing of ECVs – BS746 outlet.** **CHANGE-** **Scope:** Applicable to low-pressure ¾" and 1" diameter ECV's with BS 746 parallel male outlet thread. This procedure may be used if the existing ECV is pressure-tight but fails a let-by test, is an alternative to exchanging the ECV by conventional means of service isolation or using an ECV exchange kit and is classed as a permanent repair. Installation method: 1. Carry out a site-specific assessment to include the following: • Check the condition of the service pipe looking for signs of corrosion especially at floor / wall entry points. If significant corrosion is observed contact your Line Manager who shall arrange for the service pipe to be replaced • Ensure there is sufficient working room to allow the second ECV to be fitted, including the meter inlet pipe / flex, and ensure future access by the consumer is not impeded. • Check exposed metalwork with a Voltstick prior to operating/touching any part of the gas installation. 2. Mark the position of the standpipe relevant to its entry position to enable checks to be made for movement of the standpipe during installation of the ECV. *NOTE: If the service pipe is disturbed during installation of ECV, immediately check the whole service pipe inside and outside the property for leakage especially around the base of the standpipe. The service shall be cut off immediately and replaced as a safety precaution.*

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CHAPTER D – SERVICE ENTRIES

SECTION	Amendments (CHANGE - shown in **Blue**)
D1 – SERVICE ENTRIES D1.2 General Requirements	Additional information has been provide regarding the support of risers and laterals CHANGE - Item 13 - Risers and laterals shall be suitably supported (see Table below). Below these lengths the fitting of pipe clips is optional. Inclusion of Table D1 – Supporting Above Ground Pipework
D2 LP PE SERVICE TO INSET METERBOX D2.2 Installation:	Addition to Material listings CHANGE – Material Listings – Item 6 - Added 'Optional'
D3 LP PE SERVICE TO SURFACE MOUNTED METERBOX D3.2 Installation	Addition to Material listings CHANGE – Material Listings – Item 6 - Added 'Optional'
D7 LP PE SERVICE TO ABOVE GROUND ENTRY INCLUDING 63 MM D7.1 General Requirements	Addition to Requirements – CHANGE – Item 6 - The house entry tee shall be checked to ensure that the Integral Stopper has been set to the fully open position
D7 LP PE SERVICE TO ABOVE GROUND ENTRY INCLUDING 63 MM D7.2 Installation	Addition to Installation requirements CHANGE - Item 8 - Check that the house entry tee integral stopper is in the fully open position. The following details the steps that shall be taken to ensure the stopper is not affecting the flow or pressure performance of the service and is always correctly located Figures D6a to D6e not shown **Figure D6a:-** Crane Wask 20mm / 32mm Universal Gas Free House Entry Tee Key (WASK part nos BE0034) can be used on all sizes of tee to remove the outer cap and raise or lower the integral plug under no gas conditions SAP3487 **Figure D6b**:- Alternative House Entry Tee Key 20mm SAP054 The depth of thread on the body of these keys is the same as that of the out cap. It is used to indicate the Integral stopper has been set in the fully open position **Figure D6c:-** Using the universal key the outer cap should be removed, ensure care is taken to prevent the loss of the "O" ring seal **Figure D6d:-** Slide the square of the key into the integral stopper. Slide the body of the key onto the house entry and tighten so that the "O" ring is flush with the tee housing. It is important to ensure the "O" ring is engaged to get a gas tight seal but primarily to set the position of the stopper when raised. Holding the body of the tool rotate the key clockwise to lower the integral stopper plug or anticlockwise to lift the integral stopper. The integral stopper will meet the face of the body of the key when in the fully open position
D11.1. GENERAL REQUIREMENTS	Additional requirements inserted regarding the position of MP meter boxes (all types) The meter box shall be located on the external wall to the property with the edge of the meter box no closer than 0.18m from any opening, such as operable windows, doors, airbricks, balanced flues or similar breaches in the structure and 0.33m away from any electrical equipment.

CHAPTER E - SERVICE PRESSURE TESTING, PURGING, COMMISSIONING and RECOMMISSIONING

SECTION	Amendments (CHANGE - shown in **Blue**)
E2.2 Medium Pressure Service	Additional paragraph providing information on the Competency requirement when testing Medium Pressure Services. CHANGE - Operatives qualified to GN02 status undertaking the testing of Medium Pressure services will need to have undertaken additional training and assessment to cover this activity as it was not included in the GN02 qualification.
E3 Service Purging And Commissioning E3.1 Low Pressure	Additional information regarding the requirement to maintain electrical continuity if the meter is not immediately connected after commissioning. CHANGE - When purging is complete, close the emergency control valve and remove the purge hose. ~~**Secure the cap on the tapping tee and test with leak detection fluid.**~~ If a meter is not to be immediately connected the following shall be carried out: • The emergency control valve shall be securely capped and sealed with the valve in the 'closed' position and the Temporary Continuity Bond (TBC) left in place. Alternatively • Where the TBC is required to be removed the procedure provided in 6.8.7- *Maintaining Electrical Continuity Following Replacement of Domestic Metallic Services* can be applied
E3 Service Purging And Commissioning E3.1 Low Pressure	Rewording of the purging procedure to clarify the position of operatives during the operation. CHANGE - 1. A flexible purge hose fitted with a flame trap SHALL be connected to the emergency control valve and the hose outlet positioned outside the premises away from any openings into the property such as windows, doors, airbricks etc and from any possible sources of ignition. The ECV shall be left in the closed position The service shall be pressurised by one of the following: • PE connections – drill the main with the integral cutter and withdraw it into the top of the tapping tee • Metallic connections - withdraw the integral plug into the top of the service tee 1. An Operative should be positioned near the outlet of the purge hose and be able to communicate with an Operative positioned at the ECV.
E3 Service Purging And Commissioning E3.2 Medium Pressure	Rewording of the purging procedure to clarify the position of operatives during the operation. CHANGE - 1. A flexible purge hose fitted with a flame trap SHALL be connected to the emergency control valve and the hose outlet positioned outside the premises away from any openings into the property such as windows, doors, airbricks etc and from any possible sources of ignition. The ECV shall be left in the closed position The service shall be pressurised by one of the following:

	• PE connections – drill the main with the integral cutter and withdraw it into the top of the tapping tee. • Metallic connections - withdraw the integral plug into the top of the service tee. 2. An Operative should be positioned near the outlet of the purge hose and be able to communicate with an Operative positioned at the ECV.
Appendix I	Additional Appendices for: Guidance on the availability of Identification / Accreditation cards
Appendix J	**Additional Appendices for:** PRE-MOLING CHECKLIST Based on Section B4 Impact Moling (up to 75mm) of T/PR/SL/1

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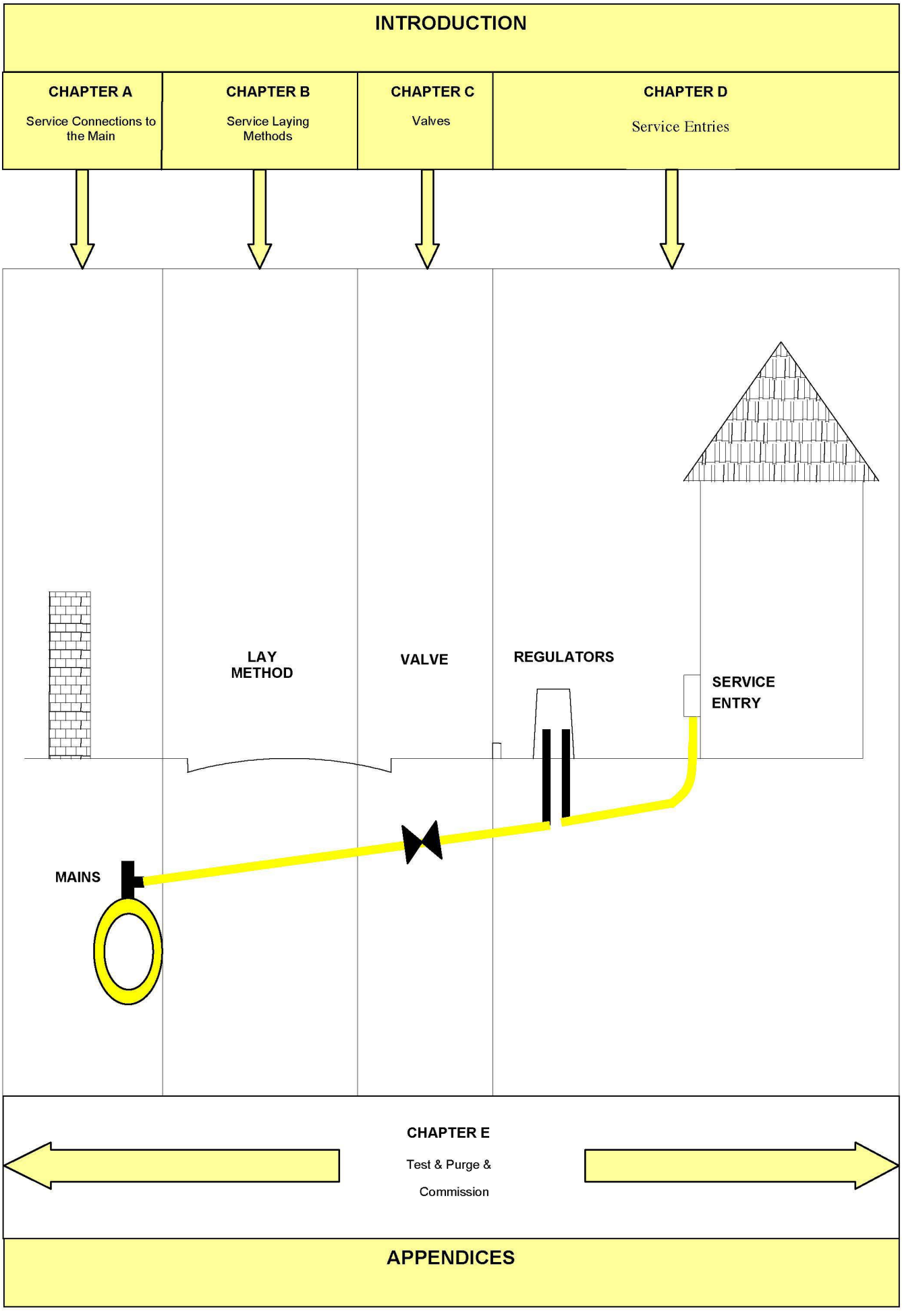
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INTRODUCTION

These Service Laying Procedures have been developed to provide concise and comprehensive information to ensure consistency of application throughout National Grid and its Service Providers. The procedures define how Service laying should be undertaken, and will help to ensure that operatives comply with legislation and safe working practice.

You are expected to have these Procedures with you at work, at all times. In the event of loss or severe damage ask for a replacement immediately.

Failure to comply with the requirements of this document could result in National Grid or individual employees facing prosecution and/or disciplinary action.

1. SCOPE

These procedures cover the installation of a service pipe from the mains connection to an emergency control valve. Service laying includes pipe work up to 63mm diameter operating at pressures up to and including 2bar.

A service pipe is a connection from a main to supply a maximum of two primary meter installations, with no other potential connections.

This edition of the procedures excludes:

- Services supplying more than two primary meters,
- Non-domestic supplies above 63mm/2” diameter,
- Intermediate Pressure Services
- Meter work

Note: Although meter work is outside the scope of this document, any associated metering activities undertaken shall be in accordance with National Grid Metering Work Procedure for Domestic Gas Meter Policy Replacement - T/FP/TMP/3001

For any work outside the scope of this document, reference should be made to the Operational Manager.

2 MANDATORY AND NON –MANDATORY REQUIREMENTS

shall: indicates a mandatory requirement

should: indicates best practices and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment shall be completed to show that the alternative method delivers the same, or better, level of protection.

3 DEFINITIONS

Operational Manager (First Line)	A direct subordinate of an Operational Manager (Senior), responsible for "day to day" activities undertaken by operatives.
Operative	All persons engaged in the construction, commissioning, operation and alteration of services and related plant shall be competent to carry out such work. Operatives shall not attempt to undertake any activity for which they have not been trained, assessed and certified as competent. When working in the highway at least 1 operative shall hold a current NRSWA operative card.

* Competence: A competent person having the ability, appropriate training, knowledge and experience to supervise and/or carry out the work being undertaken in a safe and proper manner.

3.1 Summary of Training Requirements

All operatives working on live gas mains and service related activities shall have at least one of the following core certification/accreditations to work within or as part of an operational team in one of the Gas Distribution Strategic Partner (GDSP) teams and/or Repair Process:

- Team Leader – Gas Network Operations Level 2 (GNO2) or Network Construction Operations (Gas) (NCO (Gas)) NVQ Level 2 in Mains or Service Laying
- Assistant – Gas Network Operations Level 1 (GNO1) or Network Construction Operations (Gas) (NCO (Gas)) NVQ Level 1
- Trainee – Registered with City & Guilds (C&G) and working towards GNO1 / NCO1 (Gas). Accreditation shall be gained within 6 months of start date, failure to provide evidence of successful accreditation within this six month period shall result in the individual being unable to operate as member of a distribution team.
- In addition to the above all contract operatives are required to hold the SHEA Passport for Gas

Additional training elements such as those covering multi-layer PE pipe, Safe Control of Operations, ground support systems (deep excavations), etc., are applicable as necessary.

3.2 Summary of Team Leader Ratio to Assistants and Trainees

The following ratio of team leader to Assistants and Trainees will apply.

TEAM LEADER	ASSISTANTS	TRAINEE
1	Min 1, Max 2	Max 1

- No other ratio of assistant/trainee to team leader shall be used, e.g. a team leader can have up to a maximum of two Assistants plus one Trainee under their control at any one time. A trainee **shall not** be used as an assistant for the purposes of forming a team. Therefore:

- A Team working in multiple streets shall have sufficient numbers of GNO2 / NCO2 (Gas) qualified team leaders to take responsibility for the activities being undertaken in each street. GNO1 / NCO1 (Gas) assistants shall not work remotely to a team leader in adjacent streets or properties.

- Team Members registered on the EUSR database should carry their EUS card as proof of accreditation at all times whilst working within the Gas Distribution business.

4. HEALTH & SAFETY AT WORK ACT 1974

Legal Obligations

Under the Health and Safety Act 1974 your employer has a legal duty of care toward you, your fellow employees and to the general public. The law also places some duties on you. Inspectors from the Health and Safety Executive (HSE) check that the law is being complied with and can attend on site at any time.

Employer's duties can be found in the Service laying Management Procedures.

4.1 Employees Duties

Whilst at work, you have a duty to:

- Act always in a safe manner
- Take reasonable care for your own health and safety and of others who may be affected by your acts or omissions.
- Co-operate with your employer so far as is necessary to enable him to fulfill his legal obligations, e.g. take precautions to reduce the risk of fire or gas ignition, always use the clothing and equipment provided for personal safety, etc.
- Inform your Operational Manager of any hazards of which you are aware, in order that appropriate corrective action may be taken.

4.2 National Grid Heath & Safety Responsibilities

In addition to the Health & Safety at Work Act, National Grid have a legal responsibility to have a Health & Safety Policy. The duties of the Operational Manager and Operative are detailed below.

4.2.1 Operational Manager's duty

Operational Managers are required to ensure that:

a) Operational personnel have the qualifications, registration and accreditation required to perform their duties
b) Operational personnel are competent with sufficient knowledge, equipment, practical skills and experience to deal with all foreseeable site situations
c) Sufficient numbers of personnel are available on site to enable operations to proceed in a safe and controlled manner.
d) There are established written procedures for operatives to follow.
e) There is liaison with all other affected Utilities: e.g. Electricity Companies.

Operational Managers should make provision for the overall co-ordination of all resources, satisfactory administration and supervision, and the establishment of management and technical support for site work both during and outside normal working hours.

4.2.2 Operative's duty

The following general responsibilities apply to operatives in performing their duties:

a) Follow Operational Managers instructions
b) Co-operate on health and safety matters
c) Follow the health and safety rules applicable to the job and to the specific work site.

d) Report accidents, incidents or near misses to the Operational Manager.
e) Use the health and safety protective equipment provided
f) Report defects in tools and equipment
g) Ensure that you understand the work that is required to be done and are competent to carry it out.
h) Follow written procedures and stop and report on any necessary deviation from procedure.
i) Carry out operational activities to National Grid's standards.
j) Have available Identification cards and where appropriate Accreditation cards. **(See Appendix I)**

5. GAS ESCAPE PROCEDURE

5.1 Reports of gas escapes

If at any time you are made aware of or suspect there is a gas escape or other emergency, you shall record these details:

- Address / location of the gas emergency
- Name, address and telephone number of the person reporting the escape

Ask the following questions

- Where is the smell most noticeable?
- When was the smell first noticed?
- Is the gas turned off at the meter?
- If YES, can you smell gas?
- Is there a smell of gas outside?
- Are the neighbours affected?
- Are there any special circumstances / access details?

Advise the consumer to:

- Turn off the gas at the meter, unless the meter is located in a cellar or basement – in which case, advise them not to enter the cellar / basement
- Extinguish all naked flames – do not smoke or strike matches
- Turn off all gas appliances and do not use until they are checked by the engineer
- Do not operate any electrical appliances or turn any switches on/off
- Open doors and windows to ventilate the property
- Inform the consumer that immediate access will be required
- If there is a smell in the cellar or basement, you shall advise the consumer/s to evacuate the building. Take the details of where the customer will be evacuating.

It is **your** responsibility to report the escape for the customer. Call the National Gas Emergency 24 hour gas emergency service on:

Telephone number - 0800 111 999

*All calls are recorded and monitored by National Grid plc for safety and training purposes

6 SAFETY & ENVIRONMENT

6.1 General guide to Safe Working

The following overview represents a general guide to safe working and should be read in conjunction with the National Grid Hazards & precautions Booklet. Certain items are directed particularly to those employees who have a responsibility for others. Basically you should ensure:

a) that you are aware of any hazards at the place of work;
b) that adequate supervision is available at all reasonable times, particularly for less experienced members of staff;
c) that safety rules are observed at all times and, where required, protective equipment is used;
d) that safety devices, where provided, are properly adjusted and maintained;
e) that machinery and equipment is frequently inspected to ensure it is properly maintained and safe to use;
f) that any defects in equipment are promptly reported and rectified;
g) that good standards of housekeeping are maintained;
h) that you regularly review working practices to improve Health and Safety aspects at your place of work.
i) that you review ground conditions to prevent Slips, Trips and Falls especially during the winter months.

6.2 Safe Control of Operations

The Safe Control of Operation's procedures are a management control system put in place to safeguard persons and the network. They ensure that:

- Certain activities are controlled by conducting work activities in a prescribed format or by ensuring that the necessary precautions are applied
- Those carrying out the activities are competent and fully aware of their responsibilities, and that others affected by the operation are kept informed.
- They also include reference to contingency plans that will be implemented, should a failure during the operation arise. These contingency plans will have already been signed off at the appropriate level and the consequences of implementing them determined so that people are safeguarded and the network is controlled.

Permits to Work, Forms of Authority, Non routine and routine operations shall be complied with and followed to ensure your safety, that of others and to maintain the integrity of the Network. Further information is available in the 'Safe Control of Operations' suite of procedures.

6.3 National Grid Distribution and Transmission Hazard and Precautions Booklet

The National Grid Distribution and Transmission Hazard and Precautions booklet is a valuable reference document which captures main work activities, identifies and prioritises common hazards that exists and lists the precautions to be observed to minimise their realisation.

The booklet is not intended to be fully comprehensive nor will the precautions to reduce risk be appropriate for all circumstances, but it will be useful as a quick on–site reference to be used in conjunction with the work procedures. Not all hazards will have been identified and it is crucial to the safety of employees but also contractors, visitors and the general public that any new hazard identified is recorded and that the appropriate safety precautions are applied to protect everyone. Where guidance is required, assistance is available from your manager to ensure adequate precautions will be taken and that future inclusion of the new hazard(s) and their precautions are made available to everyone through updates in the H&P booklet.

The booklet also provides information on occupational health, working with asbestos, personal protective equipment and Information on Chemicals for Employees, (ICE). The booklet is usually updated on a six-month cycle to ensure that the very latest information is incorporated.

6.4 Hazard Assessment

The Management of Health & Safety at Work Regulations, 1992, require employers to identify and assess the hazards to health and safety present in the workplace, thereby enabling the most appropriate means of reducing those hazards to an acceptable level to be determined. A risk assessment is a careful examination of what in your work could cause harm to people so that the necessary precautions can be applied. There is in effect a hierarchy of control measures to protect risks to safety and health. These include engineering controls and safe systems of work. It may be possible to do the task by adopting alternative more effective safeguards.

Specific reference shall be made to hazards and precautions associated with the assessment, location and/or repair associated with gas emergencies, outlined in the HS&E Hazards and Precautions and ICE Sheets Booklet.

6.5 Personal Protective Equipment

Personal protective equipment (PPE) and general work wear is available to ALL employees.

A minimum requirement for PPE equipment for all personnel engaged on distribution work include reflective jackets, safety clothing and foot-wear and other task specific equipment such as safety glasses or goggles, ear defenders etc shall be deployed and used at all times.

REMEMBER - SAFETY SPECTACLES ARE **NOT** A SUBSTITUTE FOR GOGGLES

Loss of Sight or Hearing Damage is not reversible – IT STAYS WITH YOU FOR LIFE

It is important that you use the correct PPE/work wear whenever required by procedures. However, it is not a replacement for proper engineering controls and safe systems of work.

With the exception of the gas escape procedures and risk assessment, further information on all other aspects of health, safety and environment shall be referenced to the National Grid Distribution and Transmission Hazard and Precautions booklet or contact the Operational Manager.

6.5.1 Protective Clothing

Operatives involved in gas operations shall wear gloves and flame retardant overalls along with all other relevant protective clothing. Where two-piece overalls are issued, both the top and the bottom parts of suits should be worn and the cuffs and neck are closed to prevent gas entering inside the work wear. Refer to the Hazards & Precaution booklet.

THROUGH A HAZARD ASSESSMENT, CONDITIONS MAY REQUIRE THE USE OF ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT.

6.6 Environmental

The environment is the surrounding in which an organisation operates, including, air, water, land, natural resources, wildlife, people and their interaction. Everyone can contribute to minimising the impact of their work activities on the environment by following work procedures. Procedures can be found in National Grid Distribution and Transmission Hazard and Precaution Booklet on the topic below:

Duties under Environmental Legislation
Working near trees
Action in the event of Spills
Hazardous Materials
Waste Management
Other activities

6.7 Works on Live Gas

If you have to work in a potentially gaseous atmosphere, be careful to minimize the risk of ignition and danger to yourself and others by taking the following actions:

- maximize the amount of ventilation;
- keep all sources of ignition at 5m upwind from the likely source of escaping gas, including vehicles and equipment to avoid ignition dangers
- use continuity bonds where necessary
- prevent smoking;
- have fire extinguishers positioned and ready for use
- provide an unobstructed exit from any excavation
- use special tools, safety clothing and safety equipment provided. Where there is no danger from electrical sources, wet the work area to prevent sparking by tools, taking care not to wet any electrical equipment or cables
- wear breathing apparatus when necessary (see BA below).
- warning signs to be displayed.
- non certified equipment to be placed 5m upwind of the gas escape

In the event of an escape of gas:

- Stop the operation and contact the National Gas Emergency Service on **0800 111 999**
- Safeguard Life
- Safeguard Property
- Remove all personnel from the vicinity
- Inform your Operational Manager
- Prevent any approach by the public
- Enforce 'no smoking'
- Remove naked flames or heat.
- Assist the Emergency Services as requested.

Do not attempt a repair until authorised by National Gas Emergency Services.

6.7.1 Risks

The most significant risks associated with working with natural gas are the occurrence of fire/explosion or oxygen deficiency, which can cause asphyxiation at high concentrations or cause narcotic effects, headaches, dizziness or nausea at lower concentrations.

The relationship between natural gas and oxygen and the effect of breathing in a gaseous atmosphere are shown on Table 1. The table also highlights the explosive range of natural gas between 5% - 15% gas in air.

Asphyxiation by natural gas creeps up on you giving you little or no warning. Natural gas deprives the brain of oxygen, causing confusion and irrational behaviour. The brain can last without oxygen, under good conditions, for about 4 minutes before definite damage appears. Once asphyxiation commences judgement is markedly affected and it becomes very difficult for individuals to make sensible decisions, such as getting out of a trench and putting on breathing apparatus. Sudden collapse can be followed within minutes by permanent brain damage and death.

Whilst losing consciousness or being asphyxiated is an uncommon occurrence, operatives shall be mindful of how quickly the environment they breathe can change due to a sudden or constant release of natural gas, especially in a confined space such as an excavation.

PPM	LEL	GIA	OXYGEN	EFFECTS	
500	1%	0.05		NORMAL	
1,000	2%	0.10		NORMAL	
1,500	3%	0.15		NORMAL	
2,000	4%	0.20		NORMAL	
2,500	5%	0.25		NORMAL	
3,000	6%	0.30		NORMAL	
3,500	7%	0.35		NORMAL	
4,000	8%	0.40		NORMAL	
4,500	9%	0.45		NORMAL	
5,000	10%	0.50	20.9	NORMAL	
10,000	20%	1.0	20.8	NORMAL	
15,000	30%	1.5	20.7	NORMAL	
20,000	40%	2.0	20.6	NORMAL	
25,000	50%	2.5	20.5	NORMAL	
	60%	3.0	20.4	NORMAL	
	70%	3.5	20.3	NORMAL	
	80%	4.0	20.2	NORMAL	
	90%	4.5	20.1	NORMAL	
LOWER LIMIT	100%	5.0	20	NORMAL	LOWER LIMIT
EXPLOSIVE		6.0	19.7	NORMAL	EXPLOSIVE
EXPLOSIVE		7.0	19.5	NORMAL	EXPLOSIVE
EXPLOSIVE		8.0	19.3	NORMAL	EXPLOSIVE
EXPLOSIVE		9.0	19.1	NORMAL	EXPLOSIVE
EXPLOSIVE		10.0	18.9	NORMAL	EXPLOSIVE
UPPER LIMIT		15.0	17.9	NORMAL	UPPER LIMIT
		20.0	16.8	SUFFERING	
		25.0	15.8	SUFFERING	
		30.0	14.7	SUFFERING	
		35.0	13.7	SUFFERING	
		40.0	12.6	DANGER	
		45.0	11.6	DANGER	
		50.0	10.6	DANGER	
		55.0	9.5	DANGER	
		60.0	8.4	DANGER	
		65.0	7.4	DANGER	
		70.0	6.3	DANGER	
		75.0	5.3	FATAL	
		80.0	4.2	FATAL	
		85.0	3.2	FATAL	
		90.0	2.1	FATAL	
		95.0	1.1	FATAL	
		100.0	0	FATAL	
Note: Air is made up of approximately 78% nitrogen, 21% oxygen, 0.97% argon and 0.03% carbon dioxide. Calculations therefore assume 21% oxygen and 79% other.					

Table 1 - Natural Gas v Oxygen – Relationship and Effects

If escaping gas ignites and is inhaled, serious and lasting damage can be caused to the lungs. Breathing apparatus will offer respiratory protection and limited face protection when working in a gaseous atmosphere.

6.7.2 Sources of Ignition

6.7.2.1 Elimination of sources of ignition

The listing below is not exhaustive, but will indicate some of the potential ignition sources to remove when working in gaseous atmospheres. Before any work is carried out, atmospheric testing should be carried out to establish the level of the gas concentration.

- Electric cables
- Non certified electrical equipment, e.g. mobile phones, electrofusion boxes, cable location devices
- Tools (see below)
- Naked flames
- Stray electric currents
- Static electricity from
    - Personnel
    - Plastic pipes
    - General – through rubbing contact
    - Dusty gas
- Hot works
- Pyrophoric dust

All equipment that could be an ignition source shall be sited in designated safe area to avoid any possible source of ignition, in all cases not less than 5m away upwind from any possible source of escaping gas.

6.7.2.2 Warning notices

Suitable warning signs and barriers shall be erected to prevent any unauthorised entry into areas where gas is, or will be discharged into the atmosphere. These notices shall be displayed at appropriate distances to warn and instruct persons affected of the hazard and to ensure that there will be no smoking on any site where live gas working is to be/is being carried out.

6.7.2.3 Tools– Elimination of Ignition Sources:

- Impact between steel tools such as hammers and chisels can cause sparks, which can ignite a gas-air mixture. Sparks can also be easily produced when the steel tools (e.g. forks, picks shovels and points) strike flints, rock, stones, concrete, etc. 'Spark reducing' tools may be used, but they do not provide a guaranteed spark – free operation.
- With all tools the use of water will reduce the likelihood of sparks occurring. In the presence of leaking gas, water should be poured on to the ground before a pick or any other tool is used.
- When a pipe is being broken out with a hammer, the pipe should be first thoroughly purged and the pipe and hammer should be dampened down in areas where impact or friction is likely to take place. This can be achieved by wrapping the pipe with a wet cloth.

For further full instruction and information refer to the Hazards & Precautions Booklet

6.7.2.4 Fire Extinguishers

At least two 9 kg dry powder fire extinguishers shall be placed in a convenient position next to the location of operations and within easy reach of the operatives on site for immediate use in an emergency.

The fire extinguisher shall be inspected for external damage, maintenance date and replaced if necessary. The fire extinguishers shall be turned upside down to prevent compaction of the powder as part of the initial checks.

Wherever a fire extinguisher has been primed, whether or not it has been used, arrangements shall be made to replace it immediately.

6.7.2.5 Dealing with a fire

Refer to the hazards and precaution booklet under "Fire"

6.7.3 Breathing Apparatus

For any routine or non routine work to be undertaken on mains or services always check the atmosphere for gas before entering the excavation and continue to monitor during and on completion of work. Some non routine operations may require atmospheric checks to be recorded. Safe and unaided egress to a firm and clear position shall be made available.

Breathing apparatus shall be assembled and ready for use when any work is to be undertaken on live gas mains or services in excavations or other such confined spaces in the following situations:

- As specified within a RO/NRO or permit to work
- Drilling of gas mains
- Connections
- Flow stopping
- For excavation more than 1.2m deep or where there is a significant risk to safety, persons shall leave the excavation immediately and a safe system of work shall be agreed with the Operational Manager.

Breathing Apparatus shall be made available at the work site at all times and be worn under the following conditions to safeguard persons from asphyxiation or internal damage to lungs from breathing in gas.

- If gas in the breathing zone is above 20% LEL and continues at that level following ventilation or the activity is likely to give rise to a gas release

- When an oxygen reduced atmosphere is present (less than 17% oxygen, refer to Table 1) in a excavation, below ground pit or other potential confined space that does not have adequate ventilation

Where one person is working in the excavation, the second person shall be on site acting as a guard for the person in the excavation. An on site hazard risk assessment will determine the requirements for a lifeline, and where necessary supplementary lifting apparatus to be made available. Frequent checks shall be carried out between the guard and BA user, to check the user's safety. Operational BA shall be available for use by the guard.

Where two persons are working in the excavation, an additional person with BA shall be in attendance.
* Confined spaces are defined as: - Any place from which (by virtue of its enclosed nature), there arises a foreseeable risk of serious injury from fire or explosion, drowning, asphyxiation or poisonous gas.

If you are unsure whether breathing apparatus should be available or worn for a particular work activity – STOP WORK IMMEDIATELY AND CONSULT OPERATIONAL MANAGER.

Further requirements regarding BA are detailed in the NG Hazards & Precautions Book, and T/FP/DIS 3.1.1 – 'Work Procedure For The Use Of Breathing Apparatus in UKD and are explained in the 'Wear It' video, which is available on Infonet.

6.8 Electrical safety

6.8.1 Voltstick – General

The National Grid Gas approved Volt Stick® is an intrinsically safe, weatherproof device, for detecting the presence of an A.C. voltage. When an A.C. voltage above 50V is detected a red indicator in the plastic tip illuminates. (see photo's below)

Figure 1– National Grid Voltstick

The Volt Stick® shall only be used as a safety device for the protection of operatives working on gas installations, for example when:

- Cutting off a service;
- Working on / disconnecting a meter;
- Carrying out any metallic mains connection work.

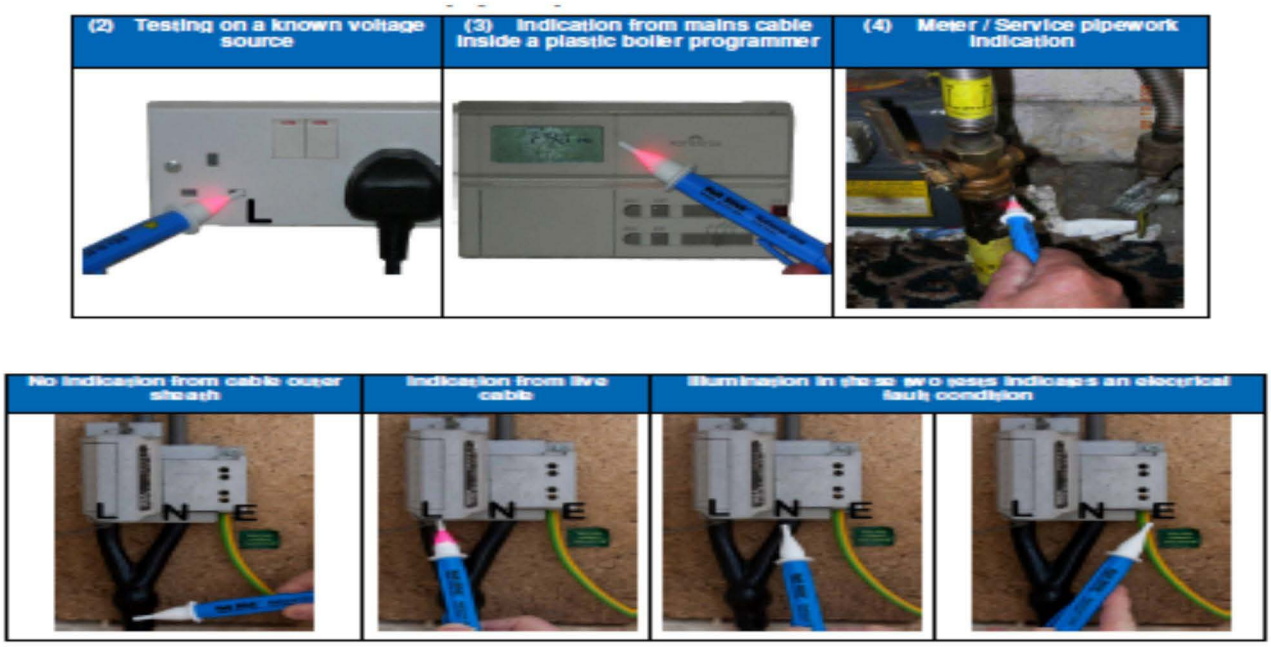

Figure 2- Examples of Voltstick usage

Indication during Priority Action to safeguard life and property

In the event of a Volt Stick® indication (illumination) being attained during a gas emergency and it becomes necessary to;

- Isolate the gas emergency control valve (ECV) or
- Isolate the customer's electrical supply, via the "consumer unit" main switch.

Then appropriate electrically insulated gloves fit for purpose shall be used.

Operating checks

The Volt Stick® shall be checked for correct operation and use as follows:

- At the start of every working day check against a known 230 V A.C. electrical supply either at an Operational Unit or at home.
- It should be held close to a 13 A socket outlet connected to a live 230 V A.C. supply and the tip shall illuminate to show correct operation (see picture 2).
- If the tip does not illuminate under these conditions and the batteries have sufficient capacity then the Volt Stick® shall be replaced.

- Prior to every use check correct operation either by the above or by rubbing the white tip quickly backwards and forwards on clothing to create a static charge, the tip shall illuminate to show correct operation.
- Damaged or defective units should be replaced immediately.

The only Volt Stick® that shall be used is the 50 – 1000V ac version (SAP code 1662 with AAA batteries (SAP code 0086)

Instructions for using the Volt Stick®

- Hold the blue body only - do not hold the white tip.
- All bare metal gas carrying pipe work and fittings within the work area shall be tested prior to touching.
- Other metalwork i.e. pipes, services, sinks, cookers etc. within the work area that is in close contact with electrical cables, including metalwork connected by earth bonding cables should be tested prior to touching.
- The Volt Stick® will illuminate through the insulation of most domestic electrical cables and when in close proximity (closer than 56mm) to other electrical insulated cables such as cooker and boiler control panels, however this does not necessarily indicate an unsafe situation (see picture 3).
- Where the body of an appliance has indicated an unsafe condition, then additional checks further away from the cabling should be made, including a check on the appliance gas supply pipe to prove safe.
- Due to the sensitivity of the Volt Stick® it may illuminate on some statically charged materials e.g. plastics, aluminium etc, however, this does not necessarily indicate an unsafe situation. Note: It is not necessary to check isolated pieces of metal e.g. metallic door handles and window frames.
- Do not dismantle the Volt Stick® in a gaseous atmosphere.

The only contact with the metalwork shall be via the tip of the Volt Stick®. Do not touch any metalwork with any part of the body during the check.

The Volt Stick® will NOT detect electrical CURRENT and in some circumstances a potentially hazardous current may still be present and for this reason before separating or disconnecting any pipe work or fittings it is essential that a temporary continuity bond shall be fitted. (a very small current can ignite a gaseous atmosphere).

If an electrical fault occurs, either inside or outside a building, it is possible for stray electrical currents to be transmitted through the gas installation pipe work. Therefore, to avoid electric shock or a spark which could ignite any gas present, it is important to maintain electrical continuity in the pipe work at all times.

Refer to **T/PM/EL/15 Electrical safety at consumer's premises** for further information

6.8.2 Temporary continuity bonds

The Gas Safety (Installation and Use) Regulations 1998, (Regulation 18.2) requires that a temporary continuity bond shall be used to maintain electrical continuity whenever a meter, gas pipe or fitting is disconnected.

A temporary continuity bond shall be fitted before any part of a service, meter installation or other pipe work within premises is connected, disconnected or cut, or when installing an insulation joints.

A temporary electrical continuity bond is a device consisting of a suitable length of flexible insulated cable, complete with appropriate clamps at each of its ends. The purpose of the temporary continuity bond is to create a safe zone in which to carry out work. It will also minimise the likelihood of an ignition source being created by an electrical discharge across a temporary gap in pipe work. Only National Grid Gas approved temporary continuity bonds shall be used.

Prior to fitting temporary continuity bonds an approved Voltstick shall be used to determine whether the pipe work is carrying a voltage greater than 50v. If sparking occurs at any time when fitting or removing a bond or the Voltstick illuminates, work shall cease immediately and the consumer advised that the installation needs to be checked by a competent electrical contractor or local electricity company. A card shall be left with the consumer and the job record shall be endorsed with details of advice given to the consumer. Further work on the installation shall only be carried out following verification by either the competent electrical contractor or local electricity company that it is safe to do so. A temporary continuity bond shall be fitted so that it will not be disturbed during the progress of the work, and shall not be removed until the work is completed. The bond shall be connected to the pipe work on both sides of the section to be worked on and shall be fitted or removed in a gas-free atmosphere only.

When fitting a temporary continuity bond the procedure detailed below shall be followed:

- Select the position on the service or installation pipe work at which the temporary continuity bond is to be connected
- Clean the pipe at this position to provide a sound metal contact. If the service pipe is wrapped steel, no continuity will be provided if the bond is connected to the wrapping. Do not attempt to remove any wrapping in order to fit the bond if an alternative position can be chosen. Ensure that the bond is of adequate length, that the cable and connection ends are in good condition with no obvious defects, and that the connection ends are clean. If defective, work should not commence until the defective bond is replaced.
- If an insulation joint is fitted the temporary continuity bond shall not bridge the insulation joint
- If the service pipe is PE, connect the temporary continuity bond to the ECV.
- Attach the two ends of the temporary continuity bond to the previously cleaned sections of pipe work and ensure that both connections are secure.
- Proceed with the connection or disconnection of pipe work/meter etc.
- Do not undertake any work on pipe work outside of the bond
- Following completion of the work, remove the temporary continuity bond;

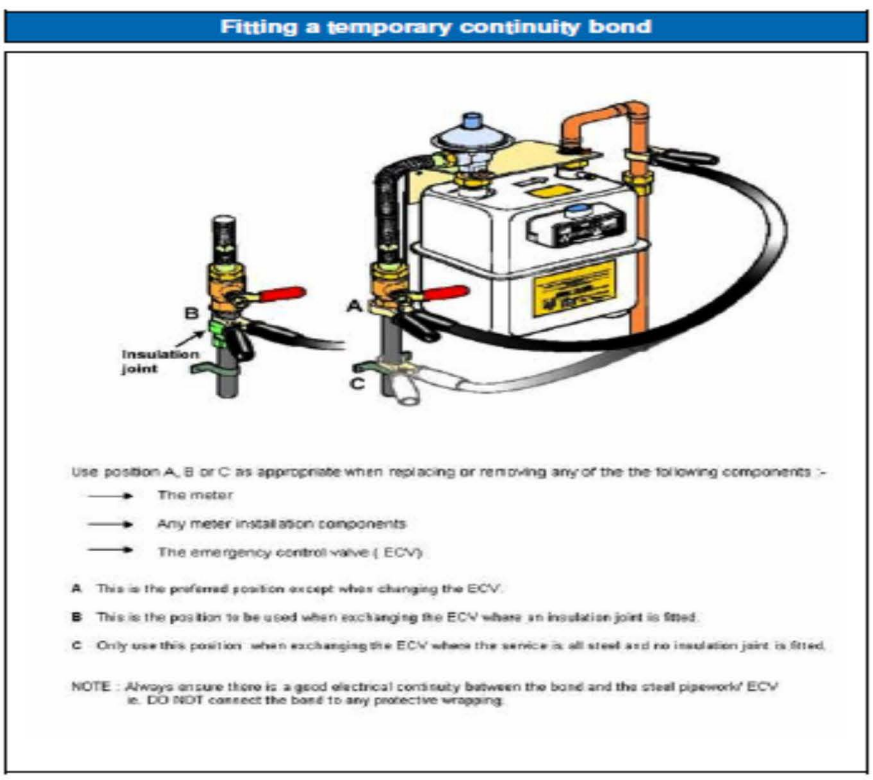

Figure 2a – Fitting a Temporary Continuity Bond

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6.8.3 Main equipotential bonding (cross-bonding)

6.8.3.1 The bonding connection:

Shall be:

- On the consumer's side of the meter on the outlet pipe work.
- As close as practicable to the meter before any branch in the installation pipe.
- In a position where it can be visually observed with a warning label.
- A mechanically and electrically sound connection that is not subject to corrosion (i.e. not exposed to the weather) and is made using a BS 951 compliant earth clamp;
- In a position on the installation pipe, depending on the meter position, as follows:
    - For internal meter installations the bonding connection shall be within a maximum of 600mm of the meter outlet.
    - For meters in outside meter boxes/housing the bonding connection should be preferably inside the building and as near as practicable to the point of entry of the installation pipe work into the building.
- Alternatively, the connection may be made within the box/housing, but it is essential that the bonding cable does not interfere with the integrity of the box/housing and the sealing of any sleeve.

Figure 2b - Examples of earth strap

6.8.3.2 Unsafe Earth connections to gas supply pipes.

If the bond connection is affixed to the gas service, (upstream of the meter) work shall cease and the consumer advised that a possible electrical fault exists and the installation needs to be checked by a competent electrical contractor.

Further work on the installation shall only be carried out following verification by either the competent electrical contractor or local electricity company that it is safe to do so.

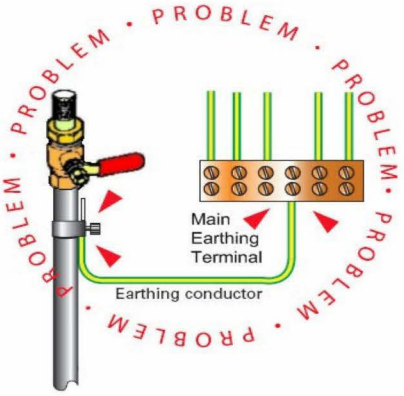


Figure 2c – Incorrect bonding on gas service pipe

6.8.3.3 Alteration to main equipotential bonding

Alteration work shall only be undertaken by an electrically competent person who has been specifically trained and assessed by an appropriate organisation as competent. Electrical earth continuity shall be maintained at all times.

6.8.3.4 Requirements following permanent removal of gas meter

Where a meter is to be permanently removed it may be necessary to fit a permanent bond before removing the temporary continuity bond. A permanent bond is required across the meter installation if the meter has been permanently removed, and

- The gas service is made of either steel or is PE inside a steel carrier which extends into the ground; and
- The distance between the two ends of pipework remaining is less than 2m when the meter has been removed.

A permanent bond will not be required if there is already an insulating joint fitted or the existing pipework is permanently connected mechanically and electrically by a metallic fitting, i.e. a steel meter bracket.

If there is no insulation joint a bond is not required where it is possible to apply a permanent electrical insulating coating to any exposed pipework (upstream of the meter), thus preventing fortuitous contact i.e. wrap with electrical insulation tape up to and including the ECV or capped end. National Grid Gas has approved the use of the EL/15 Insulation sleeve to satisfy this requirement.

Figure 2c - Example of a wrapped steel standpipe and ECV

Where it is not possible to utilise the EL/15 insulation sleeve they should completely wrap the exposed metallic inlet pipe work and ECV with insulation tape, from bottom to top ensuring a 50% overlap, in order to comply with the company's legal responsibilities.

If this is not possible then inform the Operational FLM who should arrange for a suitably qualified person to fit a permanent electrical bond between the service and the installation pipework.

The temporary continuity bond shall remain in place until a permanent bond has been fitted.

6.8.3.5 Main equipotential bonding further information

The purpose of equipotential bonding is to ensure that all metallic services within the premises remain at the same electrical potential and therefore minimise the risk of electrical shock and are robustly connected to the electrical earthing system.

In multi-occupancy premises, main equipotential bonding will usually have been fitted either within each of the individual premises or at the base of the riser system.

Where electricity supplies are of the protective multiple earth (PME) type it is a legal requirement that metallic pipes entering these premises are bonded to the electrical supply earth.

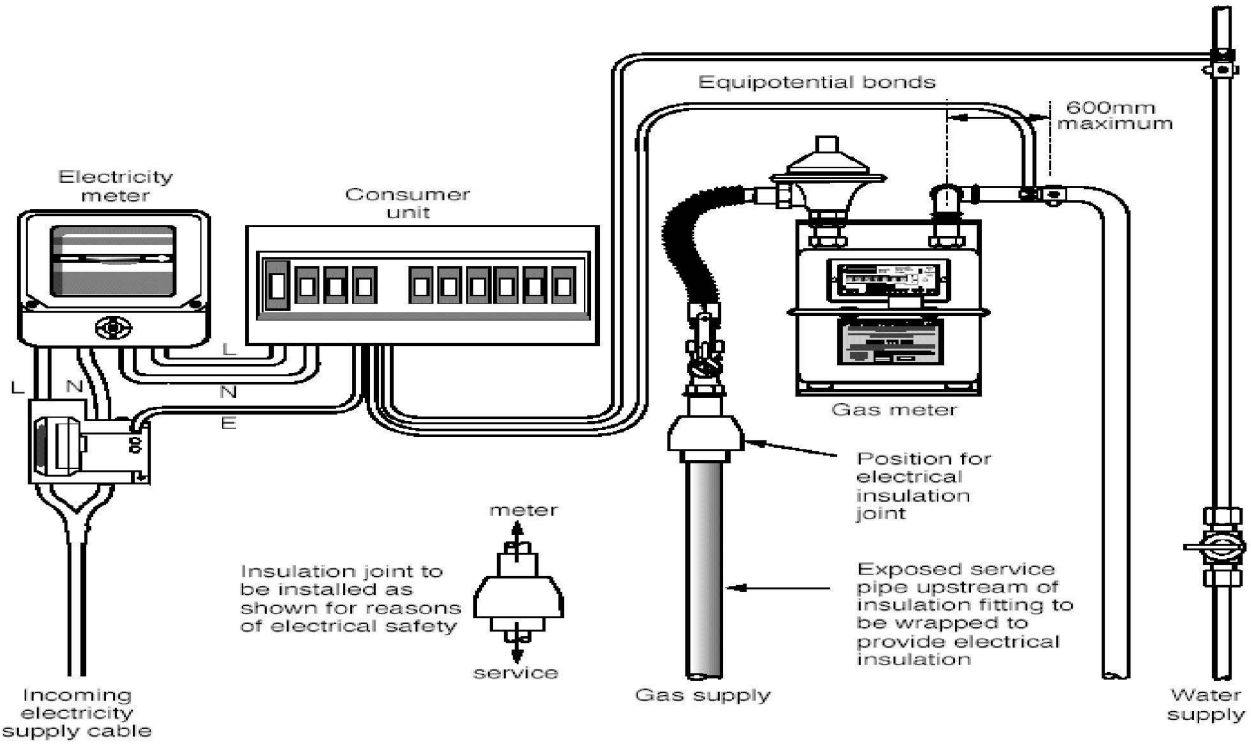


Figure 3 – Main equipotential bonding on domestic supply installations

When it is necessary to alter the position of the main equipotential bond as the result of a meter relocation it shall, in the first instance, be necessary to test the electrical integrity of the existing bond and its continuity to the consumer unit for the premises. This activity shall be undertaken by an electrically competent person.

For domestic property, proceed as follows, depending upon the particular situation:

Correct Mains Equipotential Bonding fitted
Carry out service replacement work.

Mains Equipotential bonding wrong position but will not be disturbed during gas service work
Carry out service replacement work and issue card B945 Safety Notice (Appendix C) to property owner/occupier.

No Mains Equipotential Bonding fitted
Carry out service replacement work and issue card B945 Safety Notice (Appendix C) to property owner/occupier.

Mains Equipotential Bonding in wrong position and will be disturbed during work (meter outlet to upstream pipework)

Stop work and issue card B945 Safety Notice (Appendix C) to property/occupier. Inform Operational manager.

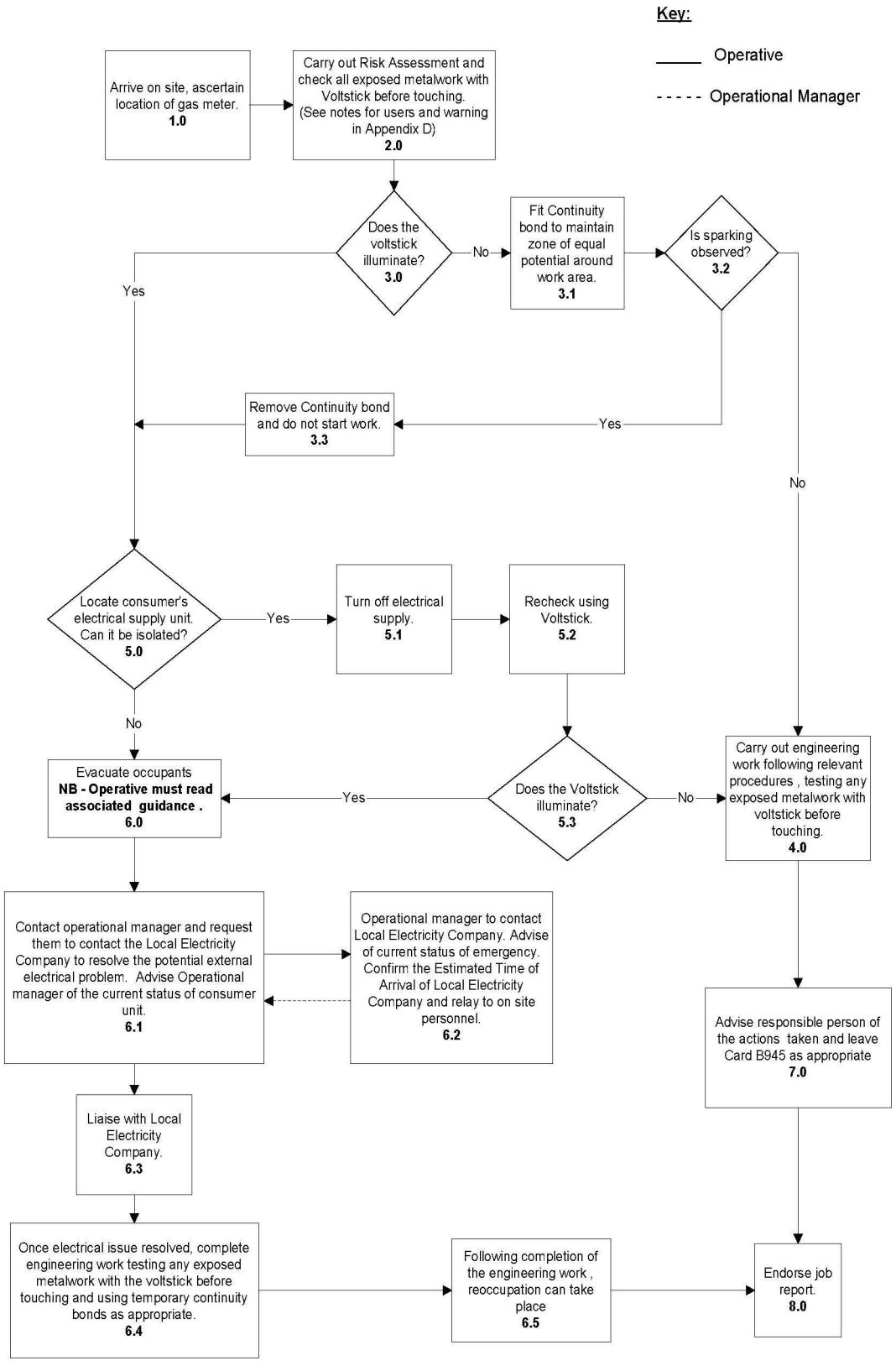
6.8.4 Electrical insulation joints

An electrical insulation joint (IJ) may have been fitted as part of the service pipework. This joint will electrically isolate the gas network and prevent the flow of stray current that may be hazardous, cause sparking or accelerate corrosion of any metallic mains & services.

Care shall be taken that such joints are not compromised by the use of temporary continuity bonds during work activities. Electrical insulation joints are only fitted to metallic pipe work which could become an electrical conductor. PE service pipe does not require any insulation joint provision as the PE pipe already has electrical insulating properties. Electrical insulation joints are commonly used on multiple steel service risers feeding flats.

Temporary Continuity bonds **shall not** be connected to the body of insulation joints.

6.8.5 Flow chart for engineering work at consumers' premises



6.8.6 Flow Chart Text

The text below refers to the numbers in the flowchart in 6.8.5.

1.0 After arriving at the property where work is to be undertaken, ascertain the location of the gas meter installation.

2.0 Before starting any work identify hazards in the work area taking all necessary precautions to ensure it is safe to proceed. This hazard assessment shall include using a Voltstick. Prior to using the Voltstick carryout the checks described in Voltstick section 16. Once these checks have been completed, check all exposed metalwork in the work area with the tip of the Voltstick. Until this part of the hazard assessment is complete, you shall not touch metallic surfaces.

3.0 Observe if the Voltstick illuminates. If the Voltstick does not illuminate, proceed to 3.1, if it does, proceed to 5.0.

3.1 Fit temporary continuity bonds where appropriate. Guidance on the correct temporary continuity bond to be used and its fitting is detailed in Section 7.11.1 of this Procedure. For the fitting of continuity bonds on mains see Chapter A6 Service Cut Off's.

3.2 If sparking is observed while fitting the temporary continuity bond, follow the actions in 3.3; if no sparking occurs follow the actions in 4.0.

3.3 Remove the temporary continuity bond and do not start work. The consumer and/or responsible person on site shall be advised of the potential danger of coming into contact with electrical surfaces and informed of the action taken and findings. Proceed to 5.0.

4.0 If the Voltstick does not illuminate, the temporary continuity bond can now be fitted. The planned engineering work can progress, following the relevant procedures. Proceed to 7.0.

5.0 If the Voltstick illuminates or the sparking is experienced when applying the temporary continuity bonds, locate the consumer's electrical supply unit (also referred to as the consumer unit) and check to see if it is physically possible to isolate, if not proceed to 6.0.

5.1 Check with the occupier to ensure there is no critical equipment plugged in within the property e.g. medical machinery. Where it is physically possible to isolate the electrical consumer unit, do so and inform occupier that it will remain off. If the consumer unit is metallic, test it with Voltstick prior to touching. If the Voltstick illuminates, use an appropriate insulated glove to isolate it. If it is not possible to isolate the consumer unit, proceed to 6.0.

5.2 Re-check all exposed metalwork in the work area with Voltstick before touching.

5.3 If the Voltstick continues to illuminate refer to 6.0 if it does not, proceed as 4.0.

6.0 In order to safeguard the consumer from electrical faults e.g. live pipework, appliances etc, evacuate the property, noting where individuals have been evacuated. It is vital that the consumer is given adequate information, explaining the seriousness of the situation, to allow prompt evacuation. If the consumer refuses to leave the premises, consideration shall be given to contacting the Police for assistance. **It is important that the operative records events and conversations that take place during the evacuation process.**

NOTE: In the case of multi occupancy buildings where electrical isolation proves impossible, the operative shall call for immediate backup via their Operational Manager to both aid in the monitoring of the on site situation and in the evacuation and control of crowds, etc.

6.1 The Operational Manager is to be advised on whether the electrical consumer unit has been isolated or not, and if so indicate whether the gas service pipework remains live. Operational Manager proceeds to 6.2.

6.2 When contacting the Local Electricity Company (LEC), the Operational Manager is to relay site details such as operating position of electrical consumer unit (on or off), detailing whether the gas service pipework remains live. Explain why the consumer unit has been left 'on'. The reason will be either, the gas levels are greater than 70% LEL above and below the unit, or the ECV is seized open (replacement required). The manager is to establish the likely time of arrival of the LEC and relay this information to the personnel on site. It is important that the Operational Manager maintains a record of conversations to ensure National Grid National Grid can defend its actions and justify any claims should the LEC take an inordinate amount of time to arrive on site.

6.3 The Operational Manager and or operatives on site are to liase with the LEC to initially establish time of arrival and following the arrival of the LEC on site, to maintain a monitor on the progress of the repair/isolation of the suspect supply.

6.4 When the LEC has confirmed the electrical supply issue is resolved the premises can be reoccupied.

6.5 Complete the engineering work in accordance with relevant procedures, testing any exposed metalwork with the Voltstick before touching, using continuity bonds as appropriate. (see 6.8.7) Proceed to 8.0.

7.0 Advise responsible person on site of findings and leave card B946 as appropriate.

8.0 Endorse the job report to indicate the work completed.

6.8.7 Maintaining Electrical Continuity Following Replacement of Domestic Metallic Services

It is essential that electrical safety in our customer's premises is maintained whilst undertaking the replacement of metallic gas services by dead insertion or Serviflex. To ensure this a Temporary Continuity Bond (TCB) is fitted across the gas meter installation prior to removal of the gas meter to allow the replacement of the gas service and this TCB remains installed until the gas meter is refitted. This requires service layers, who have been deemed competent in the removal of gas meters, to leave their TCBs connected until the gas meter is refitted by a competent meter worker.

However if the removal of the TCB is required then the following can be carried out:

- A sealed ¾" Female BS746 x ¾" Male BS746 adaptor fitting (see Figure 3a below) or a brass sealing disc complete with washer can be installed on the outlet of a ¾" Emergency Control Valve (ECV) to allow the flexible meter inlet (anaconda or lead) to be reconnected by the service layer. The fitting caps off the gas service pipe as required and will also allow the TCB to be removed. This solution is only applicable for those meter installations fitted with a flexible meter inlet with a ¾" BS746 inlet.

- In addition to inform the customer that the installation is sealed a warning label has to be fitted adjacent to the ECV as shown in Figure 3b. Figure 3c shows the completed installation with the sealed adaptor fitting installed, the warning label attached and the TCB removed.

Once the meter worker attends site they will remove the warning label and the sealed adaptor fitting and reconnect the meter anaconda to the ECV, test, purge and commission the installation pipework. They should then return the warning label and adaptor to stores for future issue and use.

Figure 3a – ¾" x ¾" BS746 sealed adaptor on outlet of ECV or a brass sealing disc complete with washer

Figure 3b – Warning Label attached

Figure 3c – Completed installation capped off and TCB removed

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6.8.8 – PE Pipe used as Electric Cable Duct

Third parties will use yellow PE pipe as electrical conduit and not consider the risk this will pose to National Grid and its contractors.

Key points to Remember:

Be vigilant and never assume always 'Stop Take A Minute'.

- Always use the cable and pipe locator tool in all modes including power socket Plug Connectors and the Genny Signal Clamp where possible, as these can induce a signal in cables running in conduits in/outside a property.
- Always use your Voltstick – it may not show the presence of a cable in a pipe but will indicate fault current on metal sleeves/pipework.
- Always use cable plans where available and/or ask property owners if they know if cable runs are located in the area you about to work in.

7 EXCAVATIONS / SITE WORKING

All excavations work shall be in accordance with the Excavation Work Procedures.
Remember – if working on new development sites, check and comply with site regulations and always wear your hard hat where you see the 'hard hat' sign displayed (Figure 4). Contact site foreman / owner before starting work and advise on proposed works.

Figure 4: Typical 'hard hat' warning sign

7.1 Signing of road works

The Department of Transport booklet *Safety at Street Works and Road Works* (D4) shall be used when signing road works. Refer to your copy when carrying out such works. This document only details the minimum requirements and may require additional measures depending on the site location and hazard assessment:

- close proximity to schools,
- higher speed roads

If you do not possess a copy, advise your Manager immediately.

7.2 Construction Sites

Construction Sites are hazardous places, before starting any work contact shall be made with the site management and ensure that all procedures, hazards are highlighted for site activities. Further information can be found in the Excavation Work Procedures and National Grid Distribution and Transmission Hazards and Precautions Booklet.

8 MATERIALS

All pipe and fittings to be used for the construction of services shall be approved and supplied through the National Grid supply chain.
Defective material shall be; marked, the support documentation completed and returned to the procurement department via the Operational Manager.

8.1 Delivery

Pipe and associated materials delivered to the site shall be unloaded carefully. Cranes, ropes and skids may be used for 100 m coils of 63 mm diameter pipe and large/bulk supplies of materials or fittings. Pipes and fittings shall not be dropped to the ground and should not be allowed to knock against each other.

The operative or other responsible person shall examine all lifting equipment before use. Lifting Equipment shall be regularly inspected and certified. Any defective equipment shall be withdrawn and clearly marked DO NOT USE. The Operational Manager shall be notified of any defective equipment as soon as possible. Equipment without a current certificate shall not be used.

8.2 Inspection on delivery

All materials delivered to the site should be inspected. All couplers and associated fittings should be delivered in suitable packaging. Rejected material should be clearly marked DO NOT USE and reported to the Operational Manager. If the damage to the pipe is in excess of 10% of the wall thickness then the pipe shall not be used. Refer to Appendix H – SURFACE DAMAGE TO PE PIPES.

8.3 Storage

Where it is necessary to store pipes and other materials on site, the location should be on a firm, level ground, free from damaging material, with suitable safe access for vehicles and/or cranes. Critical/complex components such as valves and electrofusion fittings and other associated service laying equipment remain in packaging as long as possible and when removed should be protected from dirt, water ingress or other contamination if not immediately used.

Care shall be taken to place pipes and fittings so as to avoid interference and obstruction to traffic, pedestrians or other Utilities' plant. Pipes should be wedged to prevent accidental movement and, barricades shall be erected and warning signs and lamps positioned.
Where a risk assessment determines the need a secure compound and containers should be provided to store equipment and materials.

8.4 Handling of Coils

Depending on site conditions and personnel, individual coils of pipe not exceeding 63mm diameter and 100m in length can normally be manually handled on site. To ensure a safe working environment wherever possible 63mm diameter coils should be dispensed from a coil dispenser supplied from a recognised manufacturer.

Eye Protection should be worn when coil banding is removed. Care should be exercised when dispensing coils. The movement of the tails ends should always be controlled to prevent whiplash.

8.5 Unbanding Coils

Coiled pipe contains a considerable amount of stored energy, which has a potential to cause injury if handled in an incorrect way.

Care shall be taken to avoid damage to the pipe during the removal of the bands and, if a coil dispenser or coil bag is used when pulling the pipe from the coil, avoid scratching or scoring when the pipe comes into contact with the ground or any other objects.

For service sizes up to 32mm, coils can be placed into purpose made fabric bags, which then allow the coil bands to be removed, allowing the coil to be restrained by the bag.

For 63mm coils, at least two persons shall be present during unbanding, unless the coil has been fitted to a coil dispenser that has been designed to restrain the outer layer of the coil when the bands are cut.

Complete coils are secured by both outer and intermediate bands, and the layers of the coil are secured independently. When the bands are to be released, the bands securing the outer end of the pipe be removed first, followed by those securing successive layers. Only sufficient bands shall be removed to release the length of pipe immediately required. After completion of the dispensing operation it is important to ensure that the free tail end of any part coil is secured before transporting it.

9 TOOLS, EQUIPMENT & PLANT

Only tools and equipment issued and hired by the Operative's employer shall be used. Operatives shall be competent in the use of the equipment, to comply with the requirements of the PUWER Regulations 1998.

All tools and equipment shall be visually checked prior to use, any signs of damage or defects shall the reported to the Operational Manager. Faulty or damaged tools and equipment shall not be used until repaired or replaced.

A competent person shall inspect tools and equipment on regular intervals. This will form part of the maintenance and inspection process required by PUWER.

Reference shall be made to the tools and equipment procedures for full instructions on the safe use and maintenance of tools and equipment.

10 RECORDS & DOCUMENTATION

Operatives shall complete the following documentation where applicable:

- Job instruction card
- Complete/amended as-laid drawings (see 6.1)
- Pressure test certificates
- Risk assessments
- Routine operation documents
- Permit to Work documents

10.1 Site Records

It is important that site details are recorded to allow pipes to be located in future, and therefore ‘as laid’ records for new and replacement work shall be created. It is essential that adequate detail is recorded on any drawings to allow future identification, and at least **TWO** measurements should always be made.

In general it is best to use the edge of a building as a guide and measure the distance from it to the location of the pipe or equipment to be recorded. A second, separate fixed point should then be used

for the second measurement. When buried pipe details are being recorded, the depth should also be recorded.

As laid records, prepared during Service laying operations should include where encountered:

- The position of the connection to an existing main
- The position of any valves/cap ends/pressure points/regulators etc
- A material change
- A diameter change
- A change in depth
- The location of above ground plant
- The position of the pipe every 30m (50m in the country)
- The location of cathodic protection devices
- Where pipes cross
- Where an existing pipe is exposed
- The service termination point

Remember - this requires **TWO** dimensions at every point **PLUS** the depth of cover.

The following example shows the location of a new service laid to a meter housing at no 250. The service termination and connection point to the main are clearly shown, two dimensions are added to locate them. Similarly, all of the other points are recorded using two dimensions to allow future location. The single headed arrow points i.e. 0.6m, 0.6m and 0.9m show the depth of cover of the pipe.

