VOLUME 1

STREET WORKS UK GUIDANCE ON THE POSITIONING AND COLOUR CODING OF UNDERGROUND UTILITIES' APPARATUS

ISSUE 10: 2023

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Overview

Street Works makes the infrastructure of tomorrow happen today.

Our work connects communities to the water, broadband, energy and heating they need, as well as supporting the UK's ambitious targets for next-generation infrastructure.

The core purpose of this document is to facilitate the safe installation of utility or other underground apparatus in a position which provides suitable protective cover and protection from damage. It helps ensure that this does not compromise the integrity of apparatus due to proximity to other assets and/or ancillary items. This document also aids street works operatives in the identification of underground assets.

These guidelines describe utility industry practice. However, it should not be assumed that all mains or services will conform to the recommendations for positioning or colour coding contained in this publication.

Street Works UK undertook an industry consultation on the changes proposed in the latest version of this document (Issue 10). The consultation ran for three months between September and November 2023. Street Works UK would like to thank all consultees who submitted a response to our consultation.

Foreword

Street Works UK is proud to support utilities and their contractors as they work to deliver the next generation of infrastructure, connecting communities to essential services across the UK.

We are pleased to deliver this document, in collaboration with our members, which remains vital to ensure the safety and well-being of both operatives and the communities we serve. The positioning and colour coding of underground utilities' apparatus is fundamental to efficiency and reliability in the street works sector, reducing the risk of accidental damages during works, preventing service disruptions and avoiding potentially hazardous situations.

Safety is a responsibility we take seriously, and we are dedicated to ensuring that all users of this document uphold the highest professional standards of practice. This clear framework will help to properly position and separate our underground works and helpfully aid even closer collaboration across the industry.

Clive Bairsto CBE
Chief Executive, Street Works UK

Issue 10 Change Log

Ref	Location	Change Type	Change Narrative
1	Table 1	Updated content	More comprehensive examples of utility asset types and minimum depths extended across more scenarios
2	Table 1	Updated content	Minimum depth of LV electricity apparatus LV – HV 11kV in carriageway reduced to 520mm
3	Section 3.3	New section	Guidance provided on installation of surround to apparatus
4	Section 4	Updated content	Scope of guidance extended beyond 2m wide footways and introduction of radial separation clearance
5	Figure 1	New figure	New illustration of utility sub structure with examples of minimum depths and radial proximity and separation
6	Section 4.4	New section	Guidance provided on service connection proximity and seperation
7	Figure 2	New figure	New illustration of utility sub structure and guidance for service connection proximity
8	Section 4.7	New section	Various verge topology scenarios and datum point guidance
9	Figure 3	New figure	Illustration with example of verge datum point and no interjoining footway
10	Figure 4	New figure	Illustration with example of verge datum point with interjoining footway
11	Section 5	Updated content	Risk assessment guidance introduced for positioning of apparatus
12	Figure 5	New figure	Taken from SROH v4 location of apparatus of 20mm diameter or less
13	Section 7 Figure 6	Updated content New figure	Updated guidance of trench sharing and photographic example of benching technique
14	Section 8	New section	Amalgamation of relevant Volume 2 content into this publication
15	Section 9	New Section	Area of document for new and future low carbon technologies
16	Section 9.1 Figure 7 & 8	Updated content New figures	More comprehensive explanation of district heating and new illustrations

PLEASE ENSURE THAT YOU READ THE LEGAL NOTICE AND DISCLAIMER WHICH APPEARS IN APPENDIX A OF THIS PUBLICATION.

Street Works UK Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus

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Street Works UK Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus

1. Background

1.1 The statutory right of undertakers (utilities) to carry out works within the public highway, to provide and maintain their apparatus dates from the mid-19th century. There are no statutory obligations governing the position or depth at which any apparatus should be laid within the structure of a highway other than those provided under S1.8 of the latest New Roads and Street Works Act (NRSWA) reinstatement specifications.[1] For individual specifications and service layouts, reference should be made to the appropriate utility company.

1.2 The legislative requirements to be adopted during the installation, repair and maintenance of apparatus in roads and streets are:

- The New Roads and Street Works Act 1991, as amended by the Transport Act 2000
- Traffic Management Act 2004
- Transport (Scotland) Act 2019
- Street Works (Amendment) (Northern Ireland) Order 2007
- Town and Country Planning Act 1990
- Construction and Design Management Regulations 2015

1.3 Utility apparatus can be vulnerable to damage from works carried out in the highway. Ensuring the safety of operatives and the public is a legal requirement under the Health and Safety at Work Act. It is therefore in the interests of all parties to make every effort to minimise damage occurrence and effect (see Volume 3 Guidelines on the Management of Third Party Cable Ducting). These guidelines have been produced to assist in the planning and designing of apparatus placement within the highway and its identification when exposed. Additional guidance on safe excavation can be found in the Health and Safety Executive's guidance publication HSG47.[2]

1.4 Early consultation between highway authorities, planners, architects, developers and utilities is essential to ensure that the engineering and planning requirements for installing all utility and other infrastructure are agreed upon before installation.

1.5 For innovative street designs, the placement of electric vehicle charging points, bicycle racks and other street furniture, early consultation between all stakeholders is critical to ensure that safe and easy access to existing utility services is considered for maintenance and repair.

1.6 On new development sites where the developer or a third party installs utility apparatus, the guidelines contained within this section for positioning and colour coding of underground apparatus should be followed. Any deviation from these guidelines should be with the agreement of the prospective asset owner, and any variation to the depth of cover must permit access to all utility apparatus.

1.7 Specialist advice should also be obtained when works are undertaken over, under or near the following:

- Bridges
- Trees
- Within 200m of railway level crossings
- Major Accident Hazard Pipelines
- District Heating Networks

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[1] Specification for the Reinstatment of Openings in the Highway (SROH England / SROH Wales) Specification for the Reinstatement of Openings in Roads (SROR Scotland / SROR Northern Ireland)

[2] Health and Safety Guidance 47 Avoiding danger from underground services

The appropriate authority or asset owner should be able to offer advice and assistance.

2. Scope

2.1. Due to the complexity of the layout and size of utility and other apparatus, only guidance can be given on their actual positioning. However, utilities/asset owners should endeavour to comply with the recommendations outlined within this volume. These guidelines include a recommended colour scheme facilitating the identification of apparatus within the highway, to create a safer working environment.

2.2. These guidelines apply to utility apparatus placed below:

- Footways
- Carriageways
- Cycle Tracks
- Verges
- Service Strips
- Footpaths
- Railways and Tramways

2.3 This publication applies to conventional underground distribution and transmission mains, services, pipes, cables, and ducts, including longitudinal positioning and lateral crossings such as branched/teed offtakes and service connections.

3. Identification

3.1 General

3.1.1. Tables 1 and 2 below show the recommended depths, colours and identification for ducts, pipes and cables for utilities and other apparatus. However, it should not be assumed that all apparatus will conform to these recommendations.

3.1.2. The below tables do not represent an exhaustive list of underground apparatus. Utilities and local authorities do not own all the apparatus that may be found underground. Privately owned or non-statutory authrority pipes and cables exist, and their records may not be widely available. If apparatus is discovered that cannot be identified, you should contact the highway authority in the first instance.

Table 1 - Recommended Colour Coding, Minimum Depths and Proximity Distances of Underground Utilities Apparatus

Utility	Asset Type	Material & Colour	Duct System	Recommended Minimum Depths[i]				Minimum Proximity Distance[ii]
				Footway/ Footpath[iii]	Verge	Carriageway	Agricultural Land	
Telecoms	Copper Network	Copper telephone cables	Grey, white, green, black or purple duct	250mm	250mm[iv]	450mm	800mm	250mm
	Fibre Optic Network	Fibre optic cables						
Electricity [v]	High Voltage cable (66kV and above)	Black or red cable	Black or red duct ENA TS 12 - 24	900mm	900mm	900mm	1000mm	300mm
	High Voltage cable (33kV)			750mm	750mm	750mm		
	High Voltage cable (11kV)			450mm	520mm	520mm		
	Low Voltage cable (LV)			450mm	450mm			
	LV domestic service/street furniture	Black cable						100mm
District Heating	Flow and return pipelines	HDPE, PEX, Polypropelene or Steel[vi]	Steel insulated - black	600mm	600mm	750mm	1000mm	250mm
			PE insulated – black or grey					
Clean Water	Trunk mains, distribution mains & services	Steel, spun iron, cast iron, ductile iron, Polyvinyl Chloride (PVC), OPVC, Prestressed Concrete, HDPE/MDPE (Blue), (blue with brown stripes), copper, lead, galvanised iron	PVC, twin walled PVC, steel, concrete, ductile iron	750mm	750mm	750mm	1200mm	250mm
Oil & Fuel Pipelines	Oils, petrochemicals, industrial gasses, super heated steam,	Steel	N/A	900mm	900mm	900mm	900mm	600mm
Waste Water	Gravity Networks	Vitrified clay, concrete, cast iron, ductile iron, Glass Reinforced Plastic (GRP), PVC, PE, pitch fibre, asbestos	Orange, grey, black or blue	900mm	900mm	1200mm	900mm	250mm
	Rising Mains	PVC, Polyethylene (PE), Cast Iron, Ductile Iron, Asbestos Cement		900mm	900mm	1200mm	900mm	250mm

Street Works UK Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus

Utility	Asset Type	Material & Colour	Duct System	Recommended Minimum Depths				Minimum Proximity Distance
				Footway/ Footpath	Verge	Carriageway	Agricultural Land	
Gas	Medium & Low Pressure services ≤ 63mm (MP & LP)	Steel – may have no coating	Concrete, steel, yellow twin-walled perforated PVC ducting, decommissioned legacy asset	450mm	450mm	450mm	1100mm	250mm
		HDPE (PE100) Yellow						
		MDPE (PE80) Yellow						
		Aldyl A						
		Muntz Barwell – Yellow, green or black						
		Copper						
		Lead						
	Medium & Low Pressure mains and services > 63mm (MP & LP)	Steel		600mm	750mm	750mm	1100mm	
		HDPE (PE100) Yellow						
		MDPE (PE80) Yellow						
		Aldyl A – Tan						
		Ductile Iron						
		Cast/Spun Iron						
		Asbestos						
		PVC						
	Intermediate Pressure pipelines and services (IP)	Steel	Concrete or steel	600mm	750mm	750mm	1100mm	
		HDPE (PE100) – Orange or yellow with brown stripes						
		MDPE (PE80) - Yellow or black with yellow stripes						
	High Pressure pipelines and services (HP)	Steel - Yellow PE/PVC coating, black wrapping, fusion bonded epoxy, coal tar or bitumen.	Concrete or steel	1100mm	1100mm	1100mm	1100mm	600mm
		Reinforced thermoplastic – Orange with silver stripes	Steel	1500mm	1500mm	1500mm	1100mm	

[i] Depths are taken from the surface level to the crown of the appartus
[ii] The minimum proximity distance is a 360° radial separation, with some deviation for small diameter services, explained in Section 4
[iii] Cycle track should be treated as footway/footpath or carriageway depending on its location in the highway, see Section 4.8
[iv] Telecommunications copper and fibre networks can be buried in the ground without ducting, e.g armoured 14mm fibre cables for rural grass verges
[v] Electricity apparatus includes Electric Vehicle (EV) charging infrstaructure and installations
[vi] District Heating has no specific colour coding, but is commonly grey or black

Table 2 - Recommended Colour Coding, Depths and Proximity Distances of Other Underground Apparatus