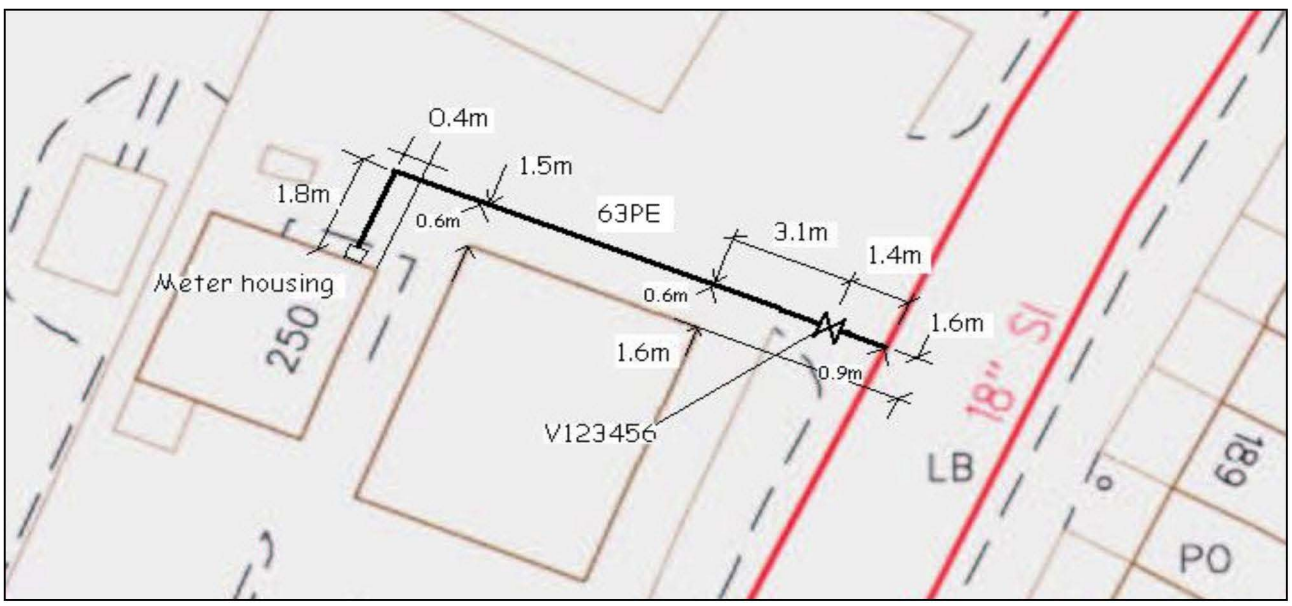


Figure 4a – Example of correctly marking up a new gas service pipe

10.2 Records with incorrect information

Corrective action shall be taken should the conditions on site differ from that of any plan or maps issued. The following examples may be encountered:

- an unrecorded main or service has been located
- mains or service position not shown correctly
- an error in the material shown
- the wrong pressure is recorded

An amended sketch or drawing should be completed and returned with job documentation.

11 FIRST AID

11.1 First Aid

This section is not comprehensive. In cases of serious injury, qualified medical help should be obtained as a matter of urgency.

In the event of an accident causing injury to personnel, the following course of action should be taken:

a) **Get help**: this does not mean that you should leave the casualty whilst you go in search of a telephone. Call out (or shout) to attract the attention of passers-by or other persons in the vicinity.
b) **Take immediate action**: do what you can to protect the casualty from further danger or injury. Lay the casualty in the recovery position. Attempt to stop any bleeding and, if you know how and the need is evident, give artificial resuscitation. You are not the doctor and might not be a qualified First Aider; so limit your aid to the more obvious, commonsense actions until expert help arrives.
c) **Comfort the casualty**: keep the casualty warm and dry and above all reassure him/her that help is on the way. Anyone who has been involved in an accident will know how good it feels to know that someone is at hand to take care of you.

11.2 Prevention of tetanus

When working in excavations there is always a risk of tetanus if you have an open wound. Cover any cuts and abrasions with water proof dressings and wear protective gloves.

11.3 Prevention of Weils disease

When you have to work in the vicinity of sewers or stagnant waterways, cover any cuts and abrasions with waterproof dressings and wear protective gloves. Wash out splashes in the eye with clean water as soon as possible.

Wash carefully after work. If you develop flu-like symptoms, especially with nausea or vomiting, within three weeks of this sort of work, report to your GP and inform your local Occupational Health department.

11.4 First aid boxes and kits

First Aid boxes and kits are provided for use in an emergency. **Do not misuse the contents;** it is not much help if an accident occurs resulting in injury to a colleague and you find that someone has taken and not replaced the essential bandages, sterile dressings, safety pins, etc.
Vehicles used by operations personnel should contain a First Aid kit. This kit should be **kept in the space provided or other prominent position** so that whoever is using the vehicle can locate it easily when required.

If a First Aid kit or any of its contents are badly damaged, the kit should be returned for replacement. If a First Aid kit supplied for in-vehicle use is lost, stolen or missing you shall provide a replacement as soon as possible.

11.5 Situations likely to require basic first aid

The casualty should be taken to a hospital, dependant on the severity of any injury with the minimum of delay. Information is found in first aid boxes regarding certain situations and the actions to take in the event of.

12 ACCIDENT REPORTING / NEAR MISS

Every accident or near miss shall be reported. Details of any injury, and the treatment (if any) given, shall be entered in the Accident Book as soon as possible after the accident.

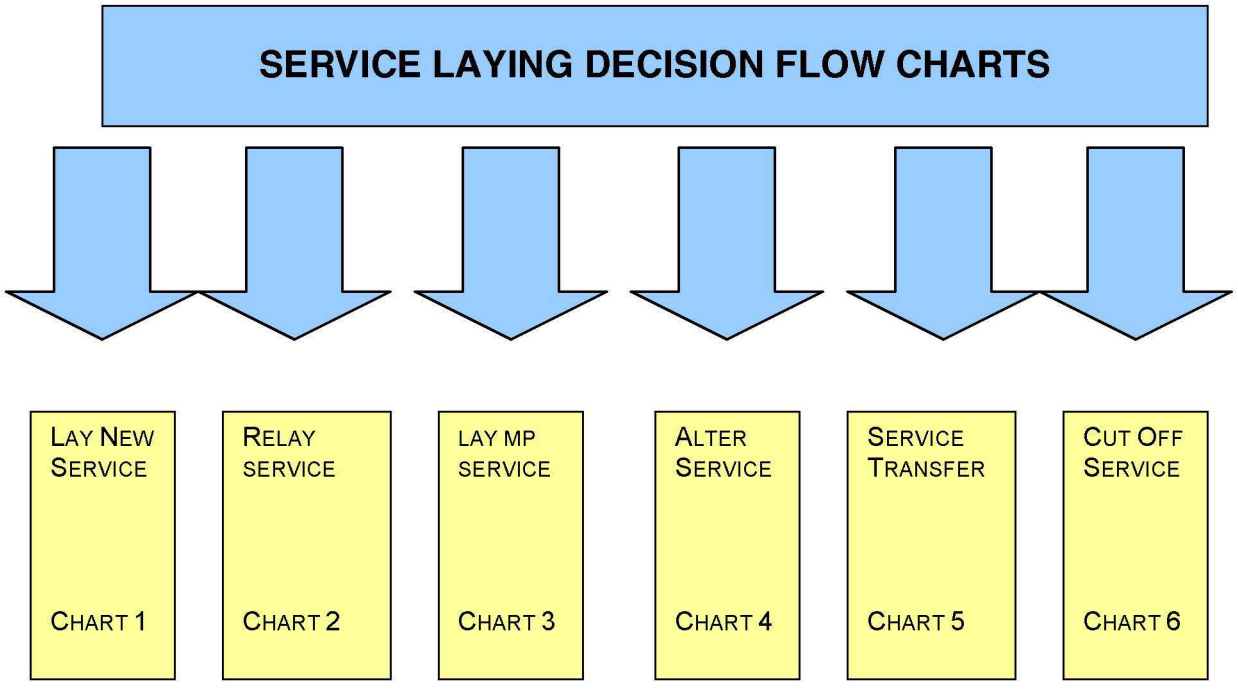
13 SERVICE LAYING DECISION FLOW CHARTS

To assist with the guidance and procedures for service laying procedure, six decision charts have been included to provide a road map. The decisions charts are split into 2 sections and are divided on the charts by a dashed line as shown below:

a) **Safety and Consumer Contact** – this gives information and guidance on what site preparations and precautions need to be undertaken prior to the work process starting. Where a number is shown within a box on the charts this is related to specific activities that should be undertaken at that point, further information on these activities can be found after the decision charts or by clicking on the link above.

b) **Work Process** – this gives the guidance on decision making to undertake the service laying activity.

Each box is numbered and is detailed with an explanation or information on how the process box is completed and where supporting information is found in the work procedures.



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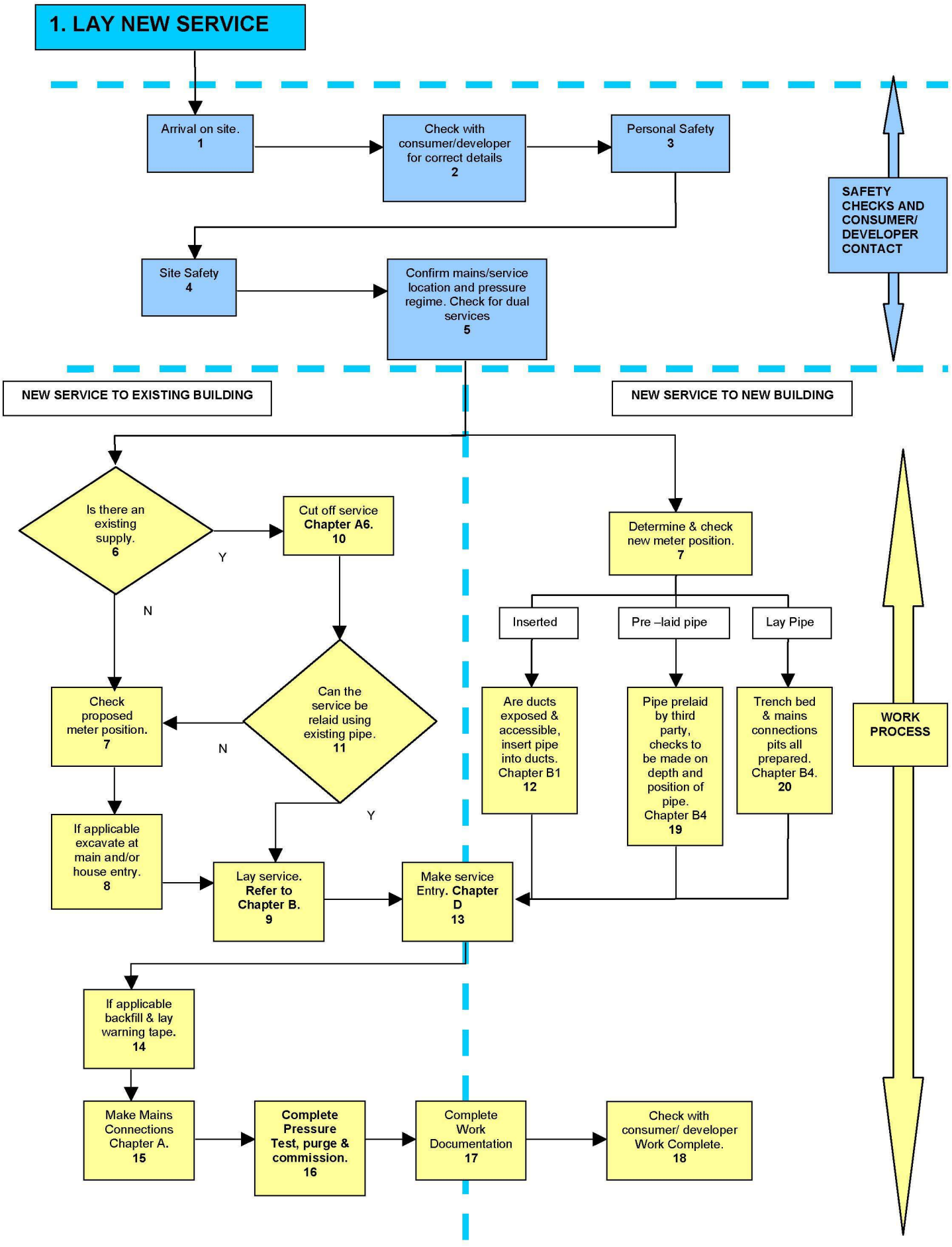
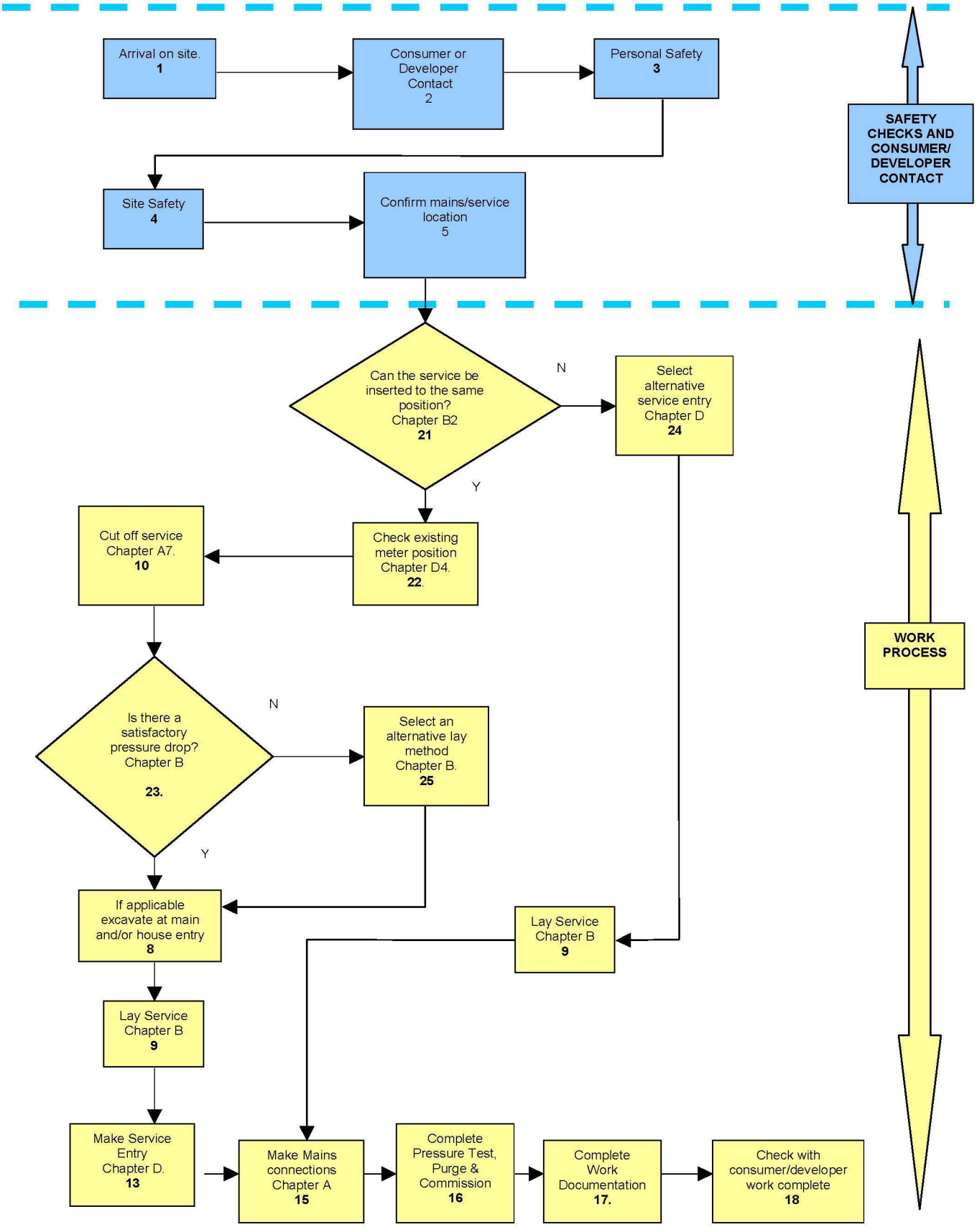

1. LAY NEW SERVICE
Arrival on site. 1
Check with consumer/developer for correct details 2
Personal Safety 3
Site Safety 4
Confirm mains/service location and pressure regime. Check for dual services 5
SAFETY CHECKS AND CONSUMER/ DEVELOPER CONTACT
NEW SERVICE TO EXISTING BUILDING
NEW SERVICE TO NEW BUILDING
Is there an existing supply. 6
Y
N
Cut off service Chapter A6. 10
Check proposed meter position. 7
Can the service be relaid using existing pipe. 11
N
Y
If applicable excavate at main and/or house entry. 8
Lay service. Refer to Chapter B. 9
Determine & check new meter position. 7
Inserted
Pre –laid pipe
Lay Pipe
Are ducts exposed & accessible, insert pipe into ducts. Chapter B1 12
Pipe prelaid by third party, checks to be made on depth and position of pipe. Chapter B4 19
Trench bed & mains connections pits all prepared. Chapter B4. 20
Make service Entry. Chapter D 13
If applicable backfill & lay warning tape. 14
Make Mains Connections Chapter A. 15
Complete Pressure Test, purge & commission. 16
Complete Work Documentation 17
Check with consumer/ developer Work Complete. 18
WORK PROCESS

2. RELAY SERVICE



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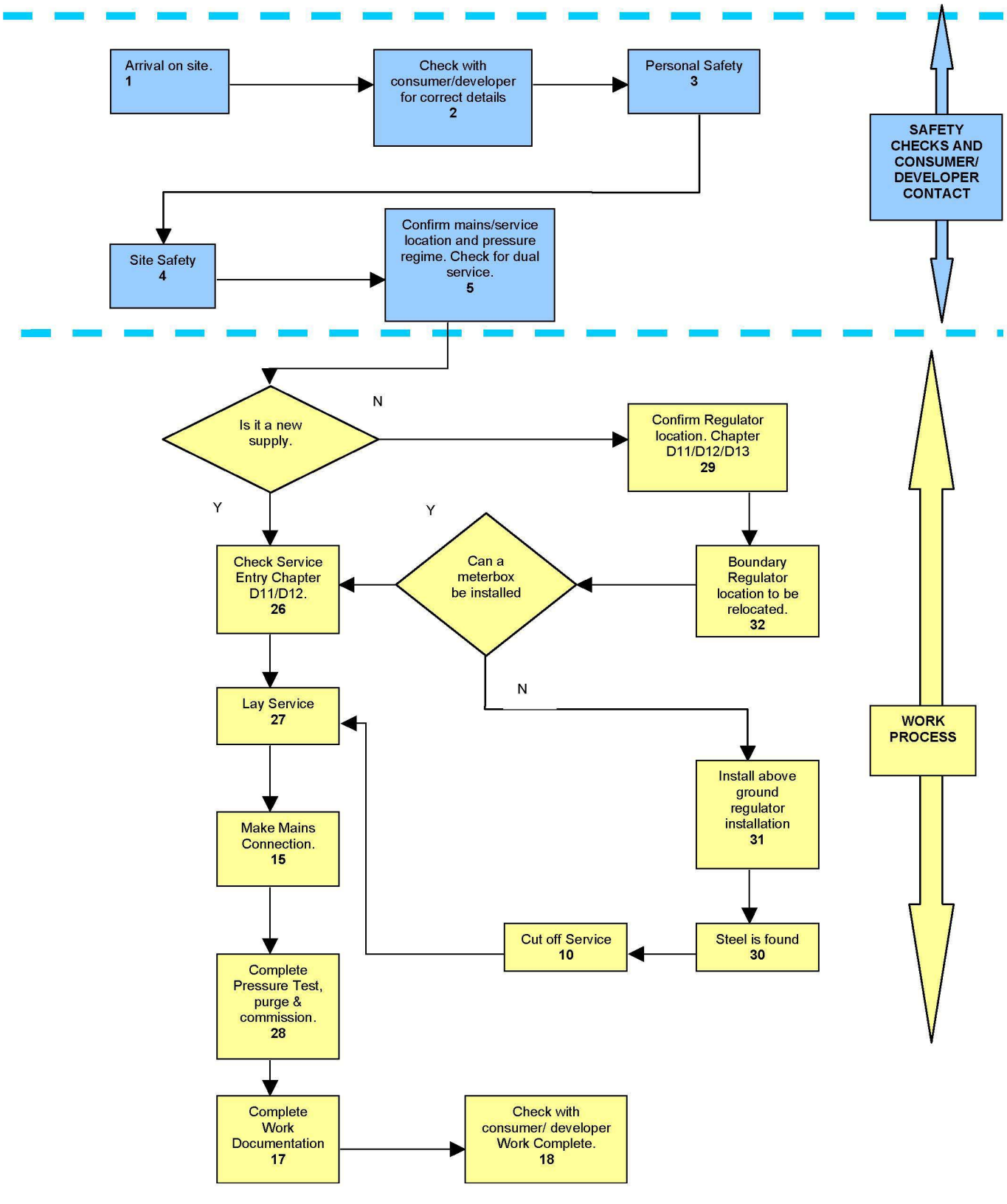
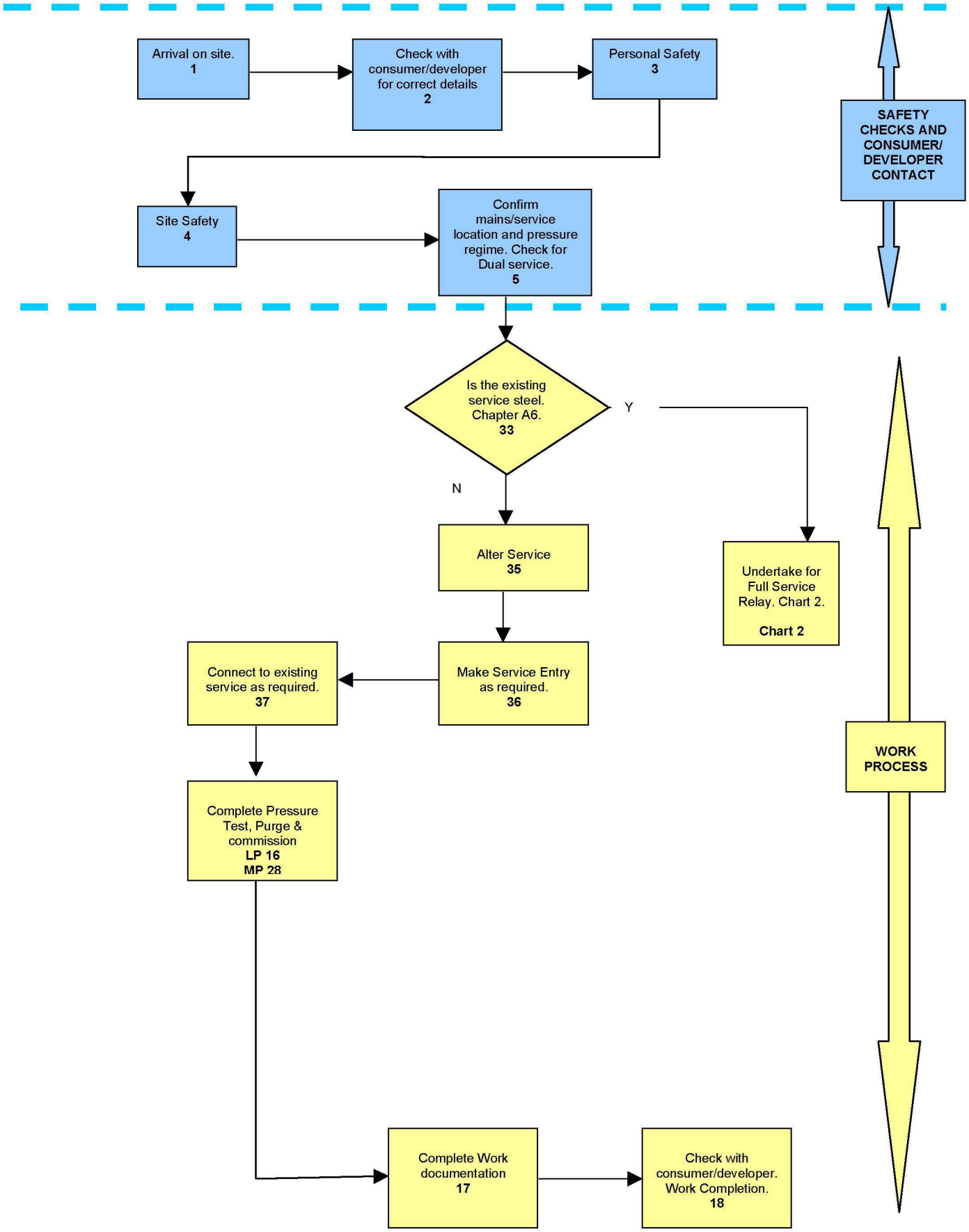
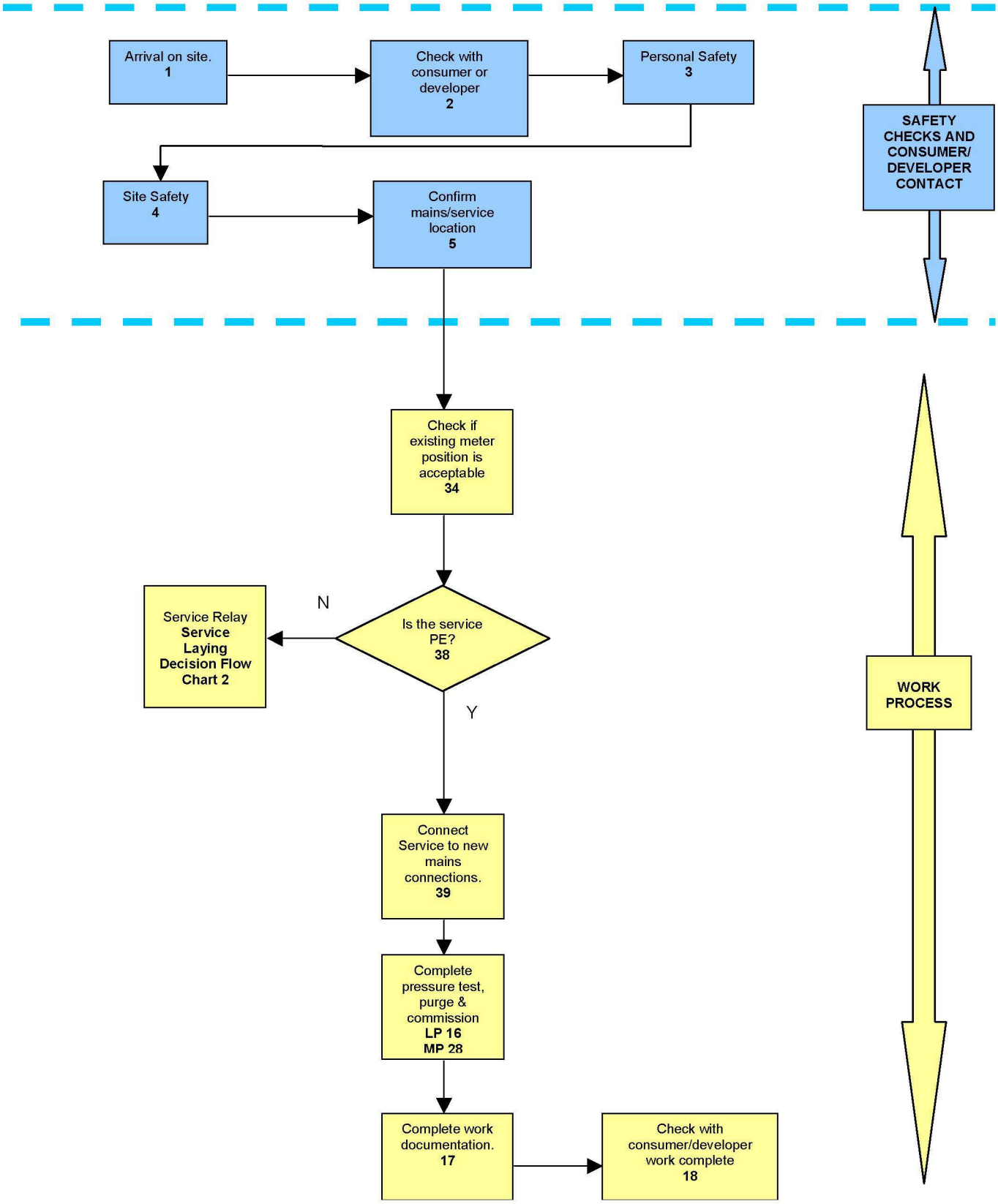
3. MEDIUM PRESSURE SERVICE



4. ALTER SERVICE



5. TRANSFER SERVICE



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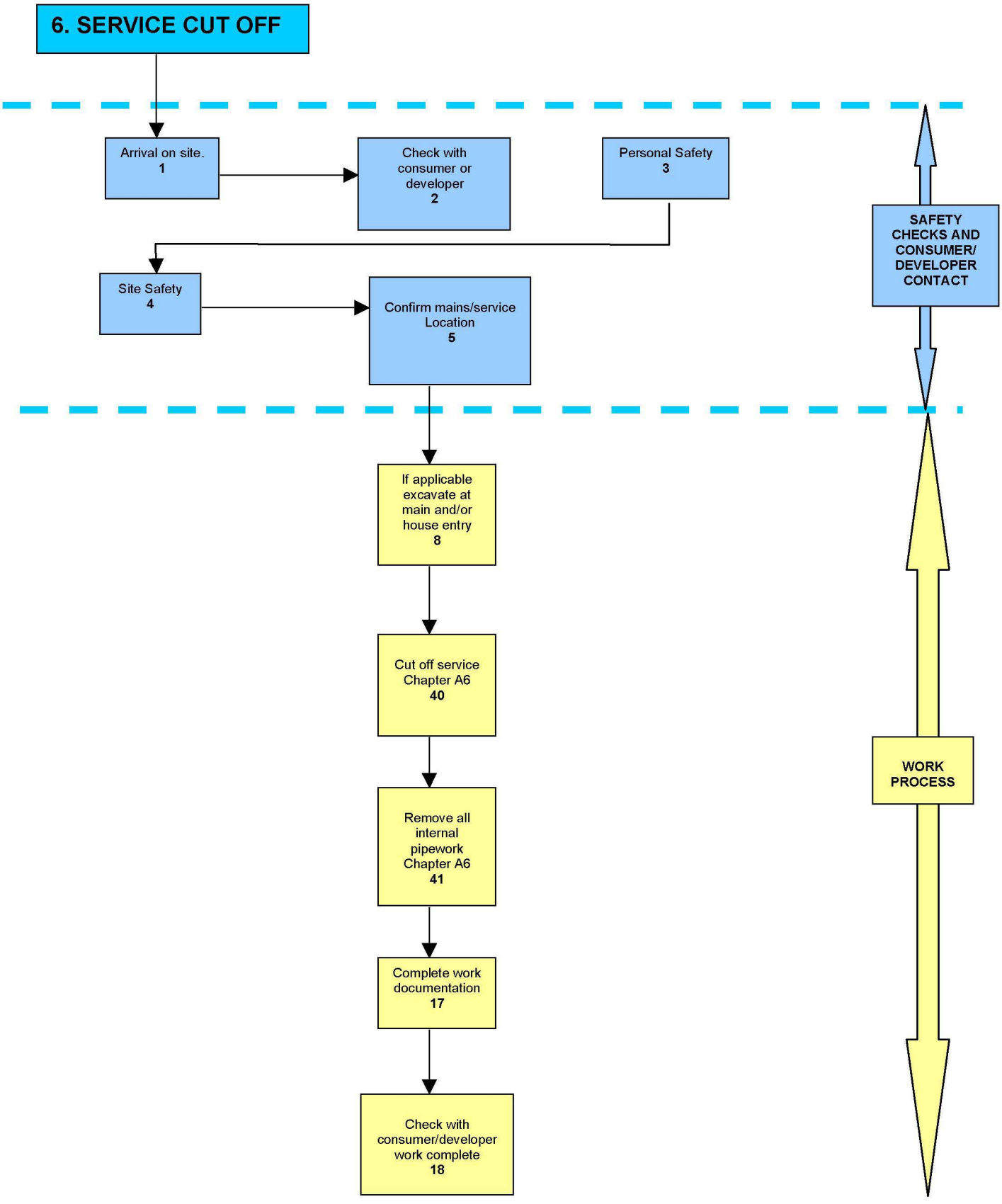
6. SERVICE CUT OFF
Arrival on site.
1
Check with consumer or developer
2
Personal Safety
3
Site Safety
4
Confirm mains/service Location
5
SAFETY CHECKS AND CONSUMER/ DEVELOPER CONTACT
If applicable excavate at main and/or house entry
8
Cut off service Chapter A6
40
Remove all internal pipework Chapter A6
41
Complete work documentation
17
Check with consumer/developer work complete
18
WORK PROCESS

13 .1 Procedure Text for Service Lay Methods.

Safety Checks and Consumer Contact

Prior to work commencing, the following on site precautions and preparations shall be completed. This will ensure that the work to be undertaken is completed in a safe and efficient manner.

Step 1: Arrival on Site:

- Park safely at the work site, ensuring where possible that the vehicle is positioned to protect the workforce.
- Ensure that access is not restricted for pedestrians and traffic.

Step 2: Consumer or Developer Contact:

- Confirm correct location details.
- Introduce yourself to consumer/developer showing ID card. Wear the company overalls
- Confirm work requirements and location of meter etc.
- Confirm if consumer/developer has special needs.
- Confirm if any pets are on site and that they are safely secured during the work.
- Explain the details of work to be undertaken, any possible issues including details of later reinstatement, the meter fix etc. and ensure the customer or developer understands.
- Identify any existing surface or property damage along the proposed route and advise the customer or developer. A photograph of any damage should be taken if possible.
- Agree with consumer or developer access and egress requirements from site during and following work.

Step 3: Personal Safety

- Undertake a site risk assessment, assessing the hazards and implementing any necessary precautions.
- Be particularly observant if working near or entering a derelict or unoccupied building
    - Do not enter Buildings which appear unused or derelict unless absolutely necessary.
    - Carry out a detailed inspection for all hazards – take note of any warning signs and fencing.
    - Always ensure that adequate lighting is available. Utilise both head and hand torches when inspecting a property. Do not borrow other peoples torches, carry spare batteries on the van at all times.
    - Never go into disused property unaccompanied, when accompanied do not split up – stay in sight of each other. One team member staying in a place of safety at all times to summon help if required.
    - Never assume the floor is sound .Stay close to the walls of a building where possible, it is less likely to give way. Where more than one person is present do not concentrate combined weight in one spot.
    - Be vigilant for concealed hazards such as razorblades and hypodermic needles on stair rails and in furniture.
- Request any SCO documentation as determined by the site assessment and contact Operational Manager for further guidance if required.
- Ensure all appropriate PPE is worn and available where required.
- Check 2 x 9kg dry powder fire extinguishers are operable and ensure they are readily accessible for use.
- Ensure 2 sets breathing apparatus are checked and set up ready for use.
- Cable-locating equipment shall be used to detect cables and pipes prior to and during excavation. Remember there may be more than one cable present in the excavation.
- If whilst on site there is a smell of gas and you are not undertaking 'live gas working', contact the National Gas Emergency Centre No **0800 111 999** and report a Public Reported Escape and take any necessary precautions to protect life and/or property (Refer to Section 5).

- Adequately risk assess before entering Cellars - Before entering cellars always refer to your training and the information contained within NGUK/PR/EM/72 (National Grid Gas Operational procedures for dealing with gas escapes and other emergencies) and the Hazards and Precautions Book – (Cellars on page 126).

Step 4: Site Safety

- Ensure the vehicle and works area is protected with necessary signs and barriers in accordance with 'Safety at Street Works and Road Works' a Code of Practice. These detail the minimum requirements; additional measures may be required as highlighted during the hazard assessment on site.
- Ensure that when approaching the site that both pedestrians and vehicles fully understand exactly what is happening and what is expected of them.
- Ensure all other safety related equipment is checked prior to use and positioned safely prior to starting work.
- Continually assess the working area to ensure it is safe and adequate for the work being undertaken and where necessary adjust the signs and barriers.
- When leaving, assess the site to ensure the signing, guarding and lighting are satisfactory and where necessary adjust the signs and barriers.

Step 5: Confirm Mains / Service Location

a. Confirm mains location
   - Use plans to identify the location of utility mains (including all gas mains) and cables including services.
   - An inspection of the surrounding area for street furniture should be made, paying particular attention to recent reinstatements, which may assist in identifying plant.
   - Mark out the proposed excavation area.
   - Use cable-locating equipment to identify the position of underground plant and mark its position that the marks extend beyond the proposed excavation area.
   - If required, excavate trial holes to identify the exact position of plant. Trials holes should be excavated by hand.
   - If 2" or below steel mains (rails) are found as part of the trial holing process, contact the Operational Manager.

b. Confirm Gas Service Location
   - Survey the existing area to identify the route of the service looking for meter boxes, house entry risers and internal meter positions.
   - If necessary visit adjacent properties to check whether the service is a dual service,
   - If the service is metallic make a direct connection with the Cable Location equipment, which should enable the service to be traced more efficiently.
   - If the service is plastic, a PE tracing device can be used to locate the service.
   - As appropriate, slit trenches can be undertaken outside the property to assist in identifying the line and route of the service..

c. Turn off the Emergency Control Valve at the meter position (applicable to service relays, transfers, alterations and cut offs).

The following steps refer to the **'Work Process'** part of the six flow charts.

Step 6: 'Is there an existing supply?'

- If an existing service is found, checks should be made on site. Is the service live or dead?

Step 7: 'Determine and check new meter position'

- Refer to Chapter D Service Entries for unacceptable meter position. Refer to Appendix B to check the meter box has been installed correctly.

Step 8: 'If applicable excavate at main and/or house entry'

- Refer to the Excavation & Safety Manuals
- Carry out safe digging practices when excavating
- Continually use cable-locating device to locate cables and other apparatus prior to and during excavation.
- Ensure the sides of the excavation are straight; undermining and undercutting should be avoided.

Step 9: 'Lay Service'

- Refer to Chapter B Service laying Methods to identify the most appropriate laying technique.

Step 10: 'Cut Off Service'

- Refer to Chapter A6 for advice on cutting off services.

Step 11: 'Can the service be relaid using existing pipe?'

- To determine whether an existing pipe can be utilised, refer to Table B3 in Chapter B Service laying Methods for details of the permissible pressure losses.

Step 12: 'Are ducts exposed and accessible?'

- Refer to Chapter B2 to confirm that the duct is acceptable to use.

Step 13: 'Make Service Entry'

- Refer to Chapter D Service Entries to confirm the type of service entry. If the service entry position is acceptable, check proximities of openings to electrical apparatus.

Step 14: 'If applicable backfill and lay warning tape'

- Refer to Module B Service laying Methods. Lay warning tape where applicable.

Step 15 'Make Mains Connection'

- Refer to Chapters A1 to A4 Service Connections. During live gas operations the safety information and precautions should be referenced in the Introductory Section.

Step 16: 'Complete pressure test, purge and commission'

- Refer to Chapter E. If the service is medium pressure refer to Service laying Decision Flow Chart 3. A 63mm diameter service shall be tested as a service if it supplies no more than 2 primary meters.

Step 17: 'Complete Work Documentation'

- Refer to Chapter D14 for information on completing labels. Complete test certificates for medium pressure services, Safe Control of Operations documentation, maintenance records and QB5 documentation as appropriate.

Step 18: 'Check with Consumer/Developer Work Complete'

- A completion check should be made with the consumer/developer.
- If any work has been undertaken on or near existing gas services particularly those with below ground entries (to ensure no leakage has been caused) a LEL survey with gas detection equipment shall be undertaken both inside and outside the property either on completion of the work or before the operatives leaves the site.
- Should you need to leave site prior to completion of the works advise the consumer/developer.
- Reinstate excavations to the required standard.
- Tidy and clear up site
- Remove and signing and guarding equipment after reinstatement

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- Complete documentation.
    - For service disconnections complete the Site Clear form on site and clarify the details of work completed with the Consumer / Developer (if available on site)
- Confirm with the consumer/developer that work has been completed to their satisfaction
- Leave meter box key with the consumer/developer as required.

Step 19: 'Pipe pre- laid by third party'

- Refer to Chapter B Table B4 for recommended minimum depths for service pipes. Where possible checks should be made on the position and condition of the pipe. Developers or third parties can lay the pipe and request National Grid undertake the connections.

Step 20:'Check trench bed and mains connection pits are prepared?'

- Refer to Chapter B4 for information on open cut trenches.

Step 21: 'Can the service be inserted to the same position?'

- Refer to Chapter B3 having checked the diameter of the existing pipe.

Step 22: 'Check existing meter position'

- Refer to Chapter D5 - Service Entries.

Step 23: 'Is there a satisfactory pressure drop?'

- Refer to Chapter B, Table B3 for information on the lengths of services and diameters which may be laid. The table should be used as a reference guide only to clarify pressure drops for replacement, (planned work should have these already stated in the work pack). Any further information if required should be sought from the operational manager.

Step 24: 'Select an alternative service entry'

- Refer to Chapter D where applicable, however when undertaking a service relay the preference is to use the existing position, check with step 22.
- If a service cannot be relayed to the existing position, preference should be given to the entries detailed in Figures D3, D4 and D7.
- Where the service pipe could be susceptible to damage or vandalism, Figure D10 type service entry should be used after discussion with the Operational Manager.
- A service entry to basement/cellar (Figure D6) should only be utilised where no other suitable position is available.

Step 25: 'Select an alternative lay method'

- Refer to Chapter B if the pressure loss is greater than 5mbar and select an alternative lay method. Any service laying method or combination of methods can be used as long as the maximum permissible pressure drop along the whole length of the service is not exceeded.

Step 26: 'Check Service Entry'

- Refer to Chapter D11 and D13.

Step 27: 'Lay Service'

- Refer to Chapter C2 to check whether a service isolation valve and/or service excess flow valve (SEFV) are required.

Step 28: 'Complete Pressure Test, Purge and Commission'

- Refer to Chapter E for medium pressure testing, purging & commissioning. Safe Control of Operations documentation should be completed as appropriate.

Step 29: 'Confirm Regulator location'

- Refer to Chapters D11, D12 or D13 dependant upon whether the regulator is installed. Where a below ground regulators is encountered, it should be replaced and preference should given to relocating it to a meter box position.

Step 30: 'Steel is found'

- If steel is found then the service should be replaced with PE.

Step 31: 'Install above ground regulator' - Refer to Chapters D11 and D12 for installation information and proximities to openings and electrical apparatus.

Step 32: 'Relocate boundary regulator'

- The preference is to relay the service to a meter box installation Chapter D11/D13, if this is not achievable then an above ground installation should be agreed with the Operational Manager.

Step 33: 'Is the existing service steel?'

- All steel pipe below ground to be replaced with PE, including steel tails.

Step 34: 'Check if existing meter position is acceptable'

- Refer to Chapter D Service Entries to confirm the type of service entry. If the service entry position is acceptable continue with transfer, if unacceptable relay to acceptable position.

Step 35: 'Alter Service'

- Refer to Chapter A5.

Step 36: 'Make Service Entry'

- Refer to Chapter D.

Step 37: 'Connect to existing service or main'

- As required connect to existing service or main.

Step 38: 'Is the service PE?'

- All steel services; including steel tails shall be relaid.

Step 39: 'Connect service to new mains connections'

- Refer to Chapter A1.

Step 40: 'Cut Off Service'

- Refer to A6. Services should be cut off at the mains connection.

Step 41: 'Remove all internal pipework'

- All redundant internal pipework should be removed where possible, avoiding any damage to the fabric of the building. If this is not possible, the internal pipework shall be sealed, securely capped and labelled

CHAPTER A. SERVICE CONNECTIONS

A1 POLYETHYLENE SERVICE CONNECTIONS

This section describes the process to be followed when connecting a PE service to a PE main using the electrofusion process.

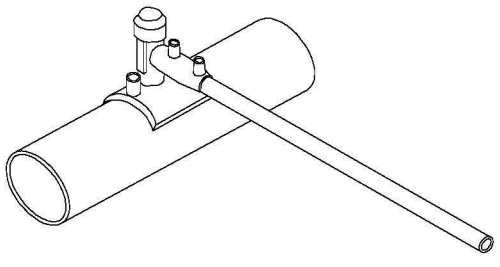

Figure A1: Electrofusion Tapping Tee

A1.1 General Requirements

1. Check identification markings on the PE main (size and SDR rating) and the colour and size of the electrofusion saddle to ensure compatibility.
2. Always store fittings and equipment in a clean dry place.
3. Do not drop or throw fittings and equipment.
4. Electrofusion fittings shall be stored in their plastic bags until they are ready for use.
5. All pipes and fittings shall be inspected for cuts, deep scratches or other damage before use. Pipe or fittings with damage greater than 10% of wall thickness shall not be used.
6. Care shall be taken at all times not to damage or remove the protective covering and contaminate the electrical filament wires.
7. Electrofusion fittings **shall not** be re-heated under any circumstance.
8. Electrofusion process shall not be used if the gas in atmosphere reading is greater than 20% LEL in the working environment.
9. Do not take or operate the electrofusion control box in the trench.
10. Minimum distances between fittings and other joints should be maintained (Appendix G).
11. Alignment clamps shall be used on all occasions.
12. A Pipe Exposure Tool shall be used for removing the skin from multi–layer pipe.
13. Pipe ends be kept clean and dry once scraped/prepared.
14. The fusion process should be undertaken without delay once preparation of pipe, fittings and equipment has been completed.
15. Ensure the generator has sufficient fuel to complete the electrofusion cycle.
16. Manifold type connections at the main shall not be installed.
17. Only use the correct hexagonal key (T bar) to drill the main.
18. Precautions when fusion jointing at air temperatures at or below -5°C or above -5°C where wind chill is severe:

    Under such extreme conditions it shall be necessary to raise the temperature of the air surrounding the fusion joint location above –5°C. For electrofusion it may be sufficient to form a sheltered area using available barriers and/or operating within the trench. Pipe, newly exposed, will generally be at ground temperature and above –5°C. To help reduce the risks in these occasions, buried below ground pipe should not be exposed until necessary.

    In summary, in very cold weather, the following actions should assist with keeping pipe and fittings above -5°C:

- Keep fittings in bags in the warmth of the vehicle until ready to use, minimize the risk of condensation.
- Use of temporary covers/shelter to protect above ground pipe overnight.
- Use of on-site vehicles/hedges/buildings to provide additional shelter from sub zero temperatures/wind chill effects.
- If using warm water to clean pipe, ensure the pipe is clean and dry prior to fusion. Warm water shall not be used to raise the pipe through wall temperature.
- Where Electrofusion jointing needs to be carried out in-trench early in the morning, cover the pipe at the jointing locations with soil/protective cover overnight.
- Use temperature gauge to check ambient (air) temp, and pipe temperatures

19 - Squeeze off shall only be carried out on pipe that is at or above 0°C.*

* Prior to squeezing off PE pipe in cold weather conditions, it is advisable to check the pipe surface temperature using a temperature indicator. Excavating and leaving pipe exposed overnight shall be avoided when low temperatures are predicted. Where the pipe has to be excavated, consider covering with soil, sand, or sand bags to reduce impact of being left exposed and unprotected from the cold temperatures.

- Excavation should only take place prior to application of the Squeeze off.
- If pipe has to be exposed, it shall be sheltered / covered until ready to squeeze off.
- If the advice outlined above is insufficient to ensure the pipe temperature is at or above 0°C, then for squeeze off only warm water may be used to raise the pipe through wall temperature, if necessary, both prior to application and prior to release of the squeeze off tool.

A1.2 Electrofusion Process

The following tools and equipment should be available when undertaking electrofusion activities:-

- Top loading clamp
- Scraping Tool & Marker pens
- Electrofusion control unit & power source
- Print control unit (if fitted)
- Gas detection equipment
- PE Pipe cutters
- Alignment Clamps 20 - 32mm
- Tent/cover
- Marker Pen (Black and White)

Pipe used for electrofusion will be factory marked, every metre as follows:

- Gas
- Polymer type i.e. A, S or X;
- Size, (outside diameter) and SDR

Fittings used for electrofusion will be factory marked as follows:

- Fusion time(s)
- Cooling time

Marking of PE Electrofusion Joints when Service Laying

To ensure traceability of new electrofusion joints Operatives undertaking electrofusion jointing on PE pipes, including the fusion of top tees and branch saddles on mains **shall** mark the adjacent pipe with the following minimum information:

- Direct Labour - Payroll No. or Contract Partner - EUSR No.
- Date of construction using DD / MM / YY

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BEST PRACTICE
Mark the heating and cooling times on the PE main with a marker pen adjacent to the fitting rather than trying to struggle to read the details off the fitting when it is clamped in position on the main in the excavation.

Figure A2 – Example of markings on electrofusion joints

During service laying work where a number of joints are made in the same excavation by the same Operative on the same day the above markings only need to be marked up once either on the parent pipe or service pipe for all electrofusion joints completed that day by that Operative. Each excavation will require its own markings.

A1.2.1 Electrofusion Tapping Tee Preparation

1. Prepare the tapping tee loading tool for use (see Figure A4).

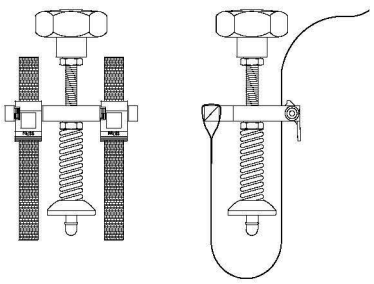

Figure A3 - Top-loading tools (straps)

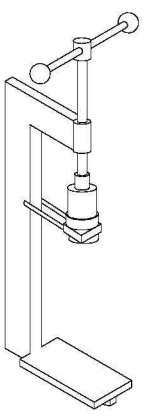

Figure A3 - Top-loading tools (clamp)

2. Top loading tools shall be in good working order and within calibration date. They shall be inspected immediately prior to every use to check they are undamaged in any way and fit for purpose, i.e. no worn straps, no bent frame, swivel base in good working order etc. and tool within calibration date. If a top loading tool becomes defective, it shall not be used and withdrawn from use. The tool shall be rechecked to ensure it is within the defined calibration interval and any other maintenance/rectification work carried out prior to returning into service or alternatively be disposed of.
3. Ensure that there is sufficient clearance around the pipe to fit the tool. Clean the jointing area of the pipe with clean, damp, non-synthetic cloth or paper towelling. If soapy water is being used, this shall be washed off with clean water and the pipe dried.

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4. With the fitting still in its protective bag, place the fitting on the proposed installation point and with a marker pen roughly mark a line around the base area of the fitting plus 25mm excess on all sides. Figure A5.
5. Mark the area to be scraped Figure A6

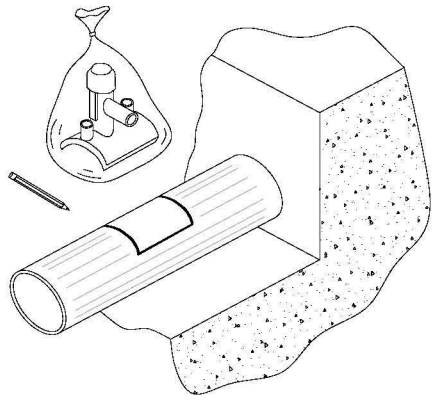

Figure A5 - Mark around the fitting

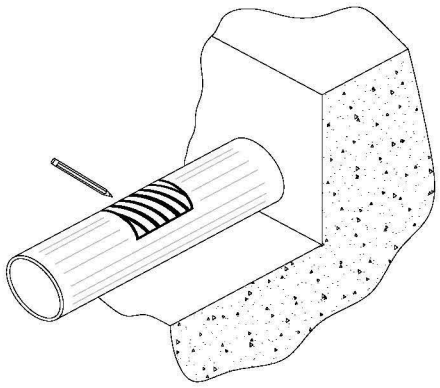

Figure A6 - Marking of pipe

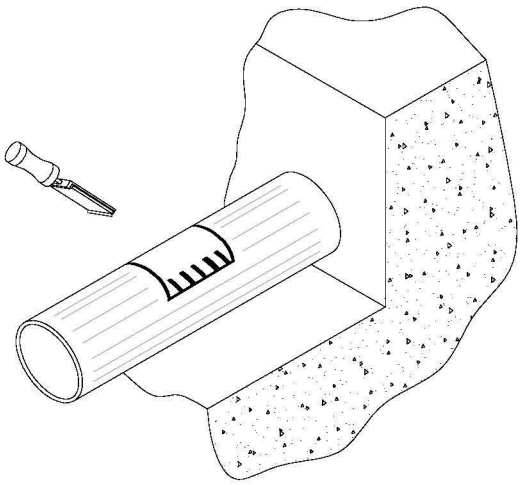

Figure A7 - Scraping of pipe

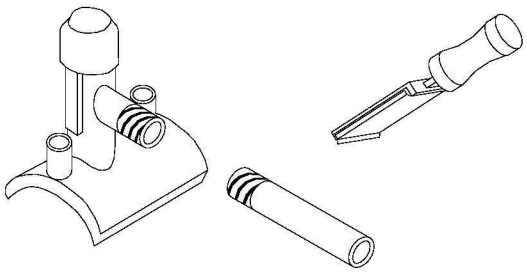

Figure A8- marking of top tee outlet

6. Scrape the whole area outlined using an approved scraper (Figure A7).
7. Remove the fitting from its protective bag.
8. Mark spiral lines and scrape the outlet of the spigot and the service pipe for a distance of half the proposed coupler length plus 25mm. (Figure A8).
9. Remove the fitting cap and store carefully.
10. Place the fitting into the top loading clamp.
11. Remove the protective cover from the base of the fitting.
12. Care should be taken not to handle or contaminate the surface containing the electrical filament wires.
13. Place the fitting and loading tool centrally over the scraped pipe. Assemble the loading tool on to the main. Apply the correct loading pressure on the fitting, this will displayed by the indicator on the tool. (Figure A9).

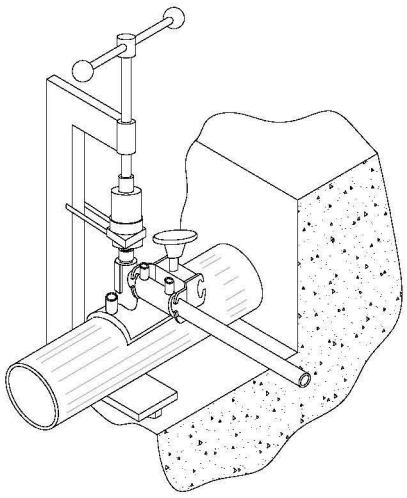

Figure A9 - Clamping and Alignment of fittings

A1.2.2 Electrofusion Tapping Tee Fusion

1. Start the generator and connect the control leads to the generator.
2. Connect the terminal leads from the control box to the electrofusion fitting.

   NOTE – Use only approved terminal connector leads.

3. For manual fittings, set the control box timer to the fusion time marked on the fitting and press start.
4. For automatic fittings check the time on the fitting corresponds with the time on the control box and press start.
5. Stand clear of the fitting when fusion is in progress. Do not adjust the saddle loading during the fusion process.
6. When the control box indicates fusion is complete, check the fusion indicators have either risen or the melt wells have completely filled to a point were the melt is roughly level or slightly proud of the melt well hole. Where the fusion indicators have not risen sufficiently or the melt well is seen to only partially fill the melt well hole the fitting shall be abandoned and a new fitting used. Prior to using a new fitting check the fusion equipment, the new fitting and that the preparation process has been correctly followed.
7. Disconnect the terminal leads from the fittings, allow the joint to cool for the time stated on the fitting prior to removing the top-loading tool, to complete the operation (Figure A10).

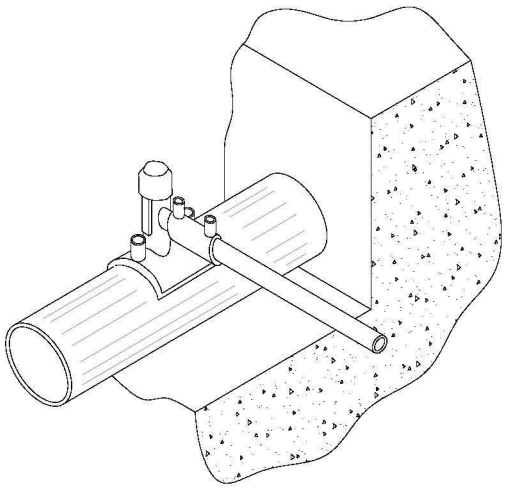

Figure A10 - completed joint

A1.2.3 Electrofusion Coupler Preparation

1. Prepare approved alignment clamp for use.
2. Ensure there is sufficient clearance around the service pipe to fit the alignment clamp.
3. Clean the jointing area of the pipe with a clean, damp non-synthetic cloth or paper towelling. If using soapy water this shall be washed with clean water and the joint area dried.
4. With the fitting still in its protective bag, position the fitting above/adjacent to the pipe and, with a felt-tip marker pen, roughly mark a spiral line around the service pipe (Figures A11a & A11b). The length to be scraped should be at least half the coupler length plus 25mm. This is the area to be scraped. Repeat for second pipe to be joined.
5. Using an approved scraping tool scrape the whole area outlined (Figure A12).

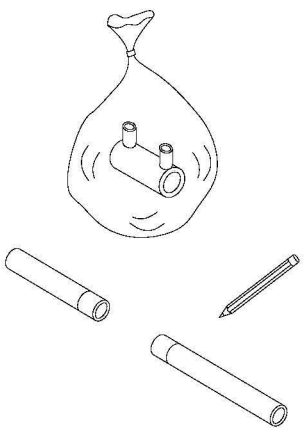

Figure A11 - Marking around fitting

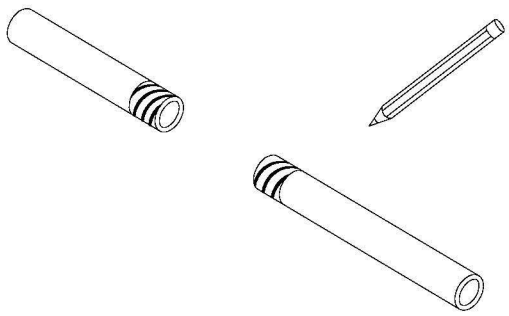

Figure A11a - Marking around pipe

6. Remove the fitting from its protective bag.
7. Care shall be taken not to handle or contaminate the surface of the fitting containing the heating coil.
8. Place the fitting over the scraped area of service pipe, ensuring the service pipe touches the central register in the coupler. Mark the penetration depth on the side of the pipe at either end of the coupler. This provides a visual identification if the fitting moves in relation to the mark prior to fusion taking place.

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9. Assemble the alignment clamp on to the service pipe (Figure A13).
10. Check the penetration. You should not be able to move the coupler along the pipe.
11. When the clamp is in place visually check pipe alignment in all planes. Rotate the fitting to ensure the assembly is not too tight.

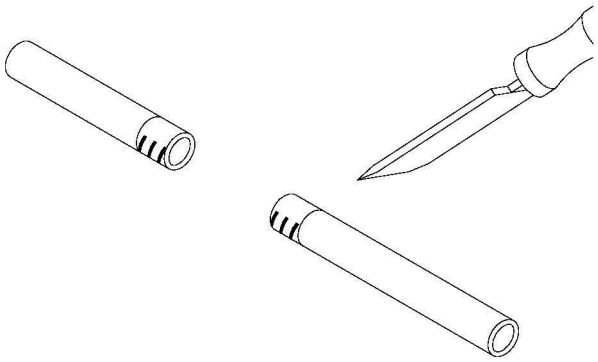
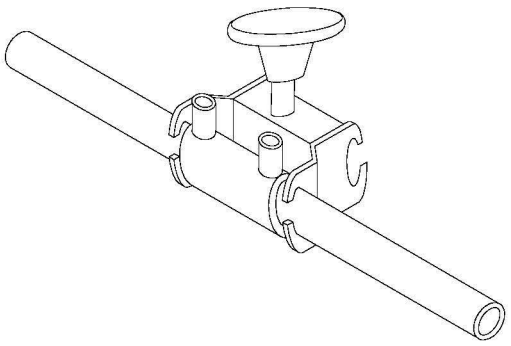


Figure A12 - Scraping of pipeFigure



A13 - Clamping/ aligning of pipe and fitting

A1.2.4 Electrofusion Coupler Fusion

1. To avoid rapid cooling of the fitting due to draughts passing through the inside of the pipe, temporary end caps should be installed.
2. Start the generator and connect the control leads to the generator.
3. Connect the terminal leads from the control box to the electrofusion coupler.

   NOTE – Use only approved terminal connector leads.

4. For manual fittings, set the control box timer to the fusion time marked on the fitting and press start.
5. For automatic fittings check the time fitting corresponds with the time on the control box.
6. Stand clear of the fitting when fusion is in progress. Do not adjust the alignment clamps during the fusion process.
7. When the control box indicates fusion is complete, check the fusion indicators, where applicable, have risen.
8. Disconnect the terminal leads from the fitting, allow the joint to cool for the time stated on the fitting prior to removing the alignment clamp. (Figure A14).

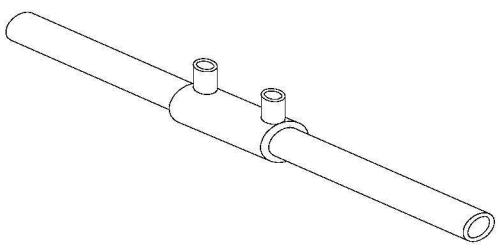


Figure A14 - Completed joint

A1.3 63mm Outlet Tapping Tee

1. Some top tee manufacturers may specify specialised tooling for 63 mm outlet tees to ensure that the correct loading is applied during the fusion process. If specialised tooling is required, information will be contained within the fitting instructions.

2. When cutting through the wall of large diameter SDR11, the torque required will be higher than a 32mm outlet-tapping tee. To minimise the risk of stripping the moulded thread inside the stack section check that the tapping tee thread followers are present and follow the manufacturers instructions (Figure A15).

3. PE tapping tees are designed for use with either the strap or pedestal type stack loading tools and shall be used in accordance with the manufacturers' instructions. Both tools perform the same function of clamping the tapping tee to the pipe with a predetermined force. (Figure A4)

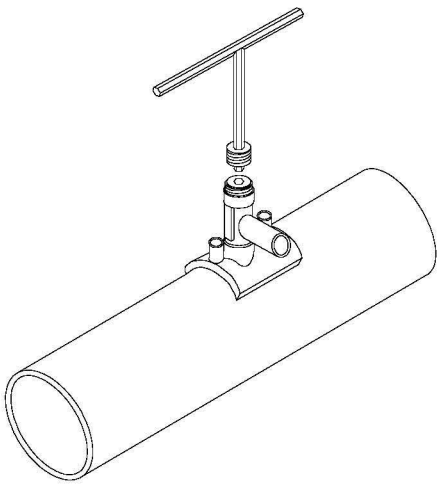


Figure A15 – 63mm Tap Tee with Drill Guide Follower.

A1.4 Multilayer Pipe (Profuse)

Information contained in Section A1 - Polyethylene Service Connection off PE Main should be referred to, in addition to the following: -

1. Ensure that there is sufficient clearance around the pipe to fit the top loading tool. Clean the jointing area of the pipe with clean, damp, non-synthetic cloth or paper towelling. If necessary, soapy water can be used to clean the pipe, however this shall be washed off with clean water and the area dried.
2. With the fitting still in the protective bag, place the fitting on the proposed installation point and with a marker pen, roughly mark a line around the area of the fitting plus 25mm. This is the area to be peeled.
3. Score the Profuse pipe skin beyond the required area using the Pipe Exposure Tool (PET) (Figure A16 & A17).
4. Peel the skin off the pipe only when ready to assemble the electrofusion fitting on to the pipe.
5. Should contamination of the peeled pipe occur, conventional scraping shall be undertaken.

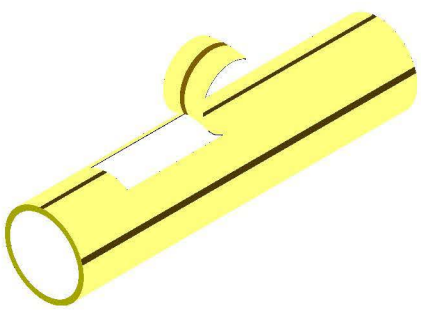


Figure A16 – Outer layer Peeled off Profuse Pipe

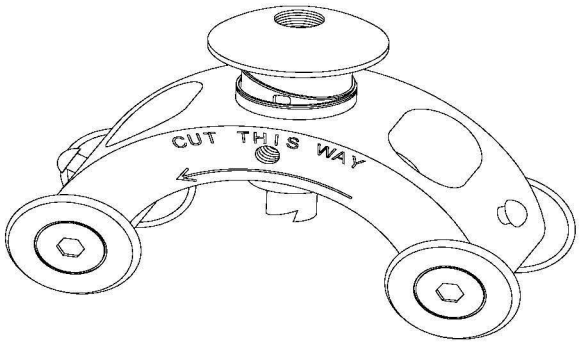


Figure A17 – Pipe Exposure Tool (PET)

A1.5 Quality Checks

1. Check that the fusion indicators have risen or melt wells filled and that no melted material or wire has extruded from the ends of the fitting.
2. If the fusion indicators have not risen the joint shall be removed and discarded and a new joint made.
3. Check that the pipe has not moved during fusion.
4. Check for cleanliness and contamination around the joint area.
5. Check for evidence of scraping.
6. If a print facility is available, print out from the control box and check the result.

A1.6 Failed Fusion

1. If the power fails during the fusion process, **DO NOT** attempt to re-heat the fitting. The tapping tee shall be cut off at the stack.
2. If the pressure test shows a failure of the tapping tee or coupler on the spigot, cut off the stack to prevent it any future use, and ensure the defective fusion/fitting is reported.

Select a new position for the new tapping tee, (Appendix G – PE Minimum Fitting Separation and Squeeze off Distances).

A1.7 Materials

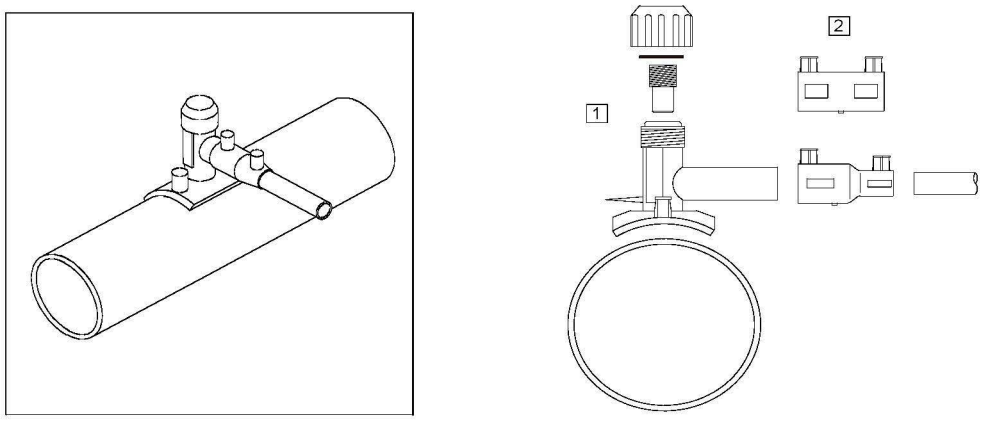


Figure A18 - PE Top Tee with coupler

The following table indicates standard PE top tee connections (Figure A18) available for use:

Item	PE Top Tee (mm)	Operating Range (mm)	PE Diameter Range Imperial (inches)
1	40 x 32	40	N/A
	55 x 32	55	N/A
Unifit	63 x 32	63 *	2
	75 x 32	75	N/A
Unifit	90 x 32	90 *	3
Unifit	125 x 32	110 to 140 *	4
Unifit	180 x 32	160 to 213 *	6
Unifit	250 x 32	225 to 280 *	N/A
Unifit	315 x 32	315 to 500 *	N/A
	355 x 32	355	N/A
Unifit	63 x 63	63	2
Unifit	90 x 63	90	3
Unifit	125 x 63	125	4
	180 x 63	180	6
Unifit	250 x 63	213 to 250	8
Unifit	315 x 63	268 to 315 *	N/A
Unifit	400 x 63	355 to 500 *	N/A
2	32 reducer	32 X 25 & 32 x20	N/A
	32 coupler	32 X 32	N/A
	63 coupler	63 x 63	N/A

Table A1 - Available approved Top Tee for use on the PE Distribution Network

(* Includes universal tees that can be installed on imperial and Swagelined mains)

A2 INSERTED PE IN METALLIC MAIN

A2.1 General Requirements

There are a number of precautions to be taken in to account when preparing for a connection to a metallic main:

1. The metallic main may have a PE main inserted within it. (unknown and not shown on drawings)
2. The metallic main may contain a thin wall plastic 'mains bursting' liner sleeve with a live PE main inside.