Asset Type	Asset Owner	Material & Colour	Duct	Recommended Minimum Depths[vii]		Minimum Proximity distance[viii]
				Footway / Footpath[ix]	Carriageway	
Highway Authority Services						
Street Lighting	England and Wales	Black Cable	Black or Orange *Consult electricity asset owner first	450mm	520mm	250mm
	Scotland	Purple Cable	Purple		450mm	
	Northern Ireland	Black or Purple Cable	Orange			
Traffic Control	All regions	Orange Cable	Orange	450mm	600mm	
Street Furniture	All regions	Black Cable	Black			
Telecomms	All regions	Black Cable	Purple or Orange	250mm	450mm	
Motorways and Trunk Road Services						
Road Lighting	England and Wales	Black Cable	Orange	450mm	600mm	250mm
	Scotland	Purple Cable	Purple			
Communications	England and Wales	Grey Cable	Purple	450mm	450mm	
	Scotland	Black Cable	Black or Grey	250mm		
Communications Power	All regions	Black Cable	Purple Duct	450mm	600mm	

[vii] Depths are taken from the surface level to the crown of the apparatus
[viii] The minimum proximity distance is a 360° radial separation, with some deviation allowed for small diameter services, explained in Section 4
[ix] Cycle track should be treated as a footway/footpath or carriageway, depending on its location in the highway, see Section 4.8

3.2. Identification of Apparatus

3.2.1. It is recommended for all new asset installations, that utilities and other parties use the colour coding shown in Tables 1 and 2 of this publication.

3.2.2. All apparatus should be treated cautiously until its ownership and use are confirmed. A pipe, cable or duct may have the asset owner's name and contact details stamped upon it. Avoiding damage to all apparatus is imperative, as the consequences are costly and dangerous.

3.2.3. When working with or adjacent to legacy assets, it is essential to remember:

a. Colours may look different under poor or artificial lighting, and aggressive soils may discolour pigments in duct, pipe and cable colourings over time.
b. An older pipe or duct could contain apparatus not explicitly indicated by its colour coding. Electricity cables are sometimes placed in ducts that do not match the colour coding of this publication.
c. In addition to colour coding, other methods of identification may be used, such as Marker warning systems, see section 3.4.
d. Water pipes, electricity and telecommunication cables may be encapsulated in plastic. If any black plastic service is found, it should be treated as a live electricity cable until proven otherwise.
e. Iron and steel water and gas pipes may appear very similar. If any such pipe is uncovered, it should be treated as a live gas pipe until proven otherwise.
f. Welded steel pipes are often used as the material for Major Accident Hazard Pipelines and should be treated with additional caution.
g. All apparatus should be deemed live unless confirmed dead by the asset owner.

3.3. Surround to Apparatus

3.3.1. The selection of materials for surrounding apparatus is the responsibility of the asset owner; however, the materials used must comply with the requirements of the NRSWA reinstatement specification (SROH/SROR), as may be amended.

3.3.2. Under SROH/SROR, the surround to apparatus may be laid to a maximum thickness of 250 mm above the crown and must not intrude into the road structure.
(Note: The asset owners' specifications determine the minimum thickness cover.)

3.3.3. A hand-rammed fine fill layer up to 200mm above the crown of the apparatus is recommended, to reduce the risk of damage.

3.4. Marker/Warning Systems and Protective Measures

3.4.1. When installing new apparatus, appropriate marker systems detailing the utility being installed, are recommended to be placed at a suitable depth between the backfill and sub-base layers. The system's width should consider the diameter of the asset being installed, and parallel assets. Where necessary, in the case of increased or shallow depth additional layers of marker tape, often differing thicknessnes may be laid.

3.4.2. Care should be taken that any exposed underground marker systems are not unnecessarily disturbed, damaged or removed. Any displaced marker system should be replaced, and contact made with the asset owner as required. It is also important to remember:

a. Some marker systems above non-metallic pipes and ducts have insulated wire, tapes incorporating a metal strip, or other passive electronic systems to aid locating the apparatus.
b. Protective matting, tapes or tiles made from concrete, clay, steel or plastic may be used to provide protection as well as identification.
c. Marker systems may not be present or directly above the apparatus due to it being installed using trenchless techniques. You should not rely on them as an accurate indicator of position.

d. Marker systems do have a value as a warning to an operator of the presence of buried plant but, they may be of limited use as a means of positive identification of the apparatus itself.

3.4.3. In addition to underground marker systems, above ground marker posts and plates may also be used as an indicator of the presence of an asset or fitting (e.g. valve, pressure point, syphon etc.) These may vary in application type (e.g. post, pit cover, housing system) and height dependant on the environment in which they are installed.

3.4.4. Where apparatus is being installed shallower than the minimum depths (see section 5) consideration should be given to the installation of improved marker systems and/or protection and approval obtained by the adopting asset owner. The "as built" drawings shall be marked up accordingly, indicating the protective measures taken, such as extent of protection or depth.

3.4.5. Where apparatus is being installed within the proximity clearance of adjacent assets (see section 5), consideration should be given to the installation of additional protective measures, such as sleeving cables in a duct where multiple apparatus cross.

4. Positioning of Underground Apparatus

4.1. General

4.1.1. Distribution and transmission mains, pipes, cables and ducts are commonly laid in longitudinal directions in parallel to other apparatus. Apparatus is also often laid to cross each other laterally (for example road crossings or service connections) and can even be laid directly above or below other apparatus.

4.2. Depth of Apparatus

4.2.1. The minimum depths are recommended to ensure there is adequate protective cover above the apparatus when subsequent excavation activities take place. And sufficient protection from effects of underground frost heave.

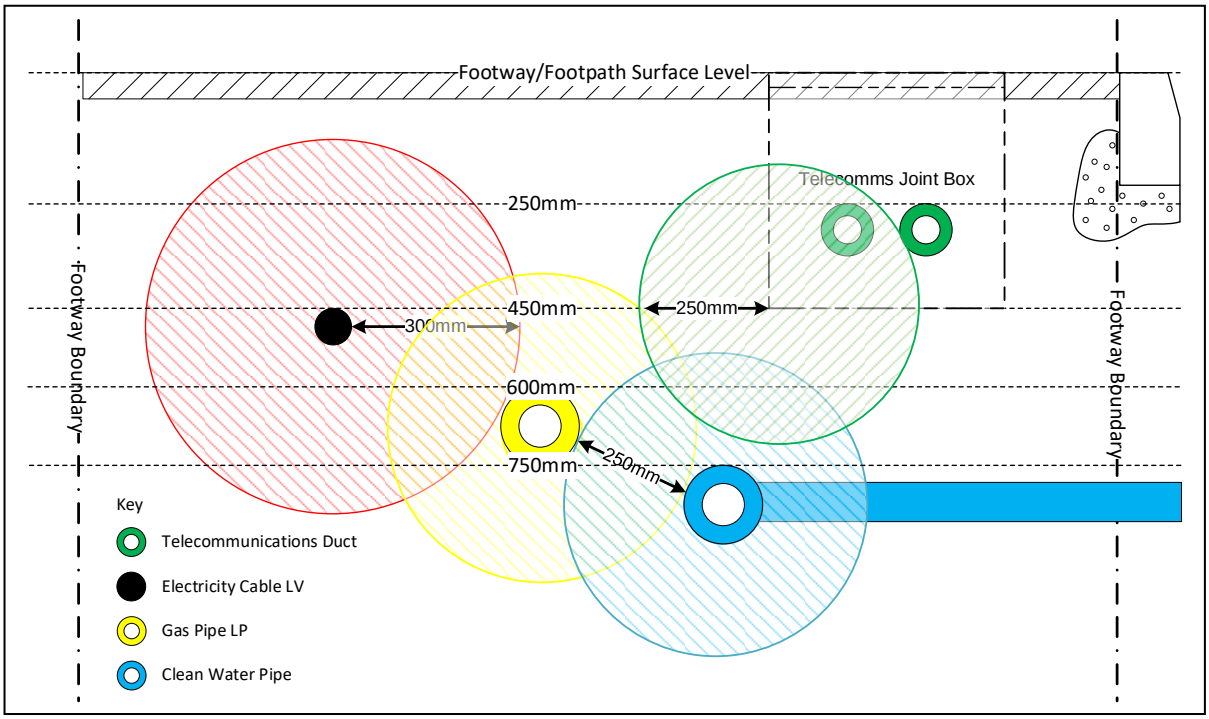
4.2.2. Where it is proposed to lay apparatus at a depth less than the recommendations of this publication, this will be determined by a risk assessment and evidenced with adherence to the hierarchy of controls in section 5.

4.3. Proximity Clearance to Other Apparatus

4.3.1. The minimum proximity distances are recommended to ensure there is adequate room for future maintenance to take place on the apparatus, in the event of spontaneous failures, such as interference damage or network integrity requirements.

4.3.2. The minimum proximity distance is a 360-degree radial separation clearance, which is normally from the outside of the pipes, duct or cables; however, there are occasions where the point of proximity could be an ancillary item such as a joint, service connection or valve/chamber pit.

Figure 1 - Radial Proximity Clearance (Cross Section Perspective)



Notes:

i. Exact underground utilities present, and configuration may vary and are not accurately depicted in this diagram

ii. This diagram is an indicative illustration of a typical utility sub structure section, however, as a consequence of multiple underground utilities present, a bespoke risk assessment will determine the actual positioning and installation of new apparatus.

iii. Diagram excludes service connections

4.3.3. Where it is proposed to lay apparatus at a proximity less than the recommendations of this publication, with the exception of scenario outlined in Section 4.4, this will be determined by a risk assessment and evidenced with adherence to the hierarchy of controls in Section 5.