A2.2 Unknown PE main inside metallic main

There is the potential for unknown PE mains to be inserted in metallic mains therefore this should always be a consideration when drilling a metallic main. Drilling through the metallic main and damaging the PE contained within has the potential to have serious consequences to life and property.

.

Actions required to prevent an occurrence

1. All Operatives undertaking drilling/tapping operations into metallic mains shall take into account the following actions in case the pipe has already been inserted with PE:
   a. Feel for any unexpected resistance during drilling/tapping operation.
   b. During the drilling operation use the pressure relief valve (similar to that shown in photographs 1 & 2 below) to verify gas is present once the metallic pipe wall has been breached.
   c. Look for signs of PE swarf on the hole cutter or drill/tap once removed from the drilling machine.
   d. Listen for unusual noises following the drilling/tapping operation which could signify an inserted PE main being breached!

2. Remind all employees that should they smell gas or be informed by a member of the public of a report of a gas escape that they follow the correct gas escape reporting requirements and telephone the National Gas Emergency Service Contact Number **0800 111 999**.

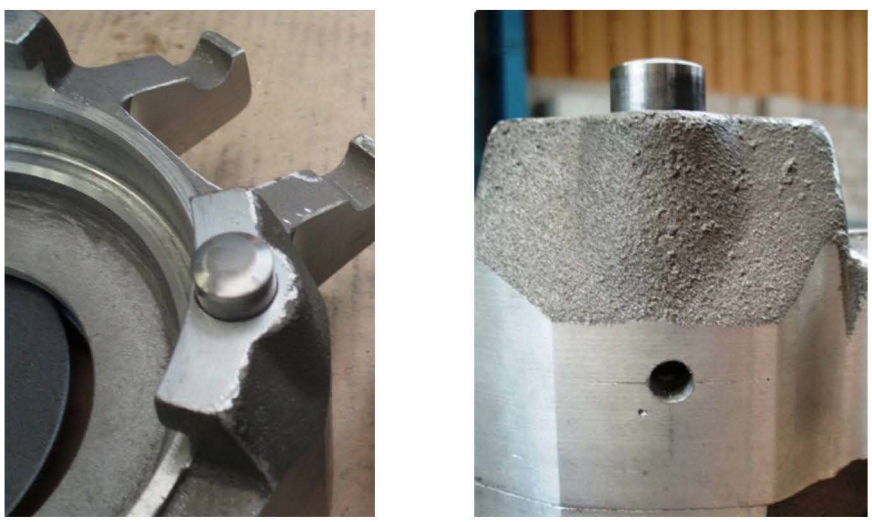


Figure 18a - Photographs 1 & 2 of Pressure Relief Valve Button and vent on WASK Mk I Teeset

A2.3 Service Connection to Lined PE Installed by Pipe Bursting

It is possible without suitable precautions being taken to mistake a Liner Sleeve for the actual inserted PE and fuse the service mains tee directly to the sleeve. These Liners are know to discolour and can resemble the colour of PE.

Liner sleeve pipe was used on 'mains-bursting' operations in some areas, (typically during the 1980's), but was discontinued. Liner sleeve pipe may be of different colours, ochre (yellow-brown) a green colour was also used and of different diameters (110mm and 140mm diameters are known to have been in use).

Punch Tee Connected to Liner Sleeve Pipe

125 mm dia gas pipe inserted within 140 mm dia Liner Sleeve Pipe

Figure 18b – Examples of tapping tees incorrectly fitted to Liner Sleeve pipe on PE pipe

Actions required to prevent an occurrence

If you encounter a pipe that is ochre / off-yellow or other non-standard colour, or is not a common PE pipe diameter, or you suspect or identify any other evidence of mains bursting, (e.g. fragments of old broken pipe around the inserted pipe, etc.), seek advice from your manager before proceeding with making connections.

Prior to making a connection to a PE main, you should always check the pipe legend (marking on pipe approx 1.0m apart) to confirm pipe diameter and SDR in order to confirm pipe/fitting compatibility.

If the marking is not evident from the exposed section of pipework, check the diameter using pipe callipers. If callipers are not available, pipe circumference can be used as a guide.

Divide circumference (measured in mm) by 3.142 to identify pipe diameter – e.g. 346mm circumference = 110mm diameter, 440mm circumference = 140mm diameter.

A3 – METALLIC MAINS – SERVICE CONNECTIONS

A3.1 General Requirements

1. Prior to work commencing, the metallic pipe shall be tested for stray voltage with a Voltstick. If an indication is present the Operational Manager shall be informed immediately and work shall not commence.
2. Ensure breathing apparatus and fire extinguishers are available for immediate use.
3. Calliper the main to check the diameter to ensure that the correct sized machine saddle is selected.
4. For mains operating above 75 mbar, or greater than 12″ diameters, drilling machines shall be attached with double chains.
5. Anti shear sleeves shall be fitted on all service tapping tee outlets up to and including 63 mm diameter.
6. Any internal stiffener supplied with compression fittings shall be used to ensure the integrity of the joint is maintained.
7. Reduced depth of cover should be authorised by the Operational Manager, recorded on drawings and protected by means of caution tape and PE tiles or a concrete slab.
8. Whenever the site is to be left unattended, the drilling assembly should be removed. Nightcaps shall be fitted onto the machine saddle with the gate valve in the closed position, or mains sealing plugs installed into the tapping and checked for leakage.
9. The manufacturer's instructions shall be followed for the installation of the service tee.
10. After commissioning of the service any metallic joints and fittings shall be wrapped (with a 50% overlap) using an approved mastic tape.
11. **63mm SDR13.6 service off-takes** - 63mm SDR13.6 PE pipe has a slightly larger bore that 63mm SDR11 PE pipe. As a consequence it shall not be used to connect directly to mechanical fittings such as the Crane and George Fischer 63mm mechanical top tees and coupler. A short length (tail) of 63mm SDR11 pipe shall be joined to the 63mm SDR13.6 PE coil using a 63mm Coupler and used to connect to a mechanical fitting.

A3.1.1 Ductile & Steel Mains

1. Where ductile mains are found with evidence of corrosion, this can significantly affect the integrity of the pipe wall. The operational manager shall be informed and a hazard assessment should be undertaken to assess the integrity of the pipe wall.
2. Steel / ductile mains up to and including 3″ diameter operating up to 75mbar, and also mains up to and including 6″ diameter operating above 75mbar, will require a full encirclement fitting to be used.

   Note: If it is known that the pipe wall thickness is greater than 4 mm, then a standard top tee can be used i.e. during service replacement work when the first hole is drilled and the wall thickness is known then the remaining mains connection points can be undertaken using top tees.
3. When working on steel mains subjected to cathodic protection, an Operational Manager should be contacted to establish whether any special precautions are required.
4. Disturbed areas of coating and wrapping on steel mains shall be repaired prior to backfilling.
5. Previous Pipe Replacement Policies, (i.e. Ductile Iron Medium Pressure, ABC20 requirements, etc). National Grid Gas's predecessor company was required by the HSE to cease conveying gas at Medium Pressure in iron pipes within 30 metres of buildings by the 30th April 2003. Such pipes were decommissioned, replaced or down-rated to low pressure in accordance with this HSE requirement. The programme was completed to schedule, however, due to new build encroachment or wrong asset information operational personnel may still come across such pipes. The following action shall be taken to ensure these pipes are identified and dealt with.

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Action by Operatives
Wherever working on any **Medium Pressure Iron** pipe check the distance to the nearest occupied buildings. If this distance is within 30m you shall immediately bring this to the attention of your Line Management (First Line Manager / Supervisor / Construction Engineer or equivalent).

Action by Line Management (First Line Manager / Supervisor / Construction Engineer or equivalent) Any reports of **Medium Pressure Iron** pipes within 30m of occupied buildings shall be reported to your Senior Operational Manager to ensure the information has been logged with the Local Responsible Manager as defined in T/PM/REP/2 to enable the main to be decommissioned, replaced or down-rated as soon as reasonably practicable.

A3.2 Mains Drilling and Tapping Operations

A3.2.1 Position & Size

1. The nominal diameter of the service shall not exceed the mains pipe diameter
2. For replacement services the existing tapping in the main should be utilised wherever possible, providing that the thread in the main is not tapered.
3. Service connections should be made at least 200mm away from any joint, split collar, new or existing tapping.
4. The maximum nominal size of tapped holes that should be used is 2″ diameter where the main is 200mm nominal size or over. Below this size the tapping sizes specified in Table A2 should be applied.
5. The main shall only be threaded and tapped with a parallel thread.
6. Reducing bushes shall not be used in the tapped hole in the main.
7. When a tapping in excess of the maximum sizes given in Table A2 is required, a full encirclement fitting should be used.
8. A combined pilot drill and drill/tap should be used for 2″ tapping.
9. Preference should be given to the use of top outlet service fittings. Where site circumstances prevent the use of such fittings e.g. depth of main, proximity of other plant, then a side outlet tee should be used.

Nominal size cast/spun iron main		Maximum BSP tapping size (inches)
mm	Ins	
-	3	$^{3}/_{4}$”
100	4	1 ¼”
-	5	1 ½”
150	6	2”
-	7	2”

Table A2 – Tapping size for mains below 200 mm nominal size

A3.2.2 Preparation

1. A top entry tee is the preferred fitting for metallic service connections installed on the top of the main (Figure A19).

2. A position on the main should be selected where there are no large corrosion defects or hard encrustations and the main cleaned by scraping and wire brushing. If necessary wash the main with clean water to ensure secure seal at the machine saddle.
3. The main should be callipered to ensure that the correct sized machine saddle is selected.
4. The condition of the machine saddle should be inspected to ensure that it is in good condition before attaching it to the main. The fixing chain nuts should be tightened evenly with the spanner provided. It is recommended that a quarter turn at a time be applied to ensure an even seal. The level of the machine should be checked to ensure that it is appropriate for the work.
5. A parallel threaded drill tap should be fitted to the chuck and inserted in the machine. In the case of double spindle machines the fitting spindle and fitting should also be assembled to the machine. (Table A2 for tapping size for mains 7″ diameter and below).
6. The end of the feed screw and drill tap should be lubricated with oil or grease.

A3.2.3 Testing & Drilling

1. Fasten the correct size of tap into the drill spindle (2) using the hexagon screwdriver provided and fit the spindle into the drilling head (1) retaining it in the raised position with the securing pin which is chained to the head.
2. Using the small spanner provided, fasten the machine body (3) on to a cleaned section of main with the securing chain, selecting the correct size of rubber saddle - the main sizes being clearly marked on the rubber. Check that the gate valve slides fully to close, and leave in the fully open position.

   Note: A longer securing chain and a pair of extension lugs are available as additional equipment enabling the machine to be fitted to any size of main over 300mm (12″).

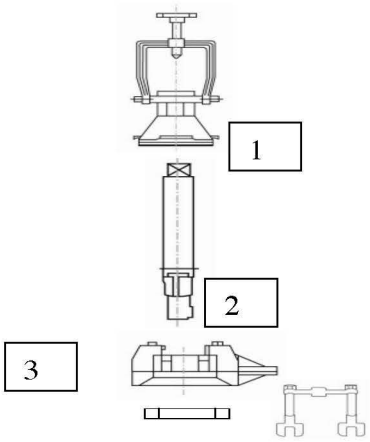

Figure A19 - Wask Tee-Set Drilling Equipment

3. On single chain machines the centre line of the securing chain indicates the centre line of the required hole.
4. Fit the drill head (1) into the body (3), pressing fully home. Pressing the vent button will assist this operation. Use the large spanner provided, rotate the head clockwise to lock onto the base.
5. For the drilling of Low Pressure mains an air test at a pressure of 100mbar shall be applied prior to undertaking the drilling operation For the drilling of mains above low pressure an air test at a pressure of 1.5 times the maximum operating pressure in the main shall be applied prior to undertaking the drilling operation.

   The pressure test shall be applied with the gate valve in the OPEN position and the machine seal checked with an approved leak detection solution. The air test should be applied from either

the test point installed into the drilling housing, (Figure 20a), or by using the fitting housing with a pressure test assembly (as detailed in Figure 20b below). No leakage should be apparent.

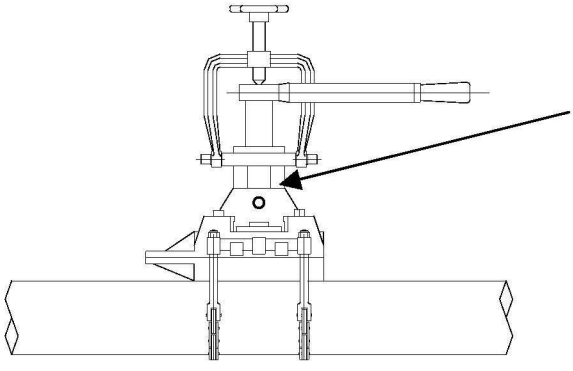

Figure A20a - Pressure testing tee-set

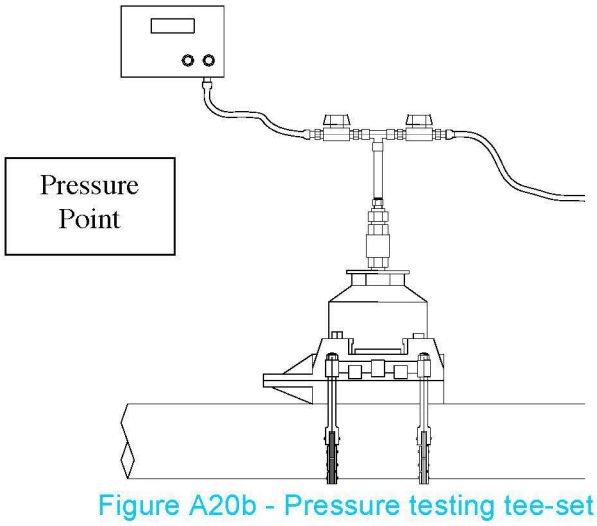

Figure A20b - Pressure testing tee-set

6. If leakage is observed the machine should be removed and the main cleaned further, saddles and rubber checked for damage or the machine replaced. Fixing chains should not be over tightened in an attempt to achieve a good seal.
7. When tested as shown in Figure A20a the pressure gauge used for this operation should be left on during the drilling operation and used to monitor the mains operating pressure.
8. Check that the valve is open and lower the drill spindle (2) onto the main. Position the ratchet handle with the chamfer upward on top of the drilling spindle and swing the bridle into position.
9. Drill and tap the main taking care to avoid excessive feed. When using air-powered drills, the feed speed should be controlled to avoid overloading of the drill motor. Air-powered drills shall not be used for tapping operations.
10. Withdraw the drill spindle (2) and retain in raised position with securing pin. Close the gate valve (note that mark on valve actuating spindle points to the position of the valve plate).
11. The gas pressure in the drill head (1) be vented by pressing the vent button. Should gas continue to pass the vent the gate should be re-opened and closed once again. If gas continues to vent, **breathing apparatus shall be worn during the installation of the service tee.**
12. Keeping the button depressed rotate the drill head (1) anti-clockwise using the large spanner provided. Remove the drill head.
13. Take the carrier spindle and required fitting and slide into the fitting head (Figure A21), tightening gland nut hand tight. Locate head in a similar manner to that of the drilling head keeping the gate valve closed.

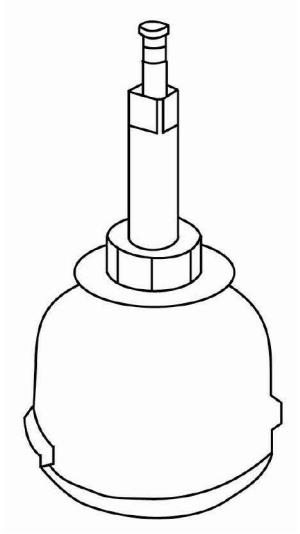

Figure A21 - Wask Fitting Head and With Spindle Attached

14. Open the gate valve, lower the fitting and screw into the tapped hole hand tight.
15. Depress the vent button until all the pressure has been released, slacken the gland nut and remove the fitting head in a similar manner to that of the removal of the drilling head, leaving the spindle attached to the fitting.
16. Release the chain and remove the machine base from the main.
17. Remove any swarf from the rubber seal and fully tighten into the correct alignment until gas tight and checked with approved leak detection fluid.

A3.3 Top Tee Entry

1. Insert the service pipe into the tee and complete the joint. An anti-shear sleeve shall be fitted. Unscrew and withdraw the retaining rod and pressure test service using a 1″ flexible adaptor or coupling on the spindle end. Figure A22.
2. On completion of a successful test attach the key to the square drive spindle when re-tightening the centre rod.
3. Withdraw stopper fully into the top of the tee and unscrew centre rod, disengage square drive, remove fitting spindle and replace the original square head plug on the top tee.
4. Purge and commission the service in accordance with Chapter E.

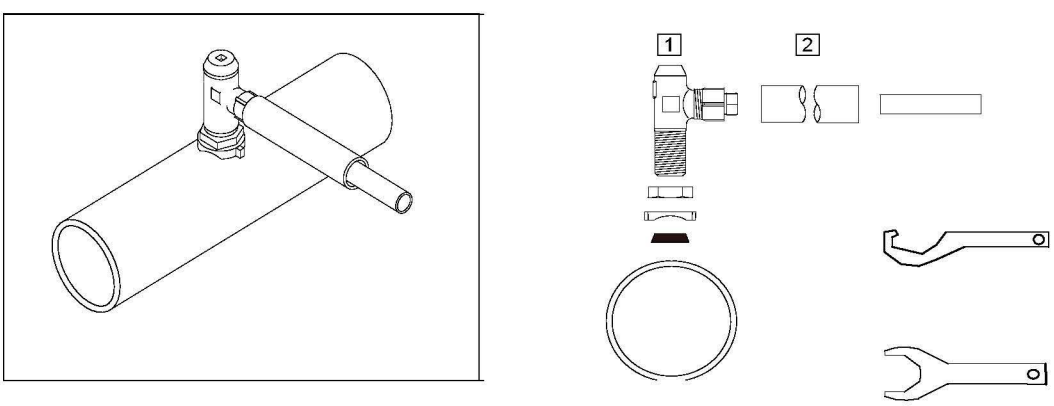

Figure A22 - PE service entry top tee & 'C' fixing spanners

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Part	Service Tee Top Entry
1	¾" BSPM x 20mm
1	¾" BSPM x 25mm
1	¾" BSPM x 32mm
1	1" BSPM x 20mm
1	1" BSPM x 25mm
1	1" BSPM x 32mm
1	2" BSPM x 63mm
2	Anti shear Sleeve

Table A3 –Available approved Metallic x PE service top tee.

A3.4 Side Entry

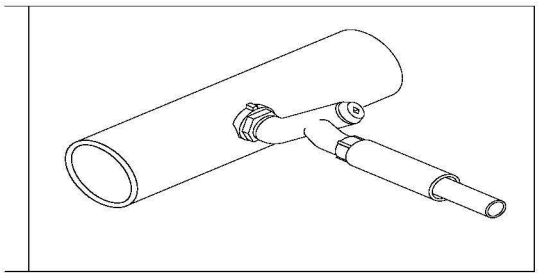

Figure A23 - Example of Side Entry Tee.

Installation of metallic side entry tees

1. Fit the drilling equipment on to the side of the main normally facing the meter location.
2. The machine body on the drilling machine is installed with the gate valve mechanism at the top of the main thereby ensuring that failure of the securing mechanism will ensure a "FAIL SAFE" situation.
3. General application, operation and installation of the side entry tee be undertaken as per the instructions in A3.2 PE Service off Metallic Mains –Top Tee Entry.
4. Ensure that the correct tooling for installation of side entry is tee used. The manufacturer of the drilling machine or supplier of fitting will provide the ancillary tooling for the tee to be used (Figure A24).

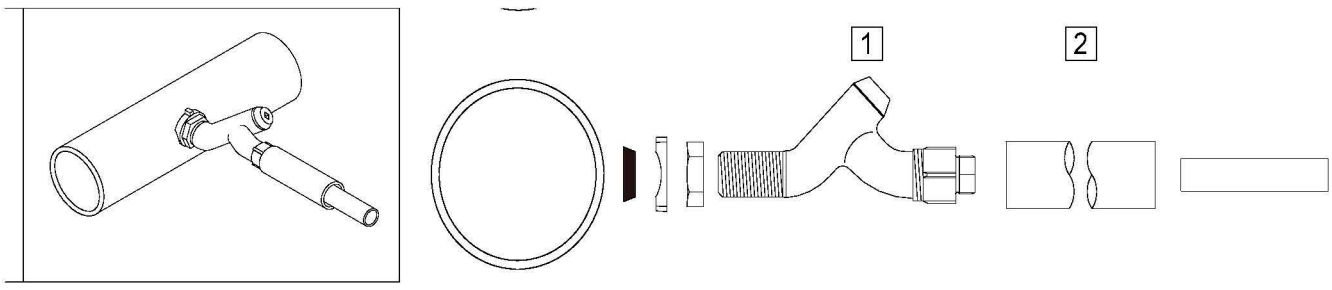

Figure A24 Example of Side Entry Tee.

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Part No	Service Tee Side Entry
1	¾" x 20mm
1	¾" x 25mm
1	¾" x 32mm
1	1" x 20mm
1	1" x 25mm
1	1" x 32mm
2	Anti-shear Sleeve

Table A4 - Service side entry tee parts list

A3.5 Two Part Tee

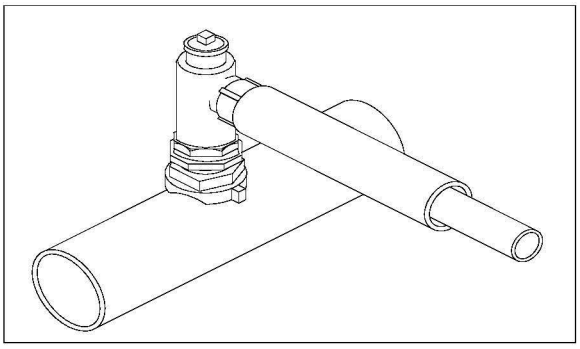

Figure A25 - Two Part Service Top Tee

1. Two part tees are supplied with a standard 2″ (63mm) outlet but the nipple assemblies are supplied with 1.5″ and 2" BSP threads for greater range of use across 5 – 7″ mains without the need to fit a split collar (Table A5 & Figure A25).
2. Metallic mains shall be drilled and tapped in accordance with A3.2.
3. The physical size of the two part tee does not allow the main body to be installed under no gas conditions through the body of the drilling machine. The nipple assembly is installed first. (Figure A26).
4. The internal sealing plug is securely inserted into the top of the nipple assembly using the correct tooling and the thread, rubber seal and locking ring checked for soundness.
5. Prior to installing the nipple assembly onto the plug carrier the operation of the tee is to be checked to confirm that the internal sealing plug moves freely through the tee.
6. The nipple assembly is inserted into the plug carrier and attached to the spindle and is then inserted through the machine into the main.
7. The vent on the drill body is opened to check for leakage of gas from the tapping and if satisfactory the drill body is removed over the spindle taking care not to disturb or loosen the threaded nipple connection.
8. Once the drilling machine is removed, remove any swarf from under the rubber seal. The nipple assembly should then be tightened using the correct tooling. The locking ring and the seal is tightened to give a gas tight seal. This is checked using an approved leak detection fluid.
9. The plug carrier and spindle are removed and the outlet assembly of the tee is secured onto the nipple assembly following manufactures instructions, facing the direction of the service entry. The internal plug remains in the nipple assembly until the service has been tested and is ready to be commissioned.
10. On satisfactory completion of the pressure test, the service should be commissioned as follows:-
    a. remove the top tee plug
    b. fit the plug spindle to the internal sealing plug.
    c. Withdraw the internal plug into the top of the top tee.

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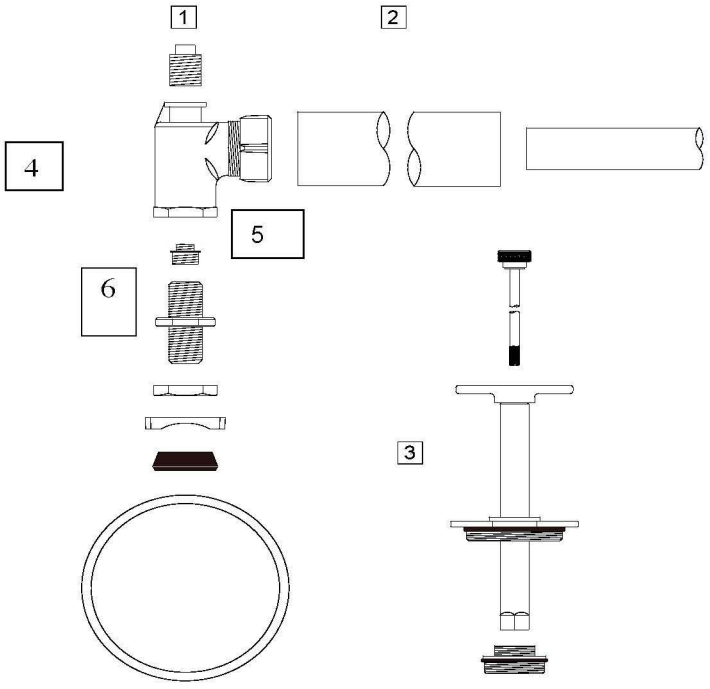
11. The plug for the top of the tee is then replaced and checked using approval leak detection fluid



Item No	Item
1	Plug
2	Anti–shear sleeve
3	Nipple tool
4	Tee Body
	2”x 63 mm
	2”x 2” Top Entry
5	Internal sealing plug
6	Nipple assembly
	1½” x 2” BSPM
	2”x 2” BSPM

Figure A26 - Two-part service tee

Table A5 - Two-part tee parts list

A3.6 ToppTee

The ToppTee is the trade name for the Polyethylene service connection tee installed in metallic mains.

Limitations of Use:
The ToppTee is suitable for connecting 20mm and 25mm PE gas services to 4″ mains and above operating at low pressure. This fitting is not suitable for use on steel mains and medium pressure systems. The 1″ mains connection is a BSP mechanical thread. A pressure tight joint is ensured with a sealing rubber located in the shroud (Figure A27).

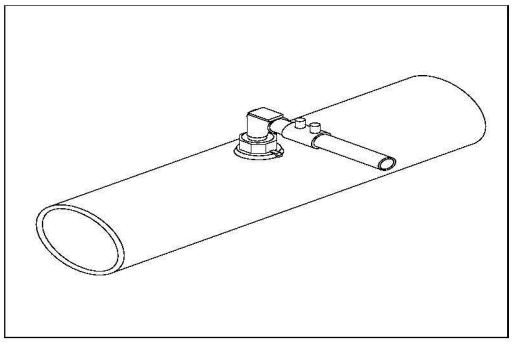


Figure A27 – ToppTee Fitting

1. The metallic main shall be drilled and tapped in accordance with A3.2 Mains Drilling and Tapping Operations.

2. Prior to installing the ToppTee, check the seal is in the bottom of the tee. This will ensure that no gas passes through the tee until the safety 'C' clip has been removed and the top of the tee pushed down (Figure A27).
3. Insert the ToppTee firmly into the product specific carrier and attach this to the fitting spindle from the drilling machine.
4. Insert the fitting spindle into the fitting housing of the drilling machine. Connect the fitting housing to the drilling machine base unit on the main.
5. Open the slide valve, push the spindle down so that the ToppTee locates in the threaded hole of the main.
6. Turn the spindle to engage the threads and screw down until resistance is felt.
7. Check that a gas seal has been achieved by venting the drilling machine.
8. Remove the fitting housing and disconnect the fitting spindle from the ToppTee.
9. Inspect and remove any swarf from under the rubber seal.
10. Tighten the ToppTee until hand tight and then use a spanner to apply one extra turn to fully tighten.
11. Using approved leak detection fluid check the connection onto the main for soundness.
12. Prior to jointing the service pipe to the outlet of the ToppTee, the service pipe should be checked to ensure that there are no blockages (in accordance with stage 1 of section E.4).
13. Rotate the head of the ToppTee to face the PE service and connect the service to the outlet of the ToppTee using an electrofusion coupler.
14. Undertake a pneumatic pressure test to prove the soundness of the service installation, in accordance with stage 2 of section E4.
15. Remove safety 'C' clip and press down on the ToppTee to eject the internal seal installed previously.
16. Pull the ToppTee back to the original position and replace the safety 'C' clip.
17. Using approved leak detection fluid check the fitting for soundness. Wash with clean water on completion.
18. Commission the service in accordance with Chapter E.

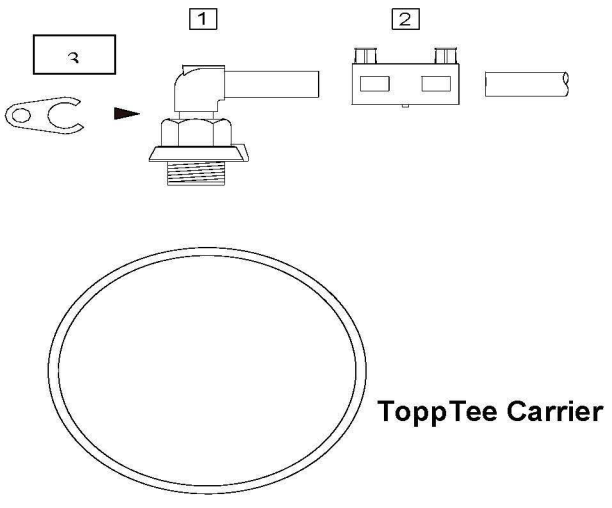
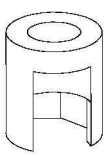


Figure A28 – ToppTee fitting



Item No.	ToppTee Service fitting complete with electrofusion coupler
1	1" x 20 mm
	1" x 25 mm
2	Electrofusion coupler
3	' C' Clip

Table A6 – ToppTee Fitting

A3.7 Emid Plug

1. Clean around the area of the main where the rubber seal is to be sited on the main.
2. Taking care not to move the body of the plug, remove the locking washer and rubber seal from the plug assembly.
3. Position the drilling base over the plug and attach the chains loosely around the main.
4. Attach the plug removal tool and spindle to the plug.
5. Install the plug housing over the spindle and onto the drilling base.
6. Secure the housing into position by depressing the plunger on the drilling base.
7. Slowly commence alternate tightening each side of the chains ensuring that the spindle is able to turn both clockwise and anti-clockwise at all times.
8. If the spindle becomes jammed, slacken off the chain and re-commence tightening when the spindle is able to turn again.
9. Repeat this operation until the drilling base is tightly fitted onto the main.
10. Unscrew the plug from the main by rotating the spindle anti-clockwise. When the plug is out of the main, raise the spindle and plug into the housing.
11. Close the valve on the drilling base and depress the plunger to remove gas pressure within the plug housing.
12. If gas pressure continues to escape open and close the valve to gain a better seal. If gas is still escaping **Breathing Apparatus shall be worn prior to proceeding with step 13.**
13. Remove the plug housing and remove the plug.
14. Install new fitting in accordance with Section A3.2.

A3.8 Encirclement Fitting

1. Steel / ductile mains up to and including 3″ diameter operating up to 75mbar will require a full encirclement fitting to be used. (See note below).
2. Steel /ductile mains up to and including 6″ diameter operating above 75mbar and up to and including 2bar will require a full encirclement fitting to be used.

NOTE: If it is known that the pipe wall thickness is greater than 4 mm, then a standard top tee can be used.

A3.8.1 Preparation

1. A PE valve shall not be used as a construction valve in this application.
2. Remove the protective coating from the main and clean by scraping and wire brushing.
3. Attach the correct size full encirclement fitting onto the main and tighten using a torque wrench as per manufacturers' instructions (Figure A29).
4. When installing the full encirclement fitting onto the main check the orientation of the tee to ensure the correct depth of cover is achieved.
5. The main can be drilled using a long reach drill (as shown in Figure 31) which is connected to the outlet thread/flange of a full bore valve fitted to the tapped boss of the fitting (as shown in Figure A29).

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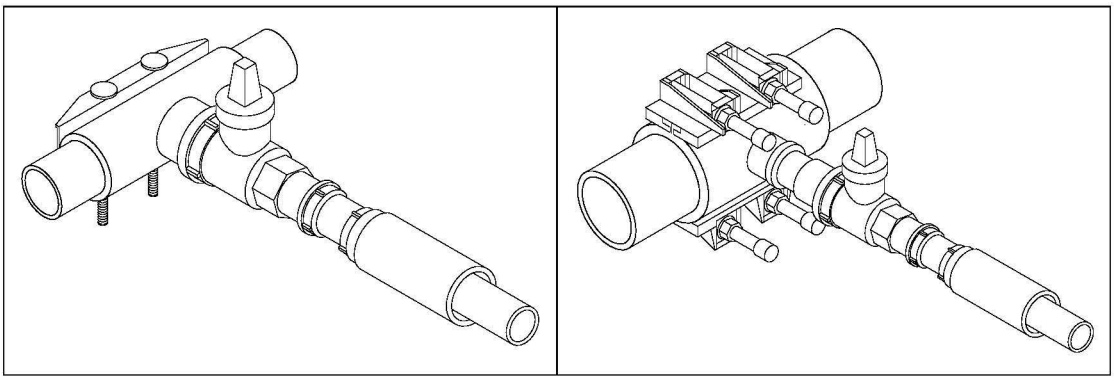

Figure A29 – Example – Service connection to an Encirclement Fitting

A3.8.2 Pressure Testing & Drilling

1. Check the drill length to ensure that the drill is the correct size.
2. Ensure that the valve can be fully closed when the drill is retracted.
3. The main can be drilled by using a long reach drill which is connected to the outlet thread of a full bore gate valve which is in turn is fitted to the tapped boss of the clamp.
4. The clamp & valve is to be tested to 350mbar for LP mains and 3bar for MP mains (using equipment shown in figure 30), for a period of 5 minutes without loss of pressure.

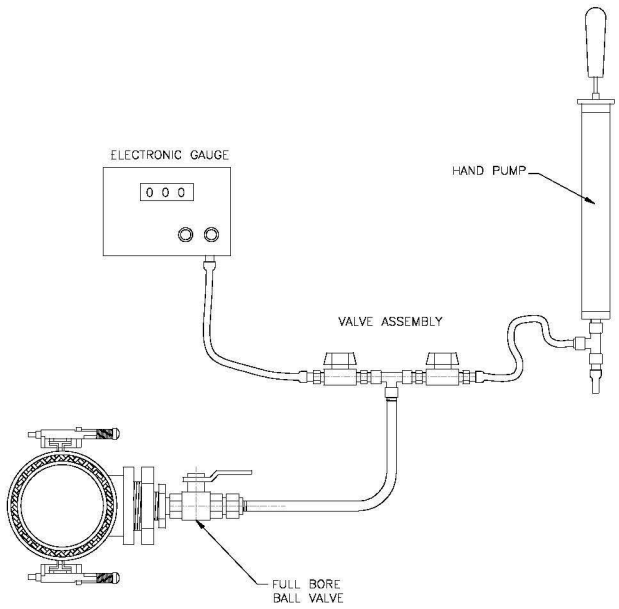

Figure A30 – Encirclement Fitting & Valve with Test Equipment

5. Approved leak detection solution should be used during the pressure test around the encirclement fitting to check for leakage.
6. Following successful testing the main is drilled by connecting the long reach drill to the outlet thread/flange of the valve, opening the valve and drilling the main in accordance with manufacturers' instructions. The pressure should be monitored throughout the drilling operation.
7. The drill is then retracted, the valve closed and drill removed.
8. Undertake a pressure test on the service by adopting the procedure in accordance with Chapter E4 ToppTee.

9. The service is then connected to the outlet connection of the valve.
10. Commission the service in accordance with Chapter E.

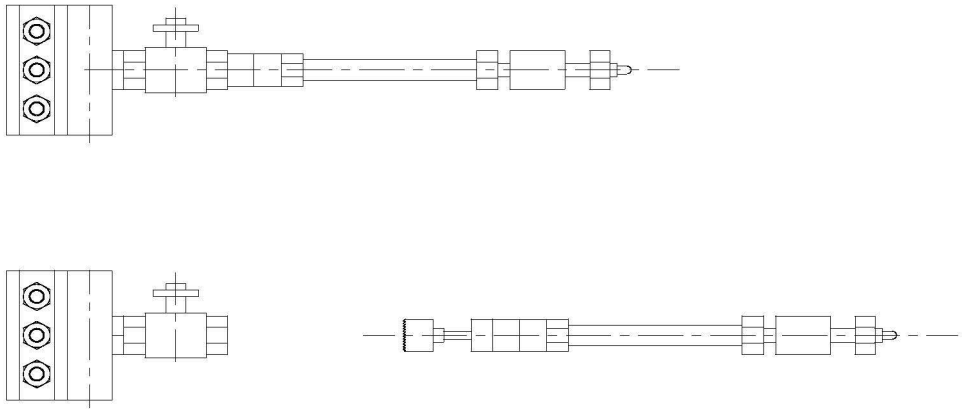

Figure A31: Long Reach Drill and Encirclement clip

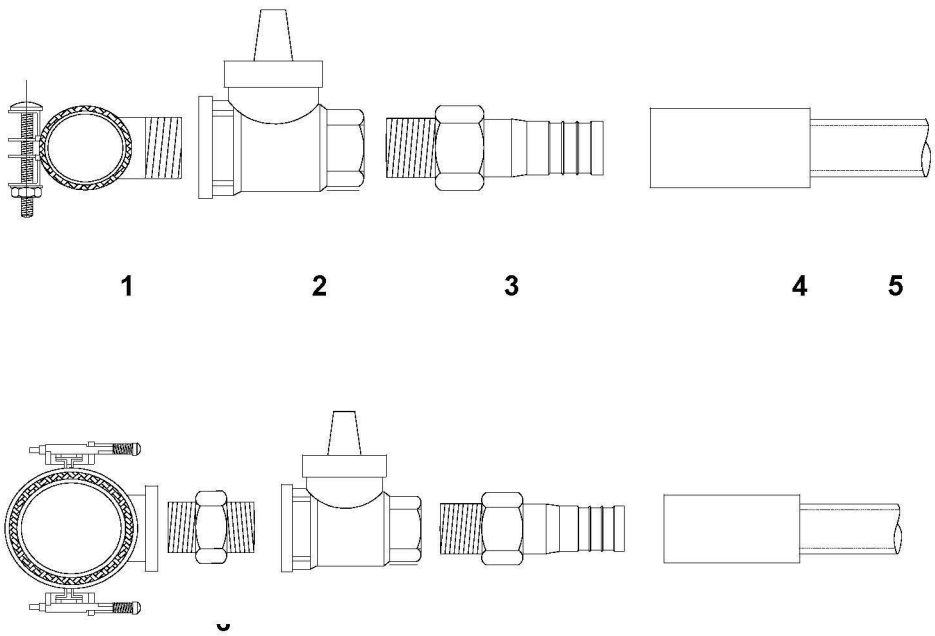

Figure A32 – Component parts

Item No.	Description	Sizes
1	Encirclement fitting	Up to 2″ outlet bosses available
2	Full Bore valve	See Chapter C table C2
3	Transition Fitting PE x Steel	1″ x 32 mm & 2″ x 63 mm
4	Anti shear Sleeve	50 mm
5	PE pipe	32 mm / 63 mm
6	Hexagon Nipple	1" & 2″

Table A7 – Encirclement Fitting parts list

A4 SERVICE TRANSFERS

A4.1 General Requirements

1. Prior to the service transfer check to ensure the service is not duelled.

2. Isolate the existing service at the meter.
3. Where a PE service crosses the line of the new main the service can be squeezed and capped off at that point and transferred to the new PE main. The remaining section of service connected to the old main can be left and abandoned along with the existing main.
4. Where existing services are not fully constructed of PE they shall be re-laid.
5. Where a steel service crosses over the point of the new main, the service can be cut and capped at this point and inserted back to the property if the pressure loss is satisfactory (see Chapter B). The remaining section of service connected to the old main can be left and abandoned along with the existing main. A leakage survey should be undertaken on the remaining live section of steel service on completion of the transfer.
6. If transferring a Medium Pressure service, it should be isolated at the main or at the service isolation valve.
7. Non standard service materials such as lead or copper shall not be transferred onto the new main. Lead and copper services should be cut off at the mains connection and relaid. There should be no steel tails left connected to PE services.
8. **Squeeze off Settings** The appropriate settings for squeeze off tooling shall be used. With SDR13.6 pipe the following settings shall be used
    - For 63mm SDR13.6, 55mm SDR11 stops should be used. If these are not available, then 90mm SDR17.6 stops may be used.
    - For 75mm SDR13.6, 63mm SDR11 stops shall be used.
9. A suitable mechanical reinforcement clamp, centralised over the pinch points with squeeze off tape applied, shall be permanently fitted to all 2" diameter (Imperial size) PE pipe following squeeze off. Once fitted, "Squeeze off applied" marker tape shall also be fitted over the clamp. If there is any doubt as to whether the PE pipe is metric (63mm) or imperial (2") a suitable mechanical reinforcement clamp shall be fitted. This is necessary in order to reduce the risk of an escape from slow crack growth from inside the pipe wall to outside.
10. Where identified Muntz Barwell (M&B) imperial size service pipe should be totally re-laid i.e. repairs or service transfers shall not be carried out on this material (see description below)

A4.1.1 How to Identify a Muntz Barwell imperial pipe.

The material was laid in service pipe sizes (½" to 2") in the NW in the early 1970s and is limited to imperial sizes only. The M&B material was originally yellow and gradually turns green prior to turning black in certain ground conditions. Some have "Muntz" indented lettering on the pipe.

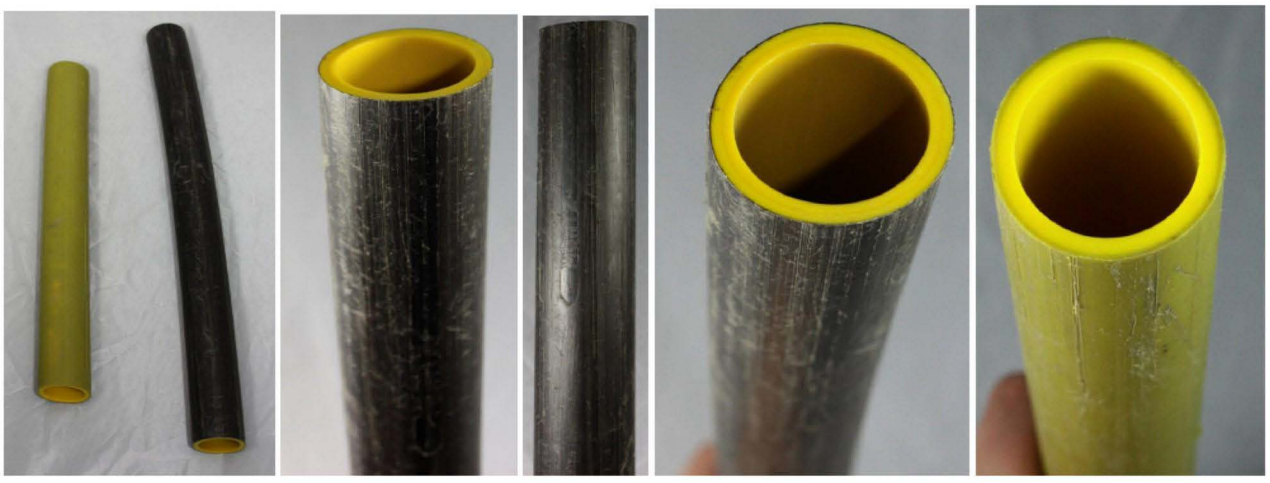

Figure 32a - Muntz & Barwell 1" SDR11 service pipe samples – most of the samples are completely black but one sample is still yellow.

A4.2 Transfer Service – Operation

- All existing live services should be disconnected in accordance with Section A6 Service Cut Offs.
- Service Transfers should be undertaken in accordance with:

- Section A1 Polyethylene Service Connection off PE Main
- Chapter B Service laying and Pressure Testing
- Chapter E Commissioning

- The proposed service will have to be sized to ensure that it will operate within permissible pressure loss requirements.

Additional precautions are required when undertaking a service transfer to an inserted main in accordance with Section A2. These include:

- Using additional personal protective equipment (PPE) when removing any fragments of main at the point of connection to the PE main i.e. goggles, gloves, face mask/visor.
- Inspecting the PE main for damage.

A4.3 Use of 32mm x 20mm Electrofusion Service Tapping Tee

A 32mm x 20mm Tapping Tee has been introduced in to UK Distribution for use on Low and Medium Pressure systems up to and including 2Bar.

Medium Pressure Application

This tee can be used for connecting new domestic or small industrial and commercial premises.

Low Pressure Application

This tee can be used on single domestic connections with a requirement of up to 3scmh, facilitate 32mm PE live transfers and facilitate the installation of a 32mm equal tee off an existing 32mm pipe by using the tee for bypass connections together with squeeze off tools, thereby eliminating the need to disrupt downstream customers. Prior to use **approval shall be sought from your First Line Manager** to check pressure loss across the proposed pipe installation.

Figure A32b – 32mm x 20mm Electrofusion Tapping Tee with top loading clamp and cutter

The following conditions shall apply to the use of this tapping tee:

1. Pressure Requirements

Reference shall be made to Section B1.1 Pressure Requirements. The Line Manager will determine a 32mm x 20mm tapping tee is suitable for the connection/supply being installed.

- The tapping tee is suitable for replacement single domestic connections with a requirement of up to 3scmh
- This tapping tee can be used for multiple service connections within the customers own boundary provided the pressure loss calculations have been taken into account and conform to existing requirements
- Tees used for bypass connections shall be limited to a maximum of 10m using 32mm pipe with reducers

- When used for a service connection the following maximum lengths of service pipe downstream of the tee connection shall be observed, however, all upstream pipework shall be taken into account for pressure loss.

	16mm = 3.0m		20mm = 10.0m		25mm = 25.0m	
Note: Pressure loss across tapping tee at 3 scmh with a source pressure of 25mbar = 0.82mbar						

2. Exclusions

- This tapping tee is not to be used for new domestic gas services – the minimum diameter is 32mm
- Connection of a Dual service to a parent main in the public highway shall not be connected using this tee
- This tee shall not be used for a domestic service connection with a requirement of more than 3scmh

3. Top Loading Clamp and Cutter

- Only the correct Top Loading Clamp and Cutter shall be used. These are available from the Emergency Response stores located in each Network
- Under no circumstances shall a strap loading clamp or other traditional pillar top loading clamp be used

4. Installation and On-site Quality Control

The installation of the tapping tee shall be in accordance with the relevant aspects of Section A1 - POLYETHYLENE SERVICE CONNECTIONS which describes the process to be followed when connecting a PE service to a PE pipe using the electrofusion process.

5. Testing, purging and commissioning

Pressure tightness testing (using the universal tester), purging and commissioning shall be in accordance with Section E.

A5 SERVICE ALTERATIONS - PE

A5.1 General Requirements

1. Prior to undertaking a service alteration, check to ensure that it is not part of a dual service.
2. If a dual service is found this should be re-laid as two individual services.
3. All sections of below ground steel services shall be replaced.
4. When a service is to be cut off for any alteration work, it should be cut at least 2m from the building line ensuring that adjacent vents and any other openings have been temporary isolated or closed. Any other potential sources of ignition should be identified and isolated where possible i.e. extinguish pilot lights on balanced flue appliances, extractor fans, etc.
5. If a service alteration is downstream of an above ground entry tee, with an integral stopper, the integral stopper should be used as a means of isolation, as long as a 'let by' test using a pressure gauge connected to outlet of the Emergency Control Valve (ECV) confirms that the entry tee is not passing gas in accordance with Chapter E.
6. The correct squeeze off distances shall be maintained between fittings or joints (Figure A34).
7. Squeeze off Settings - The appropriate settings for squeeze off tooling shall be used. With SDR13.6 pipe the following settings shall be used
    - For 63mm SDR13.6, 55mm SDR11 stops should be used. If these are not available, then 90mm SDR17.6 stops may be used.
    - For 75mm SDR13.6, 63mm SDR11 stops shall be used.

8. A suitable mechanical reinforcement clamp, centralised over the pinch points with squeeze off tape applied, shall be permanently fitted to all 2" diameter (Imperial size) PE pipe following squeeze off. Once fitted, "Squeeze off applied" marker tape shall also be fitted over the clamp. If there is any doubt as to whether the PE pipe is metric (63mm) or imperial (2") a suitable mechanical reinforcement clamp shall be fitted. This is necessary in order to reduce the risk of an escape from slow crack growth from inside the pipe wall to outside.
9. When undertaking an alteration on an MP service it should be isolated at
   - the service isolation valve, or
   - the mains connection, or
   - a suitable point for single squeeze off up to and including 63mm diameter pipe. If the squeeze off equipment fails to stop the flow of gas, an additional squeeze off should be used.

Wherever possible services should be laid perpendicular between the service entry point/meter box location on the property and connection to the existing pipework

10. Compression fittings should not be used for reconnection of services within 2m of a property.
11. Prior to leaving the site, adjacent properties should be checked to ensure that supplies have not been affected by the work undertaken.

A5.2 Service Alteration - Operation

1. The service shall be squeezed-off and cut downstream of the squeeze-off. The live end of the service shall be temporarily capped with an approved fitting.
2. An air test of 100mbar shall be applied for 5 minutes with no allowable pressure loss on the service pipe work prior to reuse. If any section of pipe work fails this test then the entire service shall be renewed or the leakage source identified and permanently repaired.
3. The service alteration (Figure A33) shall be undertaken in accordance with Chapters B, D and E.
4. 'Squeeze off' tape shall be applied at the point on the pipe where the squeeze off was applied.
5. The service pipe is not to be squeezed off again at the same point.

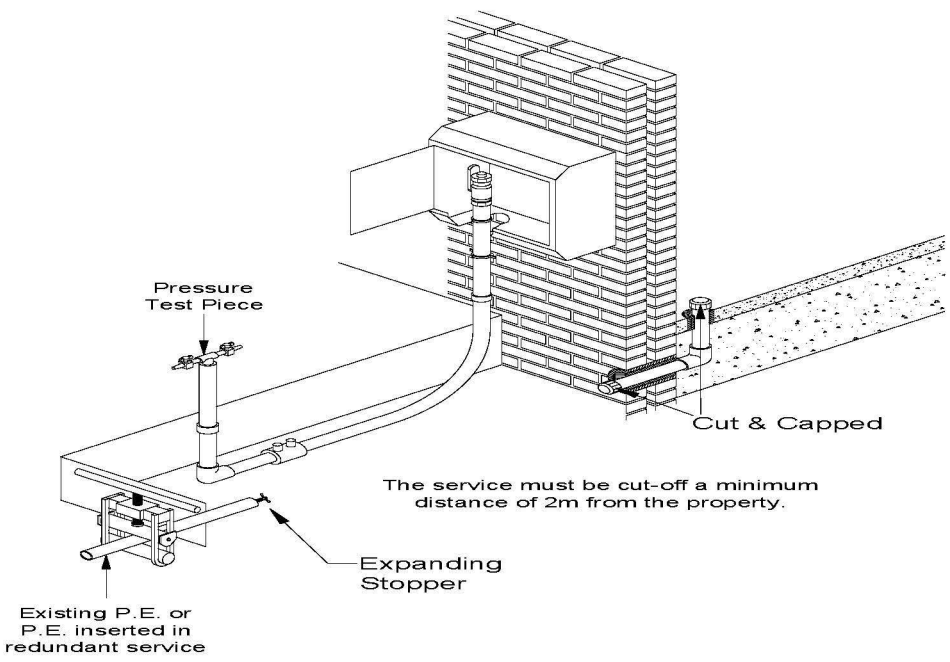

Figure A33 – Typical PE Service Alteration

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A6 SERVICE CUT OFF'S

This section details procedures to be used when a service is to be cut off when undertaking the following activities: -

Service Relay

The service should be cut off at the main or a minimum of 2m from the property if an insertion method is to be used to relay back to the main.

Service Transfer

The service should be cut off at the main, however where a service crosses over the new main, the service can be cut off and capped at that point. The remaining section of service connected to the old main can be left and abandoned at the same time as the main. Steel services shall be relaid to the new main.

Service Alteration

The service should be cut off at a minimum distance of 2m from the property to avoid any gas ingress into the property.

Permanent Service Cut Off

The service should be cut off at the main. Where the service pipe connection to the parent main is not readily accessible such as highly populated apparatus, heavy flows of traffic, the use of Live Service Insertion may be used as a means of isolation in accordance with Chapter B Section 3.4.

Note (1): In all cases where the service is cut off, the dead section of pipe shall be capped with an approved fitting.

Note (2): The service isolator tool (T/PR/SER/9) should be used to isolate the service pipe (external use) in accordance with work procedure unless using the Live Service Insertion technique to remotely isolate a metallic gas service pipe 9refer to section A6.3.3).

A6.1 General Requirements

1. The ECV should be turned off and capped.
2. Before and after cutting off the service a check should be made with adjacent properties for a dual service i.e. a visual inspection on the service entry positions, asking the consumer/s.
3. All services to be cut off should be disconnected at the mains connection point with the pipe end(s) capped off and the main plugged where appropriate.
4. Where possible the existing standpipe should be disconnected / removed without causing any damage to the fabric of the building and seal the standpipe entry.
5. Where the existing standpipe cannot be removed without damaging the fabric of the building, the standpipe may be left in situ, the ECV removed and pipe end capped. If the service entry to the property is an above ground fitting with self isolation i.e. HET, the ECV may be retained, closed, sealed with an approved cap and wired. A Service label should be fitted (where reasonably practical) to indicate the service disconnected.
6. Only approved mains sealing plugs shall be used (taper plugs and reducers are not permitted).
7. If a MP service is encountered with a Top Tee assembly as shown in Figure A36, work should proceed with caution as the integral plug may have been removed. In this situation the Operational Manager should be contacted to initiate the reduction in pressure of the main.

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8. If a MP service is encountered with a bend/long screw as shown in Figure A37, the Operational Manager should be contacted to initiate the reduction in pressure of the main. Once the pressure in the main has been reduced the service can be cut off as stated below.
9. LSI technology technique may be used for service isolations for low pressure services of ¾" to 2" diameter. (see A6.3.3 Cut metallic service remote from the mains connections for more details).
10. Isolation of service pipes using LSI is not restricted to property types but shall be completed at a remote location no longer than 10 metres of the located line of the parent main. The length of pipe left in the ground inserted back to the parent main shall be kept to the minimum.
11. Services isolated by LSI shall be recorded using the appropriate records system.
12. It is important that all work on service pipes, including permanent or temporary cut offs is recorded in the appropriate manner.
13. Squeeze off Settings - The appropriate settings for squeeze off tooling shall be used. With SDR13.6 pipe the following settings shall be used
    - For 63mm SDR13.6, 55mm SDR11 stops should be used. If these are not available, then 90mm SDR17.6 stops may be used.
    - For 75mm SDR13.6, 63mm SDR11 stops shall be used.
14. A suitable mechanical reinforcement clamp, centralised over the pinch points with squeeze off tape applied, shall be permanently fitted to all 2" diameter (Imperial size) PE pipe following squeeze off. Once fitted, "Squeeze off applied" marker tape shall also be fitted over the clamp. If there is any doubt as to whether the PE pipe is metric (63mm) or imperial (2") a suitable mechanical reinforcement clamp shall be fitted. This is necessary in order to reduce the risk of an escape from slow crack growth from inside the pipe wall to outside.

Note: Additional personal protective equipment including breathing apparatus, fire suits and gauntlets shall be worn during any live gas or Medium Pressure operation.

A6.2 Continuity Bonding

A6.2.1 Electrical bonding – Temporary Continuity Bonding (TCB) on metallic services:

1. A Temporary Continuity Bond (TCB) is used to protect the Operative and ensure that an ignition source will not be created by an electrical discharge across a temporary gap in pipe work. (Figure A35 illustrates a typical temporary continuity bond used for cutting off services).
2. A Voltstick shall be used prior to installing a TCB to check for stray voltage on the service pipe. (see Sub- section 6.8 Electrical safety - 6.8.1 Voltstick – General for more details)
3. A TCB shall be fitted before any metallic pipe work or meter is connected, disconnected or cut. The correct type of continuity bond should be selected prior to the work beginning, ensuring that the correct type clamp is used and is properly attached to the pipe (Figure A34).
4. TCB's should be visually inspected by the Operative prior to use for obvious signs of damage, mechanical weakness or broken electrical terminations. If there are any signs of damage they shall not be used and be repaired or replaced.
5. TCB's shall be fitted so that they will not be disturbed during the progress of the work and not be removed until the work is completed. The TCB needs to be connected to the pipe work on both sides of the section to be worked on and be fitted or removed in a gas free area only.
6. If sparking occurs at any time when fitting or removing a bond, work shall cease immediately and the Operational Manager shall be informed. The consumer should be advised that the installation needs to be checked by a competent electrical contractor or the electrical authority.

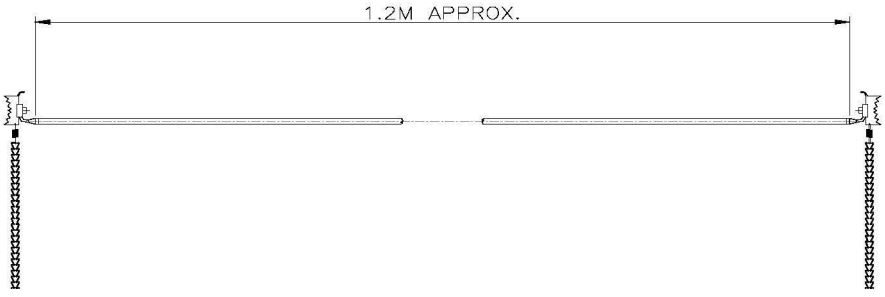

Figure A34 - Temporary Continuity Bond (TCB).

A6.2.2 Installation of a temporary continuity bond

When fitting a TCB the procedure detailed below should be followed:

1. Select the position on the main, service or installation pipe work at which the temporary continuity bond is to be connected.
2. Clean the pipe at this position to provide a sound metal contact. Where applicable this may involve removing protective coatings. The surface of the pipe should be cleaned to a bright finish using a wire brush to ensure a good electrical contact.
3. Ensure that the TCB is of adequate length and that the connection ends are clean and in good condition and the cable not damaged.
4. Attach the two ends of the TCB to the two cleaned sections of pipe work and ensure that both connections are secure. The TCB **shall not** be held securely by the use of Stilsons, etc.
5. Proceed with the connection or disconnection of pipe work.
6. Remove the TCB following completion of work.
7. Reinstate protective coating on pipe as required.

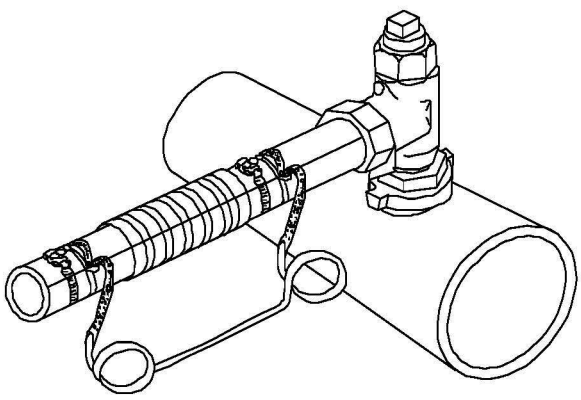

Figure A35 - Typical installation of Temporary Continuity Bond.

A6.3 Cut Off Procedures

This is a hazardous operation additional personal protective equipment is required

Breathing Apparatus shall be worn during this operation, and fire extinguishers placed adjacent to the working area available for immediate use.

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A6.3.1 Isolation and removal of a service tee fitted to metallic mains

1. Check any exposed metallic pipe with Voltstick, and excavate around circumference of the main.
2. Carefully remove the plug from the service tee in case the integral plug is not fitted.
3. Lower the integral stopper to the bottom of the tee if one is fitted. If there is no integral stopper then the service shall be cut off in accordance with Section A6.3.2.
4. Check the integral plug for leakage by applying an approved leakage detection solution and replace the plug on the top of the service tee.
5. Disconnect service pipe from service tee, depending on whether the service pipe is PE or metallic :

   a) PE service

   Disconnect the service outlet as near to the tee as possible and cap the other end of the pipe with an electrofusion cap end.

   b) Metallic service

   i. Remove any protective wrapping from the service pipe in two locations approximately 300 mm apart, the pipe should be cleaned with a wire brush to a bright finish to ensure a good electrical contact.

   ii. A temporary continuity bond shall be fitted to bridge across the section of pipe to be removed as per Figure A36, and in accordance with Section A6.2.2.

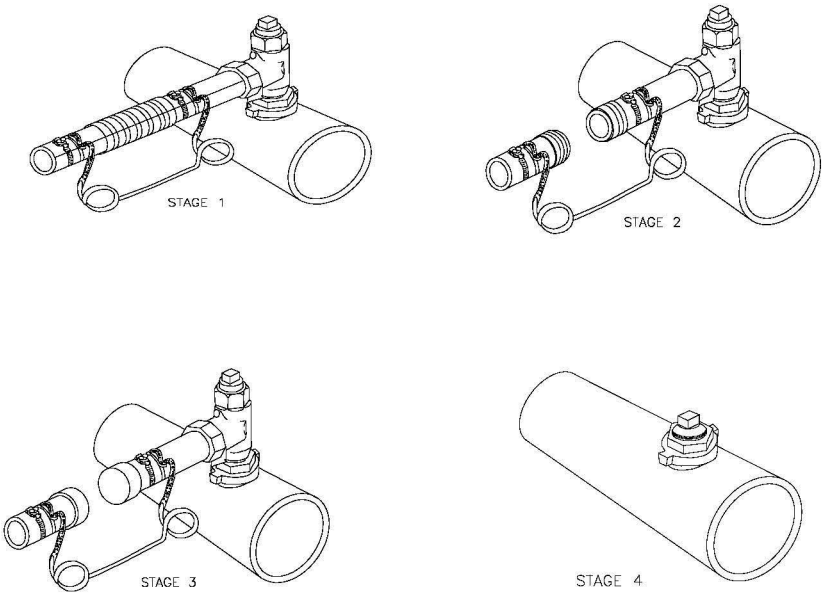

Figure A36 - Cut off Metallic Service with top tee assembly

   iii. Prior to cutting, the pipe should be wrapped with a suitable mastic bandage.

   iv. The service should be cut through the mastic bandage using a hacksaw in such a manner as to enable the cut piece to be easily removed. The cut should be sealed with mastic as cutting proceeds to minimise the discharge of gas. (Figure A36 Stage 1)

   v. Remove the cut section of pipe, cap downstream (property side) pipe with an approved cap end. (Figure A36 Stage 3).

   Disconnect the continuity bond from the service and disconnect the outlet of the service top tee.

6. Loosen the service tee on the main, taking care to restrict any leakage to a minimum.

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7. Centralise the drilling machine over the tee, fit carrier spindle and remove the tee under controlled gas conditions. Withdraw the tee into canopy and close the gate valve.
8. Attach a mains plug onto the carrier spindle and plug off the main under controlled gas condition (Tapered Plugs shall not be used, Stage 4).
9. Remove the drilling machine and tighten the plug.
10. Test the plug with an approved leak detection solution (Figure A36 stage 4).
11. The old service pipe should be removed from the property. The existing standpipe ECV and service entry should be removed, and all redundant holes sealed and any damage made good. If this cannot be achieved the underground entry and standpipe shall be capped off to prevent any potential ingress at a later date.
12. The ends of abandoned pipe above / below ground shall be sealed with an approved cap end. No open ends of pipe shall be left in any position.

A6.3.2 Cut off steel bend/long screw to metallic mains.

1. Refer to Work Procedure for use of the Rapid Service Isolator (T/PR/SER/9) and Figure A37 Stage 1-4 regarding the cutting of the service pipe.
2. Remove the cut section of pipe, cap both ends of the pipe with an approved cap.

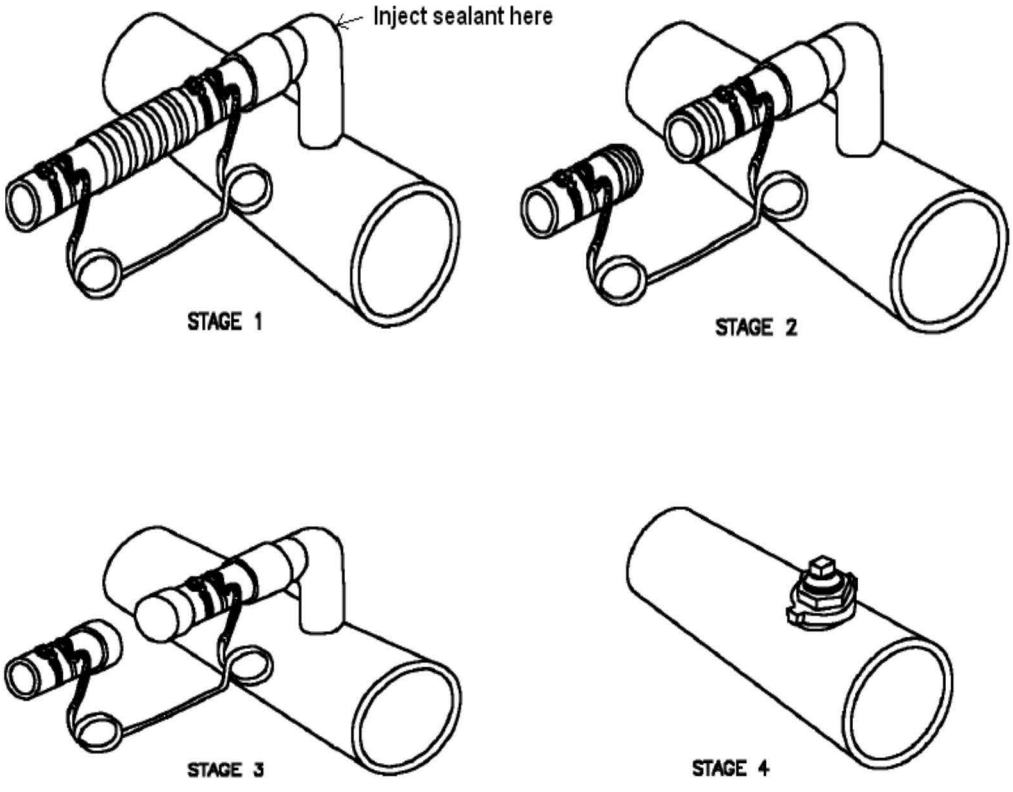

Figure A37 - Cut off metallic service with service bend to main

3. The bend and the short length of pipe from the main should be unscrewed carefully and the plug fixed immediately. To avoid the build of static charge and the possibility of a spark, the plug should be earthed by resting the plug on the main about 350 mm from the hole and slid along the surface of the pipe to the hole (stage 4).
4. The old service should be removed from the property, the old standpipe, ECV and existing service entry should be removed; all redundant holes sealed and any damage made good. If this cannot be achieved the underground entry shall be sealed with a cap end to prevent the ingress of any leakage of gas at a later date.
5. The ends of any abandoned pipe left in the ground shall be sealed with a suitable cap.

Note: If the service pipe connection is found to have no tee or bend at its junction with the main, then refer to Section A 6.3.1 5b) for guidance on cutting the pipe. Caution shall be taken when unscrewing the pipe direct from the mains drilling.

A service extraction tool, and a service pipe expanding stopper tool, should be available on site and used in the event of pipe collapse. The retained section of the pipe (still housed in the main) can be made safe with the expanding stopper or retrieved by the use of the extraction tool immediately depending on the failure mode.

A6.3.3 Cut off metallic service remote from the mains connections and isolate remaining section of live service using the Live Service Insertion technique with a solid nose cone.

1. If the service pipe to be cut off is remote from the mains connection point, then follow Section A6.3.1 (5b) Metallic Service stages i. to v.
2. The cut off should be undertaken a minimum of 2m from any building line, if this cannot be achieved the service should be cut off at the main.
3. Using the LSI technique then refer to Figure A37b and follow the normal LSI procedure with these exceptions:
   - Only fit the new white finned 'solid' nose cone when disconnecting steel services, ensuring that the PE pipe is cut square and the internal bore chamfered to prevent damage to the 'O' ring seal on the nose cone.

Existing Steel Service Pipe Diameter	Nose Cone Diameter (mm)	White Finned Nose Cone SAP Code
¾"	16	4080
1"	20	4081
1¼"	25	4082
1½"	32	4083
2"	40	4084

Figure A37a – New white finned nose cone with solid bar

- As the service will remain disconnected following the LSI process it is essential that the gas service is correctly tested to ensure that the fitted PE end cap is sound.
  a. Following the filling of the annulus between the PE pipe and the carrier reattach the pressure test equipment to the PE pipe and raise the pressure in the inserted PE service to 100mbar.
  b. Apply a squeeze off unit the minimum distance from the end of the PE pipe, remove test equipment and fit an electrofusion PE end cap in accordance with current requirements. The open end of the steel service pipe that has been disconnected shall be capped using an approved mechanical fitting.
  c. Following the cooling off period of the electrofusion end cap joint release the squeeze off and apply leak detection fluid to the end cap to ensure there is no visible leakage.

- Services isolated by LSI shall be recorded using the appropriate records system.

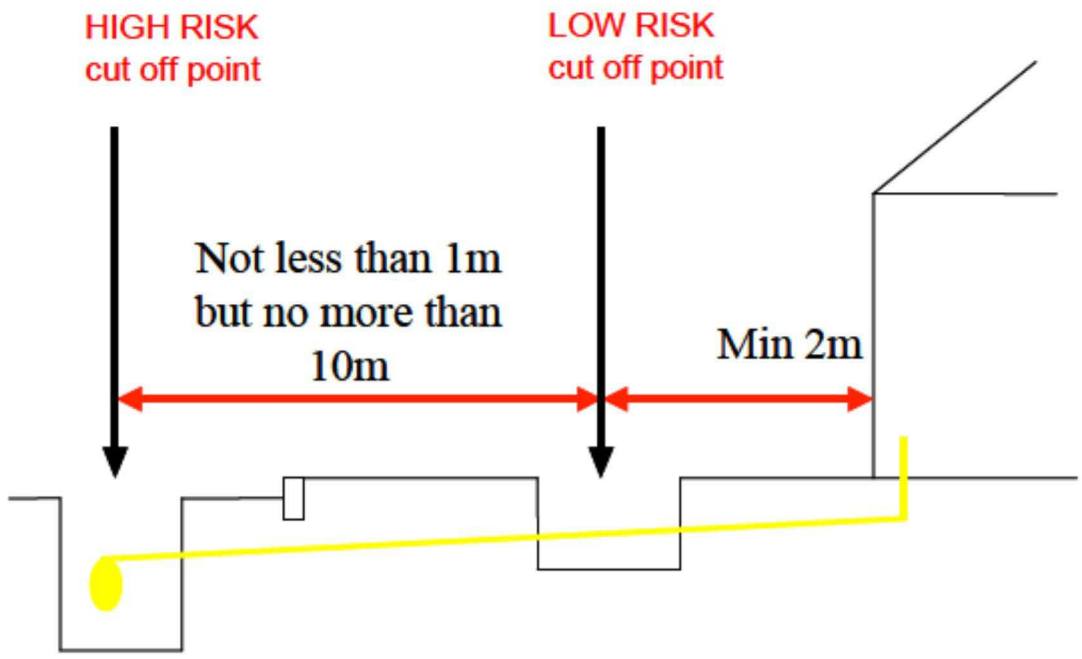

Figure A37b: Preferred cut off point at a location of lower risk than isolation at the main if utilising LSI technique.

A6.3.4 Cut off PE service off from PE main.

1. Excavate to the main and remove cap from the tapping tee and wind the cutter to the down position. Figures A38 & A39.
2. Check cutter seal by applying approved leak detection fluid into the tapping tee.
3. Drape damp cloths over the section to be cut out ensuring that the ends of the cloth are in contact with the ground. Refer to Figure A40.
4. Cut the section of pipe.
5. Fit electrofusion caps to both ends of service pipe. Figure A41.
6. Raise the cutter and replace cap.
7. Test the electrofusion cap end and top tee cap using a leak detection solution.
8. Wash off leak detection solution using clean water.
9. The end of the any abandoned pipe work left in the ground shall be sealed with electrofusion caps.

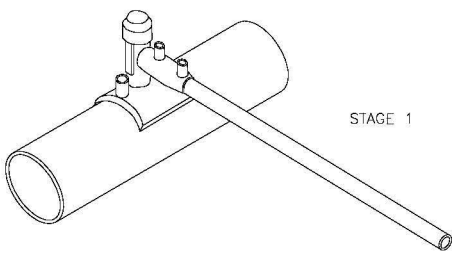

Figure A38 - PE service

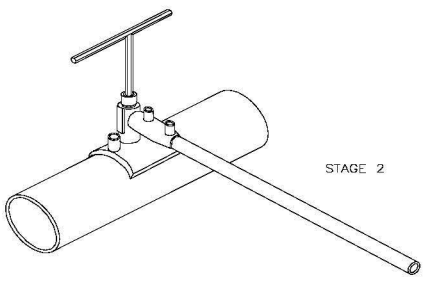

Figure A39 - Top tee plug screwed down

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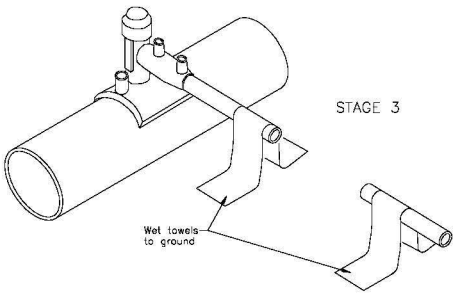

Figure A40 - PE service cut off

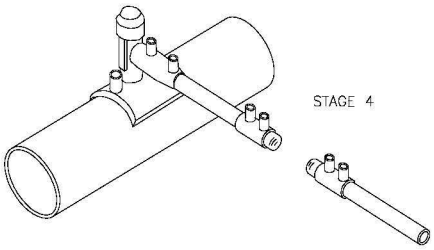

Figure A41 - PE service capped off

A6.3.5 Cut off PE service remote from the mains connections.

If the cut off is remote from the mains connections point, a squeeze off tool shall be used to isolate the service and cut the section.

1. Excavate and clean the service pipe.
2. Set the squeeze-off tool to the correct diameter.
3. Position the squeeze off tool upstream from the proposed cut out section and at least 3 x diameters away from any joint or fitting.
4. Drape damp cloths over the section to be cut out ensuring that the ends of the cloth are in contact with the ground. Figure A40.
5. Squeeze the service pipe and cut the pipe at least 3 diameters away from the squeeze-off position.
6. Fit an electrofusion caps to both ends of service pipe. Figure A41.
7. Remove squeeze off and check electrofusion cap on live section of service pipe with approved leak detection fluid.
8. Apply 'squeeze off' tape at the squeeze off locations.
9. There is no proximity to buildings for PE cut off where a squeeze off tool or other form of isolation has been used, provided an electrofusion fitting is used as the final joint.

A6.4 PE Squeeze-Off Dimensions

Refer to Appendix G for dimensional requirements for the use of a squeeze off next to fittings and other squeeze off tools.

CHAPTER B SERVICELAYING TECHNIQUES

B1. SERVICELAYING TECHNIQUES - GENERAL REQUIREMENTS

This section specifies the procedures to be followed when laying a new or replacement service. It covers the installation of the pipe from the point of connection at the main (Chapter A) to the consumers' premises by a variety of techniques.

Service Pipe Diameter

Table B2 identifies the standard PE pipe diameters that should be used for service installations. All diameters indicated can be used for replacement purposes.

PE Pipe Diameters
16mm
17.5mm
20mm
25mm
32mm
63mm

Table B2: Service Pipe Diameters

Notes

1. 16mm should not be used for open trench

2. Serviflex pipe is equivalent to 20mm PE pipe.

3. The reuse of LSI pipes capped off as a result of service isolations shall not be reinstated unless the pressure loss calculation conclusively proves the minimum design pressure of 19mbar at the ECV can be achieved. Reference shall be made to the Operations Manager or representative to allow any new connection to proceed.

4. If the inserted pipe meets the requirement in Note 3, then the PE connection can be made in accordance with the squeeze off dimensions found in Appendix G.

5. The maximum length of 17.5mm PE pipe shall be 8m – dependant on pressure requirements

B1.1 Pressure Requirements

Services are designed so that the pressure at the end of the network (at the ECV) is maintained above the system design minimum. For LP services this is 19mbar, but MP services the specific pressure depends upon the operational requirements.

Ideally, a service should be constructed from a single piece of pipe with the minimum number of joints possible. However, it may be necessary to install services made up of pipes of different diameters in order to minimise installation costs.

Construction of services will depend on site specific conditions and customer requirements, therefore the following techniques should be adopted to meet these requirements with a supported hazard assessment for all new and replacement work.

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For new lay services

Note:
All new services pipes shall be laid in 32mm diameter other than under these circumstances:

a. **where a redundant pipe is found and utilised for insertion purposes (in accordance with pressure loss calculations)**
b. **where the reduction of 32mm PE to 25mm PE is deemed necessary at the termination end to allow for the use of a smaller PVC Preformed Bend (black bend) – restrictions due to footings, drains etc.**
c. **where the reduction of 32mm PE to 25mm PE is deemed necessary at the termination end to allow for the use of a 25mm Corbelled meter box fitting**
d. **Where agreed by the First Line Manager**

The method of installation in order of preference should be:

- Open trench prepared by others (Section B2)
- Approved service pipe ducting (Section B2)
- Earth displacement (impact moling) (Section B4)
- Open cut trench technique (Section B5)

The diameter of the pipe will be calculated at the design stage and will be provided on the work documentation.
For existing properties, check to ensure that no existing service pipe exists. If any other gas service is identified, it should be checked for gas and confirmed to be dead or live. Where found to be live and the service needs to be cut off, this should be carried out in accordance with Chapter A6 Service Cut Offs.

Where the service is confirmed to be dead consideration should be given to utilising the redundant pipe for dead insertion provided the following requirements are adhered to:

- The scope is restricted to existing domestic premises using **no more than 65 kWh / 6m3/h.**
- The allowable pressure loss across the new service shall not exceed 2mbar (refer to Tables B3 or B3a)
- The route of the redundant service pipe is suitable for the termination point of the new service, i.e. laid perpendicular from the main to the existing premise
- Where it is intended to use any part of the internal section of an old redundant service pipe for insertion the redundant service pipe shall be pressure tested at 100mbar for 5 minutes with no pressure loss detected. This is to ensure that the injected sealant will fill the annulus between the new PE and old steel service. This pressure test is in addition to the current requirements prescribed in section B3.2 of T/PR/SL/1 when laying services by 'Dead Insertion'.

Table B3 or B3a (dependant upon KW/h consumption) shall be used to calculate the size of the individual component lengths of the service to ensure the maximum allowable pressure loss of 2mbar is not exceeded. Contact should be made with the Operational Manager if there is concern regarding specific calculations.

Note:

- **All new services pipes where a redundant pipe is NOT utilised shall be laid in 32mm diameter.**
- **Other than that part of the PE pipe inserted in a redundant service pipe (see above) the remaining length of service shall be laid in 32mm**

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Example:

A new supply to an existing domestic premise using no more than 65 Kwh / 6m^3/h is required. An old redundant service pipe has been located and could be used for partial insertion.

Calculation using Table B3a (Table B3 would be used if the consumption was 32 kWh)

Total new service length 23.5 metres
Old redundant service pipe is 1 ¼"

As the steel will be cut at least 2m from the building and there is1.5m of steel within the building the total length of the insertion = 3.5m

Maximum Pressure loss allowed = 2mbar

3.5m of inserted 25mm PE has a Pressure Loss of 0.6mbar leaving 1.4mbar allowable Pressure Loss for the rest of the service length

Using Table B3a locate the maximum 32mm PE that can be laid that provides a Pressure Loss below 1.4mbar = 24m

Therefore if you were to insert 3.5m of 25mm and lay 20m of 32mm (adding both pressure losses together) then you would not exceed the maximum 2mbar Pressure Loss requirement = a total Pressure Loss of 1.54mbar (0.6mbar + 1.14mbar)

For bulk and single replacement of services

The method to be adopted in order of preference should be:

- Insertion (Section B3)
- Impact Moling (Section B4)
- Open Cut (Section B5)

When undertaking insertion, the maximum replacement diameter pipe possible should be utilised e.g. for dead insertion refer to **Table B9**, for impact moling refer to **Table B13**.
For replacement of services, preference should always be given to using the host pipe as a carrier, inserted with a new pipe. The route of the existing pipe, together with its diameter and condition determines its suitability for insertion. Source pressure and / or design minimum pressure of the network should be provided on the work documentation. The system design minimum pressure at the ECV (19mbar), should be subtracted from the source pressure available at the main (this should be stated in work documentation) to determine the acceptable pressure loss across the proposed replacement service. **The permissible pressure loss for replacement of a low pressure service is up to 5 mbar**. See example below:

Table B3 *(Based on 32 kWh / 3scmh for existing Supplies)* and **Table B3a** *(Based on 65 kWh / 6scmh for existing Supplies)* should be used to calculate the size of the individual services to ensure the permitted maximum pressure loss is not exceeded. Contact should be made with the Operational Manager if there is concern regarding specific calculations.

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3 scmh						
Length (m)	Pressure loss (mbar)					
	16mm	17.5mm	Serviflex	20mm	25mm	32mm
0.5	0.43	0.16	0.14	0.10	0.03	0.01
1.0	0.86	0.31	0.29	0.20	0.05	0.02
1.5	1.28	0.47	0.43	0.30	0.08	0.03
2.0	1.71	0.62	0.57	0.40	0.11	0.03
2.5	2.14	0.78	0.72	0.50	0.13	0.04
3.0	2.57	0.93	0.86	0.61	0.16	0.05
3.5	3.00	1.09	1.00	0.71	0.18	0.06
4.0	n/a	1.24	1.14	0.81	0.21	0.07
4.5		1.40	1.29	0.91	0.24	0.08
5.0		1.56	1.43	1.01	0.26	0.08
5.5		1.71	1.57	1.11	0.29	0.09
6.0		1.87	1.72	1.21	0.32	0.10
6.5		2.02	1.86	1.31	0.34	0.11
7.0		2.18	2.00	1.14	0.37	0.12
8.0		2.49	2.29	1.62	0.42	0.13
9.0		n/a since 17.5mm PE pipe is limited to 8m long and 3 scmh	2.57	1.82	0.48	0.15
10.0			2.86	2.02	0.53	0.17
12.0			3.43	2.42	0.63	0.20
14.0			n/a	2.83	0.74	0.23
16.0				3.23	0.85	0.27
18.0				3.64	0.95	0.30
20.0				4.04	1.06	0.33
22.0				n/a	1.16	0.37
24.0					1.27	0.40
26.0					1.37	0.44
27.0					1.43	0.45

Table B3: Pressure Loss over Given Length and Diameter

(Based on 32 kWh / 3scmh)

Length	Pressure loss (mbar)				
(m)	16mm	Serviflex	20mm	25mm	32mm
0.5	1.29	n/a	0.30	0.8	0.03
1	2.58	n/a	0.61	0.17	0.05
1.5	3.84	n/a	0.92	0.26	0.08
2	n/a	n/a	1.23	0.34	0.11
2.5	n/a	n/a	1.54	0.43	0.14
3	n/a	n/a	1.84	0.51	0.17
3.5	n/a	n/a	2.15	0.60	0.20
4	n/a	n/a	2.45	0.69	0.23
4.5	n/a	n/a	2.76	0.77	0.26
5	n/a	n/a	3.07	0.86	0.28
5.5	n/a	n/a	3.38	0.95	0.31
6	n/a	n/a	3.68	1.03	0.34
6.5	n/a	n/a	3.99	1.12	0.37

Length	Pressure loss (mbar)				
(m)	16mm	Serviflex	20mm	25mm	32mm
7	n/a	n/a	4.30	1.20	0.40
8	n/a	n/a	4.91	1.38	0.45
9	n/a	n/a	n/a	1.55	0.51
10	n/a	n/a	n/a	1.72	0.57
12	n/a	n/a	n/a	2.06	0.68
14	n/a	n/a	n/a	2.41	0.80
16	n/a	n/a	n/a	2.75	0.91
18	n/a	n/a	n/a	3.10	1.02
20	n/a	n/a	n/a	3.44	1.14
22	n/a	n/a	n/a	3.78	1.25
24	n/a	n/a	n/a	4.13	1.37
26	n/a	n/a	n/a	4.47	1.48
27	n/a	n/a	n/a	4.60	1.54

Table B3a: Pressure Loss over Given Length and Diameter

(Based on 65 kWh / 6scmh)

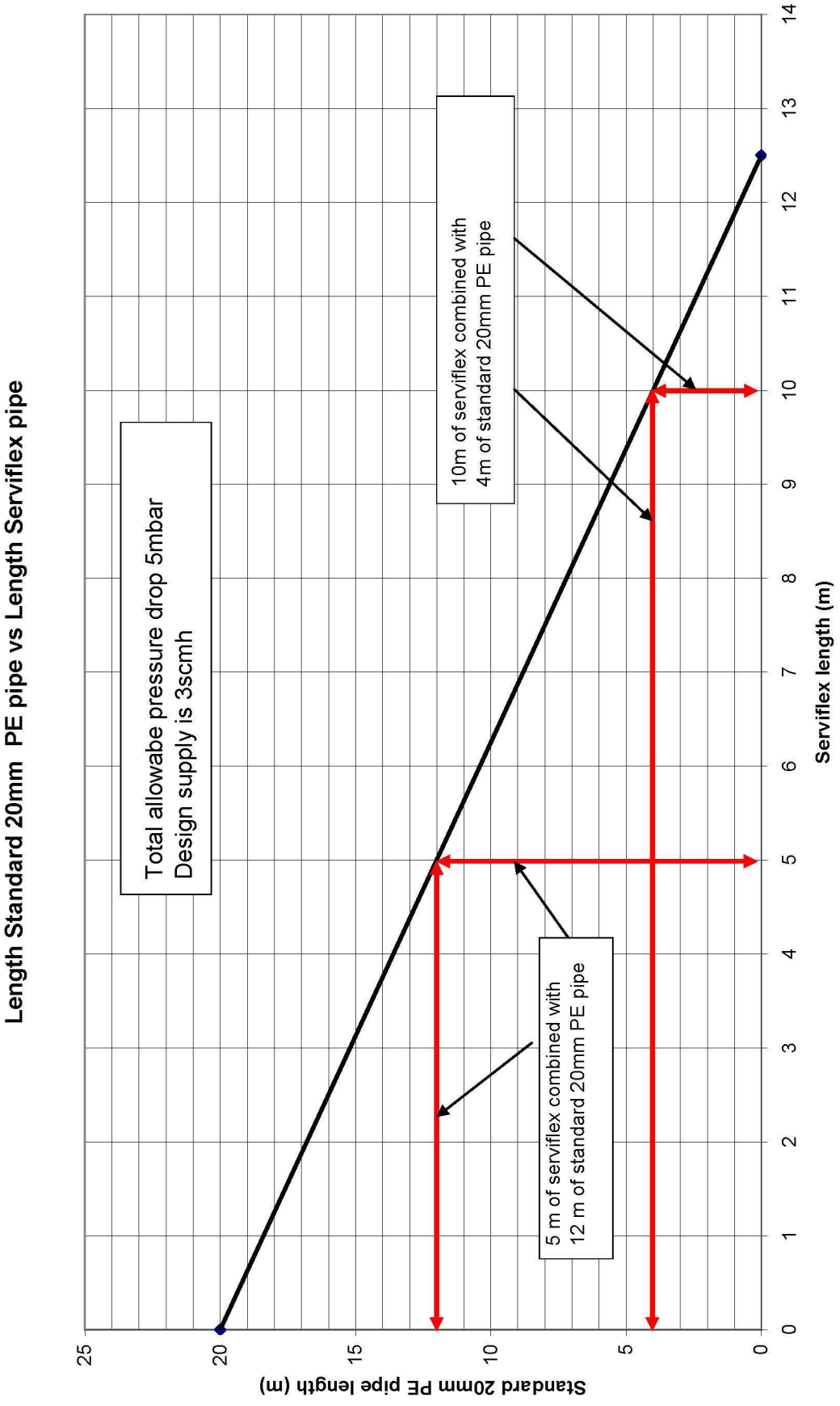

Table B3a

Graph to show the maximum length of 20mm standard PE pipe permissible when connected to Serviflex pipe

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Example of service calculation to determine pressure loss requirements.

A 1″ steel service, 20m in length, requires replacing back to the internal meter location in the premise. The main is located in the opposite footpath. The source pressure in the main is 23 mbar.

The design minimum pressure on a LP service at the ECV is 19 mbar.

Distances: A - B = 16 m
B - C = 4 m

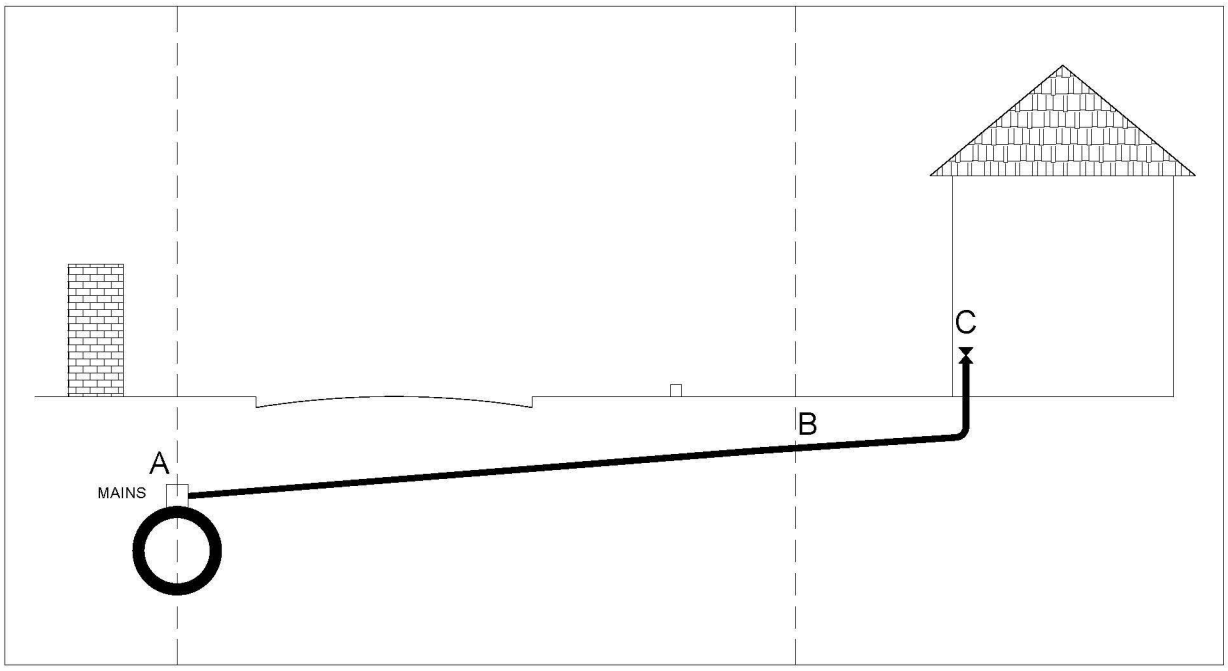

Figure B1 – Sketch for Example to calculate service pressure loss requirements

Determine Maximum pressure loss on service:

1. Confirm maximum pressure loss on total length of service (A – C) dependant on source pressure available (23mbar) and system design minimum pressure at the ECV (19mbar). ***Therefore, 23 – 19 = 4mbar is maximum pressure loss permitted.***

Identify proposed replacement technique: **First Option – Insertion**

2. Determine largest diameter PE pipe available for insertion into 1″ steel. ***This is 20mm.***
3. Determine pressure loss for 20m of 20mm PE pipe. ***Refer to Table B3, this is shown as 4.04mbar.***

This is in excess of 4mbar, therefore an alternative lay technique should be used.

Identify proposed replacement technique: Second Option – Part impact moling /part insertion

With the main being in the opposite footpath, the second option technique, the impact mole is to be used, from the main to the garden and use insertion from the garden to the internal meter position.

Note: For the purposes of the example, it has been decided to mole 16m of 32mm. Moling distances should be kept to the minimum to eliminate the risk of interference damage and maintain accuracy of the bore path. Refer to Section B4 – Impact moling.

Impact Moling

4. Determine suitable diameter PE pipe for moling
   32mm.
5. Identify the length of service to be moled.
   Distance A – B = 16m.
6. Determine pressure loss for 16m of 32mm PE pipe.
   Refer to Table B3, this is shown as 0.27mbar.

Insertion

7. Determine largest diameter PE pipe available for insertion into 1″ steel.
   This is 20mm.
8. Identify the length of service to be inserted.
   Distance B – C = 4m.
9. Determine pressure loss for 4m of 20mm PE pipe.
   Refer to Table B3, this is shown as 0.81mbar

Total Pressure loss over length of service = 0.27 + 0.81 = 1.08mbar

The service can be replaced using second option.

If in doubt with reference to pressure loss calculations contact the Operational Manager.

For single replacement of service pipes the same design principles as above should be applied. Table B3 provides guidance information for single supply replacements e.g. following a PRE on a service pipe.

B1.2 Site Requirements

Where service laying activities are being undertaken the following should be observed:

1. An Operational Manager shall be contacted to authorise the work before using equipment within 3 m of gas plant operating at above 2bar.
2. When a new MP supply passes another building the proximity distance of the PE to the building shall not be less than 3m. Where this cannot be achieved the Operational Manager shall be contacted and his guidance sought.
3. All excavations should be kept to a minimum where reasonably practical.
4. It is important that prior to excavation in public or private land, all reinstatement / property defects are noted and brought to the attention of the Operational Manager and occupier or owner.
5. All plant shall be located using appropriate detection equipment and marked on the surface prior to excavation in accordance with safe digging practices.
6. Mechanical excavators or machine-powered surface breakers shall not be used within 500mm of low pressure and medium pressure underground gas plant.
7. Hand-held power tools can damage underground gas plant and shall be used with care until the exact position of a buried pipe has been determined and shall not be used within 500mm of underground plant.
8. If a dual service is encountered as part of replacement service laying activities then the Operational Manager should be informed.
9. For new supplies/connections to new/existing premises, dual services are not normally permitted **unless designed as such,** and this design forms part of the work pack/work instructions provided. Wherever practicable the line of the service should be at right angles to the main, and to the front of the building facing the main. The line should take the shortest possible but may require diversions to accommodate any obstructions.
10. For replacement of dual services and provided the service design complies with the requirements of this document, (refer to Note 3 below), existing dual services may be replaced by a dual service laid in both the public AND private land. Examples are shown below in Figure B1a.

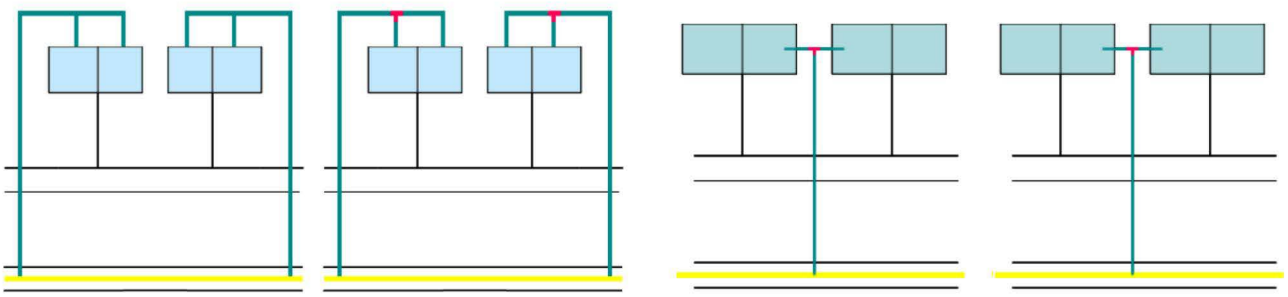

Figure B1a – Revised practice for the replacement of an existing Dual Service

(provided design complies with pressure loss requirements)

Notes:

- For replacement of services, preference should always be given to using the host pipe as a carrier, inserted with a new pipe.
- In order to maximise this practice it is permissible to increase the diameter of the individual aspects of the service pipes at the outlet of the 'T' connection in the private to that inserted in the host pipe.
- The maximum permissible pressure loss for replacement of a Low Pressure service is 5 mbar. This permissible pressure loss is calculated by subtracting the system design minimum pressure at the ECV – which is 19mbar from the source pressure available at the

main. If the pressure in the main is less than 24mbar, i.e. 22mbar, then the permissible pressure loss allowed is only 3 mbar (22 – 19 = 3).

- The pressure loss on the dual aspect of the service shall be calculated using 64 kWh / 6 scmh and then each individual service pipes shall be calculated using 32 kWh / 3 scmh unless larger flow rates have been identified. Refer to Tables B3 and B3a.

If the property owner objects to this practice then the replacement service shall be designed and constructed in accordance with Figure B1b.

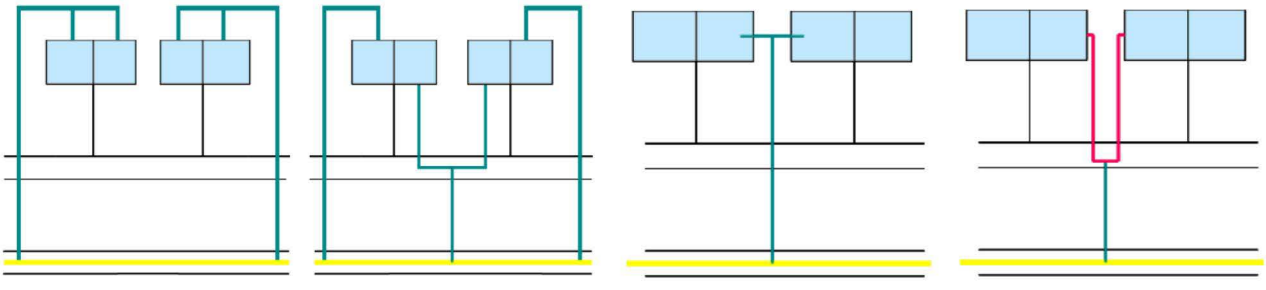

Figure B1b – Alternative practice for the replacement of an existing Dual Service (provided design complies with pressure loss requirements)

B1.3 Route Planning

Guidance and information related to route planning is contained within Section 20, step 5 and associated flow charts.

B1.4 Recommended Minimum Depths of Cover

Excavation depths of cover for services less or equal to 63 mm diameter.

Type of cover	32mm or below (mm)	63mm diameter (mm)
Garden (private)	375	450
Footpath	450	450
Roadway	450	450
Verge	450	450

Table B4 – Recommended Minimum depths of cover

.

Where minimum depths of cover cannot be achieved the Operational Manager should be contacted in order to authorise an alternative solution for the service laying operation.

B1.5 Proximity of Underground Plant

When mechanical excavators or road breaking powered surfaces breakers are to be used, it is essential that the integrity of National Grid and all underground plant is maintained through location and exposure by hand digging in advance of the machine.

When undertaking service laying there maybe occasions when other utility equipment is encountered. The following separation distances should be used:

- The minimum distance between underground utilities is 250mm.
- For electricity cables a minimum distance of 300mm should be maintained.

Where the minimum distances cannot be achieved contact should be made with the Operational Manager.

B1.6 Identifying Services

When identifying underground plant encountered during service laying operations the following points should be followed:

- Any black plastic service should be assumed to be a live electricity cable.
- Iron and steel water pipes and gas pipes will look very similar and where uncovered should be treated as gas pipes.
- Continuously welded steel pipe should be treated as containing a hazardous or high-pressure gas or liquid.
- At collieries or mines some electricity cables are coloured yellow, and should be assumed to be live electricity cables.
- When working on building sites ensure that correct ducting has been used.

UTILITY	COLOUR OF DUCT/PIPE/CABLE BURIED IN GROUND			COLOUR OF MARKER / WARNING TAPE WHERE USED
	DUCT	PIPE	CABLE	
Gas	Yellow	Yellow Orange Multilayer pipe Yellow with brown longitudinal stripes.		Yellow with black legend
Water	Blue	Blue MDPE / MOPVC/Also blue coated ductile iron Can be black in blue sheathing		Blue
Water pipes for special purposed (e.g. Contaminated ground)		Blue with brown stripes Polyethylene/also blue coated ductile iron		
Sewerage	Black			
"Grey" water		Black with green stripes		
Electricity	Black	Black	Yellow (Red for some HV)	Yellow with black legend
Telecommunications	White		Light grey, black	Yellow with blue legend
Communications	Grey, green			White with blue legend, Green and/or yellow with identification showing co-axial or optical fibre cable

Table B5 – Underground Service - Utility identification & Highway Authority Services

HIGHWAY AUTHORITY SERVICES	DUCT	PIPE	CABLE	TAPE
Street lighting England and Wales	Orange		Black	Yellow with black legend
Street lighting Scotland	Purple		Purple	Yellow with black legend
Traffic Control	Orange		Orange	Yellow with black legend
Telecommunications	Light grey		Light grey (or black)	Yellow with black legend
MOTORWAYS, TRUNK ROADS - ENGLAND AND WALES	**DUCT**	**PIPE**	**CABLE**	**TAPE**
Communications	Purple		Grey	Yellow with black legend
Communications power	Purple		Black	Yellow with black legend
Road lighting	Orange		Black	Yellow with black legend
Scotland				
Communications	Black or grey		Black	Yellow with black legend
Road lighting	Purple		Purple	Yellow with black legend

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B2 OPEN TRENCH/ DUCTED

B2.1 General Requirements

This section sets out the requirements for use of trenches or service ducting prepared by others and the criteria to be confirmed before laying the service pipe.

B2.2 Open Trench

1. Check the site plan to confirm that trench has been excavated in the agreed position.
2. The trench shall be checked for correct depth. Confirm the final ground levels to ensure that the service be laid at the correct depth (Table B4).
3. Remove any sharp objects or large stones which may damage the service pipe.
4. Gas warning tape shall be installed 75mm above the crown of the pipe.

B2.3 Ducted

1. Check the site plan to confirm that the duct has been laid in the agreed position and is the correct size (Table B6).
2. The ducting should be laid by the most direct route from the main to the proposed house entry position. This should normally be at right angles to the main.

Typical Pipe Size	Typical Minimum Duct Size
25/32mm	60mm
63mm	100mm

Table B6 - Typical Duct sizes

3. On new construction sites, the external ducting should have been terminated adjacent to the service entry point, allowing a minimum of 1 metre to assemble installation fittings below ground. If this requirement is not met contact should be made with the developers / occupiers representative in order to arrange remedial work.
4. The mains connection excavation should have been left open or clearly marked to identify the main and the end of the service duct. If this requirement is not met, contact should be made with the developers / occupiers representative in order to arrange remedial activity.
5. Prior to any work beginning, confirmation of the finished ground levels should have been be made to ensure that the service will be at the correct depth (Table B4).
6. Ducting used for PE gas service pipes (domestic) should be yellow and have perforations along its length. Ducting of the corrugated, PVC type shall not be used for entry into buildings or laid through underground chambers such as inspection manholes, etc.
7. Gas marker tape should be installed above the line of the duct by the developer.
8. The duct should be checked for any blockages prior to inserting the PE pipe.
9. PE 80 / 100 gas pipe shall not be used as ducting.
10. There is no maximum length of ducting that can be used, but for longer lengths, the site owner to enable ease of insertion should have inserted a guide rope in the duct.
11. While inserting the service pipe through the duct a ‘bullet’ nose cone or equivalent form of ‘cap’ should be used to avoid any contamination or egress of foreign matter into the pipe.
12. Any exposed section of inserted service should be examined for scoring or damage to the pipe wall. If the damage is found and is greater than the 10% of the pipe wall thickness then the service shall be retracted and the cause of the damage identified and removed.

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B3 INSERTION

This section outlines requirements for service insertion from:

- the mains connection to the point of termination in the garden
  - Minimum of 2 metres from building if using mechanical compression fittings
  - No distance restriction if using electrofusion fittings only (see Figure B1c below)
- or at the internal meter position.
  - Replacement to the meter position shall also be undertaken in accordance with Chapter D.

Only one of the following methods of service termination is to be used when using this technique with the electrofusion fitting:

- Dead service insertion (**not using Serviflex**) from the garden into the house
- Using an above ground house entry, or
- Installation of an external meter box

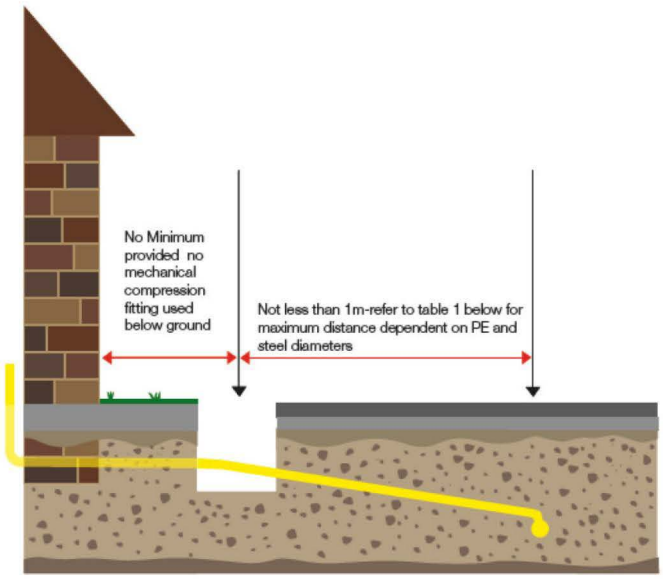

Figure B1c – Fitting distance requirements

B3.1 General Requirements

Insertion is the preferred method for undertaking replacement service pipe wherever practicable. Pressure loss **shall** be taken into account across the length of service pipe in accordance with Section B1.1.

1. Wherever possible the service should be relayed back to its existing meter position. Before and after the installation of the gas service, a check should be made with adjacent properties to determine whether a dual service exists.

Remember

a. Dead Insertion – Serviflex (meter position to garden)
b. Live Service Insertion (PE garden to main only).

Note: Live Service Insertion into a property is not allowed.

2. Remove any redundant valve or syphon-covers on completion of the PE service renewal.

Only approved insertion equipment, materials and sealants shall be used for its correct application as defined in Table B7. Always confirm grouting instructions with each pack issued.

	Live Service Insertion	Dead Insertion Serviflex	Dead Insertion PE
Foam Pack MP41	✓	X	✓
Annerseal 2763	X	✓	✓
Steve Vick Grout	X	✓	✓
Steve Vick Muff	✓	N/A	N/A

Table B7 - Annular Gap Sealants

Live Service Insertion (LSI)	Maximum distance (m)	Rationale
20mm/1"	10	The maximum length of travel of the foam in metres
25mm / $1^1/_4$"	14	
32mm / $1^1/_2$" to 2"	10	

Table B7a – Maximum Insertion Diameters and Foam Travel

3. PE pipe should be pushed and not winched.
4. The existing steel pipe to be used as the carrier shall be isolated outside the premises in accordance with Chapter A6.1/A6.2/A6.3.
5. A 'Protective cone insert' should be inserted into the entry point of the redundant pipe to protect the PE pipe from damage while inserting the PE pipe.
6. No joints should be installed in the carrier pipe inside the building.
7. Where the dead service inserted pipe is extended into the premises, the PE pipe may not negotiate an elbow without 'creasing'. To avoid this, a short length of smaller diameter PE pipe may be attached using an approved fitting prior to insertion.
   Approved fittings such as 16mm x 20mm crimp sockets are available, but should be installed a minimum of 2 m outside of the building line and located between a break in the redundant carrier service pipe. Alternatively, elbows may be removed and replaced with a slow bend.
8. Excavations for dead service insertion should be made at the connection to the main and at locations of syphons, valves and branch connections on the existing service pipe.
9. Wherever a pipe is cut or disconnected, a continuity bond shall be fitted in the following situations:

   a. At the meter position, between the service pipe and the installation pipe.

   Note: Full metering disconnection procedures can be found in T/PR/TMP/3001.

   b. From the connection at the main to the service pipe (in accordance with Chapter A).
   c. At any other cut or disconnection, between sections of pipe that remain (in accordance with Chapter A).

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B3.2 Dead Insertion

B3.2.1 Preparation for Dead Service Insertion

1. A visual inspection for severe signs of corrosion on the existing exposed steel service should be made.
2. Excavations for dead service insertion should be made at the connection point of main or minimum of 2 metres from property when using mechanical compression fittings (*there is no restriction on distance if using electrofusion fittings*) for insertion back to the meter position only. (Figure B1d & B1e).
3. The presence of an elbow or partial blockage of the existing service pipe can be detected by 'trial inserting' from the ECV using a spring or cobra rods.

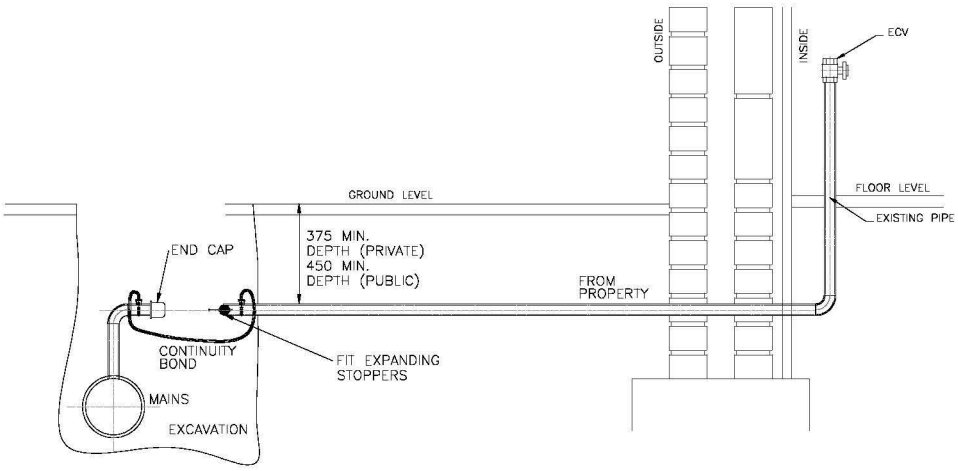

Figure B1d - Service cut off prior to dead insertion – internal position

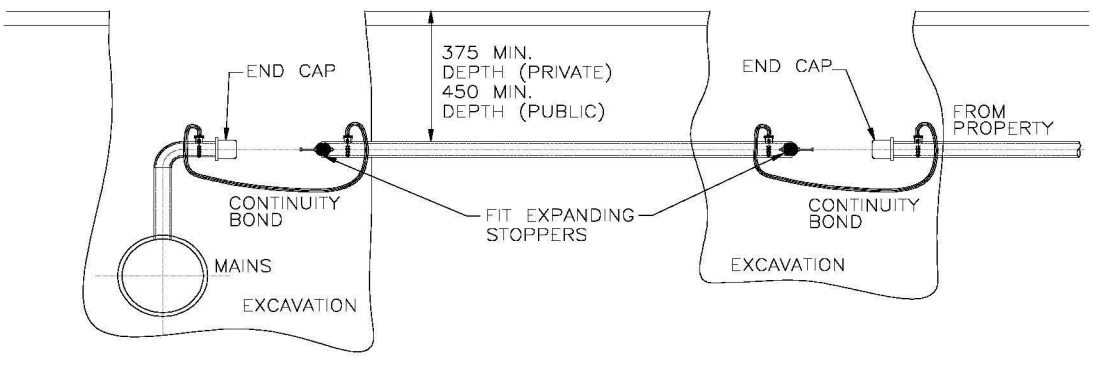

Figure B1e - Service cut off prior to dead insertion – external position

4. Purge service to 0% GIA (using purge hoses). Disconnect the meter and remove the ECV.
5. Check that the diameter of the service is compatible with the PE pipe diameters (Table B9).

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6. Check the amount of pipe required for the insertion and ensure enough pipe is available for final connections or house entry installation arrangements.
7. Ensure the inside of the host pipe is clean (Figure B2) and de-burred or where appropriate cleaned. If necessary, the service may be blown clear with air (from the meter position outwards). Collect any dust and debris and dispose of in the approved manner. A collective bag and pipe ties should be made available.

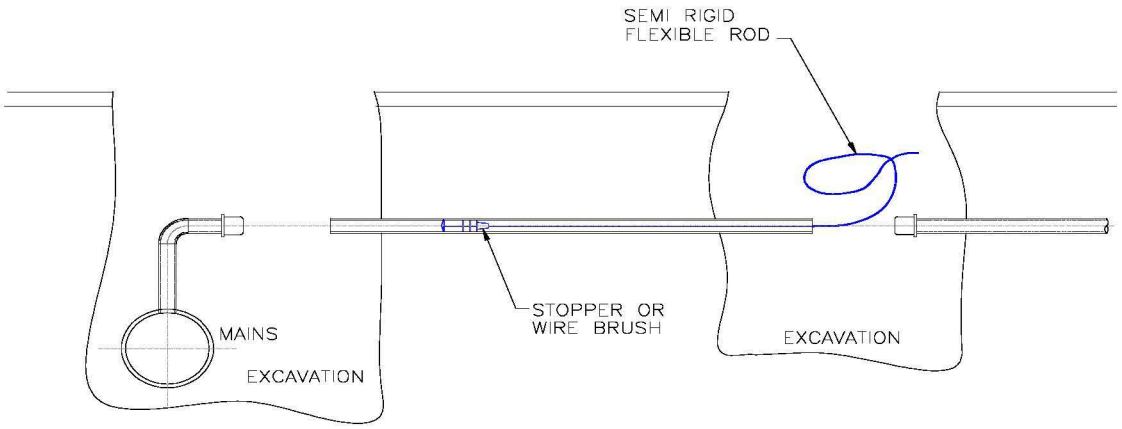

Figure B2 - Internal cleaning of metallic service

8. To minimise cutting, scratching or scoring of the surface of the pipe during dead insertion, the end of the old service pipe should be suitably protected before pushing the PE pipe through it. The use of 'protective insert cones' should be used wherever possible to protect the PE pipe.

B3.2.2 Polyethylene Dead Insertion

For PE dead insertion, the leading edge of the PE service pipe should be plugged with a bullet type nose fitting to assist insertion and prevent debris entering the insertion pipe. The pipe is inserted using a pipe-pushing machine or by hand. Every effort should be made to avoid scoring the pipe.

1. Where defects occur which are greater than 10% (See Appendix H) of the wall thickness of the pipe, this should be cut out. If scoring is persistent then an alternative method of laying the service shall be used.

Steel Size inches	PE Size mm
0.75	16
1.00	20
1.25	25
1.5	32
2.0	32

Table B9 – Pipe size for insertion

2. The new PE service should preferably be a single diameter, although if this is not possible maximum design lengths of different pipe size are given in Table B8. The maximum permissible pressure drop allowable for the service pipe shall be determined for the complete service length in accordance with Table B3 or B3a.

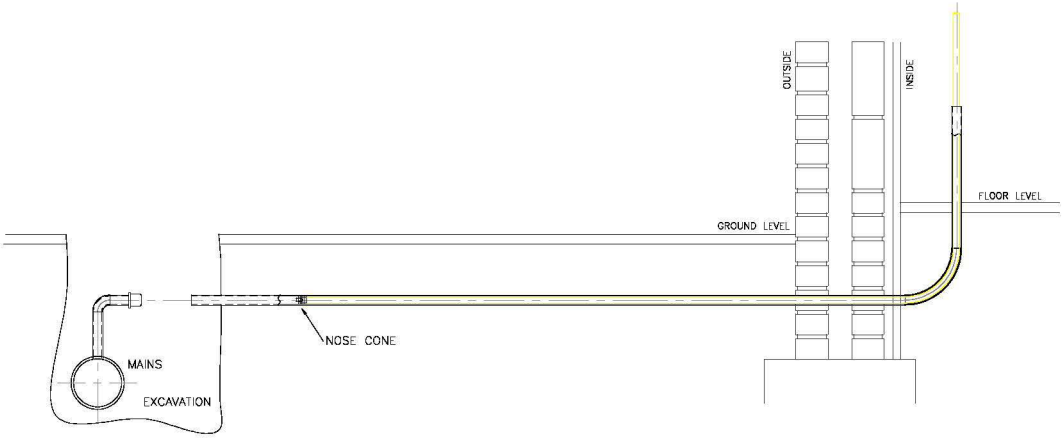

Figure B3- Insertion of PE pipe

3. Before undertaking insertion, an effective system of communication should be established between both ends of the job.
4. The presence of bends in the existing steel service should be determined using a flexible rod in accordance with the manufacturers' instructions.
5. Inserting of PE pipe through bends should be undertaken with caution to ensure that the PE pipe does not kink or become trapped.
6. The PE pipe should be inserted to allow sufficient pipe to protrude, in order that visual examination for damage can be undertaken.
7. There should be at least 1 metre of pipe, which can be cut back following satisfactory inspection, to enable the service head adaptor to be fitted (Figure B5).
8. The service head adaptor should be fitted in accordance with Chapter D4 and manufacturers instructions.
9. Insulation Joints to be fitted on steel pipe sections that are in contact with the ground as part of the relay between the ECV and the Service Head Adaptor.
10. Once the service has been successfully inserted the service shall be connected to the main and the house entry in accordance with Chapter A & D respectively.
11. The service shall be tested and commissioned in accordance with Chapter E. Pressure test the inserted service prior to wrapping any joints or injecting any annular sealant.
12. Ensure the annulus between the PE service pipe and existing service is filled with correct quantities of approved annular gap sealant in accordance with the manufacturer's instructions and Table B7.

Note:

(a) Where PE is inserted from the main to outside the building no annulus fill is required.

(b) Where PE is inserted from an internal meter position to outside the building, the annulus between the PE service and existing service shall be filled with the correct quantities of approved annular gap sealant in accordance with the manufacturers' instructions.

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B3.3 Serviflex (Dead Service Insertion – Garden to Meter Only)

This section describes requirements for using the 'Serviflex' system to insert from the garden to the existing meter position. The technique described below is based on the 'Push Guide method' and is the only approved method of undertaking this activity.

Note: If at a later date an alteration to the service is required the inserted serviflex shall not form part of the alteration and shall be abandoned.

1. Serviflex shall only be used as a dead insertion technique. It has similar performance characteristics to 20mm PE pipe, but the pipe is not designed to be laid in any open ground.
2. Serviflex shall only be undertaken on 1″ diameter (metallic) services operating at low pressure, supplying domestic properties.
3. The service disconnection / insertion point should be a minimum of 2m from the building.
4. This technique should not be used on dual services unless the gas load demand can be achieved.
5. The maximum length of service that can be inserted using this technique is 12m. Maximum pressure loss for the proposed total length of service pipe shall be determined in accordance with Table B3.
6. The line of the service should be accurately traced from main to meter to check its suitability with the chosen replacement technique. The Serviflex pipe can be reliably inserted through 3 tight knuckle elbows depending on the condition of the service pipe, or up to 6 long radius bends.
7. Service pipes containing siphons are not suitable for replacement using Serviflex insertion technique.
8. Service installations containing tees or other forms of branch connections, or containing valves are only suitable for insertion if they maintain full bore and they are capable of being filled with an annular gap sealant.

B3.3.1 Site Preparation

1. The emergency control valve should be closed and arrangements made for the meter to be disconnected.
2. Undertake an excavation on the line of the service pipe, to allow for the cut out and removal of a section of the metallic pipe. (Figure B4) accordance with Chapter A.
3. Inspect exposed pipework for signs of corrosion and for any fittings that may prevent insertion.
4. Confirm that the pipe diameter is 1″ nominal bore steel.

B3.3.2 Push Guide Technique

The method for the installation of Serviflex pipe is from the meter to either garden position or main position (dependant on total length).

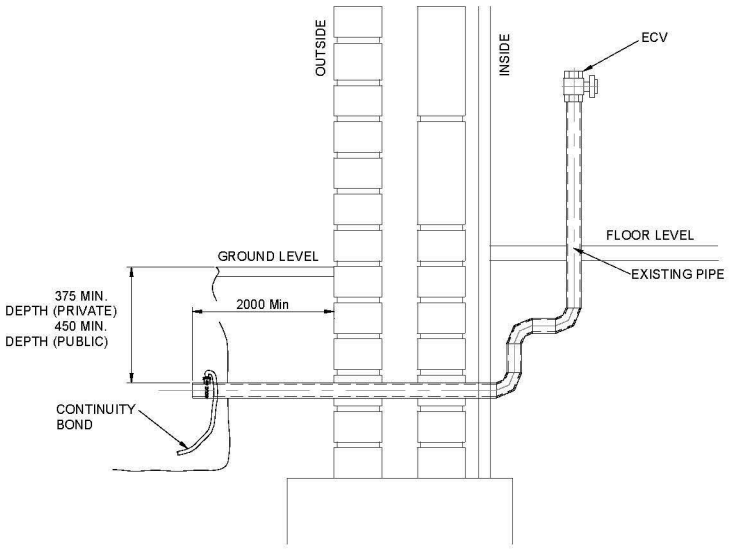

Figure B4 - Cut off service for Serviflex technique

1. Remove emergency control valve.
2. De-bur steel pipe in house.
3. Fit union with long sweep elbow and launch tube at the service entry end (Figure B5).
4. De-bur steel pipe in garden.
5. Fit the stopper to the 12m spring. (Figure B5).
6. Insert from the ECV position and probe service.

Note: If unable to probe service:

7. Fit elbow wire brush to the end of the 12m spring and clean the service (Figure B5).

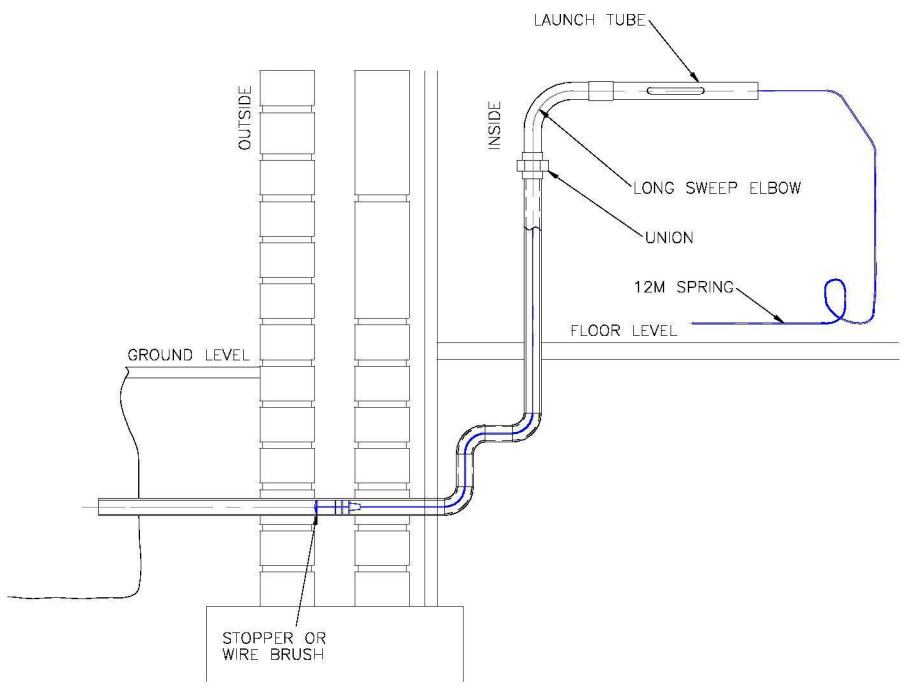

Figure B5 - Spring attached to stopper/wire brush

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8. Fit the brass towing ball to the end of the spring rod.
9. Attach the rope to the brass towing eye.
10. Retract probe spring and rope inside.
11. Detach the rope from the spring and towing eye.
12. Measure and mark Serviflex add 2 metres of measured length and cut Serviflex pipe to length.
13. Attach tension gun to Serviflex.
14. Fit gripper over pipe at opposite end.
15. Insert the spring into the Serviflex pipe through the tension gun, female end first.
16. Attach brass towing head to the end of the spring.
17. Push the spring and brass towing head until the brass head locates in the end of the Serviflex pipe.
18. Position wire twist tie wrap in end convolution and tighten with the supplied tool.
19. Straighten length of pipe.
20. Tension the pipe and take up the spring slack (feed spring a maximum of 20mm per metre of pipe).
21. Coil up piping and spring.
22. Grease nosecone with silicone grease.
23. Tie rope to towing eye.
24. Take up slack from outside. Insert nosecone into launch body.
25. Push by hand until resistance occurs.

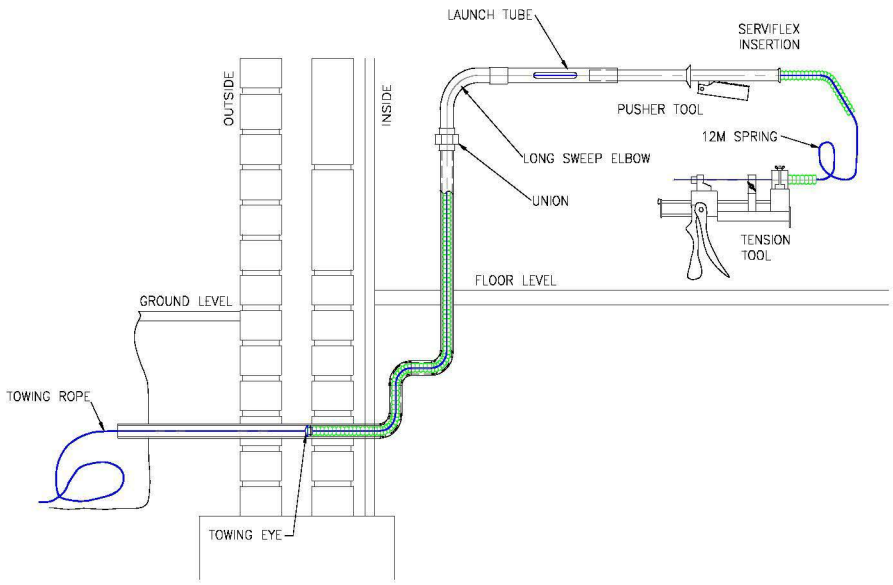

Figure B6 - Insertion of Serviflex pipe

26. Use pusher gripper to feed remaining distance (observe metre marks until approx 1m left from the top of the service). (Figure B6)
27. Check pipe has fully inserted into the excavation pit and protrudes 1m past end of steel pipe.
28. Release tension on the gun/spring.
29. Remove tension gun then nose cone, spring and then gripper.

B3.3.3 Pressure Testing

1. Remove launch tube end and union fitting.
2. Fit Service Head Adapter (SHA) as per manufacturer's instructions.
3. Fit the insulation joint.

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4. Fit garden fitting as per manufacturer's instructions with injection port uppermost.
5. Fit Emergency Control Valve.
6. Rod the service to check for no constrictions.
7. Installation test, fit short test head onto emergency control valve, fit test end and seal etc. onto PE end, service test for 100mbar 5 minutes.

B3.3.4 Commissioning

1. Ensure the correct grout is used, mix the grout and attach to Service Head Adaptor (SHA) or as per manufacturer's manual (Figure B7 and Table B7).
2. Tighten one of the SHA bleed nuts and slacken the other until hand tight and still a slight sideways movement on the nut.
3. Pump sealant into steel service until (liquid) is observed at SHA vent port and then tighten.

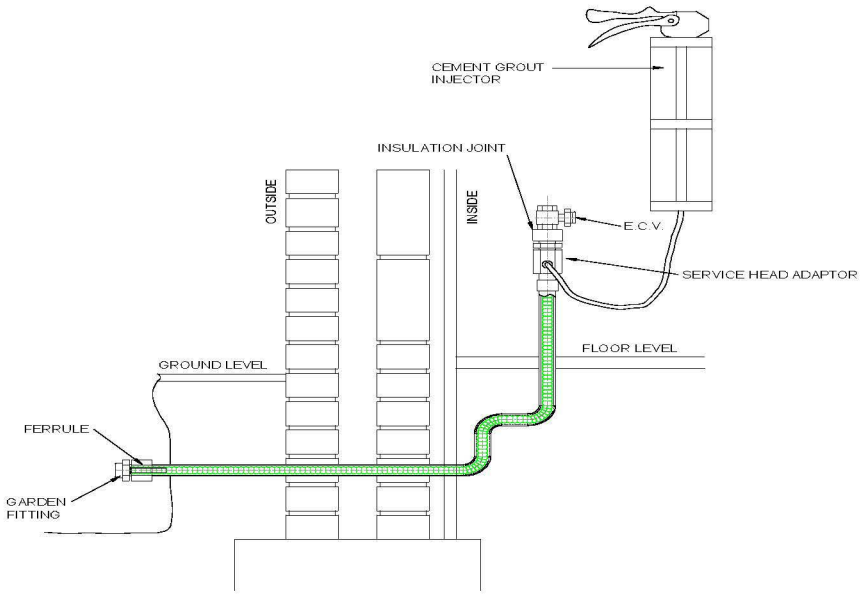

Figure B7 - Sealing of annulus with grout

4. Maintain pressure on grout gun injector for 5 min then remove grout gun as per manufacturer's instructions by tie wrapping or clipping the sachet feed tube.
5. Rod the Serviflex inserted pipe to ensure there are no constrictions using the spring and knockout probe.
6. Finish commissioning the service in line with Chapter E.
7. Dispose of all waste materials in line with current environment procedure.
8. Complete appropriate documentation to record full service details.

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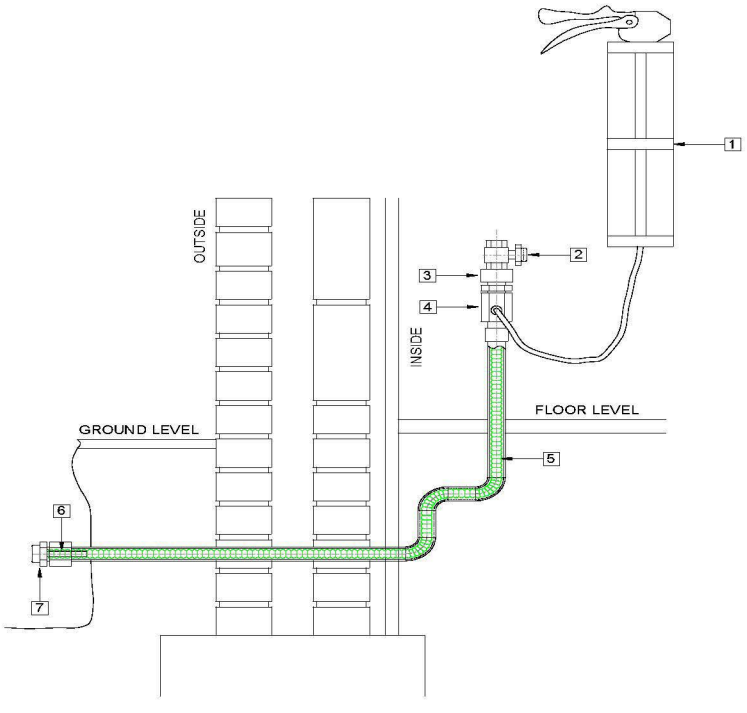

Figure B7a – Serviflex part list

	Description
1	Applicator Gun for Dispensing Foam
2	Emergency Control Valve
3	Serviflex Pipe Service Head Adaptor,
4	Insulation Joint (see Chapter D4 figure D7).
5	Black Serviflex Pipe 20mm, (Corrugated P.E. 65 x 50mm Coil)
6	Garden side of Transition fitting
7	Transition Fitting 20mm x 20mm Serviflex

Table B10 - Serviflex pipe and fittings

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B3.4 Live Service Insertion – Garden to Main

Live Service insertion can be used for single or bulk service replacement in conjunction with mains renewal projects, provided that final checks for gas readings are undertaken upon completion. If gas readings are still present after completion of the insertion, then further investigation will be required in accordance with emergency procedures.

1. Live Service Insertion (LSI) should only be undertaken on domestic properties. The point of insertion should be a minimum of 2m from the building

2. LSI is approved for existing service pipes up to and including 2" diameter and operating at low pressure (75mb or below).

3. The maximum total length of the live inserted service should not exceed 20m, which is the length of the push out rod, this allows a combination of both live and dead insertion to be undertaken. Maximum pressure loss for the proposed total length of service pipe shall be determined in accordance with Table B3.

4. If the overall length is greater than 20m the PE inserted shall be squeezed off after the knock out rod has been used to allow reassembly of the service pipe.

4a. Using appropriate plans the operative should determine the position of the main in relation to the property. This will give an indicative length of service pipe. This should be verified using approved tracer equipment.

5. The line of the service should be accurately traced and measured from the main to the meter position. Elbows and changes in direction identified should be investigated to ensure their suitability for insertion.

Note
The Length of service is critical to the selection of the correct foam seal system used later in the process.

6. A bar hole leakage survey shall be undertaken on the line of the service from the mains connection point to house entry position prior to and on completion of the work to check that that there is no leakage from the mains connection point.

7. If gas readings are found, the Emergency Call Centre shall be informed. This is to ensure that the escape is captured as a Public Reported Gas Escape and is recorded as a leak statistic. Gas readings identified on the service connection to the main shall be cut off at the main and a survey undertaken to confirm no further readings. The service shall be renewed by dead insertion.

Note: Only trained and competent personnel shall undertake the bar hole survey.

8. All exposed service pipe should be visually checked for corrosion. The operative should assess the condition of the steel service to determine its suitability to be live inserted. If it is deemed the service is severely corroded, these pipes shall not be live inserted.

9. Maximum size of PE pipe for live insertion is 32mm. Reference Table B11 for manufacturers' recommendations for foam travel and inserted pipe

Kit combinatins for length & size of insertion				
	Length of foam travel in metres			
Sachet size ml	20mm in 1" use one kit only	25mm in 1 1/4"	32mm in 1 1/2"	32mm in 2"
200	1.0 – 2.0	1.0 – 1.5	1.0 – 1.5	up to 0.5
400	2.1 – 4.0	1.6 – 3.0	1.6 – 2.5	0.6 – 1.5
600	4.1 – 5.5	3.1 – 4.0	2.6 – 3.5	
800	5.6 – 7.0	4.1 – 5.0	3.6 – 4.5	1.6 – 3.0
1200	7.1 – 10.0	5.1 – 6.5	4.6 – 6.0	3.1 – 4.5
1200 + 400	**do not use in excess of 10m**	6.6 – 8.5	6.1 – 7.0	4.6 – 5.5
1200 + 600			7.1 – 8.0	5.6 – 6.5
1200 + 800		8.6 – 12.0	8.1 – 10.0	6.6 – 7.0
1200 + 1200		12.1 – 14.0		7.1 – 8.5
1200 + 1200 + 800				8.6 – 10.0

Table B11 – Maximum insertion diameters and foam travel

B3.4.1. Preparation

1. Gauging of the existing pipe shall be undertaken prior to commencement of the work using a semi flexible rod, to confirm that live service insertion is possible as described in step 8 of B3.4.2.