4.4. Small Diameter Service Connections

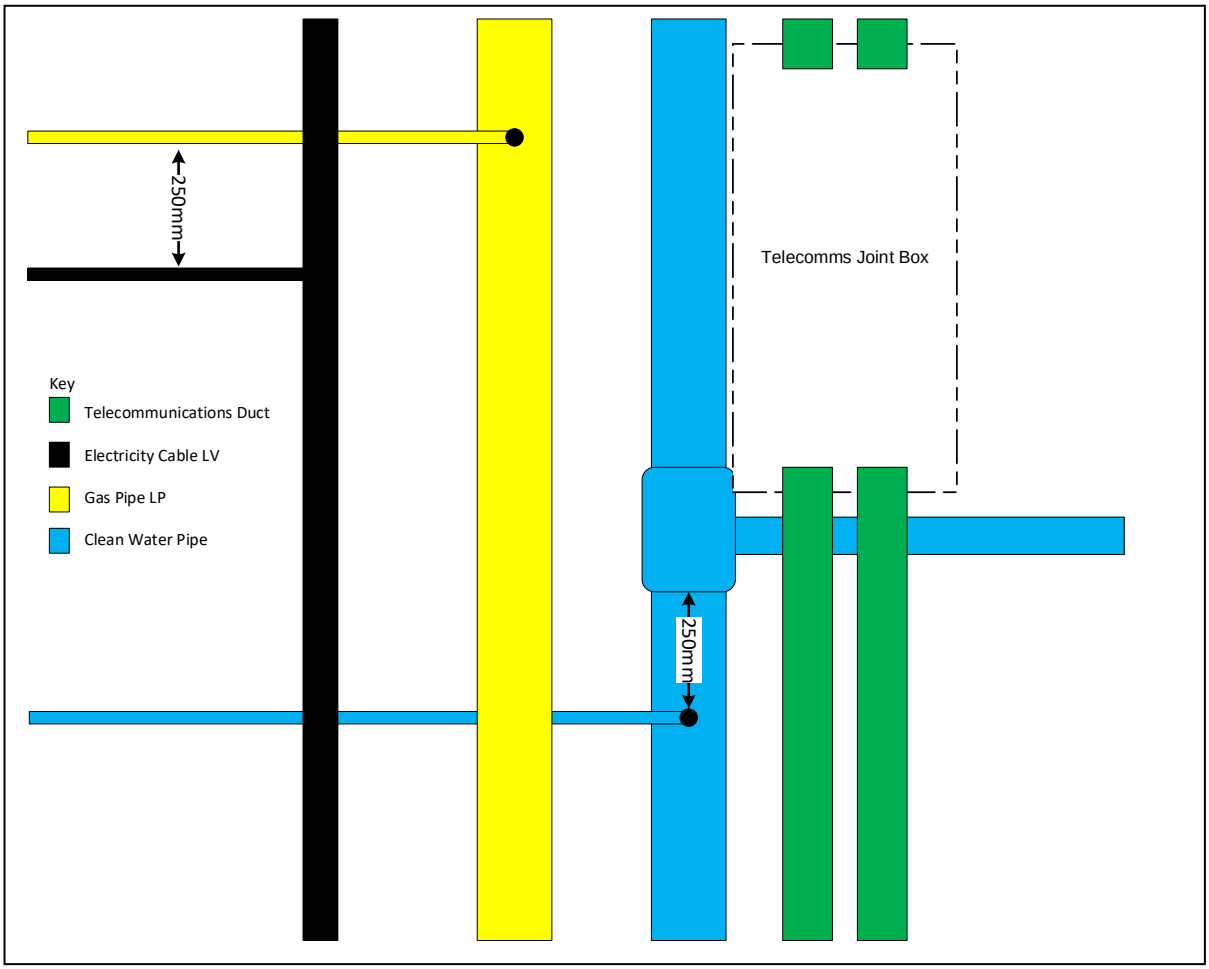
4.4.1. The minimum radial proximity can be reduced for service connections that are cables or a flexible pipe material with a diameter of 32mm or less, if it can be demonstrated it would otherwise not be reasonably practicable to provide a service connection point to the customer.

4.4.2. Non-metallic pipes with a diameter of 32mm or less have enough flexibility to manually manipulate with caution, once uncovered and exposed, to create suitable access for future maintenance activities.

4.4.3. In the event service connections are installed with a radial proximity of less than 100mm to adjacent apparatus, this will be determined by a risk assessment.

4.4.4. Where it is not possible to maintain the minimum radial separation (as per Table 1) for small diameter service connections, it is recommended where practically possible to apply a risk assessed lateral separation between each service connection and other ancillary items, such as joints or boxes.

Figure 2 - Service Connection Point Lateral Proximity (Top-down Perspective)



Notes:

i. Exact underground utilities present, and configuration may vary and are not accurately depicted in this diagram
ii. This diagram is an indicative illustration of a typical utility sub structure section; however, as a consequence of multiple underground utilities present, a bespoke risk assessment will determine the actual positioning and installation of new apparatus.

4.4.5. Where the minimum radial proximity clearance for small diameter services is reduced additional protective sleeving can be applied, this is of more importance adjacent to electric mains cables, due to potential heat dissipation and risk of damage to other assets in the event of a fault.

4.4.6. For service connections it is recommended that the minimum depths in Table 1 are applied and every effort should be made to install apparatus to these requirements. However, it is recognised due to the limited available space within modern highway footway designs and the congestion of

existing underground infrastructure often this is not always practically possible,. In such scenario's as soon as conditions allow, the service connection will be installed to the recommended minimum depth.

4.4.7. If in doubt, contact the utility asset owner of all affected apparatus for clarification of specific requirements.

4.5. Footway/Footpath

4.5.1. The minimum depth of apparatus in a footway or footpath is taken from the crown of apparatus to the footway or footpath surface level, irrespective of the height of the footway or footpath in comparison to any adjacent carriageway.

4.6. Carriageway

4.6.1. In the event of congestion of apparatus in the footway or verge, apparatus may have to be sited within the carriageway. In addition, transmission and trunk pipes and cable ducts are invariably of larger dimensions and consequently may need to be laid in the carriageway.

4.6.2. Wherever practically possible, cables which cross the carriageway should be laid in ducts to ease future maintenance, avoid disruption and reduce the risk of damage.

4.6.3. The minimum depths of apparatus in a carriageway are taken from the crown of apparatus to the carriageway surface level, irrespective of the height of any adjacent footway, footpath or grass verge.

4.7. Verges and Service Strips

4.7.1. If site conditions make available a verge which is suitable for installation of apparatus, this could be the preferred route over footways or carriageway. Installing apparatus in a verge can have multiple benefits:

a. Accelerated installation and reinstatement operations minimising disruption to customers.
b. More sustainable method compared with below made structures.
c. Easier and less disruptive access during installation, and for future maintenance such as traffic management requirements and coordination issues.

4.7.2. However, the existence of trees, hedges or other environmental considerations may influence whether the verge is the most appropriate location. Particular care should be taken if the verge is identified as a Site of Specific Scientific Interest (SSSI) or other environmental classification. For further guidance see Street Works UK Publication Volume 4.[3]

4.7.3. Where the verge surface profile is lower than or the same as the adjoining footway or carriageway surface level, the minimum depth of apparatus is always measured from the crown of the apparatus to the verge surface.

4.7.4. When the verge surface profile is higher than the carriageway surface level, except for lower risk apparatus, the minimum depth of apparatus is typically measured from the crown of the apparatus to the adjacent carriageway surface level.