2. All valves, syphons or branch connections along the existing service route should be identified and where appropriate removed prior to commencing the operation. The live insertion should be undertaken from this point.

3. Ensure approved compatible nose cone, mini end seal; sealant, sealant injection gun and sufficient PE pipe are available on site.

Note
The sealant and number of sealant injection guns will be determined by accurately measuring the length of service and analysis of foam travel tables (B11). If two kits are required e.g. 1200 + 400, both foam packs shall be injected at the same time.

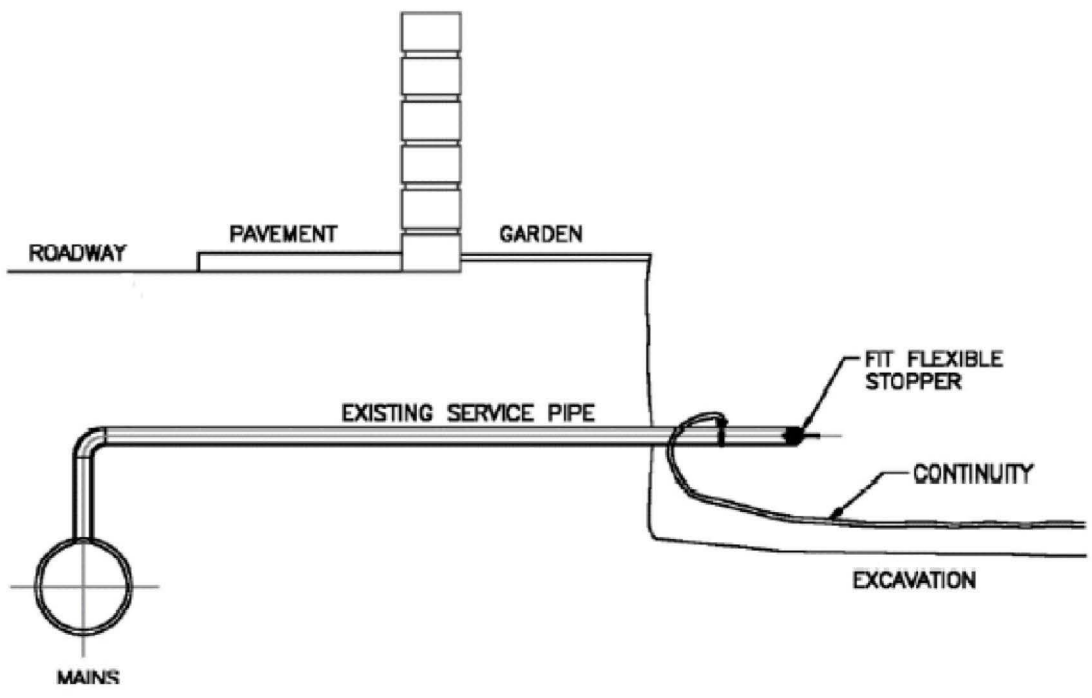

Figure B8 – Live service insertion, cut off service

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B3.4.2. Installation

1. Carry out excavation at point of service disconnection/insertion.

2. Close the emergency control valve and arrange for disconnection of the meter.

3. Prepare valve gland assembly to accommodate flexible stopper.

4. Cut out section of live gas service pipe in accordance with Chapter A7, (add isolate here)

5. Temporarily seal live service pipe with flexible stopper (Figure B8).

6. Install valved gland assembly over the flexible stopper rod, taking care not to disturb the stopper, and secure to the steel service pipe.

7. Withdraw the flexible stopper into the valved gland assembly, close valve, remove flexible stopper and re-fit the gland.

8. Insert semi-rigid flexible rod complete with correctly sized elbow tester fitted into valved gland assembly as far as the closed valve, ensuring the first 150mm of pipe is as straight as practicable. Mark with tape as an indicator on withdrawal.

9. Install pressure gauge, open gland assembly valve and check district mains pressure (refer to Figure B10).

10. Insert flexible rod as far as possible along the service. This will indicate length of service to be inserted.

11. Mark indicated service length on flexible rod with tape and steadily withdraw through valve until the tape indicating the end of the flexible rod is visible. (Figure B9).

12. Close gland assembly valve.

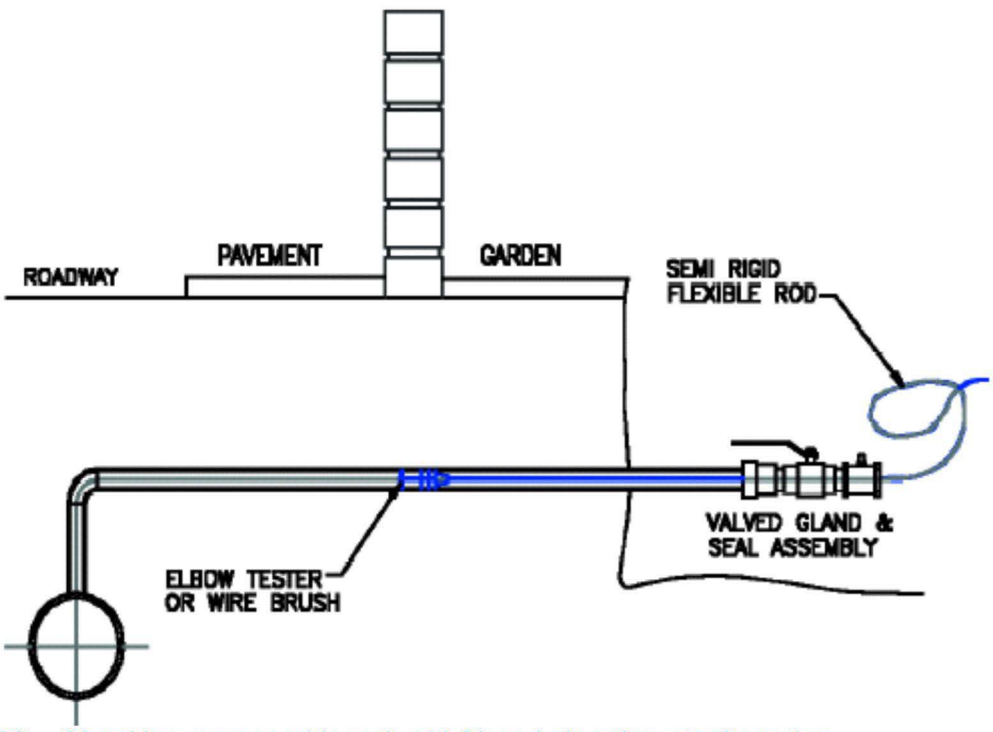

Figure B9 – Checking proposed length of LSI and cleaning steel service

13. Confirm that the marked length is comparable to the indicated mains position carried out earlier and determined by mains records. (Carry out further investigations if indicated length is considered inaccurate).

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14. Measure and mark PE service pipe against the marked flexible rod length. Note it is important to record the measurement value in order for correct selection of sealant required as per manufacturers' instructions (refer to Table B11).
15. Add 1m of pipe to allow for the pushing machine and fittings, cut and temporarily seal to avoid contamination.
16. Fit the pipe cleaning wire brush to the end of the semi-rigid flexible rod and fit into valved gland assembly. (Figure B9)
17. Open valve and push the wire brush into the service pipe and continue pushing until the whole length of the service has been cleaned as indicated by the mark on the flexible rod.

18. Withdraw the wire brush into valved gland assembly.

Note:
It is critical the process described in steps 16 to 18 are carried out to reduce the possibility of damage to the nose fin cone.

19. Re-check mains pressure to ensure no blockage has occurred during the pipe cleaning process.

20. Close valve, remove flexible rod sealing fittings from the valved gland assembly.

21. Feed PE pipe through pushing machine and fit appropriate gland to the pipe pushing machine.

22. To Fit nose cone following manufacturer's instructions first ensure the end of the PE to be inserted has been cut square.

22.1 Using the chamfer tool in the kit the internal bore of the ends of the PE service pipe should be chamfered to prevent any damage occurring to the "O" ring seal on the nose cone head.

22.2 Gently push the metal end of the nose cone into the end of the PE pipe until the 'O' ring is inside the PE pipe.

22.3 Using the correct size nose cone key, slowly start to screw the nose cone into the P.E. pipe until the shoulder of the nose cone touches the shoulder of the PE. Do NOT over tighten

Note:
Over tightening the nose cone damages the internal seal and may result in failed pressure. Additionally if over tightened there is a risk that during pull back the nose cone will become detached from the PE resulting in a failure to complete the insertion process.

22.3 Insert the nose cone pip into the Nose cone head.

22.6 The operative should NOT use grease on the nose cone in any way

23. Using suitable test equipment carry out 100mbar integrity test for 5 minutes on the PE service pipe to be inserted, (no pressure drop allowed).

24. Pull PE pipe and nose cone back into the pushing machine.

25. Connect the pipe-pushing machine to the valved gland assembly.

Note:
The use of a swept bend may be appropriate for ease of application

26. Install pressure gauge and connect purge hose to the vent on the valved gland assembly (refer to Figure B10).

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Note:
Purge hose shall be positioned at least 2.5m above the excavation and downwind

27. Slowly open gland assembly valve and record district mains pressure.

28. Using pipe-pushing machine, insert PE pipe for approx. 300mm.

29. Fully open the vent on the valved gland assembly and purge the 300mm of annulus to zero pressure. Leave vent open.

30. Slowly continue inserting PE pipe into the carrier pipe using the pipe-pushing machine, observing the pressure gauge continuously

Note:
A build-up of pressure may be observed prior to the PE pipe reaching the main due to a number of possible circumstances e.g. entering a siphon, flexible coupling, tee, change of diameter in existing service pipe

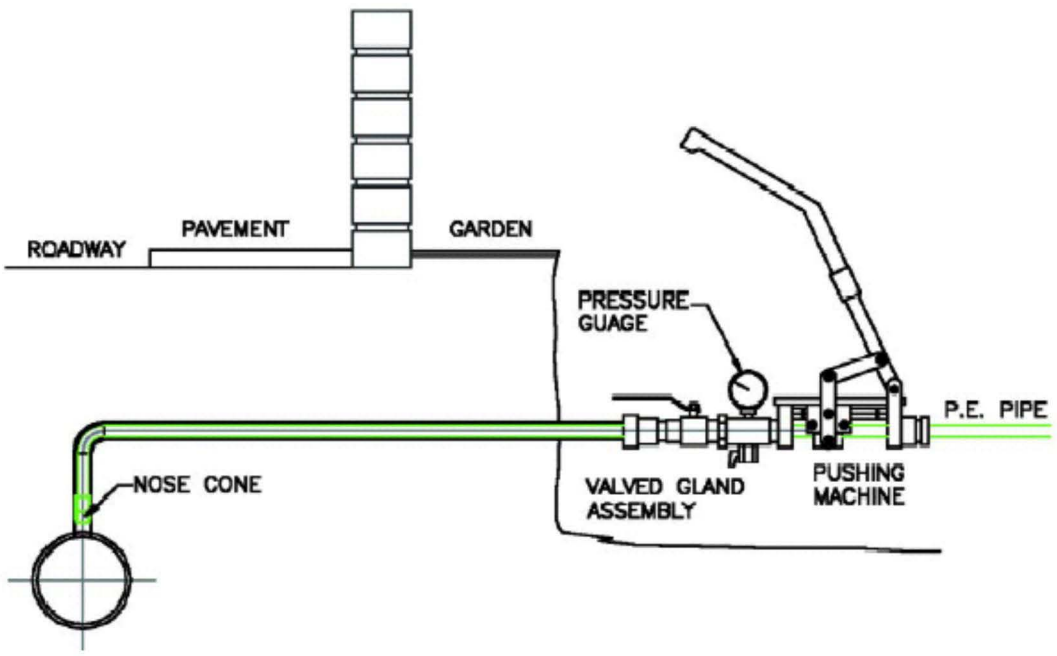

Figure B10 – Insertion of PE

31. Push the PE pipe through the carrier pipe to the service tee or bend in the main. When the nose cone enters the service tee or main, the gauge pressure will rise to full mains pressure

32. Check that the tape mark on the PE pipe is close to the entry point on the carrier pipe. It is expected that the marked position of the PE will be within 150-300mm of the entry point.

33. Reverse the pushing machine and slowly retract the PE pipe by 50mm/2" steps into the carrier pipe until a zero pressure is recorded.

33a Shut the purge valve and check the pressure gauge for effectiveness of the seal. Check for a good seal from the nose cone by checking the pressure gauge remains at zero. Ensure pressure does not rise back to full line pressure within 5 seconds. (Figure B10)

Note:
The finned nose cone acts as a seal within the carrier pipe but minor let-by may occur

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34. Pull pipe back by a further 50mm/2" to lock nose cone into final position. Re- check for good seal from the nose cone by ensuring the pressure gauge does rise back to line pressure. Ensure no buildup of pressure.

35. If the gauge does not rise to district pressure within 5 seconds, there is an acceptable seal between the nose cone and carrier pipe.

36. If the gauge does reach district pressure with 5 seconds, a good seal has not been achieved. In this case pull back the PE pipe by a further 50mm/2" into the carrier pipe and recheck the seal as before.

37. If a good seal is still not achieved, push pipe forward into the main and repeat step 36. If a good seal is still not achieved, then remove and replace nose cone and repeat procedures again

Note:
If a replacement nose cone is required operatives should inspect the damage to try and determine the cause. Insertion process should be steady and operatives should take note of any restrictions that may be associated with the fin damage such as a flexible joint.

Note:
The operation of pulling the nose cone back into the PE pipe reverses the fins and creates an effective seal against the mains pressure.

Note:
If good seal is still not achieved the operation should be stopped and dead insertion technique should be undertaken by excavating at the main removing the top tee fitting

Note
Do not create a seal using grease on the fins as this may allow foam to pass over the fins and in extreme circumstances block the parent main supply.

38. Once an acceptable seal has been formed close the vent and remove pressure gauge. Remove pipe pushing machine and valved gland assembly. Ensure PE pipe and nosecone are not disturbed.

39. Undertake 100mbar soundness test for 5 minutes on the inserted pipe. No pressure drop allowed

40. The annulus between PE pipe and carrier pipe shall be filled in accordance with manufacturer's instructions. (Figure B11)

41. Select the correct mini end seal and determine how many ports are to be used. There are multiple ports available depending on the size and the length of the annulus to be filled. The open port is the white port, The red port/s have a red bung attached to the underside of the port. This SHALL be removed for each multiple kit being used prior to the mini end seal being fitted.

42. Slide the mini end seal over the PE and secure to the steel service with the fill ports against the edge of the old service. Ensure that the crimpit ties are pulled tight at both ends of the end seal.

43. Select the appropriate sachet or sachets by following the table on the instruction leaflet.

44. Fit the cartridge into the applicator gun.

45. Attach the delivery tube to the appropriate fill port or ports, and secure with the 'O' clip provided.

Sachet mixing instructions

The mixing of annual fill shall always be carried out in accordance with the manufacturers' instructions.

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All operatives involved in this activity shall have received the relevant training and achieved correct level of competency required.

Any PPE provided with the kits shall be worn and protective goggles and appropriate glove protection and disposable suit as required under the COSHH sheet shall be worn for any mixing and dispensing of materials.

Note:

Always check the temperature range on the instruction pack of the foam to be used, as this may affect the performance of the foam / grout to be used. Some kits may supply temperature slips.

For example; in cold weather the FOAMPACK™ kit should be brought up to a user friendly temperature – the range being 5° - 25°C. This should not be done by using direct heat from exhausts of vehicles. This will allow the sealant to be mixed easier, but also, it will travel along the annular space without applying excessive pressure to the applicator gun(s).

In warm weather, the operative should be aware not to leave the foam sachet in direct sunlight, as this will increase the temperature beyond its range of 5° - 25°C.

The effect on the foam at temperatures exceeding 25°C is that the reaction and expansion rates can double, or in extreme conditions, treble. .

If multiples of sachets are being used they shall all be mixed at the same time
Disposal of waste material – place all consumables in the waste bag for disposal in line with current environmental policy

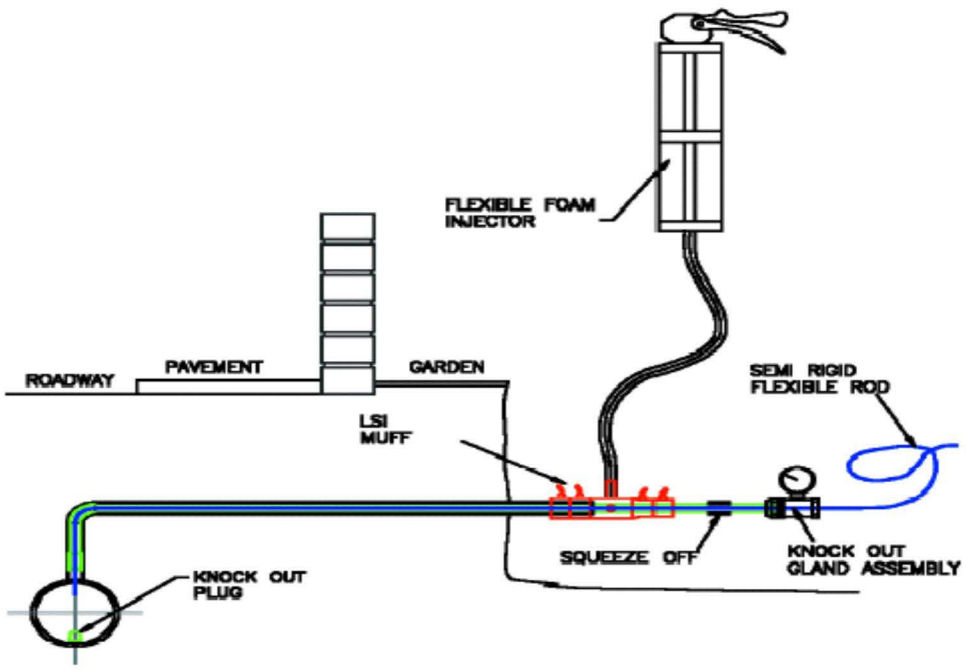

Figure B11 – Foam off of inserted service

B3.4.3. Service Commissioning

1. Complete the rest of the service relay to the property by the most appropriate method e.g. dead insertion, Serviflex, moling, open cut techniques, and connect to the live inserted section using approved fitting. Test the complete service as per Chapter E.

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Note:
If there is any doubt about the ability of the flexible knock-out rod to negotiate the section of PE pipe not live inserted e.g. due to elbows or excessive bends in the section particularly where the Serviflex, or where the total length of service from the main to meter is greater than 20m, then the live inserted section should be squeezed off and commissioned independently of the other section as detailed in Service Commissioning B3.4.4 (part service).

2. When purging and commissioning the full service from the main to the meter refer to Chapter E.

3. Install gland assembly, with pressure gauge, onto ECV.

4. Open emergency control valve and insert flexible rod into PE pipe to knock out nose cone plug. Push rod forward/backwards a few times to ensure a clear gas path is achieved. The pressure gauge should show district mains pressure.

5. Withdraw flexible rod and close emergency control valve.

6. Remove gland assembly from emergency control valve and purge service in accordance with Chapter E1.

B3.4.4. Service commissioning (Part Service)

The commissioning of the part service shall be carried out by installing a PE knockout gland over the end of the PE pipe and inserting the flexible knockout rod to the nose cone.

1. Fit pressure gauge and push out the plug in the nose cone with the flexible rod, checking Network pressure.

2. Carefully withdraw the rod into the PE gland and squeeze-off the exposed section of PE pipe.

3. After testing the dead section back to the meter the knockout gland can then be removed and the 2 separate sections of PE pipe joined by an approved fitting.

4. The squeeze-off can then be removed and the service purged and commissioned as per Chapter E1.

5. The final joint will require testing for soundness with leak detection fluid.

B3.4.5. Work Completion

1. Carry out final bar hole leakage survey from the top tee connection position to the meter position to ensure there are no gas readings.

2. Dispose of all waste materials in line with current environmental procedures.

3. Complete appropriate documentation and enter all service details on the Service label.

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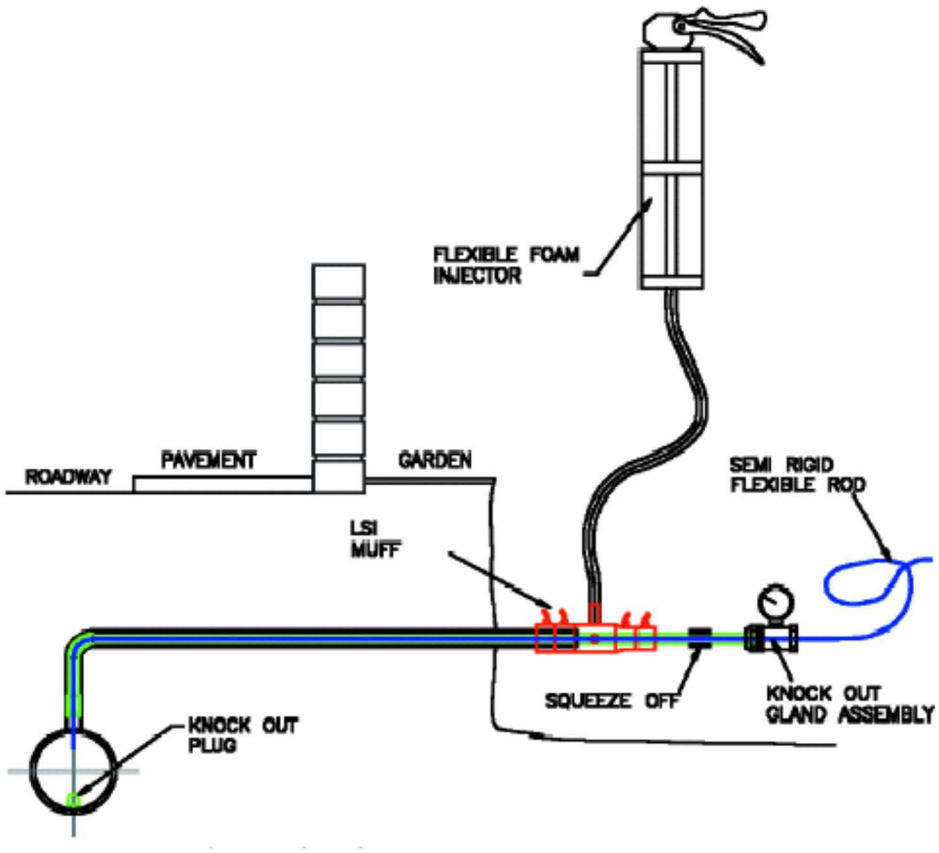

Figure B11 – Live Service Insertion parts list

NO	ITEM
1	FOAM INJECTOR GUN
2	SEMI RIGID FLEXIBLE ROD
3	KNOCK OUT GLAND ASSEMBLY
4	LSI MUFF
5	PE PIPE 20MM
6	NOSE CONE

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B4 IMPACT MOLING (SOIL DISPLACEMENT HAMMER 75mm DIAMETER AND BELOW)

Impact moling (Soil Displacement Hammer / SDH) is the preferred method for laying services (minimum 32mm diameter) where utilisation of an existing pipe cannot be used. The success of this activity depends on the composition of the soil, and the preparation and application of equipment.

This technique is hazardous and every attempt shall be taken to stay out of the excavation during the launch operations. It is therefore essential that a launching cradle be used where practicably possible. Insulating boots and gloves shall be worn when operatives are actually in contact with the impact moling equipment whilst it is in use.

B4.1 Personal Safety

Before starting work, the following shall be undertaken to ensure a safe operation is carried out.

1. Detailed working and safety instructions for use of particular types of equipment should be obtained from the manufacturer and used.
2. Moling equipment should be inspected and deemed satisfactory before use.
3. Operatives shall wear PPE at all times. Additionally, when undertaking impact moling operations electrically insulated PPE shall also be worn (i.e. electrically insulating gloves and boots of with a minimum rating of 20kV) when in contact with the equipment. In addition a pair of leather outer gloves shall be used. See section 4.4.1

Note. Electrical insulating PPE shall only be used by personnel that have received adequate information, instruction and briefing on its correct use, storage, maintenance and cleaning requirements.

4. A monitoring regime to administer either process shall be implemented. The insulating equipment is provided exclusively for protection against electric shocks.

   The PPE shall be provided to individuals on a personal issue use basis.

5. Excessive contact with the lubricant shall be avoided and PVC or disposable gloves and goggles shall be worn when undertaking maintenance checks or filling the lubricator.
6. An approved gauze facemask shall be worn when working within 1m of the exhaust from the soil displacement hammer.
7. Ear defenders shall be worn throughout the launching and receiving operation.
8. Where reasonably practicable the launch cradle should be used.
9. Moling equipment should be visually inspected and deemed satisfactory before continuing.
10. A non-electrically conductive hose shall be used at all times.

B4.1.1 Hand protection

Hand protection is provided by two pairs of gloves, an inner electrically insulating glove and an outer glove which protects the inner glove from being damaged whilst in use. Both pairs shall be worn.

(i) Electrically Insulating Gloves

The electrically insulating gloves are to the following specification: Class 3 to EN 60903, working to 26,500 Volts (Tested to 30,000 Volts). The following examination, precautions, storage and cleaning requirements shall be applied with additional guidance provided within the manufacturers' instructions.

Examination - Before each use the gloves shall be inflated, by exhalation, to check for air leaks and a visual inspection carried out for physical damage. If any leak or damage is detected the glove shall be exchanged.

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Precautions - Gloves should not be exposed unnecessarily to heat or light or allowed to come into contact with oil, grease, turpentine white spirit or strong acid or other corrosive products. Gloves that become wet in use or by washing shall be thoroughly dried before further use. The drying temperature of the glove should not exceed 65 degrees Celsius.

Storage & Transport – Gloves shall be enclosed in the bag in which they are supplied and stored in a box of sufficient size that offers adequate protection. Care shall be taken to ensure that the gloves are not compressed or folded, exposed to direct sunlight or extremes of temperature.

Cleaning – When the gloves become soiled they should be washed with soap and water and thoroughly dried.

Testing – Gloves shall be either replaced or PAT tested every 6 months.

(ii) Leather Outer Glove

This glove is a protective over glove in goat skin - minimal risk only and shall be worn over the electrically insulating glove, and shall only be used for this type of operation. The following examination, precautions and storage requirements shall be applied.

Examination - Before each use the gloves shall be visually inspected for physical damage. If any damage is detected the glove shall be exchanged.

Precautions - Gloves that become wet in use shall be thoroughly dried before further use. Gloves that have become heavily contaminated with oil or grease shall be exchanged.

B4.1.2 Foot Protection

Insulating Wellington Boot

This boot meets the following specification: Dielectric-insulating boots to ASTM F1117-93 Sole (Steel toe cap to EN 345 / No steel mid sole). The Wellington boot shall only be used whilst the impact mole is in use. The Wellington does not have a metal mid-sole and will not offer protection from sharp objects penetrating the sole of the foot.

DO NOT USE THE ELECTRICALLY INSULATED WELLINGTON BOOT FOR EXCAVATING

The following examination, precautions, cleaning and storage shall be applied.

Examination - Before each use the boots shall be visually inspected for physical damage. If any damage is detected the boots shall be exchanged.

Precautions - Boots that become wet in use shall thoroughly dried before further use. Boots that have become contaminated with oil or grease shall be cleaned as soon as possible. Care shall be taken not to score, scratch or otherwise damage the boot whilst in use as this will reduce the effectiveness of its electrical insulation properties.

Storage & Transport – Boots shall be enclosed in the bag in which they are supplied and stored in a box of sufficient size that offers adequate protection. Care shall be taken to ensure that the boots are not compressed or folded, exposed to direct sunlight or extremes of temperature.

Cleaning – Boots shall be cleaned in soap and water and thoroughly dried before further use.

Testing – No testing required.

B.4.1.3 Site Survey

1. The Pre-Moling Checklist and launch cradle hierarchy decision proforma (Appendix J) plus a site-specific hazard assessment and relevant work hazard sheets shall be available, completed and understood by all relevant parties on site.
2. Determine the route of the proposed installation and excavate as many trial holes as required.
3. The depth and route of drainage systems shall be determined by lifting drainage access points both on public and private property.
4. Check for existing street furniture and recent signs of excavation work i.e. BT covers, cable boxes, street lighting, new reinstatement patches.
5. Always ensure safe working practices by using barriers and replacing covers immediately after use.
6. Suitable plant location devices shall be utilised (this is typically the C.SCOPE or CAT & Genny).

   Note: All available modes should be used; sole use of the CAT is not acceptable.
7. All appropriate underground plant plans shall be available and all plant shall be located, marked and where possible labelled with type, depth and ratings on the ground surface (this can be done using either water based spray paint or chalk).
8. Where the depth of utility plant cannot be verified from drawings or by the use of the location equipment, trial holes should be undertaken to establish the depth and location prior to soil displacement hammer commencing. Excavate as many trial holes as necessary to examine the route of the proposed installation.
9. Where electric cables are located crossing the path of the route of the soil displacement hammer, the cables **shall** be exposed to establish depth and exact location.
10. Crossing under exposed cables should be witnessed and the speed of the soil displacement hammer should be reduced as it passes under the exposed cable.
11. Where circumstances cannot guarantee safe passage of the soil displacement hammer beneath the cable, then launch and receive holes shall be made either side of the cable and the pipe laid under or over the cable by open cut techniques.

B4.1.4 Use Of the Soil Displacement Hammer

On completion of the identification of underground plant, a thorough assessment *(including the use of the Pre-Moling Checklist – See Appendix J of this document, (use the Safety & Engineering Document Search Site for a 'Word' copy of the checklist*) of the suitability of the soil displacement technique should be undertaken

1. Survey the floor of the launch-pit with the plant-locating device prior to securing the launch-cradle with the stabilizing pins (Figure B12a). If traces of plant are found, or if the location is too congested for the use of the launch cradle, a further risk assessment should be undertaken to either:
   a) Use a launch cradle
   b) Launch from a different location.
   c) Launch by hand, which shall be supported by a risk assessment and confirmation that all items on the Pre-Moling Checklist in Appendix J are deemed safe to continue.
   d) Adopt a different laying technique.

Record the outcome of your decision on the proforma in Appendix J

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Pre-moling checklist – (see Appendix J)

Alternatively you can get a word version on the Safety & Engineering Document Search Site:
http://spcustapps/sites/SnED/default.aspx?mid=21

Simply Type in SL/1 and the document will be listed

2. Whenever possible, launch the soil displacement hammer from the most congested side of the road to minimize the risk of damage to underground plant. Impact moling towards cables should be avoided.
3. When working on an incline the recommended direction of the soil displacement hammer should be up hill.
4. The plant-locating device should be further used to survey the area into which the soil displacement hammer will be launched and received.
5. The soil displacement hammer shall not be in contact with any plant when it is launched.
6. Direct contact with the air hose/soil displacement hammer by the operator should not take place during operations. If during the operation it becomes necessary to be in direct contact with the equipment, additional PPE by way of insulating gloves and boots of a rating no less than 20 kV shall be used.
7. The soil displacement hammer should be aligned to give the maximum clearance from other underground plant, but not less than 250mm clearance for bore lengths up to 8m. Ensure the launch and reception pits have been excavated to a suitable depth and size in accordance with Table B14. The reception pit should be excavated to the minimum size, depending upon the boring technique used, and provision should be made for:
    a. Retrieval of the soil displacement hammer at the reception pit.
    b. Reversal of the soil displacement hammer, pulling PE pipe behind it.
    c. Longer bores may require a slit trench, which is expanded into a reception pit when the exit point of the soil displacement hammer is known.
8. The air hose shall be marked prior to launch, to indicate the expected distance of travel of the soil displacement hammer, allowing increased accuracy in monitoring the boring operation.
9. The soil displacement hammer should initially be launched under reduced power. Any resistance encountered during the flight of the soil displacement hammer (particularly during launching) should be investigated. When the soil displacement hammer approaches the retrieval pit, the power should again be reduced.
10. Immediately after completing the launch of the soil displacement hammer the operative should step out of the excavation. The launch cradle should not be removed until the operation is complete and it is safe to re-enter the excavation. Continual observation of the progress of the soil displacement hammer and flight of the bore should take place from outside of the excavation.

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11. The Operative shall not stand in the reception pit when the soil displacement hammer is entering the reception pit, due to the risk of being struck by the SDH or, in deeper pits, because of the risk of ground collapsing as the SDH enters the pit.
12. There should be two operatives on-site throughout the impact moling operation and at no time shall an operating impact mole be left unattended.
13. During the operation, the progress and position of the SDH should be constantly monitored. If it is suspected that the soil displacement hammer is deviating from the line or has met an obstruction, the machine shall be stopped and the cause investigated.
14. On completion of the impact moling operation a visual check of the borehole shall be undertaken to establish if there is any evidence of damage to other plant e.g. water seepage from storm or waste water pipes.

	Item
A	Friction roller
B	Vertical height adjuster
C	Horizontal adjuster
D	Securing pins
E	Cradle

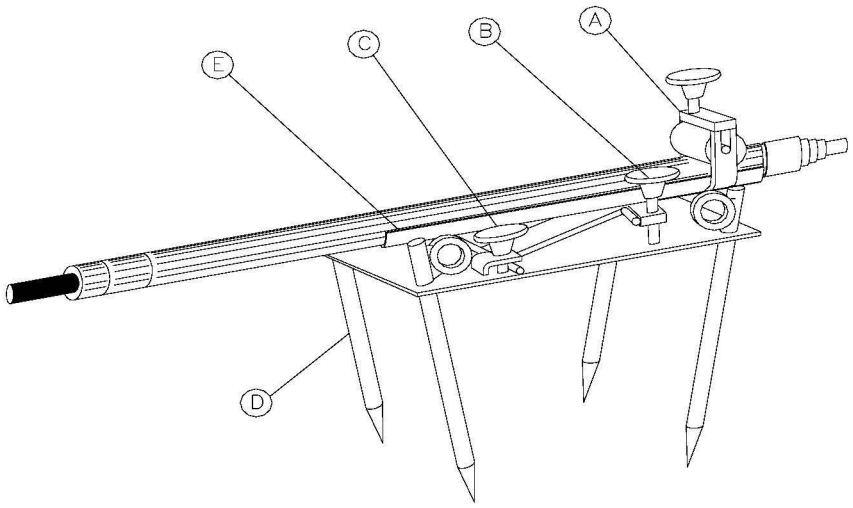

Figure B12a – Example of conventional cradle & fixing anchors

B4.1.5 Impact Moling Operations Across the Line of Existing Gas Mains or Services

1. Where there is a requirement to impact mole across the line of an existing main or service, the position of the main or service shall be located by trial holes prior to using the impact mole. Any exception to this requirement shall be subject to a permit to work, which shall include a site specific risk assessment.

2. The line of the extended service and the connection point should be recorded ("as laid" drawing) on the job record card and added to the appropriate records database.
3. Plans covering the route of the extended service run should be available and suitable warning labels should be fitted on the service entries adjacent to the meter positions.

4. The building lines of the properties in close proximity should be leakage surveyed using an approved LEL/% gas volume detection instrument or tested with a PPM gas detection instrument, to ensure no leakage has occurred as a result of the impact moling operation.

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	Item
A	Friction roller
B	Vertical height adjuster
C	Horizontal adjuster
D	Horizontal supports
E	Cradle

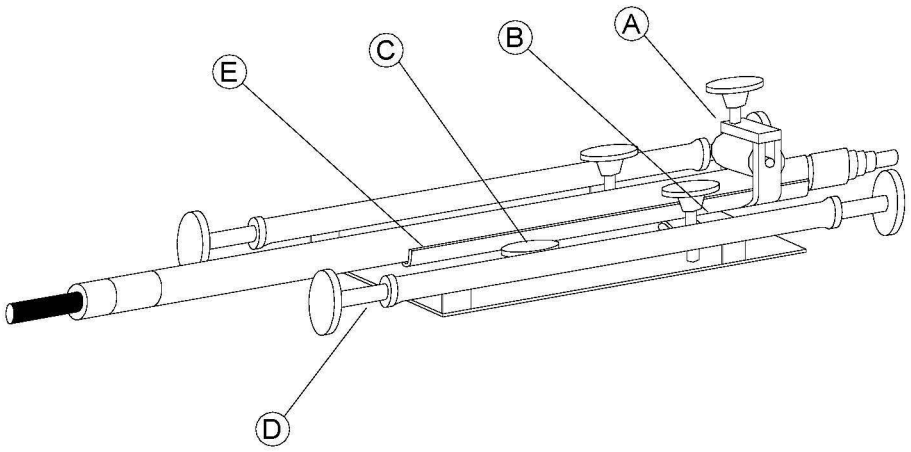

Figure 12b – example of cradle with horizontal supports.

B4.2 Equipment Selection

1. The performance of the equipment to be used can be affected certain ground condition. Table B12 recommends ancillary equipment that will aid the travel of the equipment in various soil types.

Soil Condition	Recommended Equipment	Recommended method of Inserting pipe
Clay Ground	Slip on sleeve, and over sized cone.	No preference
Compacted – sandstone, chalk	Smooth cone to eliminate friction and lateral movement.	No preference
Loose	Pulls the pipe in behind it at the same time as the boring takes place to prevent bore hole collapse	Towing attachment

Table B12 – Equipment selection for different ground conditions

2. The use of PE pipe as exhaust hose can be used provided a water based lubricant is used. (This shall be in accordance with the manufacturers instructions).
3. Select the correct size and type of equipment that will suit the PE pipe to be inserted due to an average of 10% bore shrinkage that will occur with each size of soil displacement machine (Table B13 sets out minimum requirements).

For larger size bore holes, reference should be made to the main laying suite of documents.

PE pipe to be inserted	Min Bore diameter	Standard soil displacement hammer size
32 mm	45 mm	45 mm
63 mm	70 mm	75 mm

Table B13 – Equipment size range

B4.3 Site Preparation

Site preparation is essential to the success of the SDH, and the following shall be taken into account:

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1. Extreme care shall be taken to avoid damage to the environment, other utility plant and injury to operatives by striking underground cables.
2. Excavate the launch and retrieval pits to suitable depth. The recommended minimum depth is 10 times the diameter of the SDH, this is to reduce the heave along its bore path..
3. For recommended bore lengths of the SDH, see Table B14.

Ensure where possible there is a clear line of sight.

Size of Thrust Bore (mm)	Recommended bore length (metres)	Recommended Launch Dimensions (metres)
45	10-12	1.2 x 0.5 x 0.5
75	25-30	1.6 x 0.5 x 0.9

Table B14: Recommended Bore lengths and Launch dimensions

B4.4 Assembly of Equipment

1. Attach the airline to a suitable compressor ensuring a hose restraint is in place. Potential air delivery pressure should be a maximum of 6-7 bar (85–100 psig).
2. Holding the airline and directing the connection end away from people or property switch on the compressor in a controlled manner to remove any residual dust or moisture by blowing the line.
3. If the compressor does not have a built in water separator, ensure one is fitted to the hose prior to the attachment to the lubricator. All hose connections should be supported with whip checks.
4. Ensure that there is lubricant in the reservoir, this is normally available from the local stores, supplied as Castrol 6609 oil (antifreeze oil is available for winter use). Failure to operate the soil displacement hammer through the lubricator will cause machine wear and damage. In extreme circumstances the air will cause freezing and prevent operation. This will usually happen after a period of operation. Do not pour oil down the air hose as this will cause seals to be damaged, reduced performance and in extreme circumstances the tool will cease operation.
5. Attach the air hose to the lubricator noting the direction of operation, if necessary fit a hose whip check.
6. On top of the lubricator, are two screws, one with a tee and one with a ring. Opening these will allow access for topping up levels and access to the feed screw. Do not attempt to gain access to these locations if the system is under pressure.
7. Using the integral screwdriver, adjust the oil feed screw until it is open ¼ of a turn anticlockwise. Max of ½ turn.
8. Securely replace the screw caps.
9. Attach the thrust-boring airline to the lubricator and SDH respectively.
10. Take the SDH to the retrieval pit with the hose following the proposed new installation. At the launch pit end, mark the hose. Additional marks may be added to indicate the expected location of other utilities in line of the proposed route.
11. Lift the SDH so the piston can be heard to slide to the rear of the machine. Failure to do so will result in the machine not starting.
12. Return to the launch pit, snake the hose out behind the bore direction, ensuring it does not create a tripping hazard.
13. Ensure that the SDH is in the forward position.

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B4.5 Site Operation

B4.5.1 Setting the soil displacement hammer

1. Check within the excavation with a cable-locating device to ensure that when the cradle is secured in position that there is no apparatus in the vicinity of the securing spikes that will be driven into the ground.
2. Position the launching cradle in the launch pit approximately 150mm from the front face of the pit.
3. Secure the cradle in position using the securing spikes or set horizontal supports.

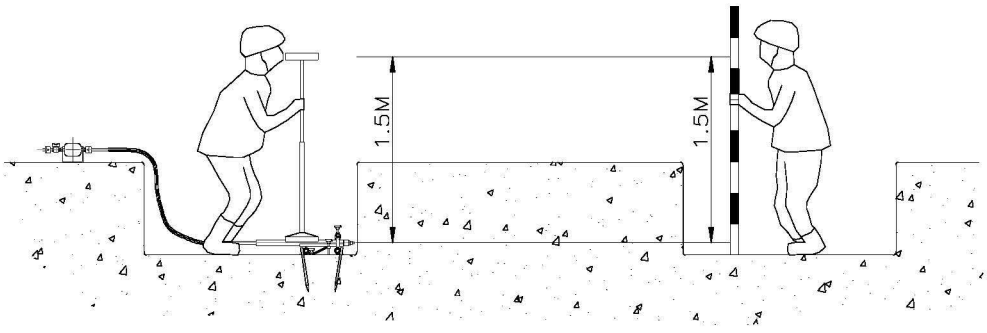

Figure B13 – Aligning and levelling the soil displacement hammer

4. Place the nose of the soil displacement hammer in the cradle and secure it in position using the one way feed roller, ensure the piston has not slipped towards the front of the hammer. Position at the desired depth and in the required direction.
5. The Operatives should position themselves outside the excavation when launching the soil displacement hammer. Do not stand directly behind the exhaust.

B4.5.2 Sighting the soil displacement hammer:

A sighting rod shall be used to ensure that an accurate launch will take place.

1. Place the sighting rod in the base of the receive pit (Figure B13). Measure a distance of 1.6m (1.0m if the scope is kept in the closed position) and mark the target stick. This mark is the height of the scope plus 100mm to allow for the height of the cradle. Where the launch depth is deeper adjust measurements accordingly.
2. Place the impact moling equipment in the launch position on the launch cradle.
3. Place the scope on the soil displacement hammer.
4. Adjust the position of the soil displacement hammer so that the cross hairs in the scope line up with the mark on the sighting rod.
5. The soil displacement hammer is ready to be launched.

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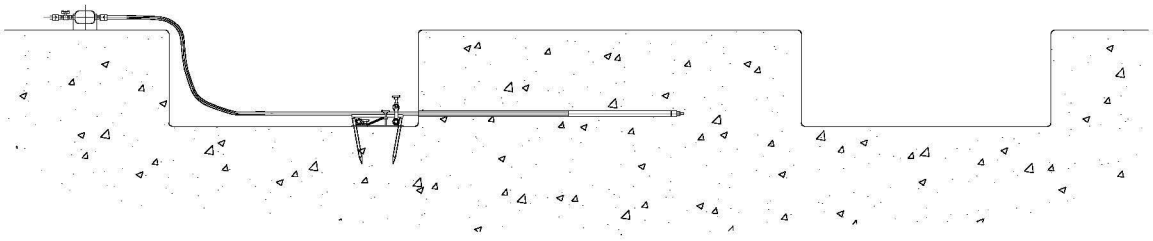

Figure B14 - Launching the soil displacement hammer

B4.5.3 Launching the soil displacement hammer:

1. Switch on the air, no more than a ¼ turn so that the piston starts oscillating. This will give a gentle hammer action and allow a controlled entry into the ground.
2. When the soil displacement hammer has entered into the ground approximately 200 mm, the air should be turned off and the line of sight should be checked to ensure the direction has not changed.
3. This process should be rechecked until the mole is 2/3rds of its length into the bore, after this the direction of the soil displacement hammer cannot be changed and a new launch will be required if the direction is not correct (Figure B14).
4. Gently increase the air feed, the safest speed for the operation is considered to be a maximum of (0.5 metre/minute).
5. Monitor the progress of the soil displacement hammer by standing on the line of route (where reasonably practicable and safe) in order to follow its line/depth, whilst in travel. This should be done in conjunction with marking the exhaust hose, in order to determine the length of travel; and the vibration would normally indicate the depth of cover.
6. When the soil displacement hammer is nearing its destination indicated by the mark on the hose, one operator should stand by the retrieval pit and observe ground movement of the SDH emerging into the pit. The operator shall signal to the operator controlling the operation to reduce the air feed to a gentle hammer action (Figure B15).

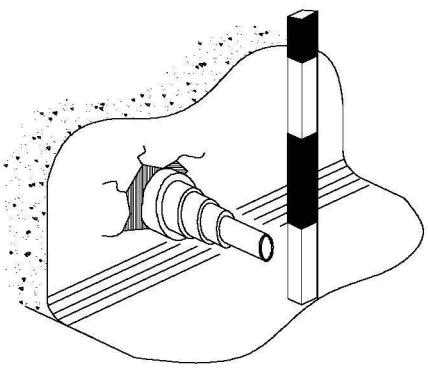

Figure B15 – Soil displacement hammer head appearing in retrieval trench

B4.5.4 Work Completion

1. Where impact moling has been carried out, an approved LEL/% gas volume detection instrument shall be used to check the annulus of the mole bore for gas readings. A further visual check of the bore hole shall be undertaken to establish any evidence of damage to other plant e.g. water seepage from storm or waste water pipes.

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B4.5.5 Inserting the PE pipe

1. Ensure that the pipe is inserted or towed in accordance with the manufacturer's instructions.
2. Ensure that an approved towing head or nose cone is attached to the front of the PE pipe prior to insertion through the borehole. If the pipe is being towed behind the impact mole machine the manufacturers instructions shall be followed to ensure correct attachment of the PE pipe to the machine.
3. Ensure that a visual check is made on the inserted pipe for evidence of damage. If the damage is found and is greater than 10% of the wall thickness, the damaged pipe shall be removed.
4. Ensure that sufficient pipe is extended out of the borehole to make the connection to the main and the house entry.

B4.6 Points to remember:

- Thrust bore should normally progress at 0.5m/min as per manufacturers' instructions.
- The average bore shrinks by 10%.
- 10 x diameter of SDH for the required depth of launch & retrieval pits.
- Launch the soil displacement hammer at 0.25 – 0.5 m/min.
- Always ensure correct alignment.
- Compressor should deliver 6 –7 bar (85-100 psi).
- PPE should be insulated to 20Kv.
- The greater the bore length the greater the bore diameter required.
- Always monitor the progress of the Thrust bore.
- After use, ensure storage requirements are met, such as
    - Regularly maintain the soil displacement hammer.
    - Never store Soil displacement hammer vertically as it can seize the hammer, always store horizontally.

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B5 OPEN CUT

1. All excavation work shall be in accordance with T/PR/SW/1 - Work Procedure for Excavations. Recommended minimum depths of cover can be found in Table B4.
2. When excavating trenches, ground conditions should be evaluated to ensure trench safety. Heavy objects, including plant and machinery that could cause collapse of the trench walls, shall be kept at a safe distance.
3. Where excavations require trench support, a hazard assessment shall be undertaken and a Permit to Work shall be initiated prior to work commencing
4. Wherever practicable the line of the service should be at right angles to the main, and to the front of the building. The line should take the shortest possible but may require diversions to accommodate any obstructions.
5. Where it is not possible to lay the service to the recommended depth, the Operational Manager shall be informed and his specific authority to continue obtained.
6. If 3rd parties have prepared the excavation and/or laid the service pipe, check: -
    a. The depths are correct (Table B4).
    b. There are no visible signs of damage to the PE pipe.
    c. Marker tape above and fine fill around the pipe.
    d. The pipe is not in tension.
    e. The pipe is not contaminated.
    f. Proximity to other utilities.

B5.1 Open Cut Operation

1. Determine the proposed route for the gas service, ensure that existing damage to the surfaces and/or walls are noted. Mark out the proposed route.
2. Ensure that the trench is excavated to provide the recommended minimum level of cover. Reduced depth of cover should be authorised by the Operational Manager, recorded on drawings and protected by means of caution tape and PE tiles or a concrete slab. Excavations wherever possible should be of uniform shape. Tunnelling and undercutting should be avoided (Figure B16).

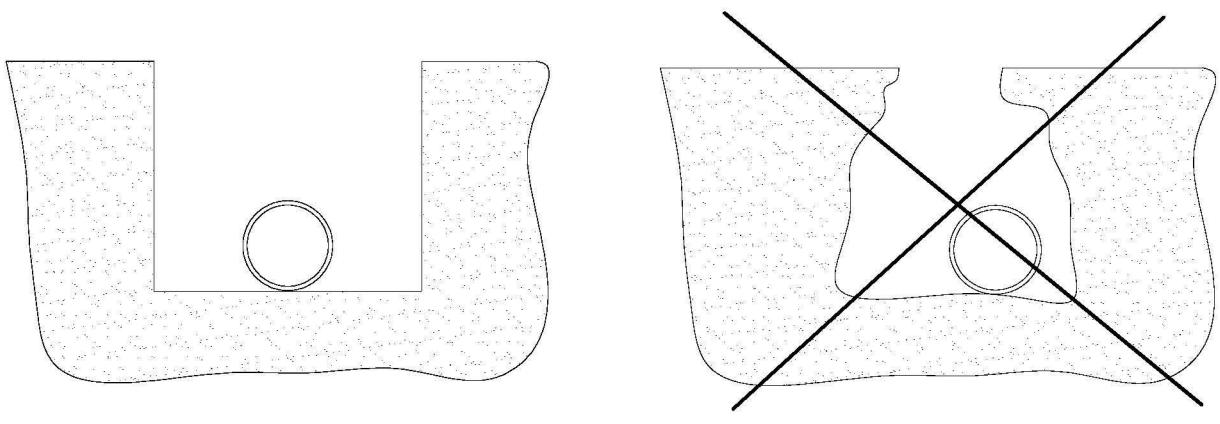

Figure B16 - Correct and incorrect excavations

3. The bed should be levelled and suitably compacted so as to provide a firm support under the pipe and should be free of hard spots or sharp stones, which are potentially damaging to PE pipe.
4. Install temporary stoppers/caps to prevent the ingress of debris into the pipe.

5. Where the trench excavation crosses poor ground conditions, i.e. rock or irregular consistency, then the trench should be excavated to 75mm below the required depth and replaced with suitable sand or other bedding material.
6. Check to ensure that the service pipe does not exceed the minimum bend radius for PE pipe. Minimum bend radius = 15 x diameter of PE pipe. (Table B15 & Figure B17)

Pipe size	Minimum Bend Radius
20mm	0.3m
25mm	0.4m
32mm	0.5m
63mm	1.0m

Table B15 - Minimum bend radius

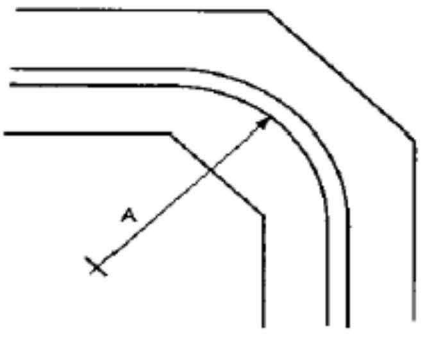

Figure B17 - Minimum Bend Radius

7. The pipe shall be covered with an appropriate fine fill material and the warning tape laid 75mm above the pipe.

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CHAPTER C – SERVICE VALVES

C1 VALVES TO BE USED DURING SERVICE INSTALLATION

This section describes and specifies types of valves to be installed in service pipes from the mains connection up to and including the emergency control valve.

A new supply of gas to premises shall not be made available unless a suitable ECV is installed.

C1.1 Definition

C1.1.1 EMERGENCY CONTROL VALVE

An emergency control valve is a valve for shutting off the supply of gas in an emergency, being a valve intended for use by a consumer of gas.

C1.1.2 SERVICE ISOLATION VALVE

A service isolation valve is a valve (other than the emergency control) for controlling a supply of gas, being;

a) Incorporated in a service pipe; and
b) Intended for use by a supplier or transporter of gas; and
c) Not situated inside a building.

C1.1.3 SERVICE EXCESS FLOW VALVE

Service excess flow valves shall be installed in domestic medium pressure services with a maximum flow rate of $6m^3/hr$. It will substantially reduce the flow of gas in the event that the flow exceeds a defined limit. (Such devices restore full flow once the upstream and downstream pressures are equalised.)

C2 EMERGENCY CONTROL VALVES (ECV)

C2.1 General

1. Service entries to all premises shall terminate with an emergency control valve (ECV). The emergency control valve shall be both accessible and operable by the consumer. Refer to Table C1 for diameters and correct types of ECVs.

2. Low pressure ECV handles should be colour coded Red (Figure C1) and medium pressure ECV handles should be colour coded Amber (Figure C1a). This also applies to ECVs used in semi concealed meter installations.

3. The preferred orientation of the ECV should be in the vertical position.

4. Handles shall be fitted to ensure that the off position is indicated by the key or lever being at right angles to the installation pipe work.

5. Any key or lever shall move in the downward direction from the ‘ON’ position to the ‘OFF’ position. (Figure C2).

6. Where applicable the handle (key or lever) of the ECV shall be securely attached to the operating spindle of the valve.

7. ECV’s shall not be installed in a position where downward travel of the handle results in the valve opening.

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Low Pressure ECV – Red Handle

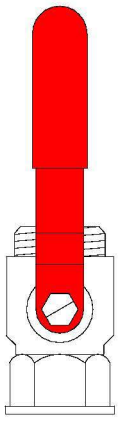

Figure C1: ¾″ BSPF x ¾ ″ BS746 LP ECV

Medium Pressure ECV – Amber Handle

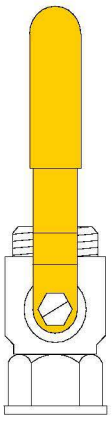

Figure C1a: ¾″BSPF x ¾″ BS5200 MP ECV

8. Medium pressure ECV's shall not be used for Low Pressure services as they do not meet fire resistance standards for use inside a building. Additionally, the outlet thread is designed for MP meter installations only.
9. Where a meter is not going to be immediately connected or reconnected at the time a service is laid or re-laid, the ECV shall be securely capped and sealed with the valve in the closed position.

10. The service information label shall be completed and attached to the inlet side of the ECV on all new and replacement installations (Figure D14).

Immediately following purge and commissioning of the service, the ECV shall be securely capped and sealed with the valve in the closed position (see also

6.8.7 Maintaining Electrical Continuity Following Replacement of Domestic Metallic Services)

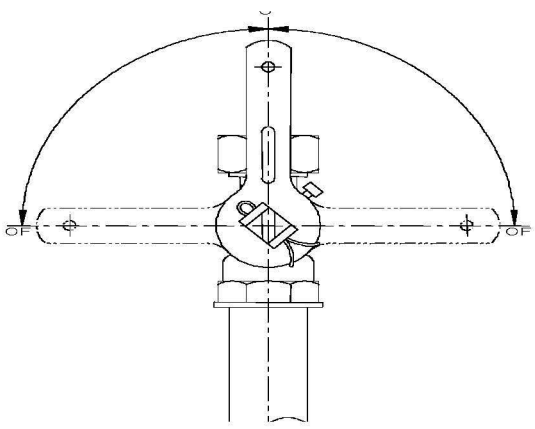

Figure C2 – Example of Emergency Control Valve

C2.2 Emergency Control Valve Sizes

Application	Sizes Inlet x Outlet	Valve Type	Outlet Thread to	Handle colour	Fire resistance	Example ECV images
Medium Pressure Domestic Meter Box Installations	¾"BSPF x 19mm ¾" BSPF x 19mm (1)	Ball valve	BSEN 10806	**Amber**	Not required	
Medium Pressure Rotary & Turbine Meter Installations	1"BSPF x 1" 1"BSPF x 2" 2" BSPF x 2"	Ball Valve	BS21	**Yellow*** **Amber**	Not required	
Low Pressure Diaphragm Meter Installations	¾ BSPF x ¾" 1" BSPF x ¾" 1"BSPF x 1" ¾"BSPF x 1" (1)	Ball valve	BS 746	**Red**	YES	
	2" BSPF x 2 "	Plug valve	BS 746	**Red**	YES	

Table C1: Valve Sizes.

Note: (1) denotes right angled ball valves for semi concealed meter boxes.

ECVs for MP domestic services should terminate with a ¾" BSEN 10806 outlet threads to fit MP meter inlet kits

C.2.3 PIGGY-BACKING OF EMERGENCY CONTROL VALVES (ECVs)

C 2.3.1 Control Valves with BS 21 (BSP) outlet thread

The following is applicable to screwed Low Pressure ECVs up to and including 2" diameter with BS 21 (BSP) outlet thread as an alternative to the exchange of the existing ECV through conventional means of service isolation or using an ECV exchange kit as described in Appendix P of T/PR/EM/74.

Note: Do not apply to existing ECVs with a BS746 rubber washered outlet.

Definition: Piggybacking is the installation a new ECV directly after an existing ECV – refer to Figures C2a and C2b. The use of this technique will be classified as a permanent repair technique.

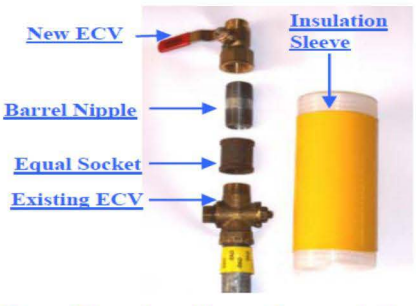

Figure C2a – Piggybacking of an existing ECV a BS 21 outlet thread

Figure C2b – Original ECV with wrapped in insulating Sleeve

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Installation Method:
When using the piggyback technique the following requirements shall be observed:

1. Complete an on-site assessment which as a minimum takes into account the following:
    a. the condition of the existing service standpipe/lateral pipework, following examination for corrosion, particularly at floor/wall entry, if this is deemed significant the service shall be replaced immediately.
    b. location of the ECV to confirm that there is:
        i. Enough access to complete the piggyback operation, remake meter inlet pipework, and
        ii. Future access by the consumer is not impeded

Note: If the standpipe is disturbed during the operation, immediately check the whole service pipe inside and outside the property for leakage, especially around the base of the standpipe. The service pipe shall be cut off immediately and replaced as a safety precaution.

2. Mark the position of the standpipe relevant to its entry position to enable checks for movement of the standpipe during the installation of the new ECV and its transition fittings.

3. Seal all new threaded joints up to the ECV with Boss Gastite.

4. On completion make final check on the mark on the standpipe to ensure the standpipe has not moved and apply an approved leak detection fluid to all exposed joints on the service and ECVs, including the barrel on existing plug valves and carry out a full gas detection survey of the whole service pipe, both inside and outside the property to ensure no leakage is present. For high rise premises check along lateral and connection to riser pipework.

5. Following the leakage survey, where possible remove the handle from the original ECV and apply a 3M EL15 insulation shrink sleeve from a point immediately below the new ECV thread to a point on the barrel of the inlet pipe ensuring there is no steel visible. (Yellow insulation sleeve 9" long for ¾" to 1¼" – SAP Code 3864, or for 1½" to 2" services use black insulation sleeves either 9" long – SAP Code 3867 or 12" long SAP Code 3866)

6. Finally complete operation by labelling the service/ECV appropriately.

C 2.3.2 Control Valves with BS 746 outlet thread

Scope: Applicable to low-pressure ¾" and 1" diameter ECV's with BS 746 parallel male outlet thread. This procedure may be used if the existing ECV is pressure-tight but fails a let-by test, is an alternative to exchanging the ECV by conventional means of service isolation or using an ECV exchange kit and is classed as a permanent repair.

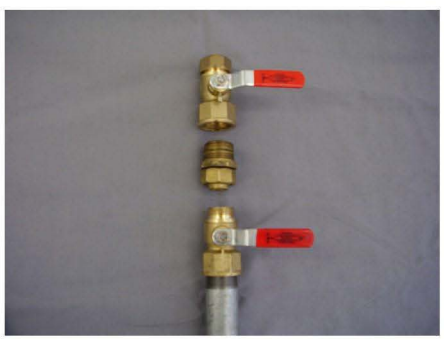

Figure C2c – Pigging Backing of a BS746 outlet ECV using a copper washer

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Installation method:

1. Carry out a site-specific assessment to include the following:
    - Check the condition of the service pipe looking for signs of corrosion especially at floor / wall entry points. If significant corrosion is observed contact your Line Manager who shall arrange for the service pipe to be replaced
    - Ensure there is sufficient working room to allow the second ECV to be fitted, including the meter inlet pipe / flex, and ensure future access by the consumer is not impeded.
    - Check exposed metalwork with a Voltstick prior to operating/touching any part of the gas installation.

2. Mark the position of the standpipe relevant to its entry position to enable checks to be made for movement of the standpipe during installation of the ECV.***Note:: If the service pipe is disturbed during installation of ECV, immediately check the whole service pipe inside and outside the property for leakage especially around the base of the standpipe. The service shall be cut off immediately and replaced as a safety precaution.***

3. Turn off the existing ECV and disconnect the downstream pipe / fitting.

4. Assemble the new ECV and Meter Union Liner (use approved gas thread sealant on the threaded joint prior to tightening) and fit a cap on the outlet.

5. Insert a copper washer into inlet seating of the Meter Union nut

6. Connect inlet of new ECV to outlet of existing ECV and tighten until finger-tight, make a reference mark on one edge of the meter union nut and body of the existing ECV

7. Using the reference marks, tighten the nut by at least two “flats”.

Figure 2Cd – Completed assembly of Pigging Backing of a BS746 outlet ECV using a copper washer

8. Open the new and existing ECV’s, apply approved leak detection fluid to all exposed joints to confirm tightness. If it fails, tighten the nut up to 2.5 “flats” and re-test. (If the connection continues to leak, replace the copper washer with a new one and repeat steps 6 to 8).

9. On completion, check the position of the standpipe relative to reference marks to ensure that it has not been disturbed during the operation.

10. Undertake a full gas detection survey of the entire length of the service pipe to ensure no leakage is present. For high rise installations check along lateral and connections to riser.

11. Secure the existing ECV in the “open” position using the locking screw, remove the handle and apply a 3M EL15 shrink sleeve to encapsulate the existing ECV.

12. Re-connect downstream pipe / fitting and label the service appropriately.

C3 SERVICE ISOLATION VALVES

C3.1 General

Service isolation valves shall be installed in the following situations:

1. Any low-pressure services of 63mm PE diameter and above.
2. Multi-occupancy buildings (Schools, Hospitals, High Rise).
3. Places of public assembly (Cinemas, Public Houses, Shops etc).
4. Supplies to industrial processes and commercial properties.
5. All Services supplying more than one primary meter in the same premises.
6. All Medium pressure (MP) services operating pressures greater than 75 mbar where no Service Excess Flow Valve (SEFV) is fitted.
7. Wherever the property being supplied has the service entering below ground and terminating in a cellar.

C3.2 Service Isolation Valve installation

1. PE valves should be used in preference to metallic valves for use below ground. (Figure C3)

Figure C3 – Example of a PE Service Isolation Valve

2. Metallic valves shall be used for above ground installations.
3. Service isolation valves shall be installed in an accessible position as near as possible to the property boundary and clearly indicated with a surface cover marked G or GAS (Figures C4 & C5).

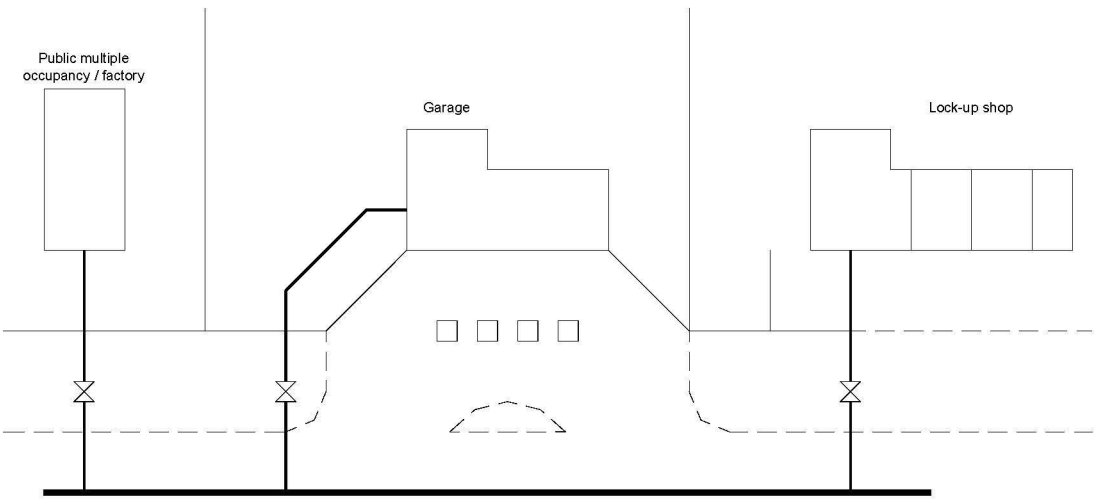

Figure C4 - Service Isolation Valve location

4. Service isolation valve covers should have a concrete surround or purpose made plastic chamber installed over the centre line of the valve (Figure C5 & Table C2).

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5. Extension spindles are available for deeper installations.
6. Service isolation valves should be left in the 'open' position after purging.
7. Metallic valves installed below ground should be wrapped with approved mastic tape after the service has been purged.
8. All service isolation valves shall be positioned as to ensure unrestricted access for operation and maintenance.
9. A service isolation valve shall not be used as an emergency control valve.