4.7.5. Lower risk apparatus (as determined by the asset owner) can be positioned using the verge surface as datum, if there is a minimum of 300mm distance between the apparatus and any parallel carriageway.

[3] Volume 4 - Street Works UK guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees

Figure 3 - Verge Datum Point no Interjoining Footway

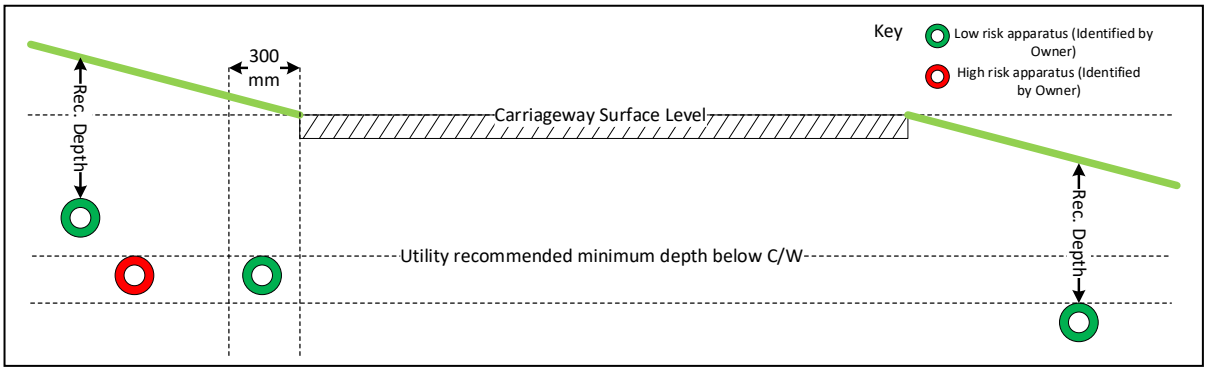
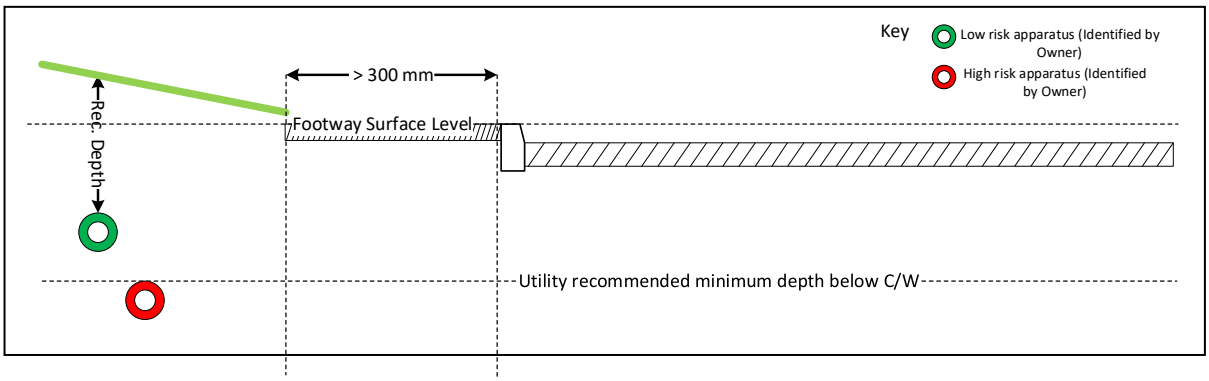


Figure 4 – Verge Datum Point with Interjoining Footway



Notes:

i. Apparatus colour coding used in the above diagrams is for illustrative purposes only, dipicting the different geographic scenarios apparatus may be positioned.

ii. Exact underground utilities present, and configuration may vary and are not accurately depicted in this diagram.

iii. These diagrams are indicative illustrations of a typical utility sub structure section, however, as a consequence of multiple underground utilities present, a bespoke risk assessment will determine the actual positioning and installation of new apparatus.

4.7.6. Variance in surface datum position maximises safety & resilience of networks, while allowing lower risk apparatus to be positioned at reasonable depth. Future redesign or repurposing of highway (such as increasing width of an existing footway or carriageway) can occasionally impact existing buried assets, so all due care should be taken to identify assets in all positions before undertaking such works.

4.7.7. It is recognised that there are scenarios where applying these recommendations would be impractical and not mitigate the required objective explained in 4.7.6, for example a grass verge embankment which may require considerable deep excavation controls. These circumstances would need to be determined by a site-specific risk assessment.

4.8. Cycle Lanes and Tracks

4.8.1. The minimum depth of apparatus in a cycle lane or track will depend on the location in the highway of the cycle route. If the cycle lane occupies part of the carriageway the minimum depth is taken from the crown of apparatus to the carriageway surface level, if the cycle lane occupies part

of the footway or footpath then the minimum depth is taken from the crown of the apparatus to the footway or footpath surface level.

4.9. Motorway

4.9.1. Motorways are protected streets and undertakers should avoid laying apparatus under them unless the apparatus is directly associated with the motorway itself (e.g. lighting, communication and signal cables, etc.).

4.9.2. Where utility apparatus does have to cross a motorway, this is usually accomplished by utilising an existing bridge, duct or service tunnel. In the absence of any existing routes for apparatus trenchless methods of excavation (e.g. micro tunnelling, horizontal directional drilling), the installation method should be used wherever practically possible. For procedures regarding protected streets see the NRSWA Coordination Code.[4]

4.10. Railways and Tram Tracks

4.10.1. Particular care is required for new apparatus installed as undertrack crossings, to avoid damage or failure of the structural integrity of the operational railway or tramline.

4.10.2. Minimum depths vary depending on installation technique (open cut/boring) and the specific transport authorities' specifications. The minimum depths and proximity recommendations of this publication are superseded by the rail or tram authority requirements, and normally agreed through the asset owners permit to work procedure.