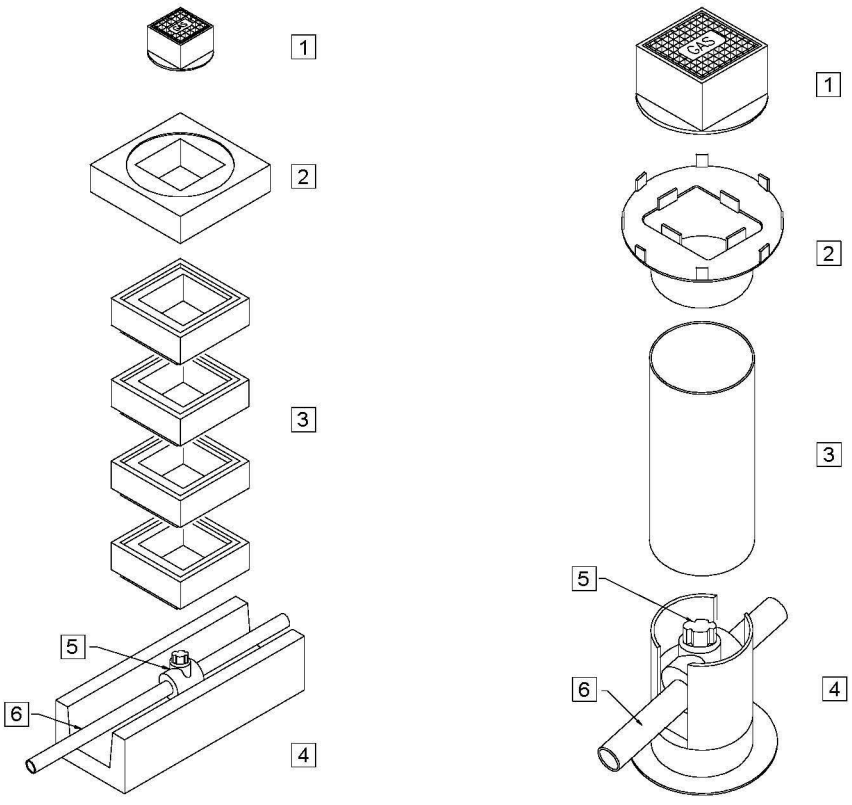

Figure C5 – PE Service Isolation Valve Chambers

No.	Item
1	Surface Box
2	Top Section
3	Intermediate concrete section/ plastic chamber
4	Base section/ plastic chamber base
5	Service Isolation Valve
6	PE pipe spigot

Table C2 - Service Isolation Valves parts list

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C4 SERVICE EXCESS FLOW VALVES (SEFV)

C4.1 General

1. SEFV's reduce the volume of gas released should damage occur to the service downstream of the SEFV.
2. Medium Pressure Services installed up to and including 32mm diameter supplying domestic properties shall have a Service Excess Flow Valve (SEFV) fitted
3. New Medium Pressure Services installed up to and including 32mm diameter supplying domestic properties in the following locations shall have a Service Excess Flow Valve (SEFV) fitted:

    a. Surface mounted Meter box installations.
    b. Semi Concealed Meter box installations.
    c. Above Ground Boundary Regulators.
    d. Inset Cavity Meter box installations

4. An SEFV shall not be installed on a medium pressure dual service. (Figure C6).

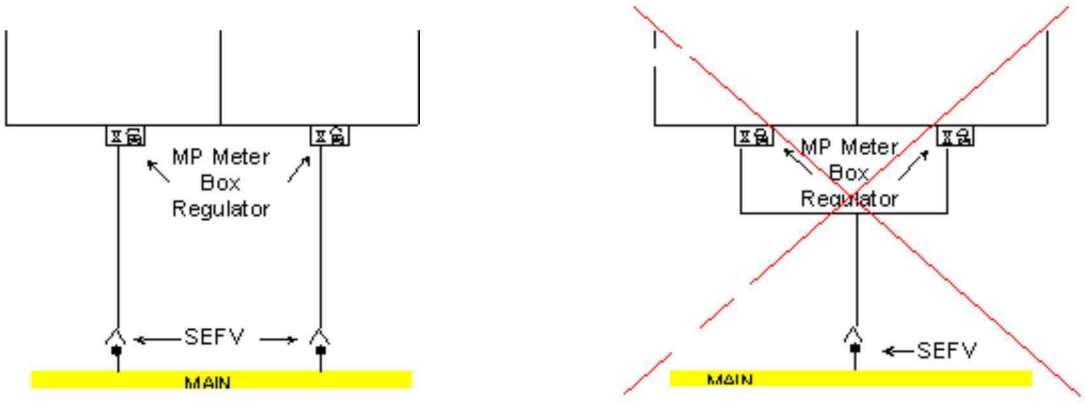

Figure C6 - Acceptable and Unacceptable dual MP Service

5. A service isolation valve (SIV) is not required where a SEFV is installed.
6. The service shall be pressure tested and commissioned in accordance with Chapter E.

C4.2 Installation

1. A SEFV shall be installed immediately on the outlet of the service top tee connection to protect the entire length of the medium pressure service. (Figure C7) For metallic connections the SEFV shall be situated as close to the top tee as possible.
2. Always check that the SEFV is fitted in the correct orientation. This is indicated by a flow direction arrow on the fitting or the manufacturers instructions contained in the packaging.
3. The PE pipe end shall be cut square and kept clean and free from internal or external burs. Electrofusion of the PE SEFV shall be in accordance with Chapter A 1.1.4 Coupler fusion.
4. The service shall be pressure tested and commissioned in accordance with Chapter E.

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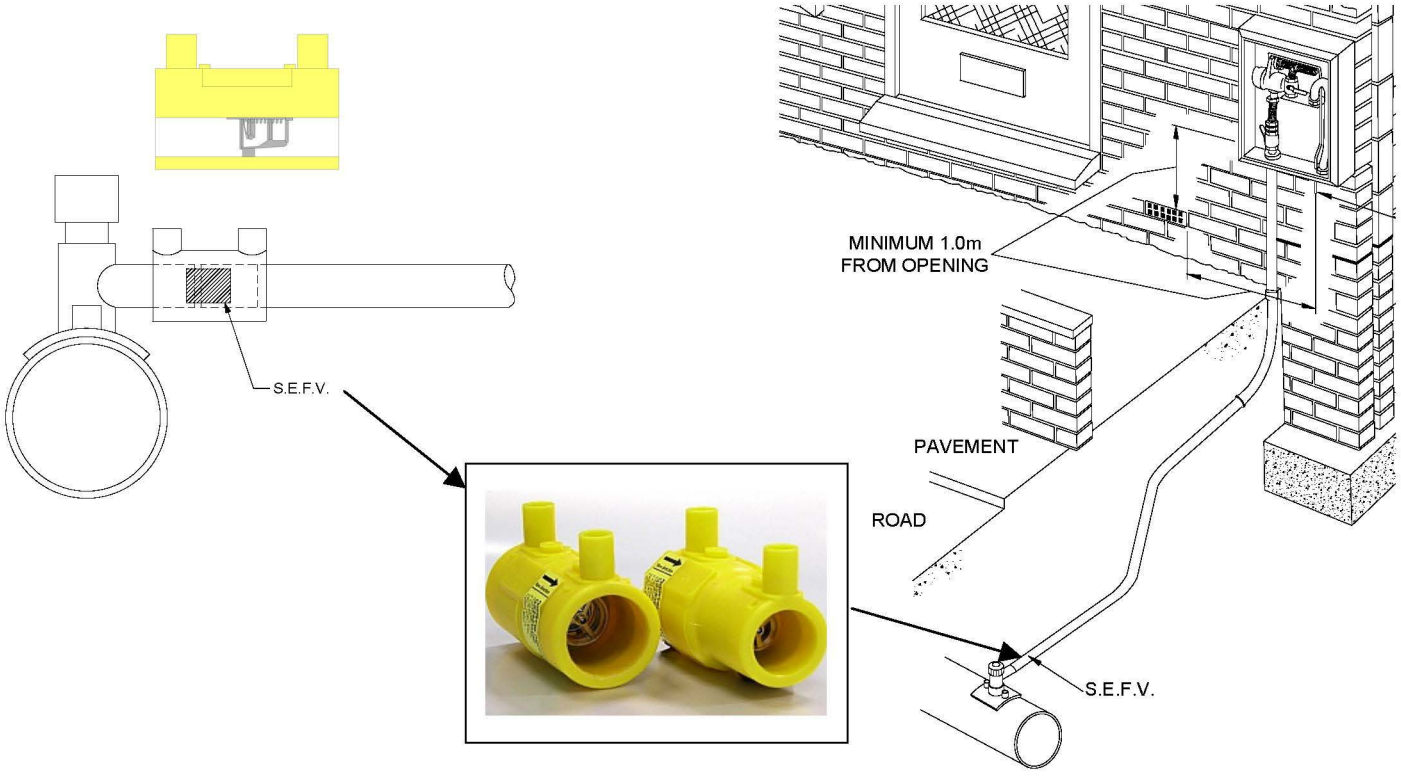

Figure C6 – Example of S.E.F.V on an MP Service

C4.3 Labelling of service

The service information label shall be completed and indicate that an SEFV is fitted in accordance with Chapter D14 of this manual.

C4.4 Records

When an SEFV has been installed, the information shall be recorded on the appropriate database.

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CHAPTER D – SERVICE ENTRIES

D1 – SERVICE ENTRIES

This section specifies the procedures to be followed when a service pipe enters premises. It covers installation of pipe from the point of entry to the consumers emergency control valve (defined as the end of the Network).

A service shall always be installed with its future integrity and safety in mind. The position of other services should be taken into account, and the new installation work shall not cause any structural damage to the building, impair the fire resistance of any part of the structure, or affect any damp proof course.

D1.1 New Services

The proposed service termination and meter position will have been decided at the planning stage. Preference should be given to the use of a meter box, which should be located:

- on the front face of the building, or
- within 2m of the front face of the external wall of the building

Where a meter box cannot be used, a meter should be sited within the premises, preferably on the internal face of the external wall of the building. If this is not practicable an alternative position can be used provided that the service termination point is within 2m of the service entry point into the building.

D1.2 General Requirements

In addition to the following general requirements, technique specific information is contained within individual service entry sub-sections.

1. MP domestic services shall not be installed within a building
2. Service entries shall not be laid in unventilated voids.
3. Where applicable, services should enter premises above ground and above any damp proof course (DPC). The PE pipe shall terminate at an external meter box or an approved transition fitting.
4. A service shall not be installed under the footing of the building, under the base of a load-bearing wall or under a floating raft.
5. Where the building construction involves a concrete raft, and there is not the recommended depth of cover between the concrete raft and proposed finished ground level (375mm), the developer should provide a slot or vertical channel in the raft to allow safe installation of the gas pipe. National Grid will not be responsible for breaking out the concrete rafts footings to provide a slot for the service pipe.
6. PE services shall not enter any premises, including integral and attached garages, unless enclosed in a metallic pipe where the annular space is filled with an approved material or has a gas tight approved seal.
7. Where a service pipe is installed through any wall or through any floor of solid construction the service pipe shall be enclosed in a sleeve. Mechanical pipe joints shall not be installed within the sleeve.
8. Ensure that the proposed internal meter position is not within 150mm of electrical apparatus, and 25mm from electrical cables and other metallic services.

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9. PVC bends shall not be cut to allow for reduced depth. The socket part of the PVC bend should protrude above the finished surface level to ensure correct depth and the bend radius of the pipe is maintained.
10. Any above ground service pipe entry should be retained by the use of pipe clips at 1 metre intervals where practicable.
11. Use approved detection equipment and visual inspection of any walls that are to be drilled for service entries, pipe clips etc, to help identify the position of any electrical cables that may be positioned in the wall. Currently hand held locators are not approved and the "Cat and Genny" should be used.
12. Where there is a serious threat of vandalism to an external service entry, or as part of the remedial work following interference damage, preference should be given to alteration to an internal meter position. Where this is not possible, steel pipe should be used in accordance with Section D9.
13. Risers and laterals shall be suitably supported (see Table below). Below these lengths the fitting of pipe clips is optional although good engineering practice may dictate the use of support at lengths less than those stated in the table.

NOMINAL BORE FOR MAXIMUM UNSUPPORTED LENGTH (m) STEEL (OUTSIDE DIAMETER FOR PE AND STAINLESS STEEL) (mm)	MAXIMUM UNSUPPORTED LENGTH (m)				
	Screwed steel horizontal	Screwed steel vertical	Welded steel horizontal	Welded steel vertical	External PE vertical
20	2.5	3.1	2.5	3,1	2.0
25	2.5	3.1	3.0	3.7	2.0
32	2.7	3.3	3.0	3.7	2.0
40	3.0	3.7	3.5	4.3	2.0
50	3.0	3.7	4.0	5.0	2.0
63	3.0	3.7	4.5	5.6	2.0

Table D1 – Supporting Above Ground Pipework

14. All service terminations shall have an Emergency Control Valve (ECV) fitted. Always ensure that the correct ECV is used for the correct operating pressure tier of the service pipe in accordance with Chapter C1.

Caution: MP Emergency Control Valves shall **NOT** be used for low-pressure services

15. Every service termination and ECV shall be labelled at the time of installation or alteration in accordance with Section D14.

D1.2.1 Meter Boxes

1. Check there is no damage to the meter box.
2. Meter boxes should not be located directly above drains, air bricks, manholes or under appliance flues etc or where access / egress may be restricted in the event of an emergency e.g. narrow foot walks.
3. Surface mounted or semi concealed meter boxes shall never be installed on public footpaths or highways where damage from pedestrians or vehicles can occur.
4. Inset meter boxes can be used for MP services. See D11a for further information.

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D1.3 Unacceptable Meter Locations- Checklist

Persons undertaking meter work shall be competent to do so, and hold the appropriate qualification to meet the criteria laid down in the Gas Safety (Installation and Use) Regulations.

The proposed meter position should be assessed before any service alteration or replacement is undertaken. The following list provides examples of locations that should be avoided for service terminations / meter positions:

a) In close proximity to any source of heat, or where it may be subjected to extremes of temperature.

b) Where food is stored.

c) Where it might be liable to mechanical damage.

d) Where it might cause an obstruction.

e) In bathrooms.

f) Where it might be affected by a corrosive atmosphere or liquid.

g) Where readily combustible material is stored.

h) Meters shall not be installed into any lockable meter housing/compartment unless the consumer has been provided with a suitably labeled key providing access.

If such a location cannot be avoided or there are any concerns, specific advice shall be sought from a qualified meter installer or Operational Manager for further guidance.

.D1.4 Completion

1. Ensure the Emergency Control Valve is left in the closed position and capped on completion of commissioning.

2. Ensure Service Labels are completed, displayed and attached to the service pipe.

The meter box key shall be left with the consumer or developer.

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D2 LP PE SERVICE TO INSET METERBOX

NEW BUILD INSTALLATIONS ONLY

D2.1 General Requirements

1. Work should only commence when the inset meter box has been installed by the developer/builder. This is the responsibility of the builder/developer or consumer.
2. Check that the meter box has been installed correctly (Appendix B1).
3. Check ground levels to confirm the correct depth of the service can be achieved after completion of civil works by the developer.
4. The base of the box should be located between 500mm and 1500mm above the finished ground level.

D2.2 Installation:

1. Inspect the meter box prior to the installation of the service to ensure that the outlet spigot is correctly fitted and sealed to prevent gas leakage into wall cavity. In addition checks should be made to confirm that the meter box is not damaged and no other holes have been provided within the meter box structure, except in the prescribed position.

   It is possible to provide the gas service to a recessed meter box where a corbelled wall is present, as illustrated in Figure D7c. The base of the box should not be less than 2 courses above the corbelled wall to allow for the correct transition fitting

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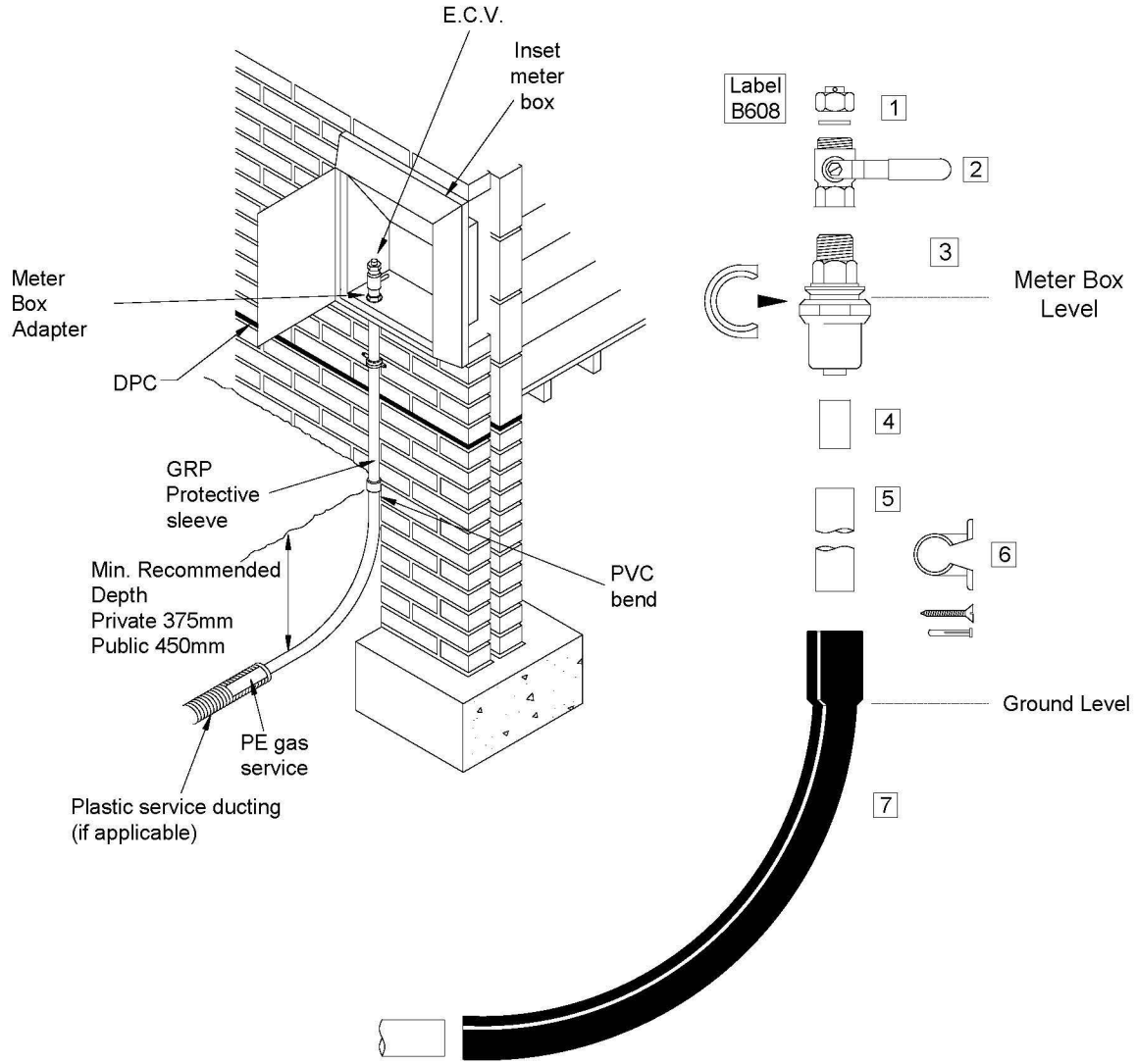

Figure D2 - LP PE service to inset meter box (New Installation)

NO	ITEM
	Service Information Label (B806)
1	**Emergency Control Valve Cap**
	¾″ x BS 746 Brass Cap c/w Washer
	1″ x BS 746 Brass Cap c/w Washer
2	**Emergency Control Valve**
	¾″BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x 1″ BS 746 M c/w Handle (Ball)
3	**Meter Box Adaptor**
	20 mm x ¾″ BSPM
	25 mm x ¾ ″BSPM
	32 mm x ¾ ″BSPM
	32 mm x 1″ BSPM
4	**20/25/32 mm PE pipe**
5	**GRP Sleeving (1 & 3 metre lengths)**
	GRP Sleeving 38 mm
6	**Pipe Clip for GRP Sleeving (optional)**
	GRP Sleeving 38 mm
7	**PVC Preformed Bend**

D3 LP PE SERVICE TO SURFACE MOUNTED METERBOX

D3.1 General Requirements

1. Surface mounted meter boxes shall not be installed in an unventilated or enclosed area, these may include building extensions such as front porches, garages etc.

D3.2 Installation:

1. The base of the meter box should be installed between 500mm and 1500mm above finished ground level and be fitted either above or below the **DPC but shall never cross it** (Figure D3).
2. It is possible to provide the gas service to a surface mounted meter box where a corbelled wall is present, however, the base of the box should not be less than 2 courses above the corbelled wall to allow for the correct transition fitting to be used. See Figure D7c

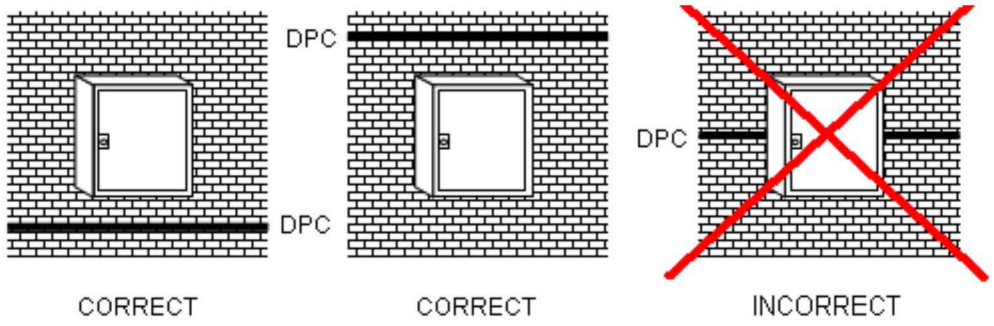

Figure D3 – Correct positioning of surface mounted meter boxes

Note: This also applies to Surface Mounted and Built-in boxes used for Medium Pressure

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NO	ITEM
	Service Information Label (B608)
1	**Emergency Control Valve Cap**
	¾ "x BS 746 Brass Cap c/w Washer
	1" x BS 746 Brass Cap c/w Washer
2	**Emergency Control Valve**
	¾ "BSPF x ¾ "BS 746 M c/w Handle (Ball)
	1" BSPF x ¾ "BS 746 M c/w Handle (Ball)
	1" BSPF x 1" BS 746 M c/w Handle (Ball)
3	**Meter Box Adaptor**
	20 mm x ¾" BSPM
	25 mm x ¾ "BSPM
	32 mm x ¾ "BSPM
	32 mm x 1"BSPM
4	**20/ 25/ 32 mm PE Pipe**
5	**GRP Sleeving (1 & 3 metre length)**
6	**Pipe Clip for GRP Sleeving (optional)**
7	**PVC Preformed Bend**

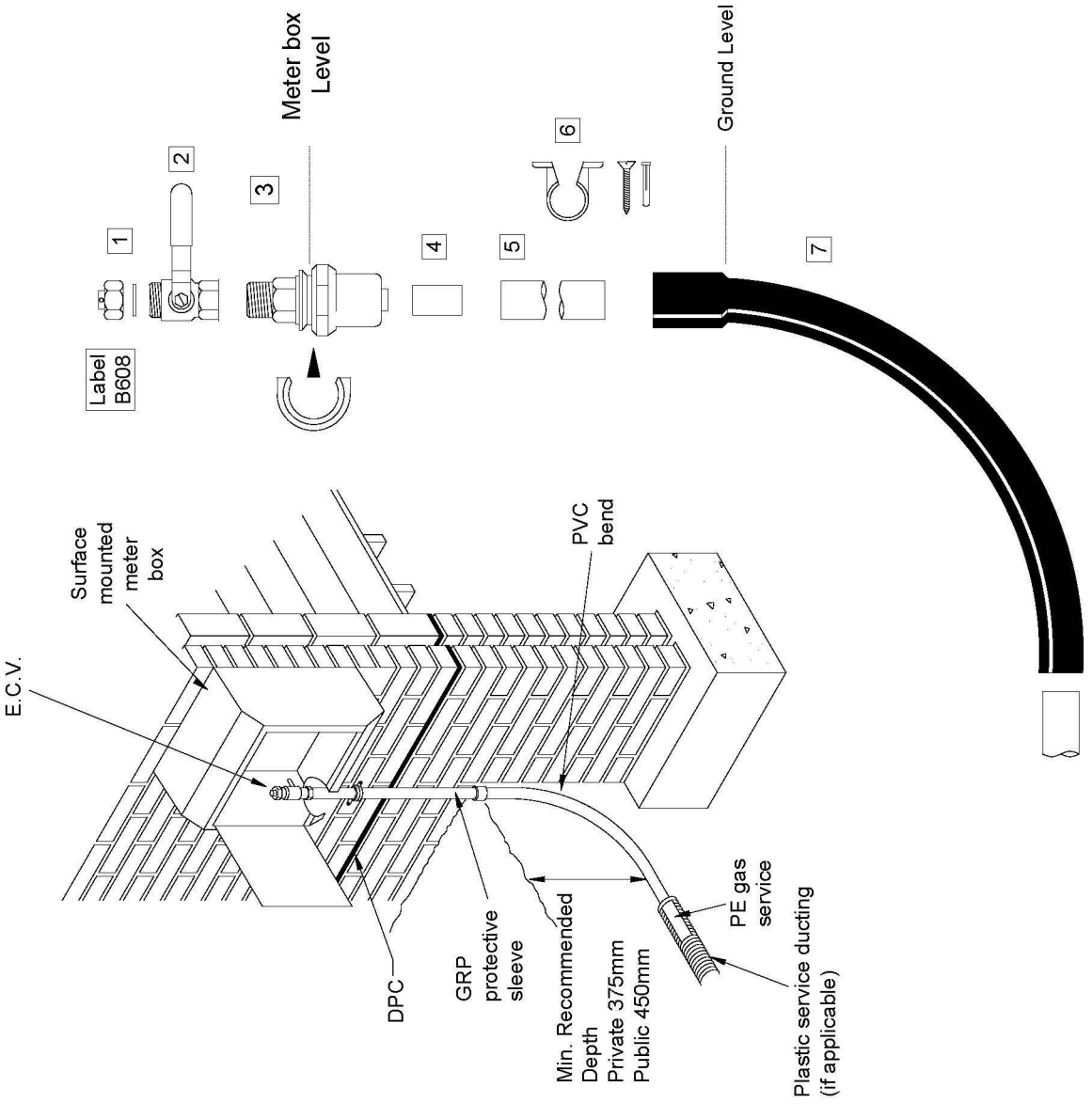

Figure D3a - LP PE service to surface mounted meter box

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D4 LP PE SERVICE TO SEMI CONCEALED METERBOX

D4.1 General Requirements

1. Semi concealed meter boxes may be installed by the developer or installed by the operative as part of the service installation.
2. The meter box should be fixed to the exterior wall using the kit supplied.

D4.2 Installation

1. Check that the box is always fitted on level ground and fixed securely to the wall.
2. When the property is on a concrete raft, a cut out section should be provided by the developer/owner. A minimum excavation size of 0.5m by 0.5m is required to accommodate the meter box.
3. Service pipe work entering the semi-concealed meter box should not be exposed.
4. Services shall terminate with a meter box adapter and be protected within a GRP / PVC preformed bend below ground.

Also refer to Appendix B3 for meter box dimensions and fitting directions

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No	Item
	Service information Label (B608)
1	**Emergency Control Valve Cap & washer.**
	1 ″x BS 746 Brass Cap c/w Washer
2	**Emergency Control Valve**
	¾ ″BSPF x 1″ BS 746 M Semi-Concealed (Ball) Emergency Control Valve
3	**Meter Box Adaptor**
	20 mm x ¾″ Semi-Concealed
	25 mm x ¾ ″Semi-Concealed
	32 mm x ¾″ Semi-Concealed
4	**20/25/32 mm Pipe**
5	**GRP Sleeving**
7	**PVC Pre formed Bend**

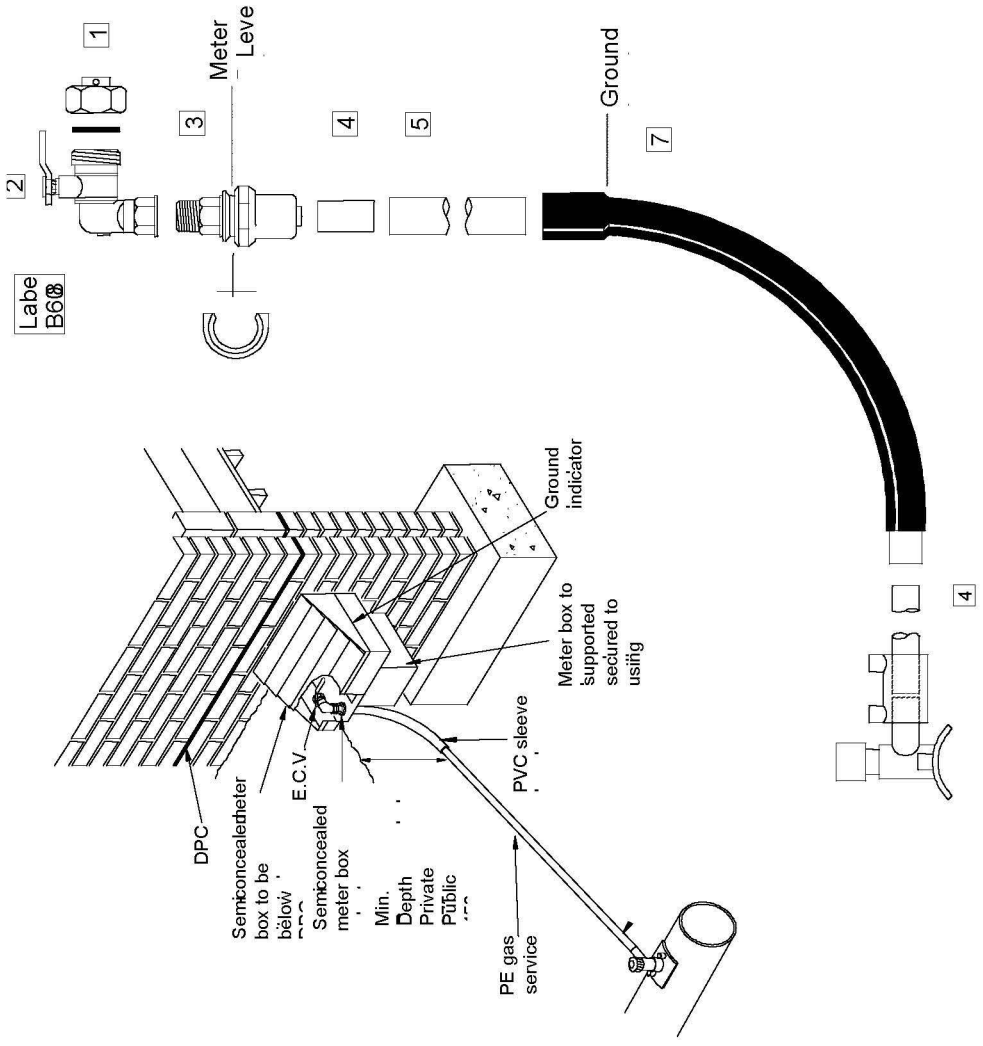

Figure D4 – LP PE service to semi concealed meter box

D5 LP PE SERVICE TO INTERNAL POSITION – DEAD INSERTION REPLACEMENT

This section should be used in conjunction with Chapter B Section B3.2.

D5.1 General Requirements

1. Where insertion is undertaken to the original meter position, checks shall be made to ensure that the position complies with the General Section of this Chapter – Unacceptable Meter locations.
2. If the existing meter location is not suitable then a suitable alternative location shall be agreed with the consumer and the Operational Manager notified. (An Inset meter box is not allowed as an option in this case).
3. Check the condition of the host pipe for any damage or severe signs of corrosion.
4. Allow for pressure drop across the length of service in accordance with Chapter B, Table B3.

D5.2 Installation

1. Disconnect the host pipe in accordance with Chapter A, Section A6, and purge to 0% GIA, using approved purge hoses and fittings.
2. A flexible rod should be used to determine any bends in line of service to be inserted. Recommended PE pipe diameters for insertion can be found in [Chapter B.2.1 Table B7]
3. Fit an insulation joint on to the service head adaptor in the correct orientation.
4. Ensure that the service head adaptor is fitted above floor level.
5. Seal the annulus between the inserted and host pipe with an approved sealant ensuring the sealant extends to a position beyond the building line.

N.B – Dependant on which dead insertion technique is used i.e. Yellow PE 80 pipe or Serviflex; the correct sealant shall be used. Reference shall be made to Chapter B, Table B4, which identifies the correct annular gap sealant to be used. Always follow the manufacturers instructions and wear the recommended protective clothing (correct gloves / safety goggles) when handling potentially hazardous substances including sealants.

6. Where services terminate in basements, the same procedure can be applied as above, with the addition of a Service Isolation Valve installed externally in accordance with Section D6.

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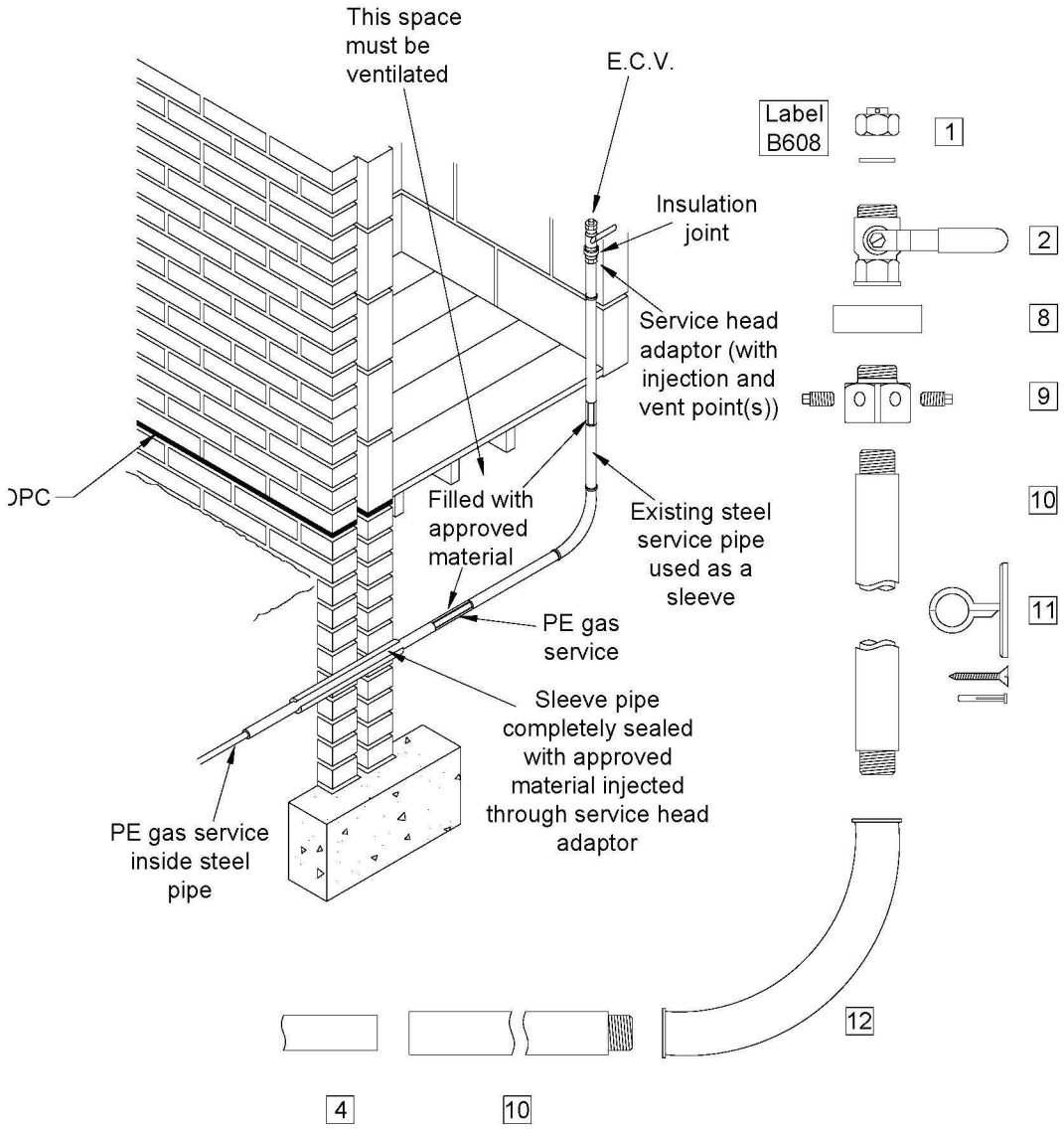

Figure D5 – LP PE service to internal position – Dead Insertion (Replacement)

No	ITEM
	Service Information Label (B608)
1	**Emergency Control Valve Cap**
	¾″ BS 746 Cap c/w Washer
	1″ BS 746 Cap c/w Washer
2	**Emergency Control Valve**
	¾ ″BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x 1″ BS 746 M c/w Handle (Ball)
4	**PE Inserted Pipe**
8	**Insulation Joints**
	¾″- BSPF/BSPF Fire Resistant
	1″- BSPF/BSPF Fire Resistant
	1 ½ ″ – BSPF/BSPF Fire Resistant
	2″ BSPF/ BSPF Fire Resistant
9	**Service Head Adaptors**
	16 mm x ¾″ BSPM x ¾″ BSPF
	16 mm x ¾ ″BSPM x 1″BSPF
	20 mm x ¾″ BSPM x 1″ BSPF
	20 mm x ¾″ BSPM x 1 ¼″ BSPF
	25 mm x ¾″ BSPM x 1 ¼ ″ BSPF
	25 mm x ¾″ BSPM x 1 ½ ″BSPF
	32 mm x 1″ BSPM x 1 ¼ ″Flex F/P
	32 mm x 1″ BSPM x 2″ Flex F/P
10	**Existing service pipe**
11	**Pipe Bracket (recommended)**
	¾″
	1″
12	**Slow bend**

D6 LP PE SERVICE TERMINATING IN BASEMENT CELLAR

NEW INSTALLATION

D6.1 General Requirements

1. Ventilation is required when installing a gas service that terminates in a cellar. Air bricks or floor vents have to be free from any obstruction or blockage and the customer informed of the need to maintain the air flow at all times.
2. The gap between pipe sleeve and wall shall be sealed.
3. The below ground entry fitting shall terminate as close as is reasonably practicable at the inner face of the property wall.
4. A service isolation valve shall be installed in the line of the service.

D6.2 Installation

1. The steel pipe inside the basement should be secured to the wall using steel pipe clips.

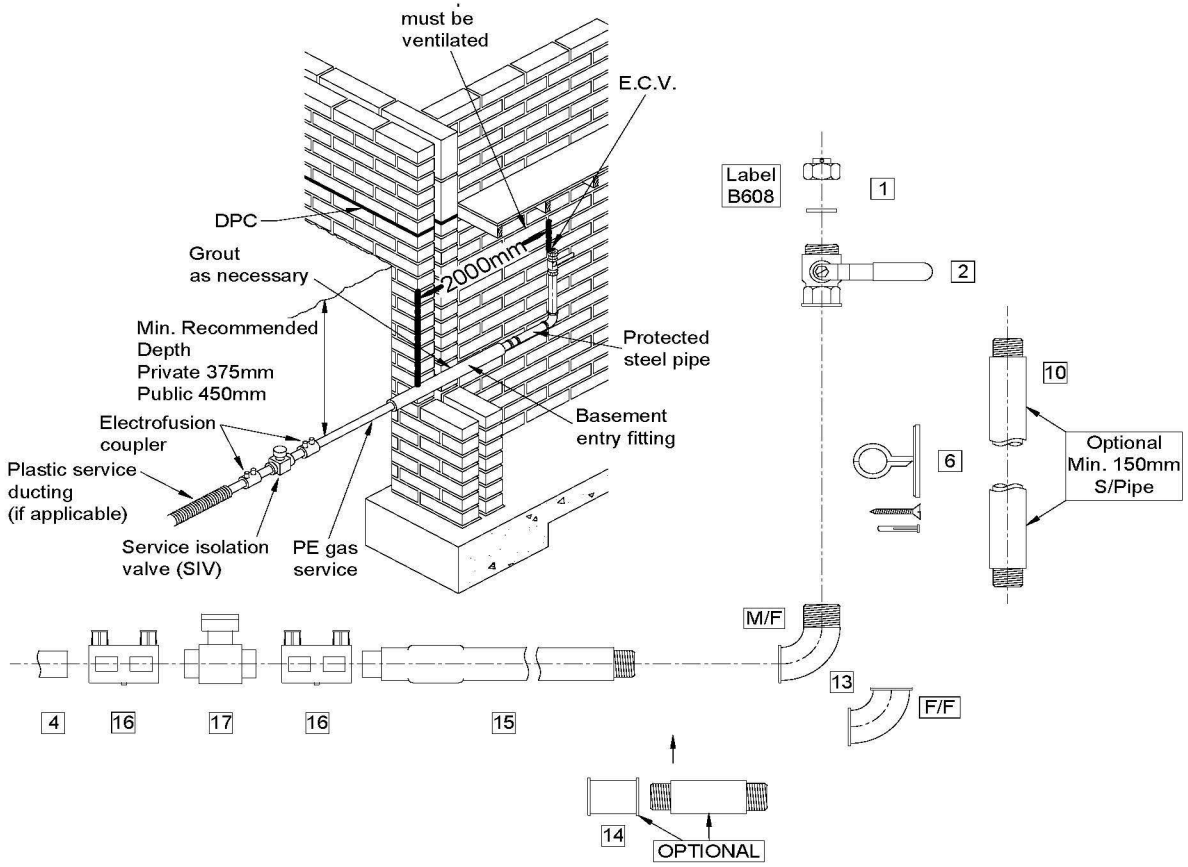

Figure D6 – LP PE service terminating in basement cellar (New Installation)

No	ITEM
	Service Information Label (B608)
1	**Emergency Control Valve Cap**
	¾″ BS 746 Cap c/w Washer
	1 ″BS 746 Cap c/w Washer
2	**Emergency Control Valve**
	¾ ″BSPF x ¾ ″BS 746 M c/w Handle (Ball)
	1″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x 1″ BS 746 M c/w Handle (Ball)
4	**PE pipe 20/25/32 mm**
6	**Pipe Bracket (recommended)**
	¾″
	1″
10	**Galvanized Pipe (3 metre length) Optional**
	¾″
	1″
13	**Galvanized Elbow**
	¾ ″BSPF / BSPF
	1″ BSPF / BSPF
	90° Elbow (M&F)
	¾ ″BSPM x ¾″ BSPF
	1″ BSPM x ¾″ BSPF
14	**Galvanized Socket Optional**
	¾″ BSPF / BSPF
	1 ″BSPF / BSPF
15	**Cellar Entry**
	25 mm x ¾″ BSPM x 500 mm
	32 mm x 1″ BSPM x 500 mm
16	**Electrofusion Coupler / Reducing Coupler**
	25 mm (40v)
	32 mm (40v)
	25 x 20 mm (40v)
	32 x 25 mm (40v)
17	**25 mm Service Isolation Valve (SIV).**
	32 mm S.I.V.

D7 LP PE SERVICE TO ABOVE GROUND ENTRY INCLUDING 63mm

D7.1 General Requirements

1. The gap between the house entry tee and the wall shall be sealed.
2. The correct size house entry tee shall always be used and not cut to size
3. The house entry tee shall be installed a minimum of 2 brick courses above the DPC.
4. The coating of the house entry tee should not be damaged while installing the fitting as this may result in future corrosion.
5. Always fit a Service Isolation Valve on 63mm factory fitted house entry tees (these do not contain integral plugs).
6. The house entry tee shall be checked to ensure that the Integral Stopper has been set to the fully open position

D7.2 Installation

1. Correctly sized core drills should be used to drill holes in the external and internal brickwork for house entry tees. Diameter hole to be drilled though brick wall construction:
    a. 35mm diameter hole for 20/25mm services,
    b. 45mm diameter hole for 32mm services and
    c. 80mm diameter hole for 63mm services.
2. House entry tees should be installed where a corbelled wall is present. The base of the house entry point should not be less than two courses above the top of the corbelled wall to allow the corbelled fitting to be fitted in accordance with Figure D7h.
3. Where the building construction involves a concrete raft, and there is not the recommended depth of cover between the concrete raft and proposed finished ground level (375mm), the developer should provide a slot or vertical channel in the raft to allow safe installation of the gas pipe. National Grid will not be responsible for breaking out the concrete rafts footings to provide a slot for the service pipe.
4. Internal retaining washers should be used with house entry tees to prevent movement of the tee away from the external wall.
5. Typical layout is shown is Figure D7f for sizes up to and including 32mm and Figure D7g for 63mm.
6. When tightening the ECV / elbow to the house entry fitting, the fitting should be held on the plain section of pipe adjacent to the threaded end. Due care should be taken not to damage protective coating on tee body when using Stillsons or grips when tightening fittings
7. 63mm factory entry tees do not have a PVC radius bend. The GRP sleeving should continue along the length of the service pipe and terminate below ground level.
8. Check that the house entry tee integral stopper is in the fully open position.

The following details the steps that shall be taken to ensure the stopper is not affecting the flow or pressure performance of the service and is always correctly located, refer to Figures D7a to D7e.

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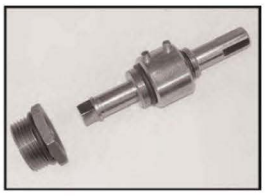
Figure D7a


Figure D7b


Figure D7c


Figure D7d


Figure D7e

Figure D7a: Crane Wask 20mm / 32mm Universal Gas Free House Entry Tee Key (WASK part nos BE0034) can be used on all sizes of tee to remove the outer cap and raise or lower the integral plug under no gas conditions SAP3487

Figure D7b: Alternative House Entry Tee Key 20mm SAP054
The depth of thread on the body of these keys is the same as that of the out cap. It is used to indicate the Integral stopper has been set in the fully open position

Figure D7c: Using the universal key the outer cap should be removed, ensure care is taken to prevent the loss of the “O” ring seal

Figure D7d: Slide the square of the key into the integral stopper. Slide the body of the key onto the house entry and tighten so that the “O” ring is flush with the tee housing. It is important to ensure the “O” ring is engaged to get a gas tight seal but primarily to set the position of the stopper when raised.

Holding the body of the tool rotate the key clockwise to lower the integral stopper plug or anticlockwise to lift the integral stopper. The integral stopper will meet the face of the body of the key when in the fully open position

Hold the key shaft to prevent it from rotating and undo the body of the key. This will then allow the tool to be removed without changing the position of the integral stopper

Figure D7e: The integral stopper has been set to fully open, the cap can now be replaced and tested for gas tight seal. The flow and pressure of the service can now be checked to ensure poor pressure was not a result of an incorrectly positioned integral stopper.

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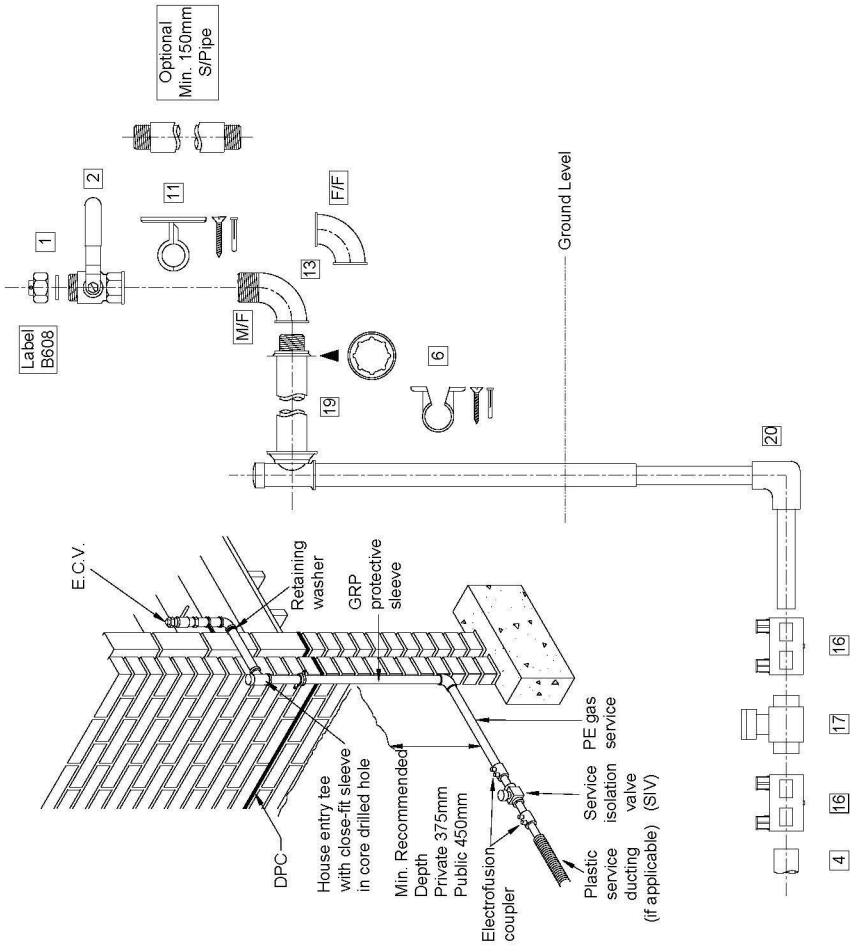


Figure D7g– LP PE (63 mm) service to above ground entry

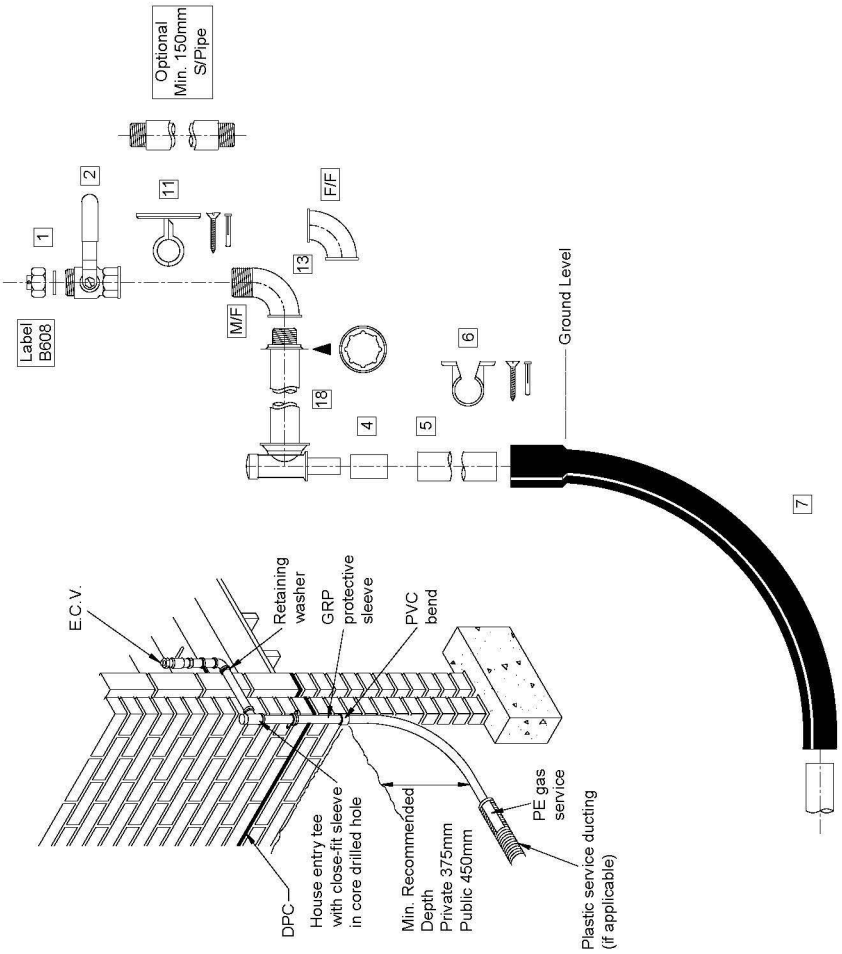
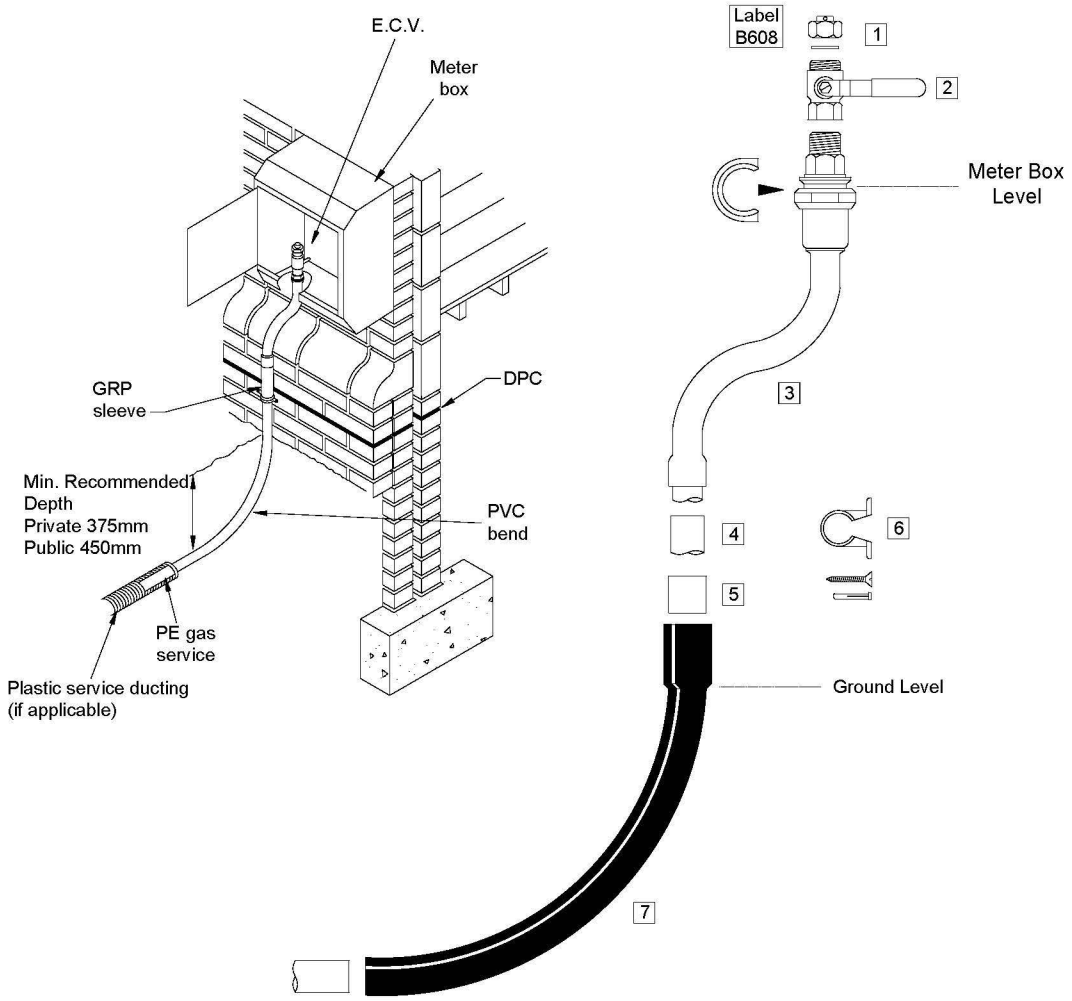


Figure D7f – LP PE service up to 32mm to above ground entry

No	Item
	Service Information Label (B608)
1	**Emergency Control Valve Cap**
	¾″ BS 746 Cap c/w Washer
	1″ BS 746 Cap c/w Washer
2	**Emergency Control Valve**
	¾" BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x 1″ BS 746 M c/w Handle (Ball)
	1 ½″ BSPF x 2″ BS 746 M c/w (Ball)
4	PE pipe 20/25/32/63 mm *
5	**GRP Sleeving (1 & 3 Metre Length)**
6	**Pipe Clip for GRP Sleeving (Optional)**
	GRP Sleeving for 20mm PE pipe
	GRP Sleeving for 32mm PE pipe
7	**PVC Preformed Bend**
13	**90° Elbow (M&F)**
	¾″ BSPF x ¾″ BSPF
	1″ BSPF x ¾″ BSPF
16	**Electrofusion Coupler / Reducing Coupler**
	25mm (40v)
	32mm (40v)
	63mm (40v) *
	Reducers
	32 x 25 mm
	32 x 20 mm
17	**Service Isolation Valve (SIV).**
	25mm
	32mm
	63mm *
18	**Above Ground House Entry Tee**
	20 mm x ¾″ x 155 mm BSPM
	20 mm x ¾″ x 345 mm BSPM
	20 mm x ¾″ x 500 mm BSPM
	20 mm x ¾″ x 610 mm BSPM
	20 mm x ¾″ x 900 mm BSPM
	32 mm x 1″x 345 mm BSPM
	32 mm x 1″x 610 mm BSPM
19.	**Factory Fitted House Entry Tee**
	63 mm x 2″ BSMP x 150 mm (Electrofusion) *
	63 mm x 2″ BSMP x 345 mm (Electrofusion) *
	63 mm x 2″ BSMP x 500 mm (Electrofusion) *
20	**90° PE Elbow**
	63 mm *

* 63mm diameter only applicable to Figure D7g.

Material Listings for Figures D7f and D7g



No	Item
	Service Information Label (B608)
1	**Emergency Control Valve Cap**
	¾″ BS 746 Cap c/w Washer
	1″ BS 746 Cap c/w Washer
2	**Emergency Control Valve**
	¾″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x 1″ BS 746 M c/w Handle (Ball)
3	**Corbelled meterbox fitting**
	20 mm x ¾" BSPF
	25 mm x ¾" BSPF
4	**PE pipe 20 mm/25 mm/32 mm**
5	**GRP Sleeving (1 & 3 Metre Length)**
6	**Pipe Clip for GRP Sleeving (Optional)**
	GRP Sleeving for 20 mm PE pipe
	GRP Sleeving for 32 mm PE pipe
7	**PVC Preformed Bend**

Figure D7h: LP PE service to above ground entry (Corbelled Walls)

D8 LP SERVICE TO GARAGE

D8.1 General Requirements

1. Services laid internally below ground shall be inserted in a steel sleeve or a prefabricated garage entry fitting.
2. The emergency control valve shall be positioned so that damage is avoided e.g. garage doors, vehicle entry etc
3. All above ground pipe work shall be constructed of steel and secured to the wall.

D8.2 Installation

1. Care shall be taken to ensure that the service pipe is securely fitted to the wall using the correct size pipe clips and that the meter position is clear of the doors at high level.

2. Where entry is by below ground method, a preformed transition fitting should be used.

3. Typical layouts are shown in Figure D8a and D8b

4. Figure D8 illustrates a service entry at low level, but a high-level service entry is the preferred option, due to less risk of interference damage.

5. Figure D9 illustrates a service entry below ground. The below ground entry fitting (bend) should be installed at the construction stage of the building prepared by the developer (this is usually undertaken at the planning stage by prior agreement with the developer)

6. Where the below ground entry bend has been used, check that the sleeved PE pipe is clear of the building line (this ensures that no PE pipe enters the building).

7. Below ground entry fitting (bend) are available in various lengths, therefore under no circumstances shall the fitting be cut.

8. When tightening the ECV / elbow to the house entry fitting, the fitting should be held on the plain section of pipe below the threaded end. Due care should be taken not to damage protective coating on tee body when using Stilsons or grips when tightening fittings.

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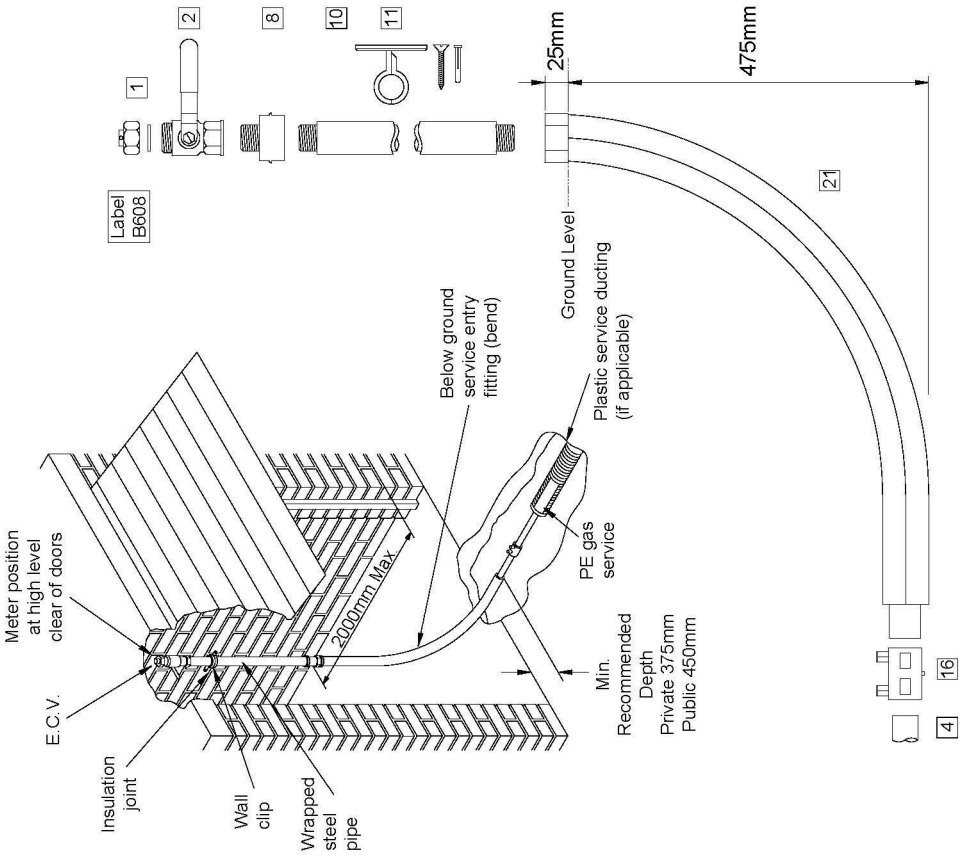

Figure D8b - LP service garage (New build)

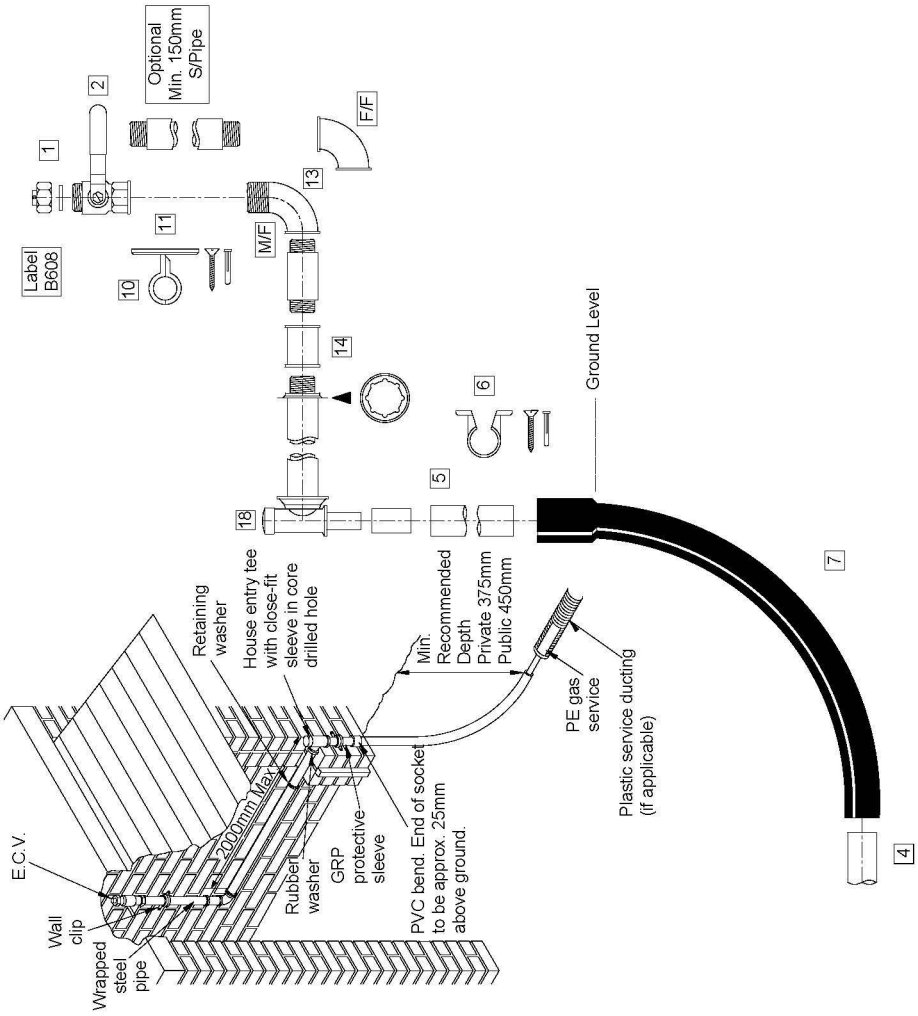

Figure D8a - LP service to garage (existing building)

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No	Item
	Service Information Label (B608)
1	**Emergency Control Valve Cap**
	¾″ BS 746 Cap c/w Washer
	1″ BS 746 Cap c/w Washer
2	**Emergency Control Valve**
	¾″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x 1″ BS 746 M c/w Handle (Ball)
4	**PE pipe 20 /25/32 mm**
5	**GRP Sleeving**
6	**Pipe Clip for GRP Sleeving**
7	**PVC Preformed Bend**
8	**Insulation Joint**
	¾″- BSPF/ BSPF Fire Resistant
	1″- BSPF/ BSPF Fire Resistant
	1 ½ ″ – BSPF/ BSPF Fire Resistant
	2″ BSPF/ BSPF Fire Resistant
9	No fitting
10	**Galvanised/Steel Pipe**
	1″
11	**Steel bracket for pipe**
13	**90° Elbow (M&F) & (F&F)**
	¾″ BSPF x ¾″BSPF
	1″ BSPF x ¾″ BSPF
14	**Galvanised socket**
	¾″ BSPF / BSPF
	1″ BSPF / BSPF
16	**Electrofusion coupler**
	20/25/32 mm
18	**Above Ground House Entry Tee**
	20 mm x ¾″ x 155 mm BSPM
	20 mm x ¾″ x 345 mm BSPM
	20 mm x ¾″ x 500 mm BSPM
	20 mm x ¾″ x 610 mm BSPM
	20 mm x ¾″ x 900 mm BSPM
	32 mm x 1″x 345 mm BSPM
	32 mm x 1″x 610 mm BSPM
21	**Below Ground Entry fitting (bend)**
	¾″ x 20 mm sizes 0.5m x 0.5m
	½″ x 25 mm sizes 1m x 0.5m
	¾″ x 25 mm sizes 1m x 0.5m
	1″x 32 mm sizes 1m x 0.5m

Material listings for Figure D8a & D8b.

D9 LP SERVICE TO BELOW GROUND ENTRY (SOLID FLOOR)

D9.1 General Requirements

1. For entries through solid floors, the service should enter the premises in accordance with Figure D9. The horizontal sleeve section should terminate in a 500 mm square hole in the floor of the premise
2. The below ground entry fitting (bend) shall be clear from the building line to allow external connection to the PE service pipe.
3. Under no circumstances shall the preformed steel bend be cut.
4. The gap between the steel bend and the wall shall be sealed.
5. This entry type should only be installed where a customer has requested it, and has agreed to arrange for a qualified tradesman to complete the building works necessary to allow National Grid to complete the installation of the pipework only.
6. Under no circumstances shall National Grid be responsible for excavation within a property to facilitate this installation.

D9.2 Installation

1. A typical layout is shown is Figure D9.

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No	Item
	Service Information Label (B608)
1	**Emergency Control Valve Cap**
	¾" BS 746 Cap c/w Washer
	1" BS 746 Cap c/w Washer
2	**Emergency Control Valve**
	¾" BSPF x ¾"BS 746 M c/w Handle (Ball)
	1" BSPF x ¾" BS 746 M c/w Handle (Ball)
	1" BSPF x 1" BS 746 M c/w Handle
4	**PE Pipe**
	20 /25 /32 mm
8	**Insulation Joints**
	¾" BSPF/BSPF Fire Resistant
	1" BSPF/BSPF Fire Resistant
10	**Galvanized Pipe (3 metre length)**
	¾"
	1"
16	**Electrofusion Coupler**
	20 /25 /32 mm
21	**Below Ground Entry fitting (Bend)**
	¾" x 20 mm sizes 0.5m x 0.5m ½" x 25 mm sizes 1m x 0.5m ¾" x 25 mm sizes 1m x 0.5m 1"x 32 mm sizes 1m x 0.5m

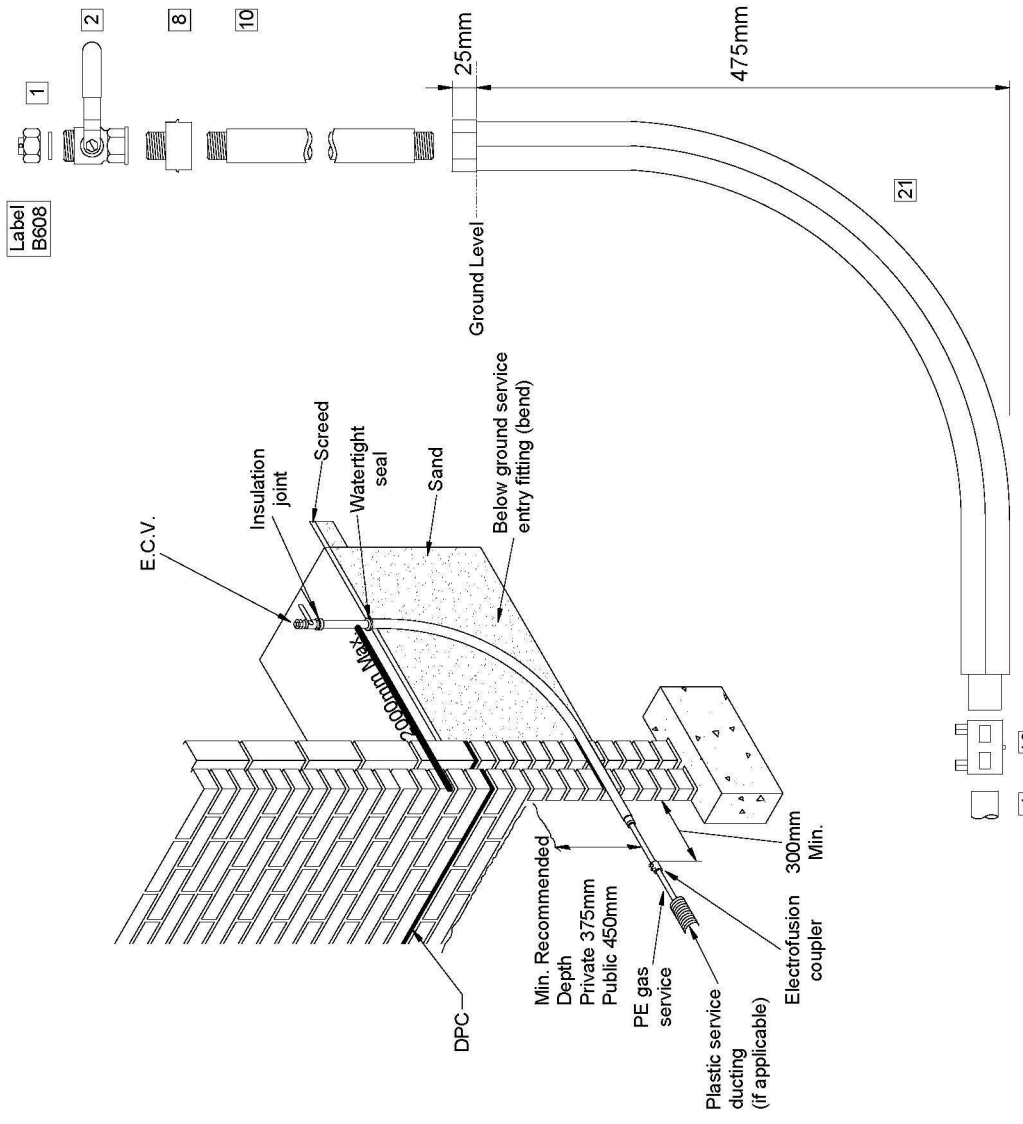

Figure D9: LP Service to Below Ground Entry (Solid Floor)

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D10 LP PE SERVICE PROTECTION FROM VANDALISM

D10.1 General Requirements

1. Where there is a serious threat of vandalism to an external service entry, or as part of the remedial work following interference damage, preference should be given to providing an internal meter position or where this is not possible, steel pipe should be used as shown in Figures D10a and D10b.
2. When tightening the ECV / elbow to the house entry fitting, the fitting should be held on the plain section of pipe below the threaded end. Stillsons or grips should not be used by holding the tee piece outside the building.

D10.2 Installation

1. The transition of the PE service pipe to the steel pipe above ground is made using a transition fitting that can be fixed against the wall just above ground surface level.
2. The steel pipe above ground should be supported using pipe clips.
3. Figure D10b illustrates the house entry tee with a screwed BSP thread to allow the steel riser to be connected.

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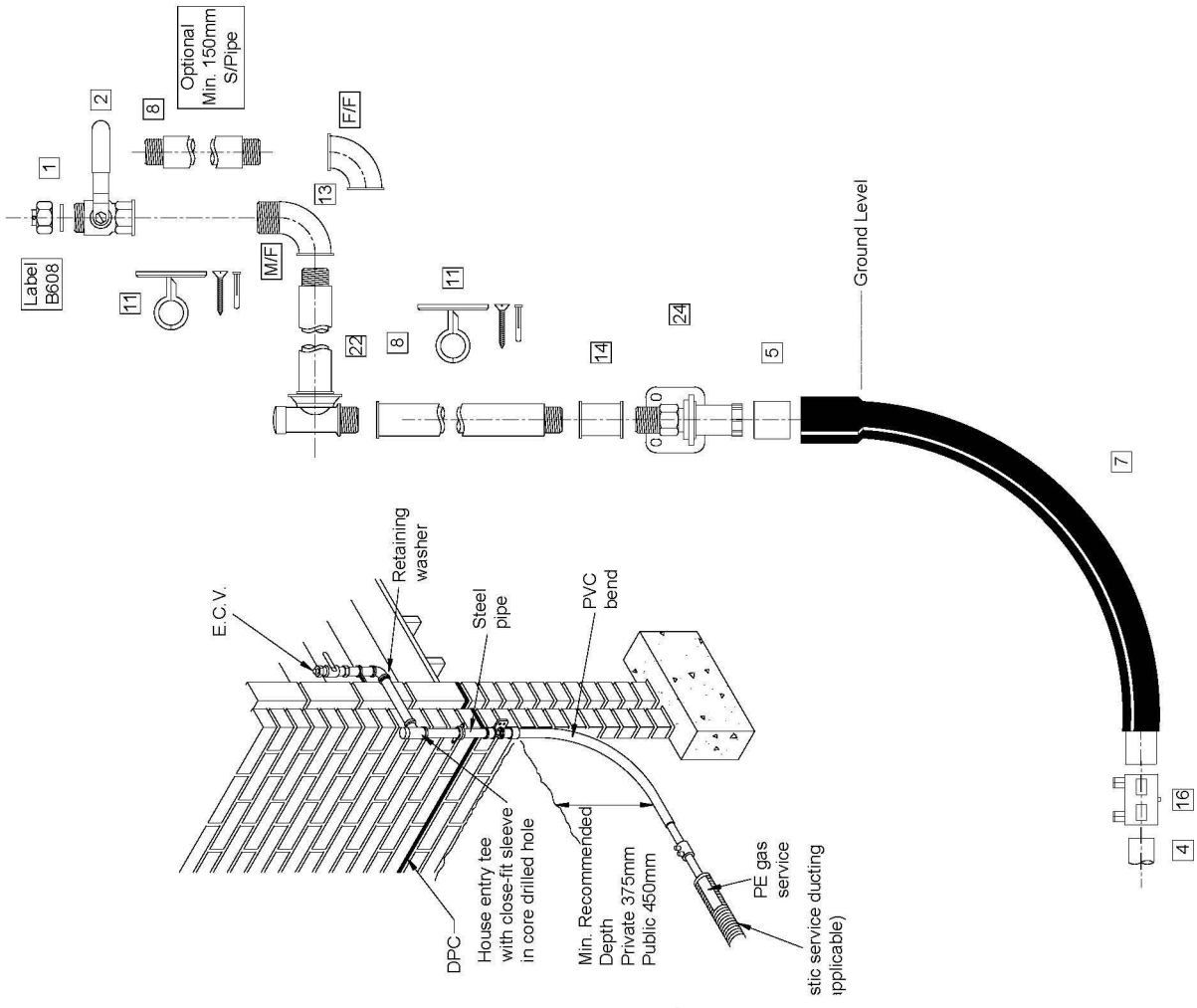

Figure D10b - PE service to above ground entry position

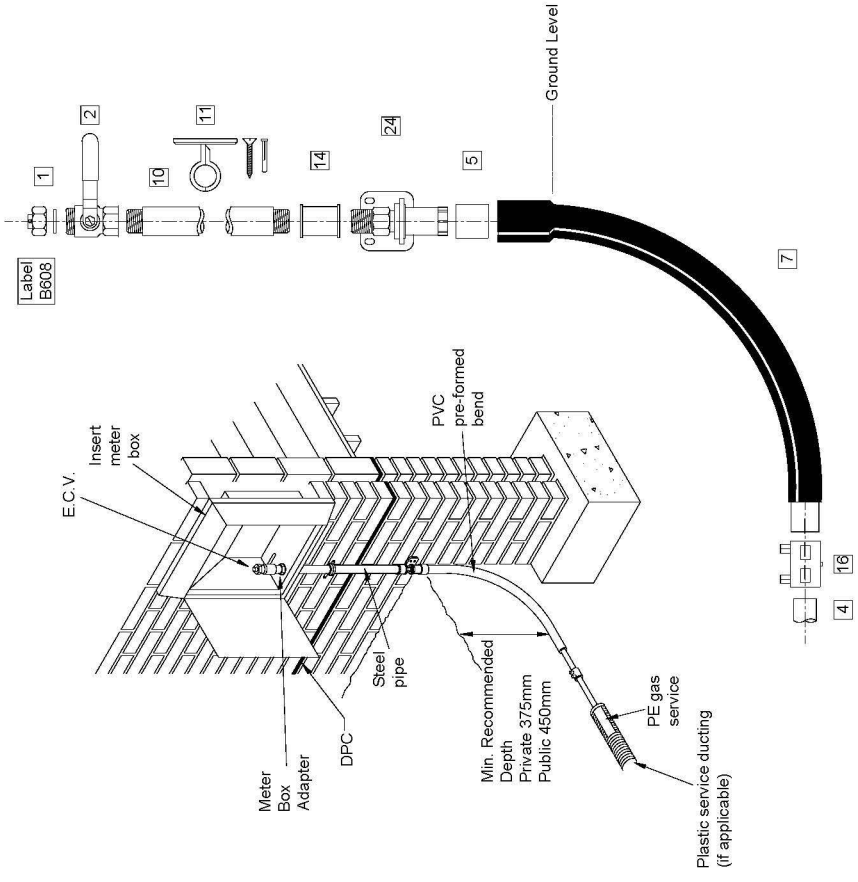

Figure D10a - PE service to inset meter box

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NO	ITEM
	Service Information Label (B608)
1	**Emergency Control Cap**
	¾″ BS 746 Brass Cap c/w Washer
	1″ BS 746 Brass Cap c/w Washer
2	**Emergency Control Valve**
	¾″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x ¾″ BS 746 M c/w Handle (Ball)
	1″ BSPF x 1″ BS 746 M c/w Handle (Ball)
4	**PE pipe 20 /25/32 mm**
5	**GRP Sleeving**
	GRP Sleeving for 20 mm PE pipe
	GRP Sleeving for 32 mm PE pipe
7	**PVC Preformed Bend**
10	**Galvanised pipe (3 metre)**
	¾″
	1″
11	**Pipe clip (Optional)**
14	**Galvanised socket**
	¾″BSPF x ¾″ BSPF
	1″ BSPF x ¾″ BSPF
16	**Electrofusion coupler**
	20/ 25 /32 mm
22	**Above ground house entry tee**
24	**Transition fitting**

Materials List for Figures D10a and D10b

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D11 MP PE SERVICE TO SURFACE MOUNTED / INSET MP METERBOX

D11.1 General Requirements

1. A service excess flow valve (SEFV) shall be installed at the outlet of the electrofusion tapping tee (Chapter C Figure C3) for domestic services up to and including 32 mm diameter.
2. If a service excess flow valve is not to be used i.e. commercial type properties, then a service isolation valve shall be installed in accordance with Chapter C, Figure C4.
3. The meter box shall be located on the external wall to the property with the edge of the meter box no closer than 0.18m from any opening, such as operable windows, doors, airbricks, balanced flues or similar breaches in the structure and 0.33m away from any electrical equipment.
4. The tip of the relief vent pipe shall not be located closer than 1.0 m to any opening into a property and a minimum distance of 1.5 m away from any electrical equipment, in accordance with Figure D11.
5. Meter boxes shall not breach the damp proof level – refer to Figure D3a.

D11.2 Installation of meter box (visual checks)

1. Reference shall be made to Appendix E for installation of meter boxes.

2. The meter box should contain a set of labels that indicate that:

    a. the ECV shall be opened slowly
    b. identifies the position of the vent pipe
    c. on a surface / inset mounted box, prohibits the removal of the rear knock out and identifies the pipe exit point.

3. For an inset meter box a visual inspection should be carried out before installing the service pipe:

    There shall not be any aperture or spigot constructed, or subsequently made, in the box that could allow gas to enter into any cavity or into the property. In particular, there shall not be any aperture constructed in the back of the housing for any purpose.

    Self adhesive labels shall be positioned inside the meter box as indicted in Figure D11a.

    Neither installation pipework nor cables shall enter the property directly from the meter box (i.e. installation pipework shall exit the meter box before entering the property – see Figure D11b).

    Inset meter boxes for MP installations shall not be secured by a method that involves breaching the box, e.g. securing with hammer fix screws is not allowed.

    A meter shall not be installed in an inset meter box with its main body damaged such that there is a risk that gas may enter the cavity or property.

D11.3 Installation of the service regulator

1. Only an OFGEM approved meter installer may work on the system downstream of the Emergency Control Valve. The MP regulator is now part of the meter installation.

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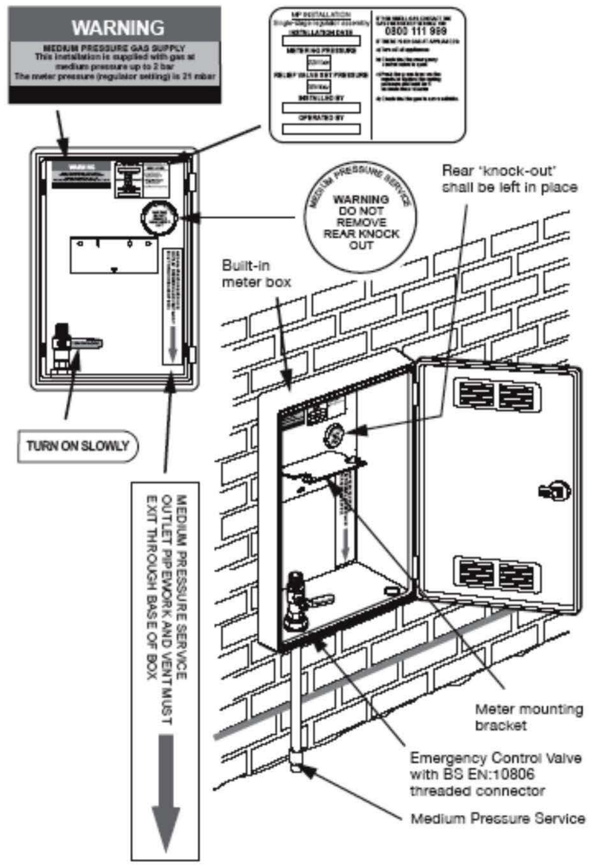

Figure D11a

Positioning of labels prior to installation of the meter.

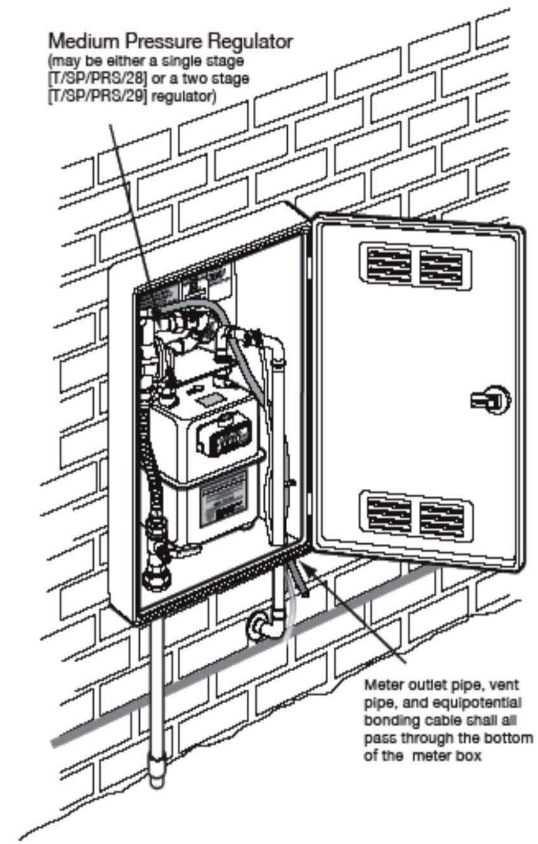

Figure D11b:

Installed meter with outlet pipe, vent pipe and electrical cross-bonding connection all exiting the box via a hole in the box's base.

NO	ITEM
	Service Information Label (B608)
1	**Emergency Control Cap**
	¾" BS 5200 Brass Cap c/w Washer
	1" BS 5200 Brass Cap c/w Washer
2	**Emergency Control Valve**
	¾" BSPF x ¾" BS 5200 M c/w Handle (Ball)
	1" BSPF x ¾" BS 5200 M c/w Handle (Ball)
	1" BSPF x 1" BS 5200 M c/w Handle (Ball)
3	**Meter Box Adaptor**
	20 mm x ¾" BSPM
	25 mm x ¾" BSPM
	32 mm x ¾" BSPM
	32 mm x 1" Galv BSPM
4	**20/25/32 mm PE Pipe**
5	**GRP Sleeving (1 & 3 metre length)**
6	**Pipe Clip for GRP Sleeving (optional)**
	GRP Sleeving 38 mm
	GRP Sleeving 38 mm
7	**PVC Preformed Bend**
23	**SEFV**
	32 mm SEFV

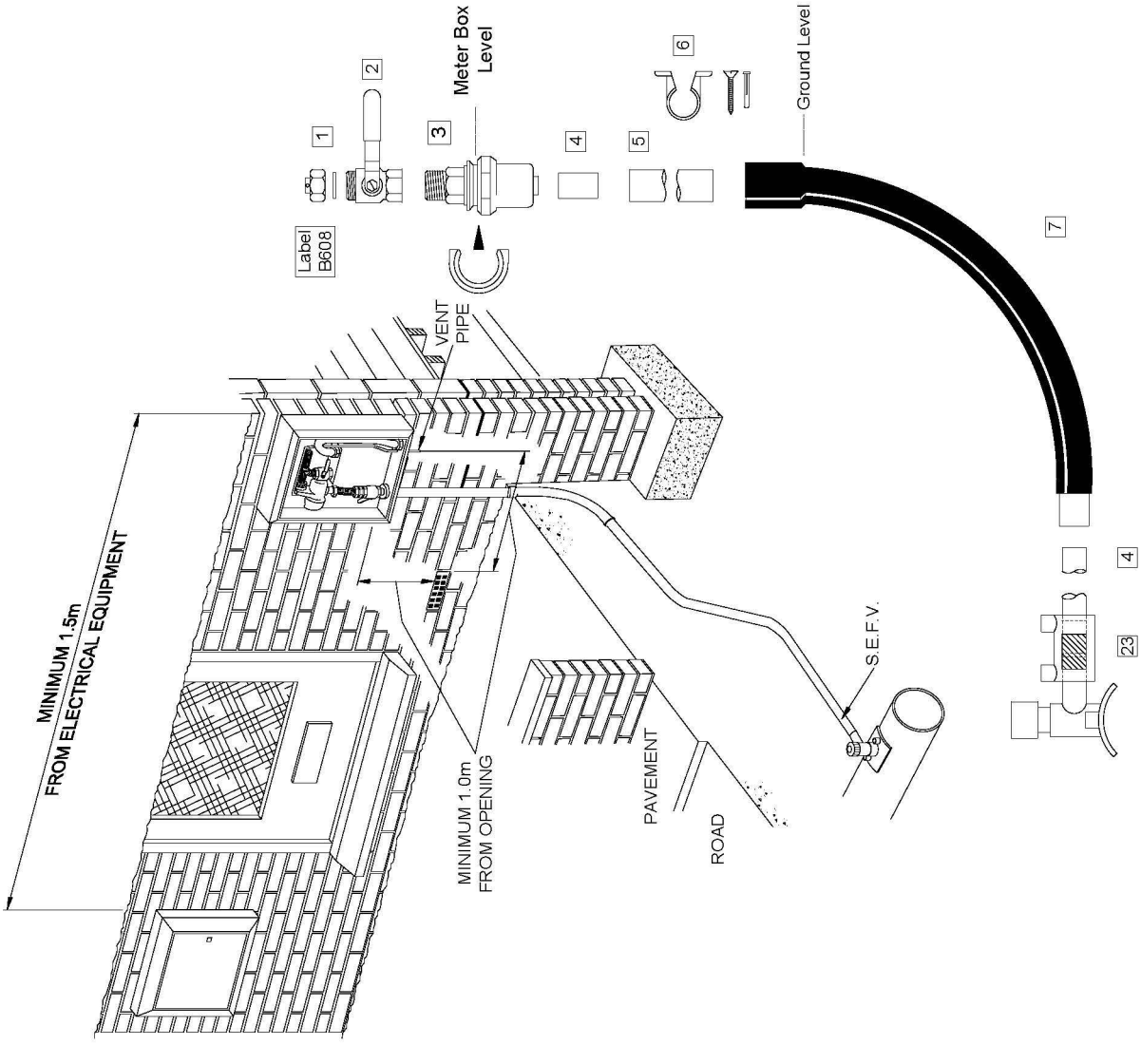

Figure D11 - MP PE service to surface mounted / inset meter box

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D12 MP PE SERVICE TO SEMI CONCEALED METERBOX

D12.1 General Requirements

1. A service excess flow valve shall be installed at the outlet of the top tee in accordance with Figure C3.
2. The meter box shall be located on the external wall to the property with the edge of the meter box no closer than 0.18m from any opening, such as operable windows, doors, airbricks, balanced flues or similar breaches in the structure and 0.33m away from any electrical equipment.
3. The tip of the relief vent pipe shall not be located closer than 1.0 m to any opening into a property and at least 1.5m away from any electrical equipment, in accordance with Figure D12.
4. Ensure the end of the vent pipe cannot be buried.

D12. 2 Installation

1. Figure D12 shows the layout.

D12.3 Installation of the service regulator

Only an OFGEM approved meter installer may work on the system downstream of the Emergency Control Valve. The MP regulator is now part of the meter installation.

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No	Item
	Service Information Label
1	**Emergency control valve cap & washer.**
	1″ x BS 5200 Brass Cap c/w washer
2	**Emergency Control Valve**
	¾″ BSPF x 1″ BS 5200 M Semi-Concealed (Ball) Emergency Control Valve
3	**Meter Box Adaptor**
	20 mm x ¾″ Semi-Concealed
	25 mm x ¾″ Semi-Concealed
	32 mm x ¾″ Semi-Concealed
4	**20/25/32 Pipe**
5	**GRP Sleeving**
7	**PVC Preformed Bend**
23	**SEFV**
	32 mm SEFV

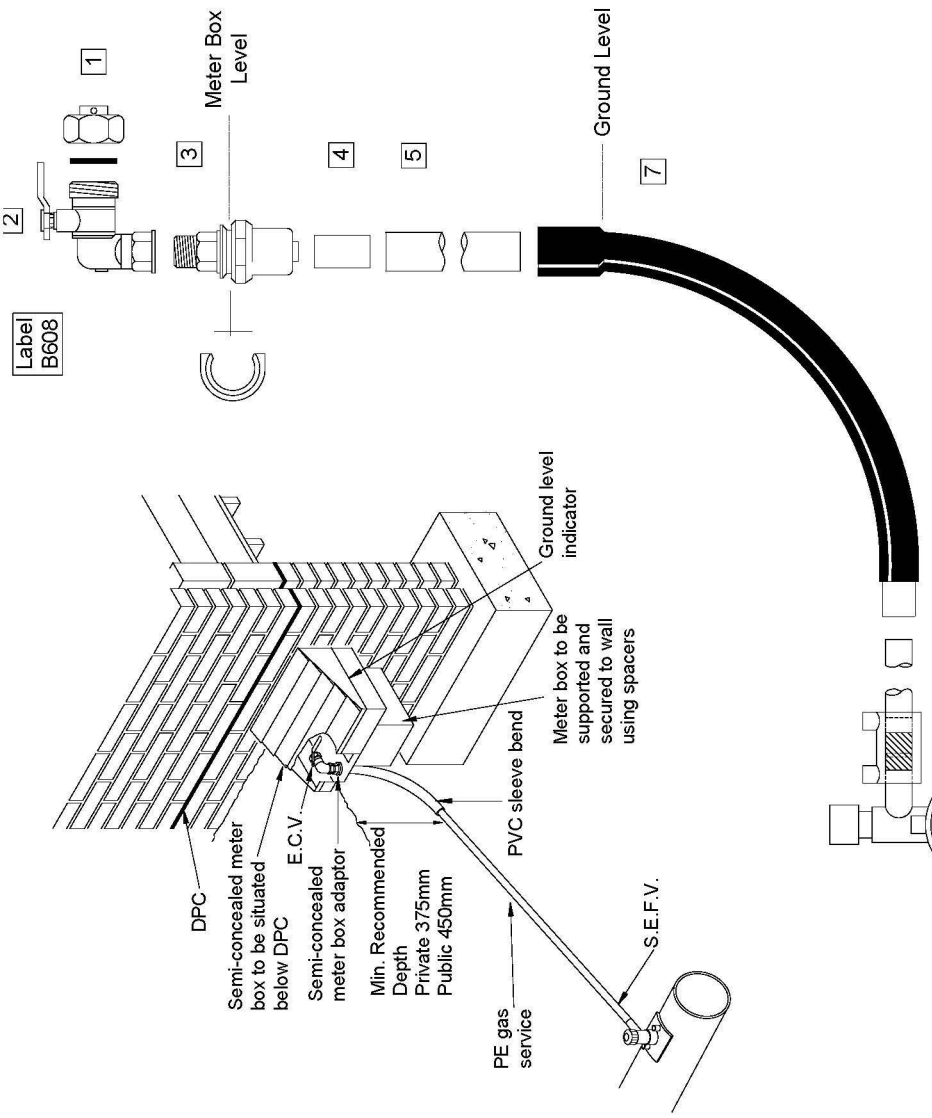

Figure D12 - MP PE service to semi concealed meter box

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D13 MP SERVICE - BOUNDARY SERVICE REGULATOR

D13.1 General Requirements

1. MP services require a regulator to provide a low-pressure (below 75mbar) outlet supply.
2. Fixed ventilation is provided through the walls or roof of the regulator and this shall not be blocked, restricted or sealed. Ventilation provided shall not be less than 2% of the floor housing area.
3. The installation shall be a minimum of 3 metres from inhabited buildings, but as close to the property boundary as possible on private ground.
4. The regulator shall be installed and commissioned by a competent operative
5. A service excess flow valve (SEFV) shall be installed at the outlet of the service tee

D13.2 Installation

1. Check the regulator assembly for obvious signs of damage (contact an Operational Manager if damage is found).
2. Check the assembly is free from debris or other foreign matter, e.g. Swarf, PTFE or jointing compound.
3. PE / Steel transition fittings should be used on the inlet and outlet to the regulator in accordance with Figure D13.
4. Mark the finished surface level of the installation onto the entry and outlet pipework as per manufacturers' instructions.
5. Position the assembly in the excavation, vertical and level, backfill and compact to finished level.
6. Place the concrete pre-cast kiosk base over the installed regulator and check for level.
7. Fit the kiosk onto the base and check for level. Alter level if required.
8. Disconnect the service regulator to facilitate the inlet and outlet pipework pressure tests in accordance with Chapter E3.
9. Where gas to the property(s) is not required immediately, the ECV shall be capped off and secured.
10. A trained and competent operative shall carry out testing & commissioning of the regulator.
11. Check the outlet pressure is correct at the ECV prior to leaving site.

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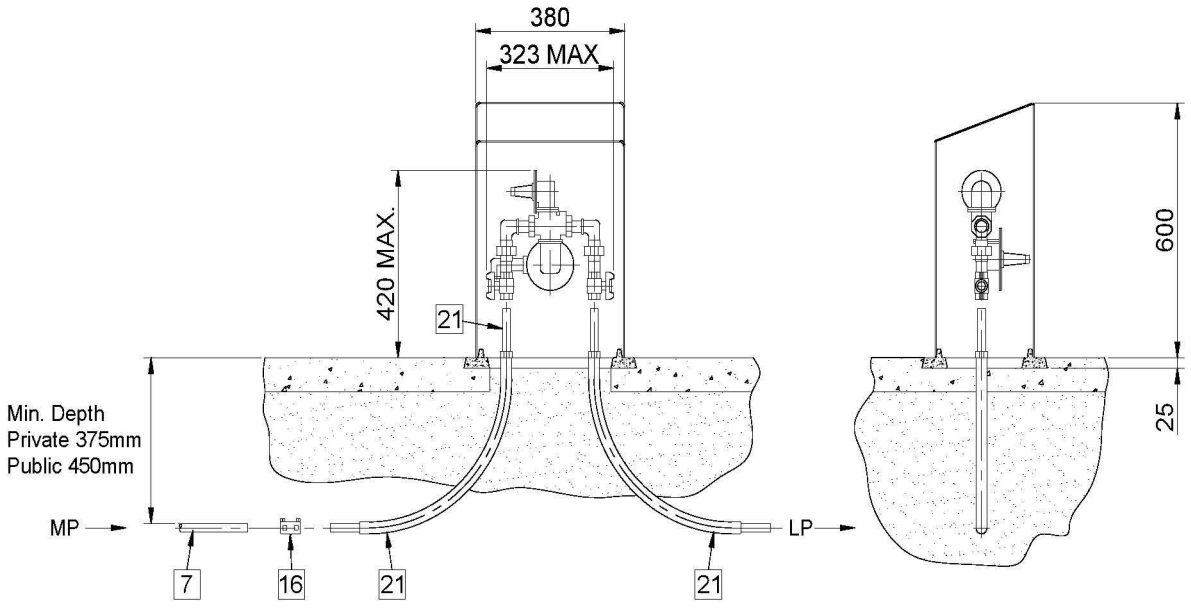

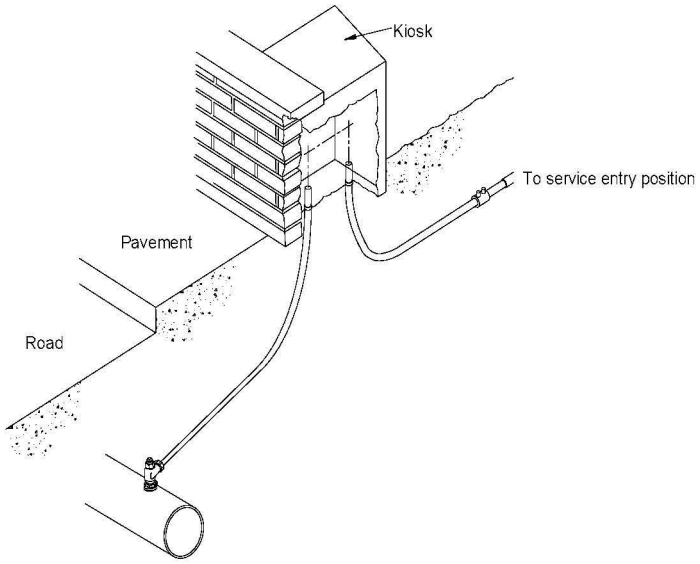

Figure D13 - MP Service - boundary service regulator

No	Item
	Service Regulator
7	**PE Service Pipe 25 /32 mm**
16	**Electrofusion coupling 25 /32 mm**
21	**PE Below ground entry fitting (bend)**
	¾″ x 20 mm sizes 0.5m x 0.5m ½″ x 25 mm sizes 1m x 0.5m ¾″ x 25 mm sizes 1m x 0.5m 1″x 32 mm sizes 1m x 0.5m

Material listing for Figure D13

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SERVICE INFORMATION LABELS

D14.1 General Requirements.

An Emergency Control Valve shall be installed and labelled as per Figure D14a at the end of all new and replacement gas services. The service information label (B608) shall be completed on site at the time of the installation of the service pipe and attached to the inlet side of the ECV; the mandatory information is detailed in Figure D14b.

Label information will depend on the type of service activity being undertaken: -

1 – New build

Information in boxes 1-5 in Figure D14b will be completed and provided as part of the job pack issue. Operatives shall complete the remaining information.

2 – Replacement

Operatives will need to complete any of the information not provided as part of the job pack.

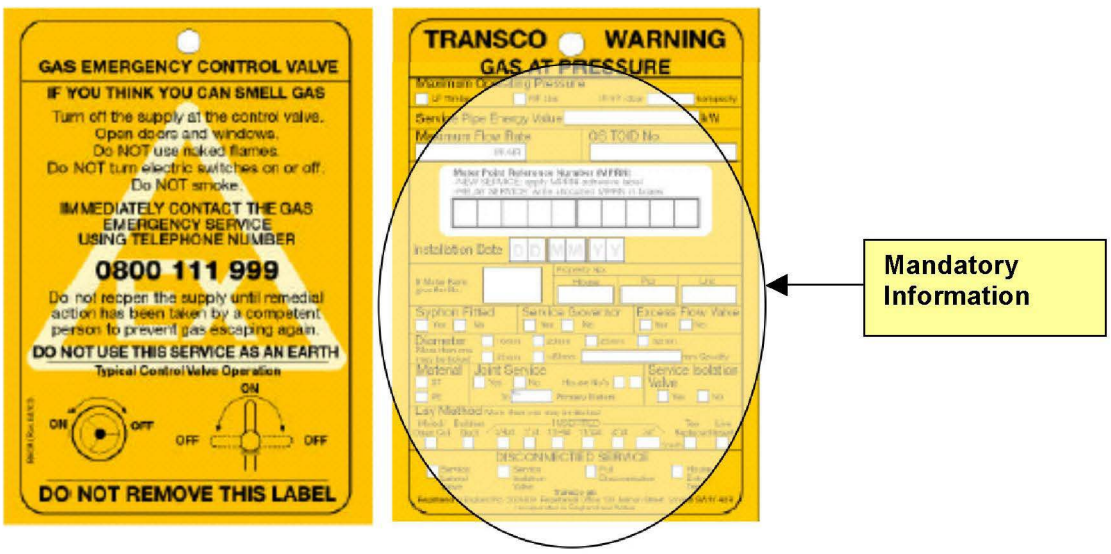

Figure D14a - Emergency Control Valve and Service Information Label

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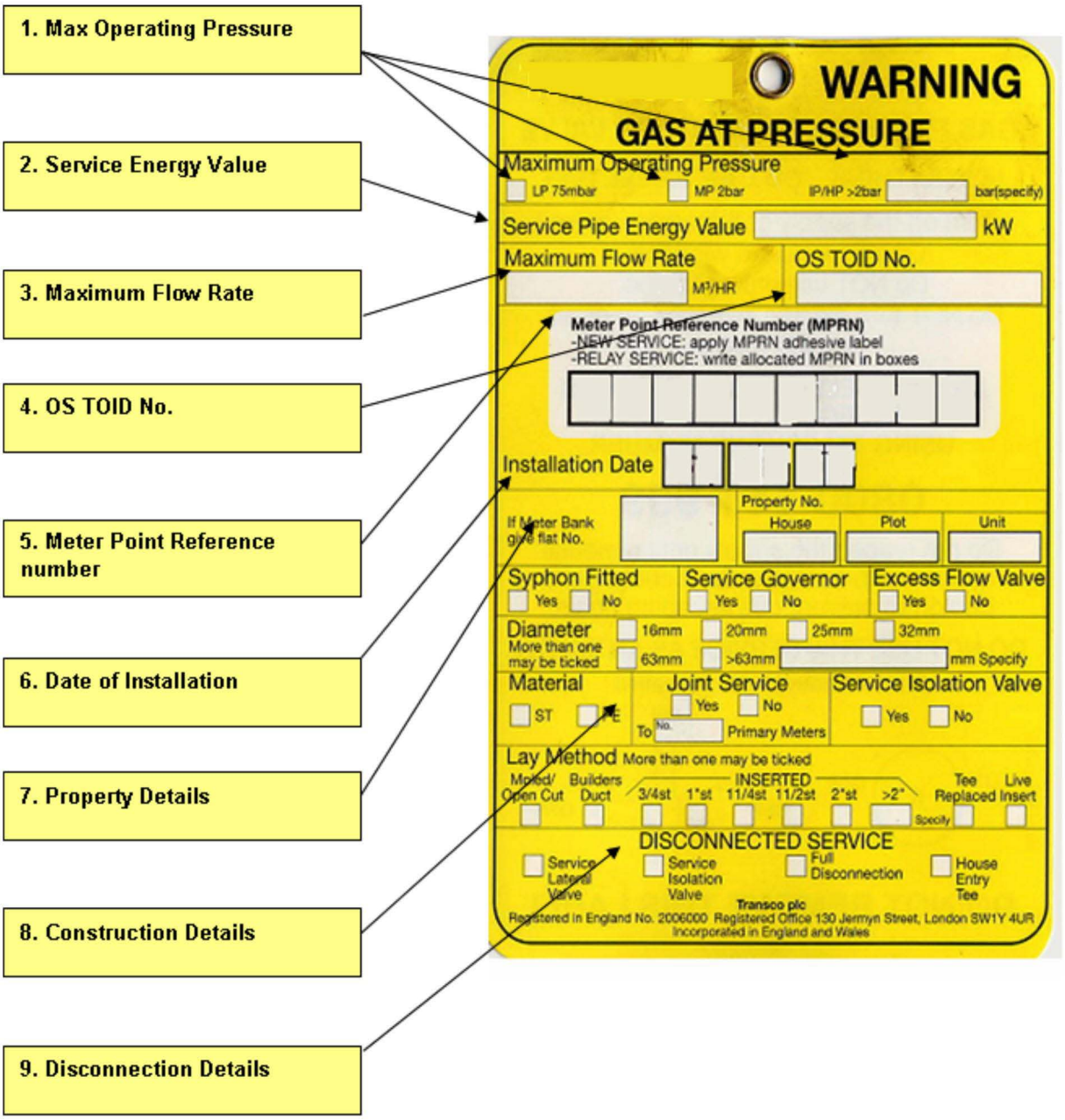

Figure D14b – Example of Service Information Label

D14.2 Section Information for service label

The following information should be completed in the fields on the service label by either tick boxes or entering information. Please note that Figures 14a and 14b are only shown as examples and may be subject to changes.

1. **Maximum Operating Pressure: (Tick box)**

   LP Services operating up to 75mbar
   MP Services operating between 75mbar and 2bar

Note: Medium Pressure networks can operate up to 5 different pressure tiers. These shall be stated in the job pack or identified for you on the label. The pressure tiers will be identified by the lowest operating pressure in mbar (the small figures shown below):

For MP Meter Installations
MP35 ☐ MP65 ☐ MP105 ☐ MP180 ☐ MP270 ☐

2. Service Energy Value: (Enter information).
Nominal Energy capacity KW of the gas service, calculated as part of the design of the service. This will be issued as part of the job instruction.

3. Maximum Flow Rate: (Enter Information)
Design Capacity in m^3 of the gas service, calculated as part of the design of the service. This will be issued as part of the job instruction.

4. OS TOID No. – Ordnance Survey Topographical Identifier: (Enter Information)
Ordnance Survey system for referencing geographical data. For future use.

5. Meter Point Reference Number (MPRN): (Enter Information)
All new services will have a MPRN, and will be allocated and registered at the time of installation. In the case of replacement services, the MPRN will be found on the meter.

Figure D15: Meter Point Reference Number (MPRN) Label

This label (Figure D18) is used to place over the relevant section on the information label titled Meter Point Reference Number.

6. Date of Installation: (Enter Information)
Completed on site at the time of installation in the format below.

DD/MM/YY

7. Property Details: (Enter Information)
House Number, flat number, plot number or unit number.

8. Construction Details: (Tick box)
Tick boxes to indicate the following information

- method of lay, if the following has been installed;
  - i. Service Syphon
  - ii. Service Governor
  - iii. Service Isolation Valve
  - iv. Service Excess Flow Valve
- The diameter and material of the service.
- If the service is a dual service and the number of primary meters installed.
- Lay Method.

9. Disconnection Details: (Tick box)
Tick box to indicate the means of service disconnection:
- Service Lateral
- Service Isolation Valve
- Full Disconnection
- House Entry Tee

CHAPTER E - SERVICE PRESSURE TESTING, PURGING, COMMISSIONING and RECOMMISSIONING

E1 SERVICE PRESSURE TESTING, PURGING, COMMISSIONING and RECOMMISSIONING

This section describes the process to be followed when undertaking pressure testing and commissioning/re-commissioning of low and medium pressure services.

E1.1 General

Table E1 identifies the pressure testing requirements for low and medium pressure services.

Type of System	Working Pressure	Testing Pressure	Test Duration	Pressure Loss	Type of Test Gauge
Service	Low Pressure	100 mbar	5mins	Nil	Water based Manometer (U Gauge) or Electronic Tester
Service	Medium Pressure	3 bar	5mins	Nil	Electronic Tester
Encirclement Fitting	Low Pressure	350 mbar	5mins	Nil	Electronic Tester
Encirclement Fitting	Medium Pressure	3 bar	5mins	Nil	Electronic Tester

Table E1 – Pressure Testing Requirements for Services

1. Any service diverted, altered or renewed shall be pressure tested.
2. Preference should be given to pressure testing from the mains connection back to the emergency control valve.
3. The emergency control valve shall be left in the open position and capped during the test.
4. A service being tested should not be subjected to any shock loading e.g. backfilling.
5. A visual check should be made to ensure that there are no other live gas services within the premises prior commissioning the new service.
6. A service laid to replace existing supplies should not be commissioned until the old service, or that part of the old service, which is unique to the premises, is cut off and permanently isolated (see Chapter A6 Service Cut Off's).
7. Following commissioning, the pressure at the ECV shall be recorded on the service information label.

E2 SERVICE TESTING PROCEDURE

For low rise premises supplying up to 2 ECV's, the service should be tested as follows:

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E2.1 Low Pressure Service

1. The service shall be tested. The test equipment used for all low pressure service testing is shown in Figure E1 and Table E2.

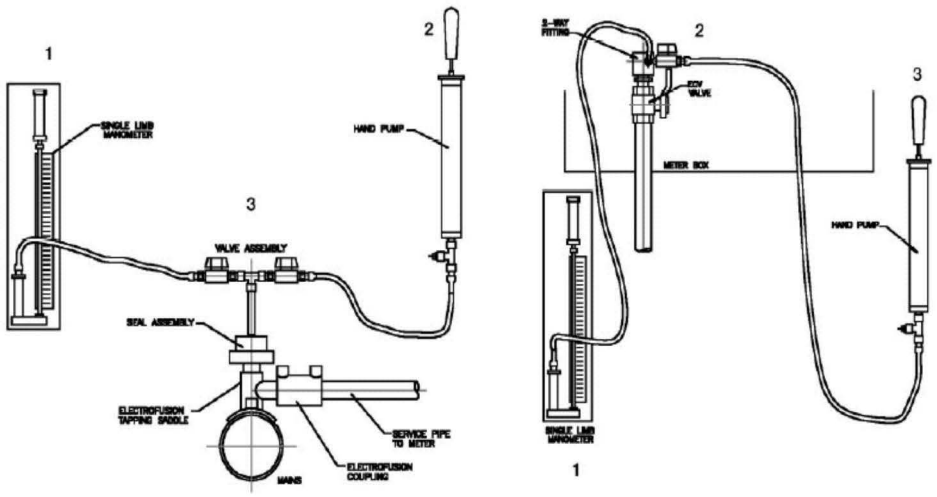

Figure E1- LP Service Test Equipment

No	ITEM
1	Manometer
2	Hand pump
3	Universal test equipment

Table E2 - LP pressure test parts list

2. The opposite end of the service to the test apparatus shall be securely blanked or capped.

3. Air should be introduced slowly using a hand pump through the test apparatus attached either to the emergency control valve or the mains service tee as shown in Figure E1. The valve to the hand pump should be closed when the pressure on the gauge has reached a minimum of 100mbar in accordance with Table E1.

4. No temperature stabilisation period is required.

5. The test period shall be 5 minutes and no perceptible pressure loss is allowed. Pressure gauges should not be positioned in direct sunlight as this can have an effect on the accuracy of the pressure reading.

6. Test all exposed fittings and joints with leakage detection fluid and rectify leaks as necessary.

7. If the test is applied from:
   a. the emergency control valve – close the ECV and disconnect the pressure gauge to reduce the reading to zero. Apply leakage detection fluid to bore of valve. Fit cap to ECV, slowly open valve and check for leakage. Close ECV.

   b. the mains connection – open the ECV and check cap for leakage.

Note: The ECV shall be replaced if leakage is found, when testing bore of valve or external cap and the complete service test completed.

8. On completion of a successful test, close the emergency control valve.

9. The test pressure should be released from the end of the service opposite to where the test apparatus was connected in order to prove the whole service was tested and free from blockages.

10. Care should be taken when venting the pressurised air does not come into contact with exposed hands or face may cause injury.

11. The service(s) should be immediately purged and commissioned in accordance with E3.

12. Complete all relevant job documentation including the Service Information label.

E2.2 Medium Pressure Service

Operatives qualified to GN02 status undertaking the testing of Medium Pressure services will need to have undertaken additional training and assessment to cover this activity as it was not included in the GN02 qualification.

1. The MP Service should be tested **from the main to the inlet valve of the service governor**, which is open and securely capped. The inlet valve will either be: -
    a. If fitted to a Meter Box Regulator - emergency control valve. (ECV)
    b. If fitted to a Boundary Regulator - pressure regulator inlet isolation valve. (PRIIV)

2. The test equipment should be installed on the mains connection.

3. Air shall be introduced slowly into the service via a hand or foot pump.

4. A test pressure of 3bar shall be applied. No temperature stabilisation period is necessary.

5. The test shall be maintained for a period of 5 minutes with no pressure loss allowed.

6. Test all exposed fittings and joints with leakage detection fluid and rectify leaks as necessary.

7. On completion of a satisfactory test, close the inlet valve of the service governor.

8. The test pressure should be released from the opposite end to where the test equipment was installed in order to prove the whole service was tested.

9. Care shall be taken when venting the pressurised air to ensure it does not come into contact with exposed hands or face may cause injury. (If the ECV is opened too fast, the SEFV (where fitted) will close).

10. Low Pressure outlets from external positioned regulators shall be tested in accordance with section E2.1 - Low Pressure Service.

E2.3 PE ToppTee Service fitting (Metallic Mains)

This section describes the process to be followed when pressure testing and commissioning a low pressure service that has been connected to the main via a Topptee fitting. Additional information related to this fitting is contained within Section A3.6

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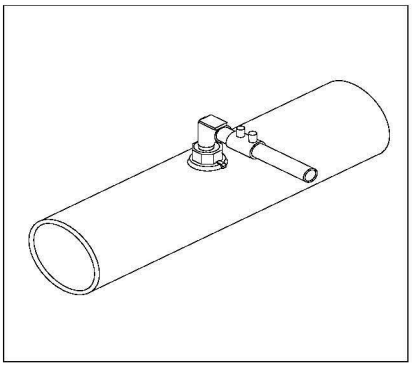

Figure E2 PE ToppTee Service Fitting

E2.3.1 Ensuring that there are no blockages in the service pipe

Note: To be undertaken before service pipe connected to fitting.

1. Pressure test equipment should be fitted to the emergency control valve.
2. A pressure test end incorporating a release valve should be fitted to the tail of the PE service pipe at the position of the main connection.
3. The ECV shall be in the open position.
4. Air should be introduced slowly under controlled conditions into the service via the pressure test equipment at the ECV.
5. The pressure in the service shall be raised to a nominal pressure of 100mbar.
6. Release the pressure from the valve at the mains connection end and cause instantaneous loss of pressure in the service pipe.

E2.3.2 ToppTee Pressure Test

Note: to be undertaken following jointing of the service pipe to fitting.

1. On successful completion of E2.3.1 the pressure in the service shall be raised back up to: a. 100 mbar for low pressure services.
2. No temperature stabilisation is required.
3. The test period shall be 5 minutes and no pressure loss is allowed.
4. On completion of the pressure test, close the emergency control valve, remove the pressure test equipment and check the ECV for let by in accordance Section E2.1 note 7. Should the ECV be passing, it should be replaced and the pressure test of the complete service carried out again.
5. Open the emergency control valve to vent the service pipe on completion of all tests.

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E3 SERVICE PURGING AND COMMISSIONING

E3.1 Low Pressure

Following a successful pressure test the service shall be commissioned. For a LP service follow the test procedure 'E2.' of T/PR/SL/1 and for MP services the test procedure in E2.2.

1. A flexible purge hose fitted with a flame trap **SHALL** be connected to the emergency control valve and the hose outlet positioned outside the premises away from any openings into the property such as windows, doors, airbricks etc and from any possible sources of ignition. The ECV shall be left in the closed position

The service shall be pressurised by one of the following:

- PE connections – drill the main with the integral cutter and withdraw it into the top of the tapping tee.
- Metallic connections - withdraw the integral plug into the top of the service tee.

2. An Operative should be positioned near the outlet of the purge hose and be able to communicate with an Operative positioned at the ECV.

3. Open the emergency control valve to allow a gas purge.

4 The purge shall be maintained until: -

a. Two successive tests confirm 90% gas in air (GIA) at the outlet of the purge hose using a Gascoseeker or other approved gas detection instrument;
Or
b. When the service has been purged with natural gas for one second for each metre length of service pipe not greater than 32mm diameter, and four seconds for each metre length for a 63mm diameter service.

5 When purging is complete, close the emergency control valve and remove the purge hose.

6. If a meter is not to be immediately connected the following shall be carried out:

- The emergency control valve shall be securely capped and sealed with the valve in the 'closed' position and the Temporary Continuity Bond (TBC) left in place.

Alternatively

- Where the TBC is required to be removed the procedure provided in 6.8.7- *Maintaining Electrical Continuity Following Replacement of Domestic Metallic Services* can be applied

7. Where a cap has been fitted the emergency control valve shall be opened and the cap checked for tightness with leak detection fluid..

6. Close emergency control valve and secure the handle with the restraint pin to make it inoperable.

7. Where a dual supply is to be purged the above procedure shall be carried out for both 'legs' of the dual service.

E3.2 Medium Pressure

The service shall be immediately purged and commissioned up to the inlet valve of the service governor or ECV.

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1. A flexible purge hose fitted with a flame trap **SHALL** be connected to the emergency control valve and the hose outlet positioned outside the premises away from any openings into the property such as windows, doors, airbricks etc and from any possible sources of ignition. The ECV shall be left in the closed position

The service shall be pressurised by one of the following:

- PE connections – drill the main with the integral cutter and withdraw it into the top of the tapping tee.
- Metallic connections - withdraw the integral plug into the top of the service tee.

2. An Operative should be positioned near the outlet of the purge hose and be able to communicate with an Operative positioned at the ECV.

3. Slowly open the inlet valve of the service governor / ECV.

4. The purge shall be maintained until:

   a. Two successive tests confirm 90% gas in air (GIA) at the outlet of the purge hose using Gascoseeker or other approved gas detection equipment;
   Or
   b. When the service has been purged with natural gas for one second for each metre length of service pipe not greater than 32mm diameter, and four seconds for each metre length for a 63mm diameter service.

5. Close the inlet valve of the service governor / ECV on completion of the purge and allow the service to pressurise.

.

N.B – Where a service excess flow valve has been fitted, allow time for gas pressure to build up in the service to the ECV or inlet valve of regulator. The time needed for the pressure to build depends on the length of service and should be in accordance with Table E3 below.

Pipe pressure / mbar	Length of service line / m					
	5	10	15	20	25	30
75	10 sec	15 sec	25 sec	30 sec	40 sec	50 sec
2000	50 sec	100 sec	150 sec	190 sec	240 sec	290 sec

Table E3 – Indicative time allowed for gas pressure to build up in the service pipe

6. A check should now be undertaken to prove the safe operation of the SEFV.

7. The inlet valve to the service governor / ECV should be quickly opened and gas allowed to vent through the purge hose. Gas flow should decrease, which confirms successful operation of the SEFV. The SEFV should shut down and stop the flow of gas. If there is no reduction in gas flow, the SEFV has failed to close. The service should be isolated and the SEFV replaced. A further pressure test shall then be undertaken on the service and the commissioning repeated.

8. On confirmation that the SEFV has closed. The inlet valve to the service governor / ECV should be closed to allow the service time to re-pressurize. The time needed for the pressure build up can be found in Table 1.

9. Gradually open the ECV to confirm the SEFV has reset. The flow of gas should be constant.

8. If there is no or very little flow of gas from outlet of the hose then repeat step 8 onwards.

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9. If a meter is not to be immediately connected, close emergency control valve and secure the handle to make it inoperable.

10. In situations where a boundary MP regulator has been installed, always check that the minimum operating pressure is recorded at the ECV. Always confirm the operating pressure requirements with the competent person (if boundary regulator installed) before completing service information label.

11. Check the cap on the inlet valve of the service governor for leakage with leak detection solution.

E3.3 ToppTee Purging & Commissioning

1. Purging shall be accordance with section E3.1 Purging and Commissioning of Low Pressure Supplies.
2. On completion of purge, soap test on all new joints.

E4 DECOMMISSIONING

Meters with a capacity greater than 6m^3/h should be removed by suitably qualified staff in accordance with current metering procedures.

Before de-commissioning a service, any meters connected to that service shall be disconnected.

Meters of a capacity not exceeding 6m^3/h shall be disconnected as follows:

1. Prior to starting work the meter installation shall be checked with a Voltstick and a temporary continuity bond fitted.
2. The meter, meter regulator and semi-rigid connector should now be disconnected. If the meter is to be re-fitted immediately following the renewal of the service it should be capped and placed in a well ventilated area until it can be re-fitted. If the meter is not to be re-fitted it should be capped and returned to the depot.
3. The consumer's installation pipework shall be capped or sealed using an appropriate fitting.
4. Details of the removed meter, including site address, MPRN and supplier should be recorded and returned with job documentation.

After disconnecting the service to meter, an external cut off shall be carried out in accordance with Section A6.

E5 DECOMMISSIONING

E5.1 Recommissioning of service following Gas Safety (Installation & Use) Regulations 1998 Cut Off

Re-commissioning services which have been isolated using the house entry tee's shut off device, i.e. Gas safety cut off under the GS (I&U) Regulations 1998, where services are disconnected/isolated following the removal of a primary gas meter.

E5.1.1 Testing/Recommissioning of House Entry Tees (HET)

1. Check the ECV is in the closed position and remove the ECV cap.
2. Install test equipment onto the ECV. Figure E1.
3. Open the ECV and monitor for 'let by' across the closed house entry. See E5.1.3. There should be no pressure increase on the gauge.

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4. If there is a pressure increase the house entry tee cap should be removed and the shut office device checked to ensure that it is fully closed. If not fully closed, replace the HET cap and repeat above. If the HET shut off device is fully closed the HET should be replaced.
5. Remove house entry tee top cap or plug to gain access to the house entry tee's shut off device.
6. Lift the house entry tee's shut off device up to the fully open position.
7. Use approved leak detection fluid to test all joints and check the ECV for external leakage.
8. Conduct a 'let by' test on the ECV by closing the ECV and disconnecting the pressure gauge to reduce the pressure to zero. Reattach to monitor for 'let by' across the closed valve for 1 minute. There should be no pressure increase. If there is pressure increase the ECV should be replaced and service test repeated.
9. Use an approved gas detector to test the entry and exit points of the house entry tee through the wall.
10. There should be no visible signs of leakage and a reading of 0% LEL shall be obtained from all joints for the test to be acceptable.
11. If leakage is noted, the service shall be re-laid in accordance with Chapter B2.
12. Purge the service in accordance with Section E3.
13. Replace house entry tee cap/plug and test cap using approved leak detection fluid.
14. Replace the cap on the ECV and label service with service information label in accordance with D14.

E5.1.2 Testing/Recommissioning of Service Isolation Valves

The effectiveness of the "service isolation valve" seal should be established using a pressure gauge connected to the outlet of the ECV.

1. Check service isolation valve is closed.
2. Vent pressure to zero, close vent.
3. Connect test equipment as in Figure E1 to ECV.
4. Test integrity of service isolation valve using a let by test as accordance with Section E5.1.3. Monitor the pressure in the service for five minutes. No pressure increase is permissible.
5. Test 1 – Test the service for 5 minutes at 20mbar, No pressure loss or gain allowed.
6. Test 2 – Test the service for 5 minutes at 100mbar, No allowable pressure loss.
7. Conduct a 'let by' test on the ECV by closing the ECV and disconnecting the pressure gauge to reduce the pressure to zero. Reattach to monitor for 'let by' across the closed valve for 1 minute. There should be no pressure increase. If there is pressure increase the ECV should be replaced and service test repeated.
8. Any pressure loss detected or failure of the let by test, the service should be relayed and tested. Use an approved gas detector to test the entry and exit points of the house entry tee through the wall.
9. Use an approved gas detector to test the entry and exit points of the service to the property.
10. There should be no visible signs of leakage and a reading of 0% LEL shall be obtained from all joints for the test to be acceptable.
11. Purge the service in accordance with Section E3.
12. Replace the cap on the ECV and label service with service information label in accordance with D14.

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E5.1.3 Let-By Testing

To be used for Recommissioning and Decommissioning of services when the meter is being removed or is removed.

House entry tee

1. Remove the ECV cap.
2. Test the HET Cap on the above ground entry with approved leak detection fluid to ensure the stopper is not passing.
3. Connect the test equipment onto the outlet of the ECV.
4. Open the ECV and monitor the pressure in the water gauge until a stable reading is obtained.
5. Monitor pressure on the water gauge.
6. Allow 1 minute for stabilisation.
7. Monitor the water gauge for a further 2 minutes to ensure that there is no pressure gain.
8. If there is no pressure gain after 2 minutes then the test is successful. If there is a pressure gain then the test is unsuccessful and further investigations should be made on the cause of the test failure.
9. Carry out a final soap test on all joints or connections.

Service isolation valve

1. With service isolation valve in the closed position remove the ECV cap.
2. Connect the test equipment to the outlet of the ECV.
3. Open the ECV and monitor the pressure in the water gauge until a stable reading is obtained.
4. Close the SIV.
5. Monitor the pressure on the water gauge.
6. Allow 1 minute for stabilisation.
7. Monitor the water gauge for further 2 minutes to ensure that there is no pressure gain.
8. If there is no pressure gain after 2 minutes then the test is successful. If there is a pressure gain then test is unsuccessful and further investigations should be made on the cause of the test failure.
9. Carry out a final soap test on all joints or connections.

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APPENDIX A - JOINTING TECHNIQUES

INTRODUCTION

Standard jointing techniques are detailed within this Section, although minor deviations maybe required depending on the specific type of fitting. It is therefore important that manufacturers instructions, that are incorporated in the packaging, are observed at all times.

APPENDIX A1 - Cutting & Threading

Screwed Joints

The thread in use for tubes and fittings, where pressure tight joints depend on the thread, is the British Standards Pipe (BSP) thread to BS 21.

After the threads have been assembled hand tight, a tightening allowance of about 1.5 turns should be applied. Threads to be joined should be clean, dry and free from rust, dirt, oil and grease. If the joint is being remade or a fitting being reused, then any previously used jointing compound shall be removed. Pipes should be carefully & adequately supported. Over tightening joints gives no advantage in soundness or strength, and damage to the fittings will occur if this is done. Apply sealant to avoid leaks, unless it is specifically stated not necessary to do so..

Table AA1 and Figure AA1 give details of the overall lengths of thread to be made and the length that will be inserted into fittings.

Nominal bore of pipe	**19 mm ¾″**	**25 mm 1″**	**38 mm 1 ½″**	**50 mm 2″**
Length of male threads	20mm	21mm	25mm	28mm
Fitting engagement length (F.E.L)	14mm	14mm	20mm	22mm
Amount of thread showing	6mm	7mm	5mm	6mm
Number of threads per inch	14	11	11	11

Table AA1 - Thread Lengths

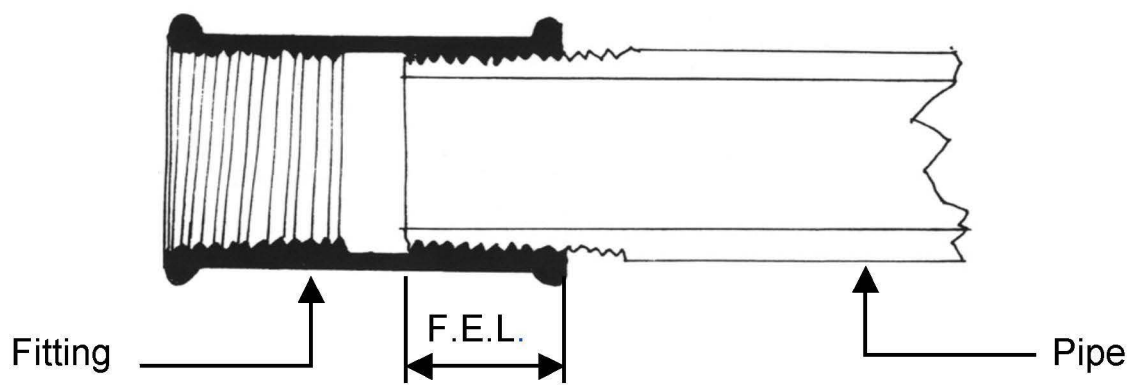

Figure AA1 - Fitting Engagement Lengths (F.E.L.)

Screwing pipe

Dies used for cutting threads on domestic installation pipes up to 25mm are usually solid block dies, held in ratchet stocks. Above this size the dies may be solid or adjustable up to 50 mm, above this size only adjustable are used.
Before beginning to thread the pipe it is essential to ensure that:

- The pipe has been cut square i.e. at right angles to the pipe.
- There are no burrs or obstructions on the inside or outside of the pipe.
- There is sufficient straight pipe behind the pipe end to accommodate the stocks and dies when the thread is fully made.
- The die block is clean, in good condition and fitted in the stock the right way round.
- The guide is a reasonable fit on the pipe. If this is too slack it will be difficult to ensure that the thread is cut parallel with the pipe, particularly with handed stocks.
- The pipe is fixed securely in a vice.
- A supply of cutting and threading lubricant is available.
- When cutting tapered threads the die block should be screwed on until the face of the die is flush with the end of the pipe.

Taps & Dies

Taps and Dies are very brittle and rough handling can easily chip the teeth (Figure AA2). The taps should be turned backwards frequently to remove the metal cuttings. The taps are easily broken and should not be forced. Always lubricate the cutting edges of taps and dies using oil or grease for steel.

Keep the dies and guides clear of swarf and clean off excess oil. Check that the vice is clean and firmly fixed.

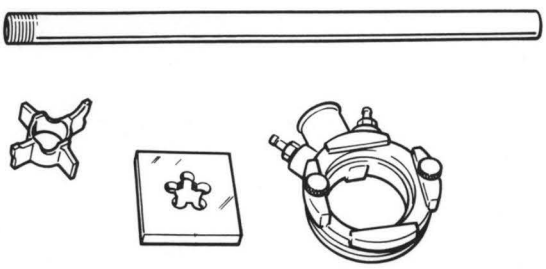

Figure AA2 - Taps & dies

Jointing Materials

Commonly Used Jointing Compounds approved for National Grid use: -

1. Boss Gastite (normally used on distribution and installation pipework)
2. Stag Plasticoll X 10g (normally used on higher pressures and on LPG work).
3. Stag Joint Paste Type B (normally used only on governor pipework)
4. Rocol Gas Seal (on gas appliances only).
5. Fernox Hawk White (normally used only on governor pipework)
6. PTFE tape (normally used only on governor and installation pipework)

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Note: Boss White shall not be used for Natural Gas and LPG Work.

ALSO SEE TABLE AA2 BELOW FOR APPLICATION.

Be aware that the maximum operating pressures given in Table AA2 are only guidelines from the manufacturer based on British Standards that they achieve in their tests. They will give no guarantees in the field as to MOP or leak-sealing as this primarily depends on the actual condition of paste/ tape, thread type, thread quality, method of installation and expertise of installer.

On existing natural gas low pressure systems there is only a need to use hemp reinforcement above 2" diameter or on the back-nuts of short-piece fittings (long threads). There may be a need on certain LP systems to use hemp reinforcement for extra joint strength but this should have been identified at the design stage.

Note: New installations shall not be threaded above 2in diameter.

Otherwise jointing shall follow manufacturer's recommendations for use and shall be applied to fill all the threads from start of thread to end of pipe. Pastes & compounds should be applied by brush or spatula as recommended avoiding any skin & eye contact as far as possible.

Paste-type compounds need stirring before use. If the paste has lost its consistency or has gone hard then it should be discarded in the correct way. Lids should be resealed as soon as possible before any hardening takes place as this reduces the sealing properties of the paste.

Product	Gas Application	Limitations	Comments
Boss Gastite Pipe Jointing Compound 400g tub to BS6956, Part 5 and BS EN 751	For thread sealing only up to 2bar on Governor small diameter pipework and up to 2bar and up to 2in diameter on distribution and installation pipework	Not on LPG in liquid state.	Hemp needed only on existing pipe diameters above 2", on short pieces; for example, long screws or where the design dictates necessary.
PTFE Tape 0.2mm thick X 12mm wide X 5m roll to BS6075, BS EN 751-3, BS 7786 grade H and BS 5292 type C	For thread sealing up to 2in diameter single wrap at 2bar	Up to 2in diameter pipe with single wrap	Governor pipework only. Shall **not** be used on the distribution system including service risers
Jointing Hemp Flex 250g hank	Only on LP natural gas on short pieces; for example, long screws, or where design requests it.	Not above LP natural gas or on LPG	Can be used on existing screwed pipework above 2" diameter
Jointing Spatula	For application of jointing pastes and compounds	-	-

Table AA2 – Current jointing pastes and compounds in use in National Grid Distribution up to 2bar applications

Note: Do not use jointing pastes or compounds on PE compression joints

APPENDIX A2 – DRAWLOCK FITTINGS

The installation of Drawlock fittings (available for 20mm, 25mm and 32mm PE pipe) see Table AA3, should be undertaken as follows: -

1. DRAWLOCK FITTINGS – METERBOX ADAPTORS

1.1 Preparation - PE Pipe

1. Cut the PE pipe so that the end is square and level with the bottom of the meter box and remove any burrs.
2. Wipe the PE pipe with a clean, dry cloth.
3. Inspect the pipe surface for defects
4. Mark the insertion depth onto the PE pipe. The correct insertion depths will be indicated on the protective packaging e.g. 14mm for 20mm pipe.
5. If excessive scratches or gouges are visible, cut off the defective length and repeat steps (1) to (3).

1.2 Preparation - Drawlock Fitting

1. Before removing the fitting from its protective bag check that it is the right type and size.
2. Remove the fitting and ensure that all components are included in the pack and not damaged.

1.3 Preparation - Drawlock tool

1. Remove the draw lock expander from the draw lock tool and check that it is the correct size for the fitting to be installed.
2. Clean and grease the threads on the draw lock tool to ease the drawing through of the expander.
3. Push the draw lock tool through the top of the fitting so that the threaded portion protrudes through the bottom.
4. Place the copper insert over the threads of the draw lock tool ensuring that the wider portion faces the nut at the top.
5. Replace the expander onto the bottom of the draw lock tool until it comes into contact with the copper insert. Ensure that the copper insert is located in the centre of the base of the fitting.