4.10.3. Additional marker systems and information may be required as per the relevant transport authorities' requirements.

4.10.4. The network operator will have additional permits to work requirements regarding third party operational procedures within proximity to their network. All authorisations must be obtained before installation works begin. For further information regarding working on or near to rail tracks or tramways see the NRSWA Coordination Code

4.11. Combined Service Ducts, Subways and Tunnels

4.11.1. There are circumstances where utilities may be required to install their apparatus in designated service ducts, subways and tunnels.

4.11.2. When considering these options, the following should be taken into account:

a. Accessibility - when considering the positioning of apparatus, access and maintenance.
b. Positioning of apparatus - as directed by the asset owner.
c. Any permit to enter requirements for installation and future maintenance.

4.11.3. For placing apparatus in the London Authority Service Subways see the guidance in the Local Authority Code of Practice.[5]

4.12. Use of Abandoned and Surplus Apparatus

4.12.1. Abandoned or surplus assets can be used by other utilities to insert their new apparatus. This installation type reduces the risk of potential damage to third party apparatus and mitigates underground utility congestion.

4.12.2. It is essential that both the original and new asset owners record the change of use and update their plant records accordingly.

4.12.3. Any new apparatus installed should be colour coded in accordance with Table 1, however arrangements for the reuse of abandoned or surplus assets are bespoke to each utility and

[4] Code of practice for the coordination of street and road works
[5] Code of practice for the access, egress and safe working in local authority service subways

identification may be difficult for sections of the installation which are entirely within the annulus of the old asset.

4.12.4. The reuse of abandoned and surplus assets can only be agreed between the previous and proposed new asset owners.

5. Factors Influencing the Positioning of Underground Apparatus

5.1. Due to technical, engineering, or legal constraints there may be exceptional circumstances where these recommendations cannot be adhered to. Examples include:

a. Width restrictions
b. Depth restrictions
c. Environmental reasons e.g trees, planted shrubs, hazardous vegetation
d. Restrictions imposed by legislation
e. Safe access to apparatus
f. Clustering of utilities' apparatus
g. Existing underground structure such as a cellar or culvert
h. Jointing chambers or valve installations
i. Apparatus exiting from or entering asset buildings or chambers e.g electricity substations and telephone exchanges.
j. Surface apparatus e.g kiosks, street lighting and cabinets.

5.2. In such circumstances it may be necessary to deviate from the recommended minimum depths and proximity clearance to facilitate installation. If a deviation results in the apparatus being positioned in the footway or carriageway construction, see Section 6 for guidance on when written agreement is required from the highway authority.

5.3. Deviations are common across bridges where the minimum depth of cover is not available within the structure and a diversion would be unsuitable or not possible. In any event the installation depth and proximity distance of the apparatus should be agreed with all affected asset owners, including the bridge owner, and should not compromise the stability of any highway structure.

5.4. Where it is proposed to lay apparatus below the footway or carriageway construction and outside the scope of the recommendations of this publication, this will be determined by a risk assessment and approved by the affected asset owner.

5.5. Risk assessments and content will vary dependent on the specific asset owner's policy and procedures, apparatus proposed to be laid, and site-specific conditions. Because of this an example template is not provided.

6. Specifications for the Reinstatement of Openings in Highways/Road's Code of Practice

6.1. The recommendations of this publication are to follow the minimum depths for apparatus as per Table 1 for "utilities" and Table 2 for "other". These are minimum depths, and where the existing highway construction is significantly engineered resulting in a greater depth of bound structure, apparatus may need to be installed at a greater depth than the minimum to compensate for this.

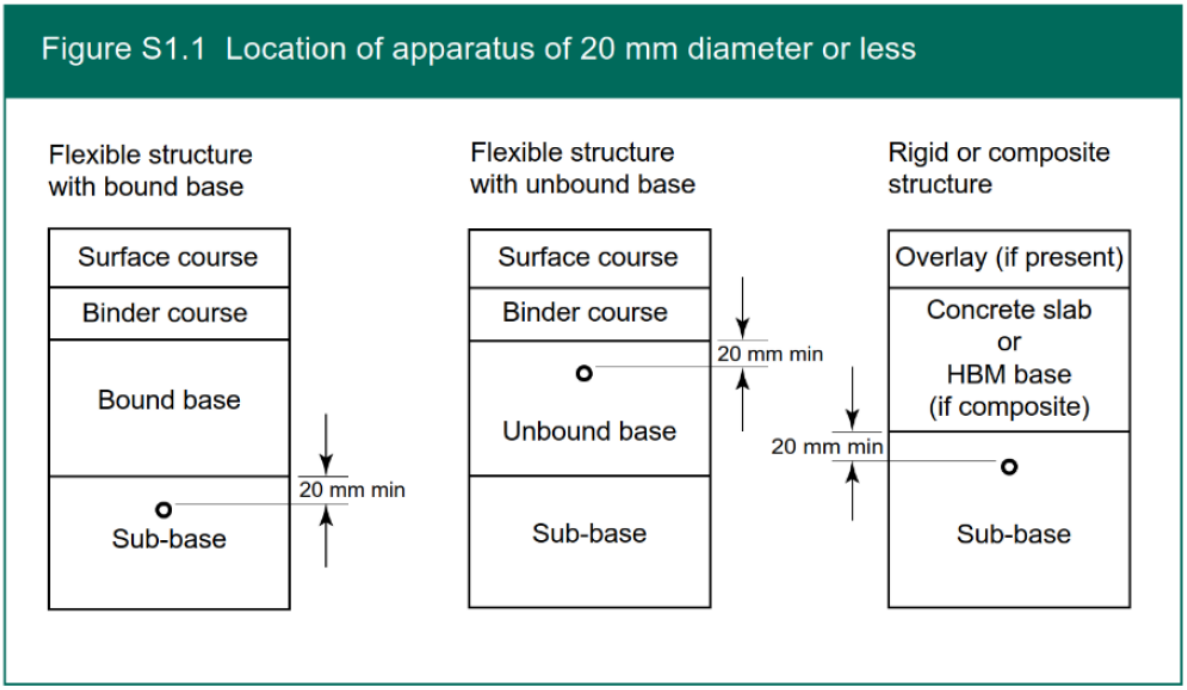
6.2. Utility apparatus is installed below the road, footway, and cycle track construction unless special arrangements are made with the relevant authority. Apparatus installed within these structure layers is significantly more at risk of damage from traffic loads and excavation activities.