1.4 Installation

1. Push the black bend and GRP sleeve, (or in the case of a semi-concealed meter box the black sleeve only) over the end of the PE pipe to be connected to the draw lock fitting
2. Push the PE pipe into the fitting and over the draw lock tool until it bottoms in the fitting.
3. The fitting should not be rotated during or after assembly.
4. Using the correct spanner to stabilise the draw lock tool whilst holding the PE pipe secure, commence rotating the nut at the top of the draw lock tool in a clock wise direction.
5. Continue with (4) above until the draw lock tool passes through the fitting.
6. Locate the GRP sleeve or black sleeve over the base of the fitting.
7. Secure in position using the ‘C’ clip.
8. Complete assembly of service and pressure test in accordance with Chapter E of this manual.

Size
3/4" x 20mm
3/4" x 25mm
3/4" x 32mm
1" x 32mm

Table AA3 - Drawlock sizes

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2.0 DRAWLOCK FITTINGS – SERVICE HEAD ADAPTERS

Drawlock fittings for service head adapters allow a seal to be provided when a PE pipe has been inserted into a steel carrier pipe. Sizes available for PE diameters are 16mm, 20mm, 25mm and 32mm, refer to Table AA4.

The installation of these fittings is the same regardless of size, however, care should be taken to ensure the correct size Drawlock tool, adapter bush and expander is used. Figure AA3.

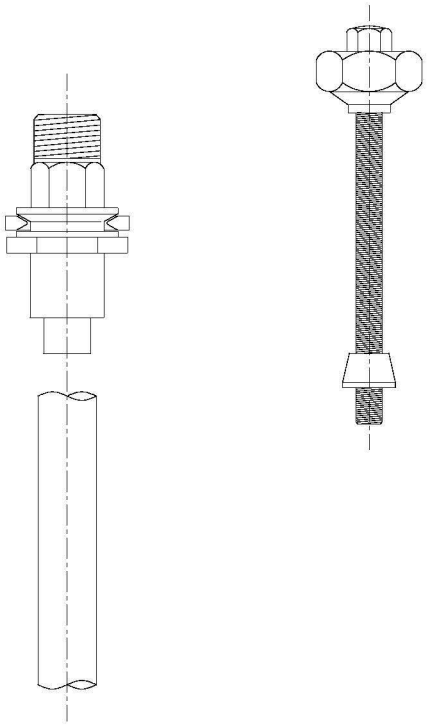

Figure AA3 - Typical Drawlock Fitting

2.1 Preparation – PE Pipe

1. Before cutting the PE pipe ensure that the PE pipe that has been inserted has relaxed and is not under any tension or strain. This will prevent any unwanted movement during and after connection of the fitting.
2. Cut off the PE pipe leaving 20cm above the end of the steel carrier pipe.

2.2 Preparation – Steel Carrier Pipe

1. Clean the threads of the steel carrier pipe.
2. Apply jointing paste to the threads of the steel carrier pipe.

2.3 Preparation – Service Head Adapter Fitting

1. Before removing the fitting from the protective bag, ensure that the fitting is the correct size, type and check that all components are present.
2. Remove the plastic protection caps and the Drawlock copper liner from the service head adapter.
3. Slide the service head adapter over the PE pipe and tighten fully onto the steel carrier pipe.

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2.4 Preparation Drawlock Tool

1. Remove the draw lock expander from the draw lock tool and check that it is the correct size for the fitting to be installed.
2. Clean and grease the threads on the draw lock tool to ease the drawing through of the expander.
3. Slide the Adapter bush over the end of the Drawlock tool (for 16mm fittings, ensure this is correct way round).
4. Slide the copper liner over the draw lock tool up to the adapter bush, ensuring that the wider end of the copper liner is closest to the adapter bush.
5. Screw the expander on to the Drawlock tool ensuring the tapered end is closest to, and touching the copper liner.

2.5 Installation

1. Once the PE has been checked for tension or strain, cut the PE flush and square with the end of the service head adapter and de-burr.
2. Insert the assembled Drawlock tool into the end of the PE until the adapter bush touches the top of the service head adapter. It is crucial that this is not forced, as unwanted movement of the PE could occur.
3. Using the correct size spanner, turn the nut on top of the draw tool in a clockwise direction, whilst exerting a slight downward pressure.
4. Continue turning until the Drawlock tool becomes loose and comes away from the service head adapter.
5. Remove the Drawlock tool and saw off the protruding copper liner and PE flush and square with the top of the service head adapter.
6. When fitting the ECV, ensure that the hexagonal part of the service head adapter is held with another tool to stop any unwanted movement of the fitting.

SIZES
16mm x 3/4" BSPM x 3/4" BSPF
16mm x 3/4" BSPM x 1" BSPF
20mm x 3/4" BSPM x 1" BSPF
20mm x 3/4" BSPM x 1.1/4" BSPF
25mm x 3/4" BSPM x 1.1/4" BSPF
25mm x 3/4" BSPM x 1.1/2" BSPF
32mm x 1" BSPM x 1.1/2" BSPF
32mm x 1" BSPM x 2" BSPF
20mm x 3/4" BSPM x 1" Flex F/P
25mm x 3/4" BSPM x 1.1/4" Flex F/P
32mm x 1" BSPM x 1.1/2" Flex F/P
32mm x 1" BSPM x 2" Flex F/P

TABLE AA4 – DRAW LOCK FITTING – SERVICE HEAD ADAPTORS RANGE

APPENDIX A3 - CRIMP FITTINGS

Crimp fittings are available for jointing PE pipe and are available for:

- House Entry Tees
- Meter Box Adaptors
- Above ground entries
- Wall mounted transition (for use with PE risers).

The installation of all the fittings (refer to Figure AA4 and Table AA5 - available for 20mm, 25mm and 32mm PE pipe) should be undertaken as follows.

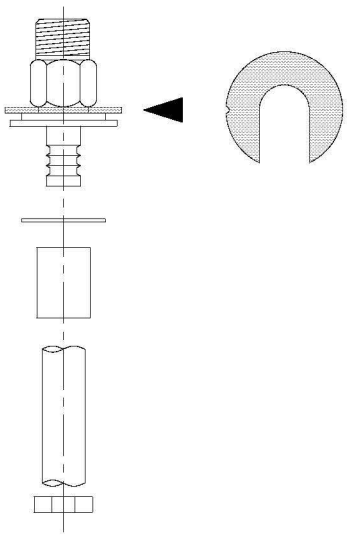

Figure AA4 - Typical Crimp fitting

1.0 Preparation - PE Pipe

1. Cut off the PE pipe so that the end is square and remove any burrs.
2. Wipe the PE pipe with a clean, dry cloth.
3. Inspect the pipe surface for defects
4. If excessive scratches or gouges are visible, cut off the defective length and repeat steps (1) to (3).

1.1 Preparation - Crimp Fitting

1. Ensure that the crimp tool opens and closes. If necessary oil to ease application.
2. Clean and grease the threads on the crimp tool to ease the winding down on the nut arrangement.
3. Wind the nut anti-clockwise back to the end of the thread.

1.2 Preparation - Crimp tool

1. Ensure that the crimp tool opens and closes. If necessary oil to ease application.
2. Clean and grease the threads on the crimp tool to ease the winding down on the nut arrangement on the tool.
3. Wind the nut anti-clockwise back to the end of the thread.

1.3 Installation

1. If a House Entry Tee or Meter Box Adaptor is to be fitted push the black bend and GRP sleeve, (or in the case of a semi-concealed meter box the black sleeve only) over the end of the PE pipe to be connected to the crimp fitting.
2. Place the rubber protector over the PE pipe.
3. Put the copper sleeve over the end of the PE pipe.
4. Ensuring that the plastic washer is in place at the top of the crimping section of the fitting, push the fitting into the PE pipe until it touches the top of the crimp fitting and the plastic washer.
5. Push the copper sleeve up to the top of the PE so that it is over the inserted crimp part of the fitting with the PE pipe in between.
6. Place the crimping tool over the PE sleeve and close the tool.
7. Wind the nut on the crimping tool clockwise ensuring that the nut pulls the two halves of the crimping tool together (while winding ensure the copper sleeve does not move away from its original position).
8. Stop crimping when the two ends of the crimping tool touch each other.
9. Rewind the nut and remove the crimping tool.
10. Locate the rubber protector below the fitting and push the GRP sleeve over the protector and up to the base of the fitting. For semi-concealed meter boxes the rubber protector is not required. The black sleeve would be pushed up into the base of the fitting.
11. Pressure test service in accordance with Section E of this manual.

Item	Size	Thro' Wall length
House Entry Tee	3/4" x 20mm 3/4" x 20mm 3/4" x 20mm 3/4" x 20mm 3/4" x 20mm	150mm 345mm 500mm 610mm 910mm
	3/4" x 25mm 3/4" x 25mm 3/4" x 25mm	150mm 345mm 500mm
	3/4" x 32mm	150mm
	1" x 32mm 1" x 32mm 1" x 32mm	345mm 500mm 610mm
Above Ground Entry	3/4" x 20mm 3/4" x 20mm	155mm 345mm
	1" x 32mm	345mm
M/Box Adaptors Corbel Walls	3/4" x 20mm	-
	3/4" x 25mm	-
Couplers - Reducing	20mm x 16mm	-
	25mm x 20mm	-
	32mm x 25mm	-
Wall Mounted Crimp Elbow	32mm x 20mm left hand elbow 32mm x 20mm right hand elbow	- -
Wall Mounted Crimp Tee	32mm x 32mm x 20mm	-
	20mm x 20mm x 32mm	-

Table AA5 – Crimp Fittings.

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APPENDIX B - METER BOX FITTING INSTRUCTION

APPENDIX B1 - INSET METER BOX

1.0 Description

The inset meter box, Figure BB1, provides an unobtrusive installation built into the cavity wall. The meter box should be installed by the property owner or developer. Carry out the following checks prior to any work commencing.

1. Check the meter box is installed on an exterior wall.
2. Check that the meter box does not cross the damp proof course.
3. Check for any signs of damage to the meter box i.e. cracked door or interior.
4. Check that the meter box is sealed to the property.
   a. The base of the meter box should be installed between 500mm and 1500mm above finished ground level and fitted either above or below the **DPC but shall never cross it**

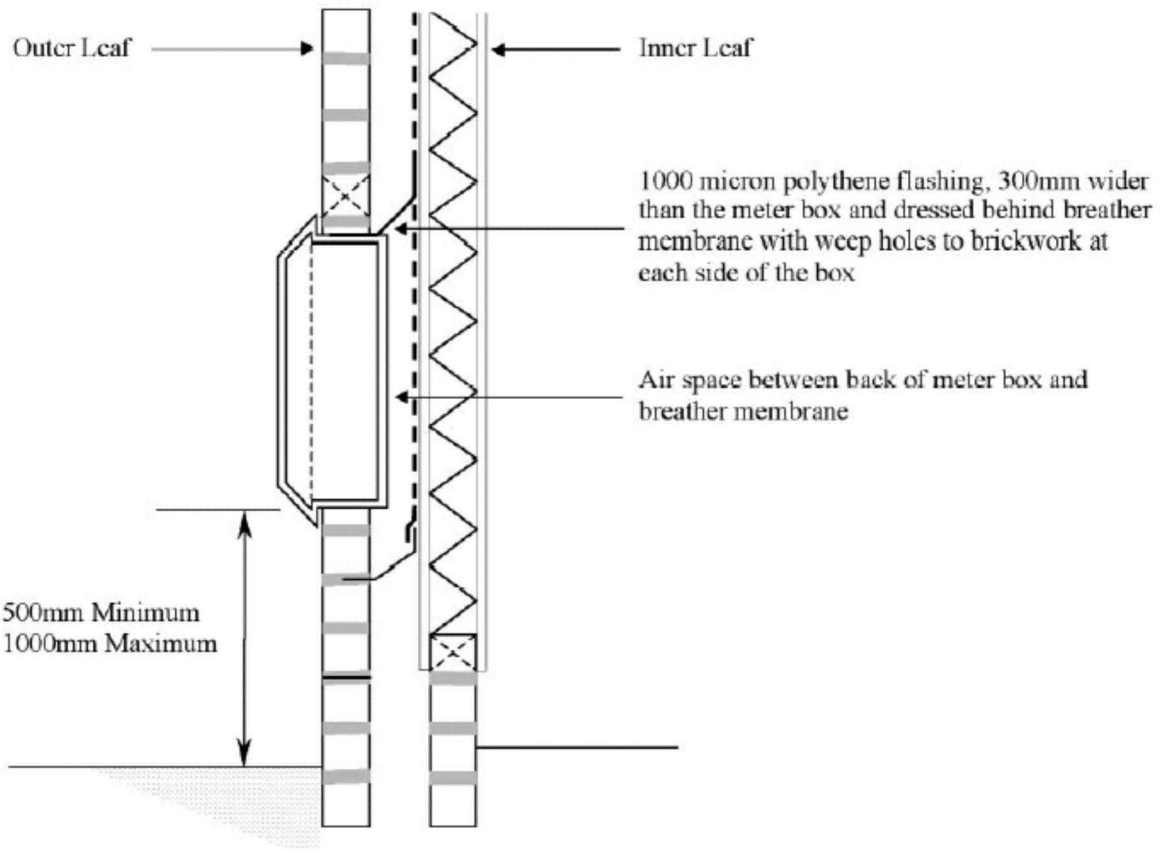

Figure BB1 - Inset meter box

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APPENDIX B2 - SURFACE MOUNTED METER BOX

Description

Surface mounted boxes, Figures BB2 and BB3, provide an easily installed alternative to an inset meter box, and are especially suitable for conversions or modernisation of older homes. The back plate is screwed to the wall, then the meter assembly hung on to it, and the cover and door then added.

1.0 Installation

1. The meter box should be inspected for signs of damage when delivery is made to site. Never install a damaged meter box.
2. The surface mounted meter box shall be sited on the outer wall and its base should be between 500mm and 1500mm above finished ground level.
3. The box shall not bridge a damp proof course. (DPC)
4. Outer walls of houses or garages are preferred options for sitting the box.
5. The box shall not obstruct a passageway or drive.
6. The box can be painted by the house owner if required to blend in with the finishes of adjacent surfaces.

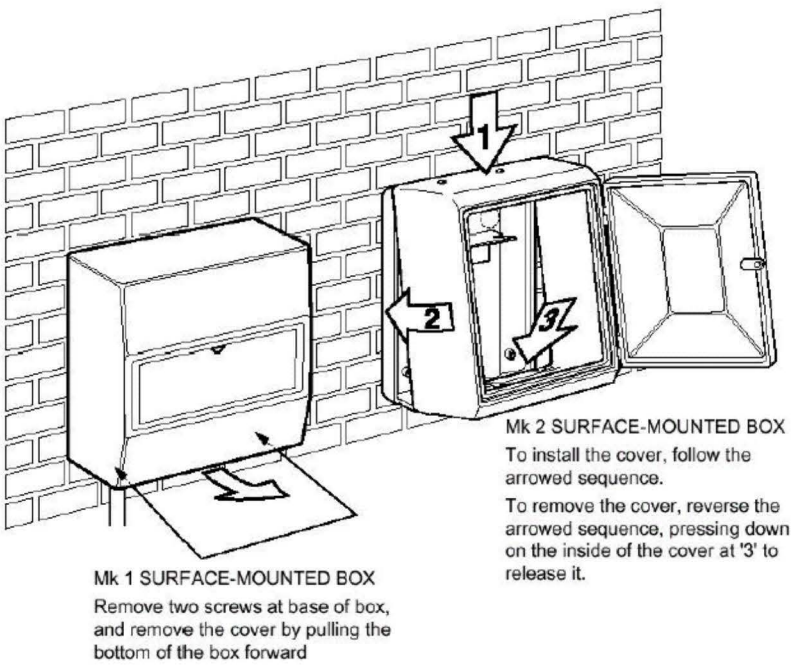

Figure BB2 - Surface Mounted Meter Box Installation

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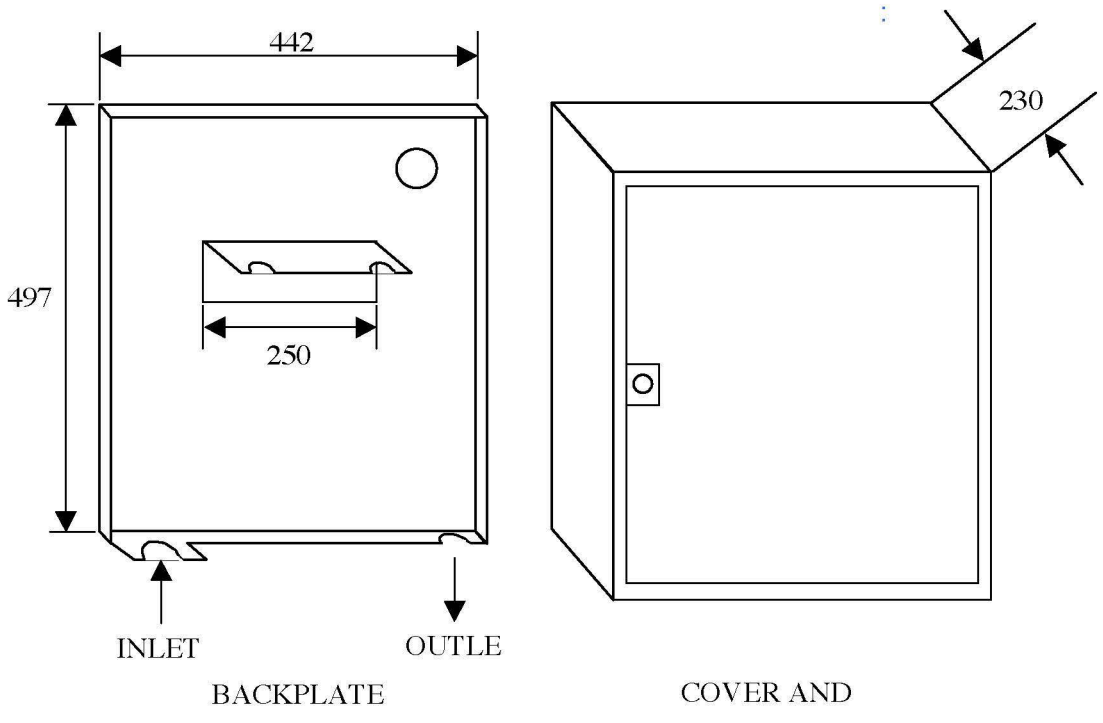


Height – 506 mm
Width - 450 mm
Deep - 230 mm

Figure BB3 - Surface Mounted Meter Box Dimensions

7. It is possible to install a surface mounted meter box with classically designed corbelled wall construction. The base of the meter box should not be less than two courses above the top of the corbelled section.
8. Where the building construction involves a concrete raft, and there is not the recommended depth of cover between the concrete raft and proposed finished ground level (375mm), the developer should provide a slot or vertical channel in the raft to allow safe installation of the gas pipe. National Grid will not be responsible for breaking out the concrete rafts footings to provide a slot for the service pipe.
9. Use the backing plate to mark the centre of the knockout in the back plate and drill through the wall.
10. Secure the back plate to the wall using zinc plated round- head screws and washers.

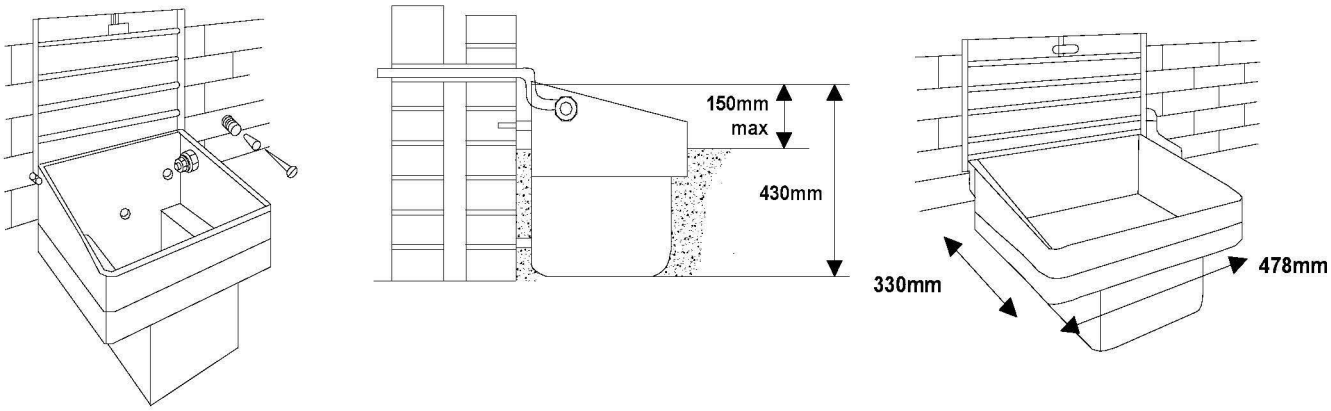
APPENDIX B3 - SEMI - CONCEALED METER BOX

Description

Semi-concealed meter boxes, Figure BB4, provide an unobtrusive installation partly buried at the foot of the outer wall of the property. They project as little as 100mm above the ground, and are ideally located two brick courses below the damp proof course.

1.0 Installation

1. The meter box should be inspected for signs of damage. Never install a damaged meter box.
2. The meter box should be fixed against an exterior wall.
3. It should be situated where it will not cause an obstruction or be exposed to damage from vehicles etc.
4. An excavation of 500mm wide by 750mm long by 500mm deep will normally be adequate to position the box and to receive the service pipe.
5. Where the building construction involves a concrete raft, and there is not the recommended depth of cover between the concrete raft and proposed finished ground level (375mm), the developer should provide a slot or vertical channel in the raft to allow safe installation of the gas pipe. National Grid will not be responsible for breaking out the concrete rafts footings to provide a slot for the service pipe.
6. When the property is on a concrete raft, a cut out section should be provided by the developer/owner. A minimum excavation size of 0.5m by 0.5m is required to accommodate the meter box.
7. Unless previously determined, ground level is assumed to be two brick courses below the damp proof course (DPC).



COMPLETE ASSEMBLY:

- Width - 478mm
- Front to back - 330mm
- Overall depth - 430mm
- Above ground – 150 mm

Figure BB4 –Semi concealed Meter Box installation

8. Using the box as the template, mark the three fixing holes on the wall, ensuring that the box is level. Fit the three spacers and secure the box to wall using the screws, washers and plugs provided.
9. Fit the lid with the fasteners provided when the service is commissioned and work is completed.

APPENDIX C - SAFETY NOTICE – EARTH BONDING

B945-Safety Notice – Earth Bonding

SAFETY NOTICE

Dear Sir/Madam

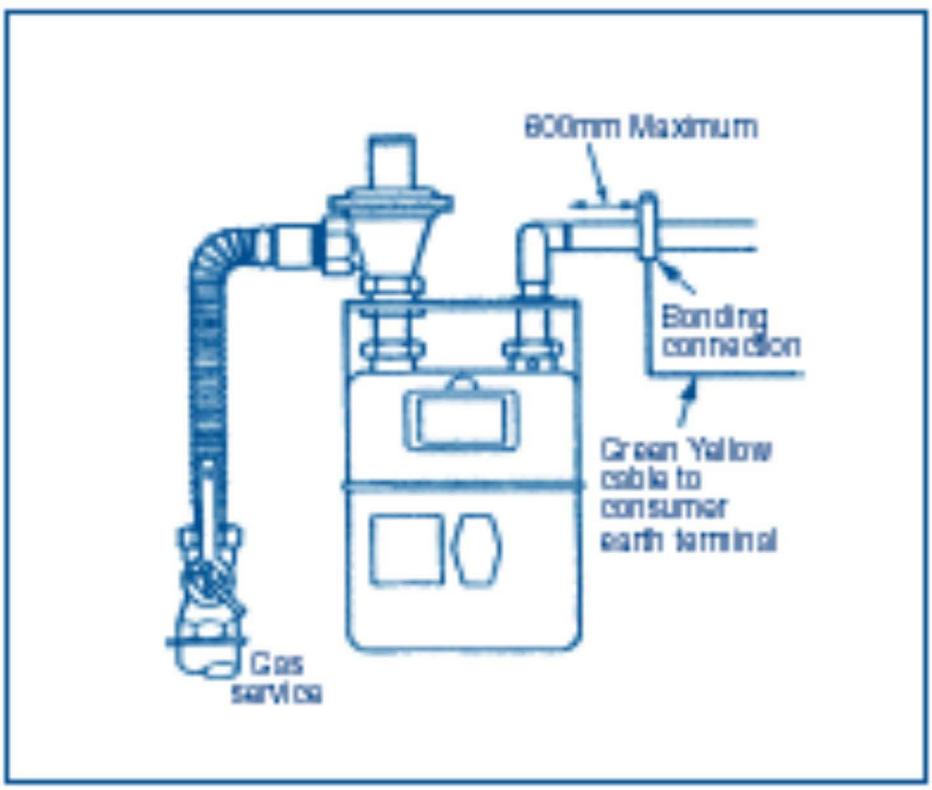
It appears that the gas installation pipework fitted at your property may not have Electrical Equipotential bonding correctly fitted.

I am required under section 18(2) of the Gas Safety (Installation and Use) Regulations 1998 to advise you that the Electrical Installation should be checked by the local electricity company or by a competent electrical contractor.

If you are a tenant of this property, would you please bring this card to the attention of the owner or his agent.

1 ELECTRICAL EARTH BONDING

B945 (Rev. 10/02)



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APPENDIX D - Conversion Factors

Length				
cm	2.54	1	0.394	inches
m	0.914	1	1.094	yards
km	1.609	1	0.621	miles
Volume				
m^3	0.765	1	1.308	yd3
ltrs	4.546	1	0.22	gal
Area				
m^2	0.836	1	1.196	yds2
km^2	2.59	1	0.386	miles2
Torque				
Nm	1.37	1	0.73	lbft
Nm	4.11	3	2.19	lbft
Nm	6.85	5	3.65	lbft
Nm	13.7	10	7.3	lbft

Pressure				
mbar	2.5	1	0.4	wg
bar	0.69	1	14.5	lb/in^2
lb/in^2	14.18	1	0.071	kg/cm^2
Weight				
gram	28.33	1	0.0353	oz
kg	0.454	1	2.205	lbs
Velocity				
m/s	3.23	1	0.31	ft/s
m/s	16.15	5	1.52	ft/s
Temp				
	℃		℉	
	0		32	
	5		41	
	30		86	

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APPENDIX E - DEFINITIONS OF SERVICE LAYING TERMS

ADDITIONAL EMERGENCY CONTROL VALVE (AECV)	An AECV is a valve, not being the ECV, for shutting off the supply of gas in an emergency, intended for use by a consumer of gas. An AECV may be located within either the meter installation or installation pipework and, as such, may not isolate all of the consumer's pipework or meter installation. Note: An AECV performs the same function as the ECV with respect to emergency isolation, usually of an individual premises or dwelling and is required by GS(I&U)R in many situations. It does not, however, denote the end of a network and is always fitted downstream of the ECV. The existence of an AECV does not affect the required existence of an ECV (which is always fitted).
ALIGNMENT CLAMPS	Clamps used to hold pipes in the correct position prior to welding or heat fusion.
AMBIENT TEMPERATURE	The environmental temperature.
ANCHORAGE	Fixing of pipe ends, bends and tees in order to prevent movement.
ANNULUS	The space between a carrier pipe and sleeve.
ANTI-SHEAR SLEEVE	A sleeve used to minimise local stresses in rigid PE joints
BRANCH	A connection, usually at right angles, often to a larger pipeline.
BY-PASS	A pipe valve and gauge system, used to provide and control the continuity of gas supplies, normally used when alterations to pipelines are carried out.
CARRIER PIPE	The existing pipe into which another pipe is inserted.
CATHODIC PROTECTION (CP)	A method of inhibiting corrosion of buried metallic plant by ensuring that it is permanently cathodic, i.e. electrically negative, to the electrolyte in the surrounding soil.
COLLAR	A fitting used to join together the plain ends of two pipes.
CONTINUITY BOND	An electrical connection made between two sections of a pipeline prior to and during their temporary severance, to prevent sparking from stray currents or static electricity.
CREEP (AS APPLIED TO POLYMERIC MATERIALS)	Deformation of material over time, under constant stress.
CROSS BONDING	Means of ensuring electrical continuity between gas pipework and the customer's electricity supply earth terminal.
CUT-OUT	A section of pipeline to be isolated for replacement, repair or the installation of an in-line tee to extend supplies.
CUTTING & THREADING NOMINAL BORE OF PIPE FITTING ENGAGEMENT LENGTH AMOUNT OF THREAD	 Internal diameter of the pipe. Length of threads engaged into fitting

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SHOWING	Length of threads still showing after fitting is engaged.
THREADS / INCH	Number of threads produced per inch when threading pipe.
ROOT DIAMETER	Diameter of the pipe excluding the depth of the thread.
FULL DIAMETER	As per nominal external diameter.
THREAD ANGLE	Angle thread is cut at whilst producing thread.
ROOT	Point at which thread is at its lowest point
CREST	Point at which thread is at its highest point.
DESIGN PRESSURE (DP)	The pressure on which design calculations are based.
DUCT (ALSO SEE "SLEEVE")	An encasement installed to protect a pipe or to facilitate its passage through or under a structure.
EMERGENCY CONTROL VALVE (ECV)	A valve, not being an AECV, for shutting off the supply of gas in an emergency, intended for use by a consumer of gas and being installed at the end of a service. The outlet of the ECV terminates the network.
ELECTROFUSION	Method of jointing PE pipe, using fittings having integral electrical heating coils.
ENCIRCLEMENT FITTING	Two part fittings installed around pipe jointed together longitudinally and jointed to the pipe circumferentially at each end.
EQUIPOTENTIAL BONDING	(See Cross bonding)
FUSION	Welded joints made on PE systems, by the controlled application of heat and pressure.
INSULATION JOINT	A fitting having high electrical resistance, which can be inserted in a pipeline to insulate electrically one section of pipe from another.
LOWER EXPLOSIVE LIMIT	The concentration of flammable gas in air, above which ignition can occur.
LOWER FLAMMABLE LIMIT	The concentration of flammable gas, vapour or mist in air, above which combustion can be sustained.
MAXIMUM OPERATING PRESSURE (MOP)	The maximum pressure at which a system can be operated continuously under normal conditions.
METER INLET VALVE (MIV)	A valve fitted upstream of, and adjacent to, a gas meter to shut off the supply of gas.
OPERATING PRESSURE (OP)	The pressure, which occurs within a system under normal conditions.
PIPELINE	A system of pipework with all associated equipment and stations up to the point of delivery. This pipework is mainly below ground (buried) but includes above ground pipework.
PRESSURE	Bar or mbar above atmospheric pressure, i.e. gauge pressure (1 bar = 100,000 $N_m\ m^{-2}$)

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PRIMARY METER	A meter connected to a main or service, the index reading of which constitutes the basis of charge for all gas supplied through that main or service.
PURGE	Displacement of one type of gas with another.
PURGE GAS THE GAS THAT IS USED FOR	The gas that is used for displacement when purging.
RISER	The vertical part of a service leading to one or more primary meter control valves or ECV.
SACRIFICIAL ANODES	A means of corrosion protection for buried equipment. A mass of relatively electro-negative metal, such as magnesium or zinc, electrically connected to a pipeline, to ensure that the pipe is maintained as the cathode in a galvanic cell.
SADDLE	A fitting that conforms to the shape of a main and is used for making a service connection to a main.
SADDLE FUSION	Jointing of a shaped fitting onto the outside wall of a PE pipe.
SERVICE	A pipe for supplying gas to premises from a distribution main, being any pipe between a distribution main and the outlet of an ECV.
SERVICE EXCESS FLOW VALVE	A device, installed in an M.P. service, designed to reduce the flow of gas released from a damaged pipe
SERVICE HEAD ADAPTOR	A fitting used to provide a gas-tight seal between a PE service, its steel encasement and a MIV or steel pipe
SERVICE ISOLATION VALVE	A valve inserted in a service, outside a building, for shutting off the supply of gas.
SERVICE REGULATOR	Apparatus for automatic regulator of pressure or of volume flow at a selected point within a service.
SERVICE TEE	A fitting utilized to connect a service to a distribution main.
SINGLE STAGE REGULATOR	A regulator which breaks down inlet pressure to outlet pressure in a single stage
SLEEVE (ALSO SEE "DUCT")	An encasement inserted into a prepared hole in a structure for the reception of a service
SOIL DISPLACEMENT HAMMER	Sometimes known as either Thrust bore or mole.
SQUEEZE OFF	A means of stopping the flow of gas in a PE service by squeezing off the pipe with a specialist tool.
STANDARD DIMENSION RATIO (SDR)	The ratio of average outside PE pipe diameter to minimum specified wall thickness.
STANDPIPE	A small diameter pipe, connected vertically to a pipeline.
SIPHON	A vessel installed at a low point in the pipeline network, to collect condensate and other liquids.
TWO-STAGE REGULATOR	A regulator which breaks down inlet pressure to outlet pressure in two stages in order to give a compact design with good control of outlet pressure.
VENT PIPE	Small diameter pipe connected vertically to a pipeline and terminated with a flame trap well above the ground level.
VOLTSTICK	This is a device for detecting the presence of an AC voltage on exposed metalwork.

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APPENDIX F - ABBREVIATIONS OF SERVICE LAYING TERMS

AECV	Additional emergency control valve
CCTV	Closed circuit television.
CDM	Construction (Design and Management) Regulations.
CP	Cathodic protection.
CV	Calorific value.
DP	Design pressure.
DPC	Damp Proof course
ECV	Emergency control valve.
EPM	Emergency Procedures Manual.
GS(I&U)R	Gas Safety (Installation and Use) Regulations
GS(M)R	Gas Safety (Management) Regulations.
GT	Gas transporter.
HASAWA	Health and Safety Act at Work etc. Act.
HAUC	Highways Authorities and Utilities Committee
HDPE	High-density polyethylene.
HSE	Health and Safety Executive.
LEL	Lower explosive Limit
LFL	Lower flammable limit.
LPG	Liquefied petroleum gas (commercial butane, C_4H_{10} and commercial propane, C_3H_8 or mixtures or combinations thereof).
MDPE	Medium density polyethylene.
MIP	Maximum incidental pressure.
MIV	Meter inlet valve.
NJUG	National Joint Utilities Group.
NRSWA	New Roads and Street Works Act.
OP	Operating pressure.
PE	Polyethylene.
PPE	Personal Protective Equipment.

PRI	Pressure regulating installation.
PSR	Pipelines Safety Regulations.
PVC	Polyvinyl chloride.
QC	Quality control.
SDR	Standard dimension ratio.
SEFV	Service excess flow valve.
SIV	Service isolation valve.

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APPENDIX G – PE MINIMUM FITTING SEPARATION AND SQUEEZE OFF DISTANCES

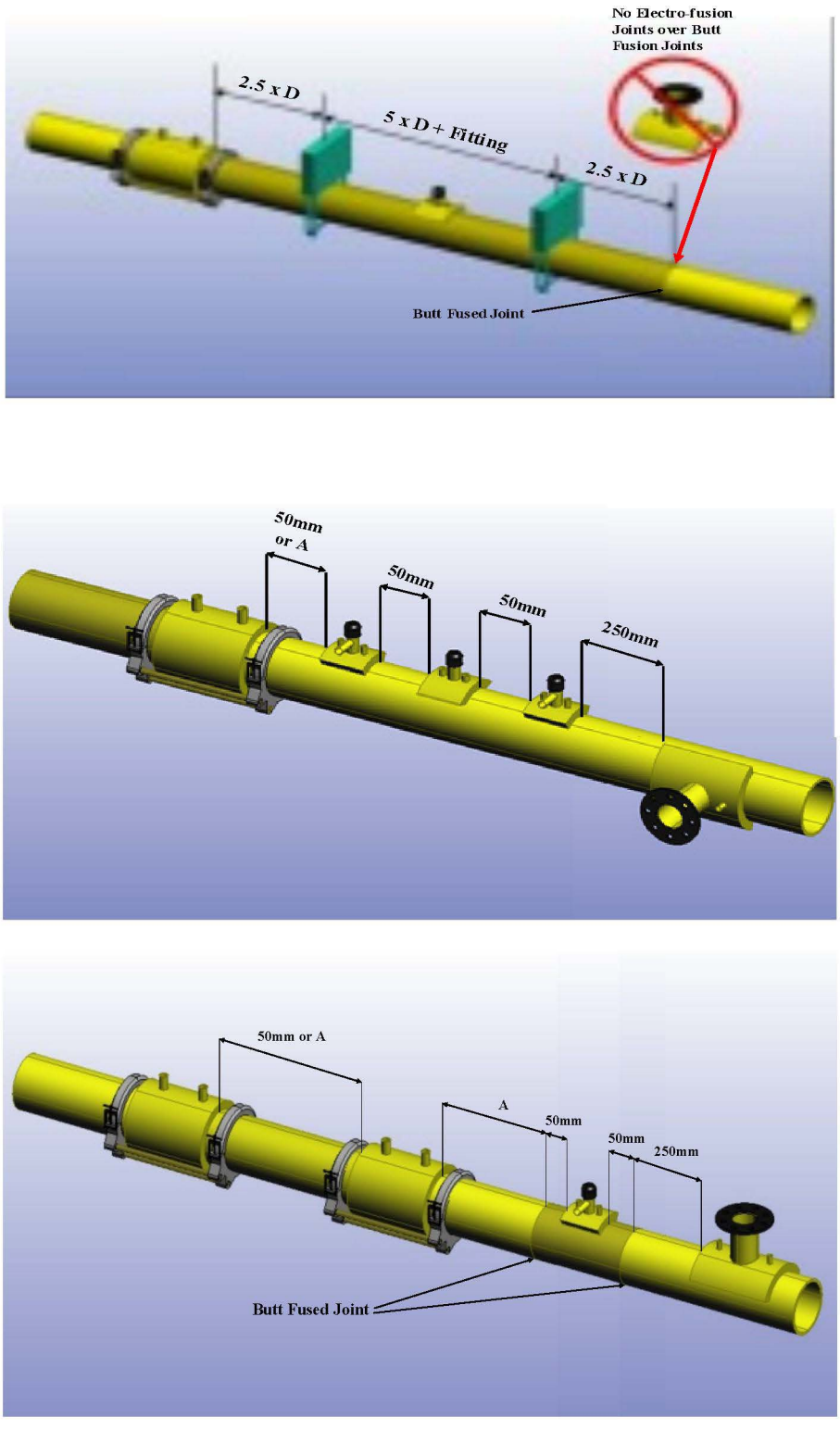

Figure G1 – PE Minimum Fitting Separation and Squeeze off Distances for PE80 and PE100 pipes laid post 1976 operating at up to and including 2bar

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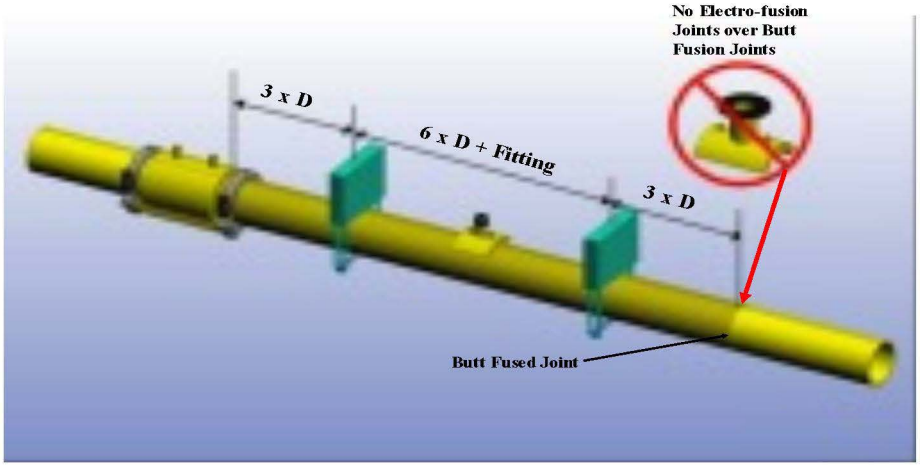

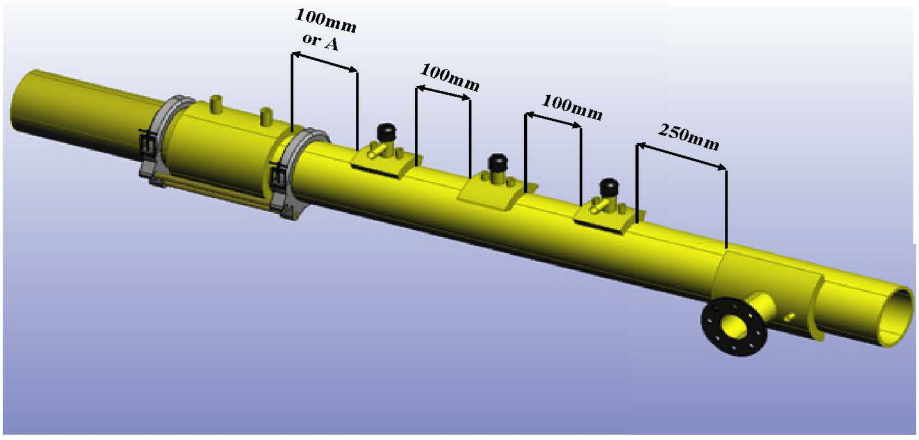

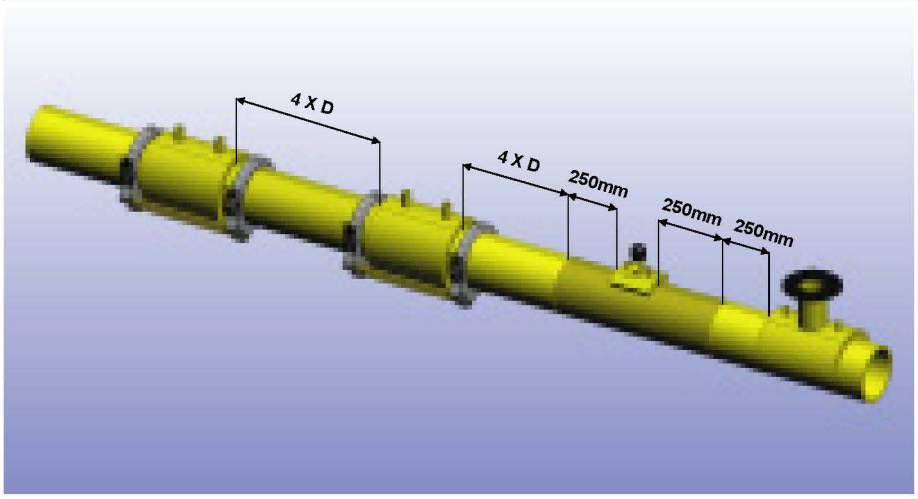

Figure G2 – PE Minimum Fitting Separation and Squeeze off Distances for pre 1976 PE pipes and all imperially sized PE pipe including DuPont Aldyl-A, Muntz Barwell, Hoechst and others operating at up to and including 2bar

Notes for Figures G1 and G2

1. Where non-standard PE pipe is encountered the Operations Manager shall be contacted before work continues on the main and an agreed work method established.

2. The fusing of saddles and top tees across butt fusion joints is not allowed.

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3. To maintain the integrity of the PE system the dimensions given in Figures G1 and G2 shall be maintained when jointing and squeezing off PE pipe. These distances are required to ensure that:

   a) The heat introduced into the pipe when fusing is taking place does not affect the 'heat affected zone' of adjacent fittings/joints
   b) To provide sufficient room for the pipe to be properly scraped/peeled
   c) To enable inspection of the pipe surface to ensure there are no gouges that could act as leak path from fittings
   d) When squeezing off the distances are required to ensure any adjacent joint/fitting is not affected by the stresses introduced into the pipe which could cause the joint/fitting to fail.

4. Ensure that you correctly apply the separation distances for the various types of PE pipe identified. If in any doubt over the pipe material identification or when the pipe was laid then the dimensions from Figure G1.1a shall be used.

5. A squeeze off tool can only be applied within 2.5D of any type of PE joint if the joint has been visually examined by a competent person and no concerns about the welding process or joint quality are apparent. If there is any evidence that the joint is substandard, then the joint shall be cut out and your Operational Manager informed.

6. PE Branch saddles cannot be fitted to close fit or Swagelined pipes, e.g. those PE pipes with an SDR of 26, as the fusing process will potential melt through the pipe wall.

   Key to Figures G1 and G2

   D = External Diameter of pipe

   A = 50mm of the minimum distance required to fit an alignment clamp, whichever is the greater.

Fundamentals of PE pipe jointing

- PE pipes shall not be installed in underground locations where the temperature of the ground surrounding the pipe is expected to exceed 20°C.

- Live PE pipe shall not be installed above ground unless fitted into a purpose designed sleeve to protect it from sunlight. The pipe manufacturer shall stipulate acceptance of the sleeving system.

- Precautions should be taken when carrying out pipe jointing when the air temperature is below -5°C or above 40°C. At or below -5°C, fusion jointing should only be carried out in a heated tent. At or above 40°C, extra cooling time shall be allowed prior to removal of alignment clamps. In addition, in such extremes of temperature, written advice should be sought from the equipment and pipe manufacturer before commencing fusion jointing under such conditions.

- Pipe preparation is one of the key elements to ensuring a good quality joint, others include ensuring correct alignment and ensuring that the correct pressure, heating and cooling periods are applied.

- Pipe ovality can occur both in coils and sticks of PE pipe and if not rectified will create a potential failure of any joint made to the pipe. Where pipes show signs of ovality re-rounding clamps shall be used for a minimum period of 10 minutes prior to pipe preparation and fusing taking place. Alignment clamps used on the larger diameter PE pipes can be used to re-round the pipe.

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- It is essential when fusing pipe together by either Butt or Electrofusion that all pipe joints and fittings are dry and once surface preparation has taken place the surface is not touched or contaminated and the fusion process started immediately.

- Where contamination has occurred after scraping or pipe peeling the only approved method of removing the contamination is by scraping.

- Pipe preparation and fusing is a continual operation. Fittings SHALL be kept in their protective bags to prevent contamination and minimise further oxidation until immediately ready for fitting and fusing. Fittings that have been removed from their protective bag for an extended period of time before fusing or where the protective bag has been damaged or punctured should not be used.

- Pipe and fittings shall be supported with approved alignment clamps throughout the fusion and cooling process. In very exceptional circumstances, e.g. large diameter tie in connections in excavations the use of alignment clamps may be impracticable due to site restrictions/conditions, however in such cases every effort shall be made to ensure joints are correctly aligned.

- The complete system shall be allowed to cool down to ambient temperature prior to pressure testing.

- **No refusing or reheating of fittings is allowed, unless specifically permitted by the manufacturer.**

APPENDIX H – SURFACE DAMAGE TO PE PIPES

When PE pipe is transported, laid, inserted, excavated or otherwise worked with, there is a possibility of damage since the PE pipe material is comparatively soft compared with metal tools, rocks, stones, bricks, etc. A small amount of damage is permissible. PE pipe can sustain damage on site of up to 10% of the pipe wall thickness (excluding the peelable skin where applicable) and still perform satisfactorily over its design life. The form of the damage is not relevant (it may be a circumferential gouge, a longitudinal score, etc.) provided it does not penetrate beyond the 10% depth in the pipe wall (see Figure 1.1b). The depth of damage may be measured where necessary by taking a reference on the pipe away from the damage using a dial test indicator on a bridge between two rollers, and then using the same device to obtain a depth reading on the damaged area or using a alternative method.

All pipes and fittings shall be inspected for cuts, deep scratches or other damage before use. Any defective material shall not be used.

Table 1.0 below shows the minimum and maximum wall thickness for PE80 and PE100 peelable pipes together with the measurement equivalent to 10% of the pipe wall thickness. This 10% thickness is based on the minimum diameter for the pipe wall.

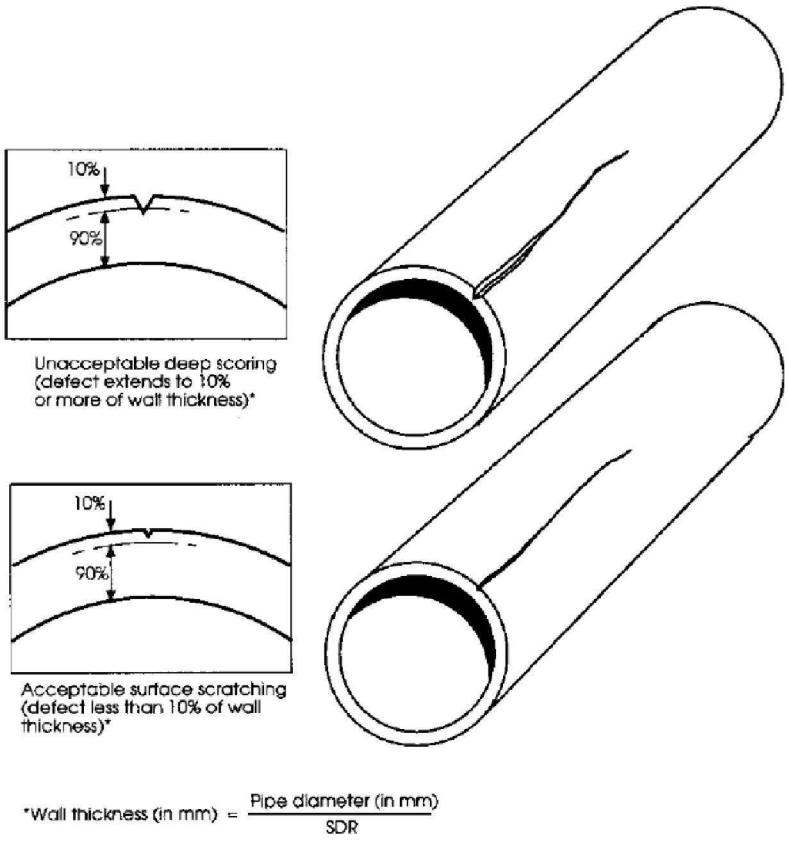

Figure H1 – Surface damage to PE pipes

Notes:
1. For pipe sizes 16 mm and 20 mm, the actual values are SDR7 and SDR9 respectively due to minimum wall thickness considerations.
2. 63mm and 75mm PE80 pipe is now delivered with an SDR of 13.6
3. The 10% wall values quoted for Multilayer / Peelable pipe are damage to the white or black core after full penetration of the outer yellow peelable skin with brown / green stripes

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PE Pipe Diameter (mm)	Wall Thickness for PE80 medium density pipe (mm)												Wall thickness for Multilayer/Peelable PE100 pipe SDR21[3]		
	SDR11			SDR17.6			SDR21			SDR26					
	Min	Max	10%	Min	Max	10%	Min	Max	10%	Min	Max	10%	Min	Max	10%
16 & 20[1]	2.3	2.7	0.23	-	-	-	-	-	-	-	-	-	-	-	-
25	2.3	2.7	0.23	-	-	-	-	-	-	-	-	-	-	-	-
32	3.0	3.4	0.30	-	-	-	-	-	-	-	-	-	-	-	-
40	3.7	4.2	0.37	-	-	-	-	-	-	-	-	-	-	-	-
50	4.6	5.2	0.46	-	-	-	-	-	-	-	-	-	-	-	-
55	5.1	5.8	0.51	2.9	3.3	0.29	-	-	-	-	-	-	-	-	-
63 [2]	5.8	6.5	0.58	3.6	4.1	0.36	-	-	-	-	-	-	-	-	-
75 [2]	6.8	7.6	0.68	4.3	4.9	0.43	-	-	-	-	-	-	-	-	-
90	8.2	9.2	0.82	5.2	5.9	0.52	-	-	-	-	-	-	4.3	4.8	0.43
110	-	-	-	-	-	-	-	-	-	-	-		5.2	5.9	0.52
125	11.4	12.7	1.14	7.1	8.0	0.71	-	-	-	-	-	-	-	-	-
140	-	-	-	8.0	8.9	0.80	-	-	-	5.4	6.1	0.54	-	-	-
160	-	-	-	-	-	-	-	-	-	6.2	7.0	0.62	-	-	-
180	16.4	18.2	1.64	10.3	11.5	1.03	-	-	-	7.0	7.8	0.7	-	-	-
200	-	-	-	11.4	12.7	1.14	-	-	-	7.7	8.6	0.77	-	-	-
213	-	-	-	-	-	-	-	-	-	8.2	9.2	0.82	-	-	-
225	-	-	-	-	-	-	-	-	-	8.6	9.6	0.86	-	-	-
250	22.7	25.1	2.27	14.2	15.8	1.42	-	-	-	-	-	-	11.9	13.2	1.19
268	-	-	-	-	-	-	-	-	-	10.3	11.5	1.03	-	-	-
280	-	-	-	-	-	-	-	-	-	10.7	11.9	1.07	-	-	-
315	28.6	31.6	2.86	17.9	19.8	1.79	-	-	-	12.1	13.5	1.21	15.0	16.6	1.50
355	32.3	35.7	3.23	20.2	22.4	2.02	16.9	18.7	1.69	-	-	-	16.9	18.7	1.69
400	36.4	40.2	3.64	22.8	25.2	2.28	19.0	21.0	1.9	-	-	-	19.0	21.0	1.90
450	40.9	45.1	4.09	25.6	28.3	2.56	21.4	23.7	2.14	-	-	-	21.4	23.7	2.14
469	-	-	-	-	-	-	22.3	24.7	2.23	-	-	-	22.3	24.7	2.23
500	45.5	50.2	4.55	28.4	31.4	2.84	23.8	26.3	2.38	-	-	-	23.8	26.3	2.38
630	-	-	-	35.8	39.5	3.58	30.0	33.1	3.0	-	-	-	30.0	33.1	3.00

Table H1 – Wall thickness and permissible 10% damage dimensions for PE80 and PE100 peelable pipes

APPENDIX I – AVAILABILITY OF IDENTIFICATION / ACCREDITATION CARDS

SCOPE

The following formalises the requirements for the production of Identification (ID) / accreditation cards on operational work sites involving replacement, connections and repair activities. It is targeted at all personnel from Operations, Strategic Partner staff and all other subsidiary contractor organisations engaged in these operational activities on the NGG gas distribution network.

REASON FOR AVAILABILITY

To enable easy verification by any NGG personnel, Contract Partner manager/supervisor or any other visitor, site owner/operator, e.g. Customers, HSE Inspectors, GLND independent inspector/auditors, Compliance Officers, Highway Authority inspectors, construction site managers, etc. of the validity and competence of individuals (both Supervisors and Operatives) working on behalf of NGG. The possession and production of such cards enables the individual to demonstrate and prove their identification and their operating qualifications/skills plus their health and safety awareness to confirm they are competent to undertake the specific work activities being undertaken.

EXAMPLES OF IDENTIFICATION CARDS

The following types of cards (as applicable) shall be available by the individual either on their person or in their vehicle for all Managers, Supervisors and Operatives undertaking operational work activities:

No.	Types of cards [1]	Requirement
1	Identification Badge, e.g. issued by NGG or partner organisation	All
2	Energy and Utility Skills Registrations (EUSR) Card	All contract partners [2]
3	Street Works Qualification Register (SWQR) Card	As applicable [3]
4	Construction Plant Competence Scheme (CPCS) Card	As applicable
5	Construction Skills Certification Scheme (CSCS) Card	As applicable
6	Gas Safe Registration Card for all Operatives who work downstream of the ECV	All
7	Others – relevant to work activity being undertaken, e.g. 'Essential Electrics Card'	As applicable

Notes:
(1) Some individuals may possess more than one card from the same scheme holder
(2) Some NGG Direct Labour may hold an EUSR card
(3) At least one team member shall be in possession of a SWQR card to enable works to progress in the public highway

NEW, UPDATING, LOST, MISPLACED OR STOLEN CARDS

There will be occasions when a card has to be updated or it has been mislaid, lost or stolen. In such cases, as soon as it becomes apparent, it is the responsibility of the individual to make this known to their line management. A request for a replacement card(s) shall be made (either by the individual or their employer as applicable) to the requisite company/scheme holder(s) to enable a replacement card(s) to be dispatched as soon as is reasonably practical. Where an individual is waiting for a new or replacement card(s) a 'Cover Note' (refer to specimen below) will need to be approved/issued by a nominated manager (either a NGG or Contract Partner manager, minimum Level 7) within that business along with a copy of the individuals training records from the requisite industry scheme(s) provider and these shall be held either on their person or in their vehicle until the replacement card(s) have been received.

Such 'Cover Notes' shall be **limited to a maximum 60 day period**, refer to specimen overleaf. If the new or replacement card(s) has not been issued by the awarding body or company within the 60 day period then a Deviation shall be raised and submitted to the Engineering Policy Manager advising of the special circumstances surrounding the failure to supply and the course of action being taken to close out with a deadline date set.

RECORDS.

It is advisable that copies of such ID cards (both sides of the cards as applicable) are retained locally within the individuals personnel folder.

SITE VISITS
During site visits personnel should be requested to show their ID cards to verify that they still have them in their possession and checked to verify that they are only undertaking work activities to which they have been trained, assessed and qualified to undertake.

Specimen Cover Note:

nationalgrid

(Sequential Numbering System)

Cover Note for Identification / Accreditation Cards

This cover note is issued to:

Full Name: (print) .....

EUSR No/Payroll No: * .....

On: (insert date): .....

Limitations of Use: .....

.....

.....

.....

.....

.....

(Insert: To act as a e.g. Service Layer, Main Layer, CP under SCO/5, 5 Tonne 360^0 excavator driver, etc.)

Date of expiry: .....
(60 days from today)

Issued By:

Name: (print) .....

Designation: (print) .....

Company: (print) .....

Associated documents:
(Attach relevant copies of the individuals training records from the requisite industry scheme(s) provider and these shall be held either on their person or in their vehicle until the replacement card(s) have been received)

* delete as applicable

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APPENDIX J – PRE-MOLING CHECKLIST

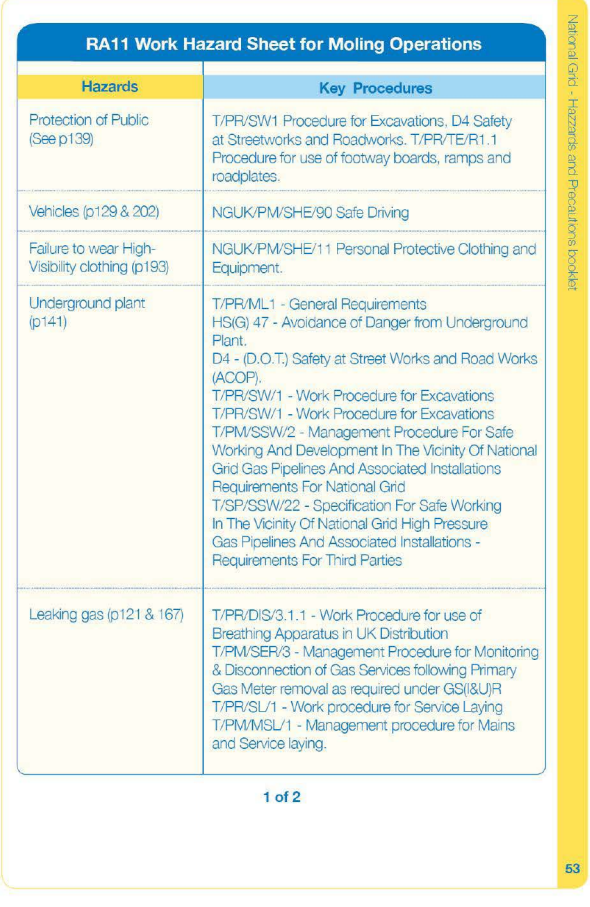
Based on Section B4 Impact Moling (up to 75mm) of T/PR/SL/1

Team Leader's name:	**Date:**
Site Address:	

Pre-Moling Checklist		**SAFE TO CONTINUE** (Circle YES or NO)	
1.	Have you undertaken a site-specific risk assessment? (Refer to Note 1 below)	**YES**	**NO**
2.	Do you have and have you studied and understood ALL the utility and 3rd party apparatus drawings provided?	**YES**	**NO**
3.	Have you checked for visual indications of buried services and lifted drainage covers to determine depth and route?	**YES**	**NO**
4.	Have you traced the entire area to be moled, using a cable and pipe locating tool in all Modes?	**YES**	**NO**
5.	Have you used the plug connector to trace the electricity service from the property to the main?	**YES**	**NO**
6.	Have you used a cable clamp on exposed cables to trace the route and/or used the magnetic clip to trace street light cables?	**YES**	**NO**
7.	Have you excavated on and exposed all buried utilities on site including electric, gas, street lighting, cable TV, BT, water, or any other known street furniture, etc.?	**YES**	**NO**
8.	Have you excavated and exposed the entire route in the footpath that will be affected by the route of the mole?	**YES**	**NO**
9.	Have you identified a safe moling route leaving at least 300mm clearance from parallel electric cables and 250mm clearance from other parallel services?	**YES**	**NO**
10.	Have you identified in which direction to bore, i.e. towards the lowest risk area?	**YES**	**NO**
11.	Do you have all the additional PPE required for moling (electrically insulated boots and gloves plus outer gloves) which have been checked prior to use and you are wearing it?	**YES**	**NO**
12.	Have you accurately marked the distance to be moled on the non-conductive hose or PE pipe?	**YES**	**NO**

Note 1:
For National Grid personnel refer to Work Hazard Sheet RA 11 which identifies key Hazards when moling and can be found in the NGG Hazard & Precautions Booklet – See extract overleaf

Launch Cradle Hierarchy - Record Decision Here (Refer to page 115)		
Option	**Status** (Circle as appropriate and complete necessary information)	
Use a Launch Cradle	Yes / No	
	If No indicate why not: (circle reason below)	
	Plant indications	Congestion
	Other (describe in box opposite)	
Launch from a different location	Yes / No / Not Applicable If Yes state which location?	
Launch by hand, which shall be supported by a Risk Assessment and confirmation that all items on the Pre-Moling Checklist are deemed safe to continue.	Yes / No / Not Applicable	
	Risk Assessment attached: Yes / No / Not Applicable	
	Pre-Moling Checklist confirmed Safe to Continue Yes / No / Not Applicable	
Adopt a different laying technique	Yes / No / Not Applicable If Yes state which technique?	



RA11 Work Hazard Sheet for Moling Operations

Hazards	Key Procedures
Protection of Public (See p139)	T/PR/SW1 Procedure for Excavations, D4 Safety at Streetworks and Roadworks. T/PR/TE/R1.1 Procedure for use of footway boards, ramps and roadplates.
Vehicles (p129 & 202)	NGUK/PM/SHE/90 Safe Driving
Failure to wear High-Visibility clothing (p193)	NGUK/PM/SHE/11 Personal Protective Clothing and Equipment.
Underground plant (p141)	T/PR/ML1 - General Requirements HS(G) 47 - Avoidance of Danger from Underground Plant. D4 - (D.O.T.) Safety at Street Works and Road Works (ACOP). T/PR/SW/1 - Work Procedure for Excavations T/PR/SW/1 - Work Procedure for Excavations T/PM/SSW/2 - Management Procedure For Safe Working And Development In The Vicinity Of National Grid Gas Pipelines And Associated Installations Requirements For National Grid T/SP/SSW/22 - Specification For Safe Working In The Vicinity Of National Grid High Pressure Gas Pipelines And Associated Installations - Requirements For Third Parties
Leaking gas (p121 & 167)	T/PR/DIS/3.1.1 - Work Procedure for use of Breathing Apparatus in UK Distribution T/PM/SER/3 - Management Procedure for Monitoring & Disconnection of Gas Services following Primary Gas Meter removal as required under GS(I&U)R T/PR/SL/1 - Work procedure for Service Laying T/PM/MSL/1 - Management procedure for Mains and Service laying.

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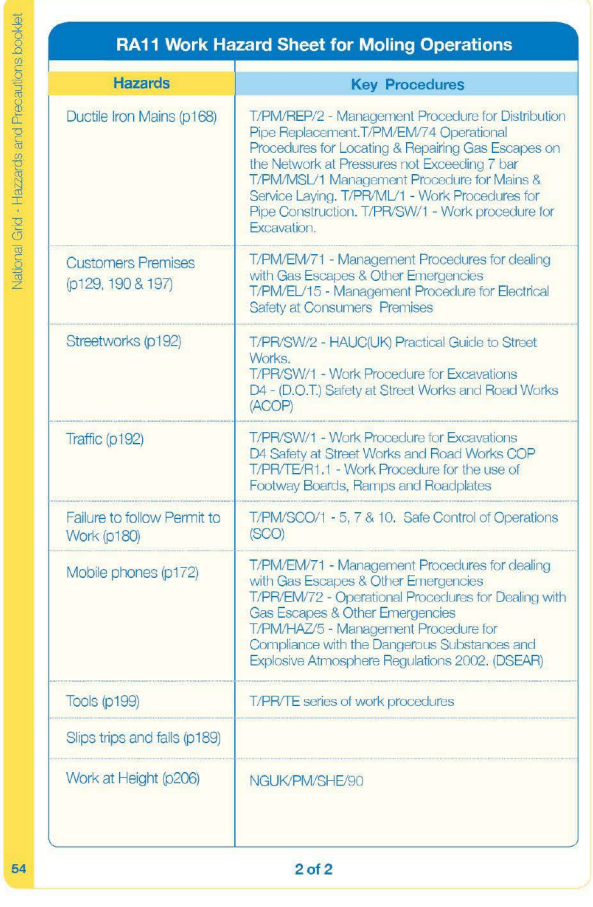

RA11 Work Hazard Sheet for Moling Operations

Hazards	Key Procedures
Ductile Iron Mains (p168)	T/PM/REP/2 - Management Procedure for Distribution Pipe Replacement.T/PM/EM/74 Operational Procedures for Locating & Repairing Gas Escapes on the Network at Pressures not Exceeding 7 bar T/PM/MSL/1 Management Procedure for Mains & Service Laying. T/PR/ML/1 - Work Procedures for Pipe Construction. T/PR/SW/1 - Work procedure for Excavation.
Customers Premises (p129, 190 & 197)	T/PM/EM/71 - Management Procedures for dealing with Gas Escapes & Other Emergencies T/PM/EL/15 - Management Procedure for Electrical Safety at Consumers Premises
Streetworks (p192)	T/PR/SW/2 - HAUC(UK) Practical Guide to Street Works. T/PR/SW/1 - Work Procedure for Excavations D4 - (D.O.T.) Safety at Street Works and Road Works (ACOP)
Traffic (p192)	T/PR/SW/1 - Work Procedure for Excavations D4 Safety at Street Works and Road Works COP T/PR/TE/R1.1 - Work Procedure for the use of Footway Boards, Ramps and Roadplates
Failure to follow Permit to Work (p180)	T/PM/SCO/1 - 5, 7 & 10. Safe Control of Operations (SCO)
Mobile phones (p172)	T/PM/EM/71 - Management Procedures for dealing with Gas Escapes & Other Emergencies T/PR/EM/72 - Operational Procedures for Dealing with Gas Escapes & Other Emergencies T/PM/HAZ/5 - Management Procedure for Compliance with the Dangerous Substances and Explosive Atmosphere Regulations 2002. (DSEAR)
Tools (p199)	T/PR/TE series of work procedures
Slips trips and falls (p189)	
Work at Height (p206)	NGUK/PM/SHE/90

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ENDNOTE

Comments

Comments and queries regarding the technical content of this Engineering Standard should initially be directed to your Line Manager. Where a more detailed response is required please contact:

Safety and Engineering Registrar
SSR Directorate
National Grid Gas
National Grid House
Warwick Technology Park
Gallows Hill
Warwck
CV34 6DA

Buying documents

Contractors and other users external to National Grid should direct their requests for further copies of National Grid Safety and Engineering documents to the department or group responsible for the initial issue of their contract documentation.