6.3. Section 1.8 of the SROH / SROR explains the circumstances that undertaker's apparatus can be placed within a road, footway, and cycle track construction.

a. Apparatus with external diameter greater than 20mm is not permitted within any structure without HA agreement.

b. Apparatus of 20mm external diameter or less can be installed within an unbound sub-base without HA agreement.

Figure 5 – SROH v4 Location of apparatus of 20mm diameter or less



6.4. See Section 5 for guidance on managing exceptional circumstances which influence the positioning of apparatus.

7. Trench Sharing and Multi Utility Installations

7.1. Whilst opportunities for laying multiple apparatus in single excavations historically has been limited between differing asset owners. It is recognised this activity is now becoming more common through regulatory collaboration incentives and the expansion of multi-utility organisations and contractors.

7.2. The minimum depths and proximity distances are still applicable when laying two types of apparatus in a single trench. This may require increased scope of excavation works to accommodate benching techniques and / or the application of a propping system. An alternative option in site conditions which limit the excavation width could be to lay apparatus deeper than the recommended minimum depths.

Figure 6 – Example of benching technique during multi-utility installation of gas and water

7.3. Due to the additional operational complexities and challenges, multi utility installation activities will involve bespoke Risk Assessment and Method Statement (RAMS) to ensure a safe system of work.

7.4. For further information on trench sharing and collaboration see the NRSWA Coordination Code.

8. Installation of Apparatus on New Development Sites

8.1. Preliminary Enquiry

8.1.1. When preparing for an acquisition of land, a developer will require information about the position and availability of existing utility services. At this early stage it is unlikely that detailed development plans will be available to enable a formal application for supply to be made. However, it is considered best practice for the developer to obtain preliminary plant records as early as reasonably possible.

8.1.2. Preliminary utility enquires will also serve to establish contact between the developer and utility, ensuring consultation takes place at the earliest stage in the project. The developer should appoint a co-ordinator to oversee these engagements.

8.2. Early Consultation

8.2.1. Early consultation by developers is essential to ensure that any special considerations for the project are identified, such as:

a. Ordering of special items of plant;
b. Disconnection of existing supplies;
c. Arrangements for protecting and / or diverting existing utility apparatus;
d. Siting of, acquisition of and early access to land required for plant or governor houses, substations and other large items of apparatus.

8.3. Variations

8.3.1. Wherever practicable, utilities should notify the developer of any relevant changes that affect the estimated costs and timescales in relation to the provision of services to the development.

8.3.2. Similarly, the developer should notify the utilities if it is decided to delay, make changes to or abandon any development.

8.4. Apparatus Installed by a Developer

8.4.1. On new development sites where utility apparatus is installed by the developer or a third party, details contained within these guidelines should be followed. Any deviation from these guidelines, such as reduced proximity clearance to other utility apparatus or lay depths, should only be conducted with agreement of the asset owner.

8.5. Apparatus Installed by a Utility

8.5.1. To allow utilities to install their apparatus in the correct position, footways and carriageways should be clearly marked out by the developer:

a. By constructing a kerb or a permanent and substantial kerbline (depending on agreed site drawings)
b. By suitably marking the line and level of back of footway and boundary lines.
c. Footways, footpaths and other routes should be clearly marked out to final line and level with suitable pegs or pins, or brought up to formation / final level.
d. The planned route should be kept clear of hard materials such as bricks, concrete and other large debris.
e. All routes should be maintained and clear of all building and other materials during the installation of apparatus.
f. If service entry points are not evident, markers should be provided by the developer to indicate the position at which the service connections are required.
g. Developers should clearly mark both ends of pre-installed road crossing ducts to indicate their position. Ducts laid by the developer should be suitably spaced to avoid congestion at entry and exit points, to facilitate potential installation of joint boxes, bends etc. Ducts laid for cable installation should always include draw ropes.
h. Provision should be made by the developer to permit adequate access for utility plant and machinery.
i. The developer should contact the utility to determine the minimum length of lay to be prepared before commencement of installation.
j. The developer should ensure effective co-ordination of utility installation works throughout, to avoid delay and potential conflict.
k. Routes under overhead electricity lines must be marked in accordance with HSE Guidance Note GS6.
l. Where ducts are installed by a developer or third party, particular attention should be paid to the appropriate colour coding and materials. For further details see Tables 1 and 2.
m. Exact specifications for the use of ducts on development sites should be agreed with the relevant asset owner.

8.5.2. It is important developers follow the above guidelines as utilities reserve the right to reschedule their work if the site has not been adequately prepared.

8.6. During construction

8.6.1. As far as reasonably practicable, utilities should ensure works programmes are completed within the agreed period.

8.6.2. Particular attention should be paid to:

a. The correct reinstatement of all construction levels to the developer's specified standards.
b. The removal or re-distribution of surplus spoil and other materials where necessary.
c. The protection of developer line and level markers.
d. The use of ducts to facilitate the installation of apparatus beneath carriageways, footways, footpaths and paved or landscaped areas.
e. The co-ordination and communication of changes to planned routes, plant / apparatus positions, or service connection entry points.

f. The communication of any interruptions to the programme and the expected date of recommencement.

8.7. Early Access to Plant and Governor Houses, Substation Sites and Other Special Sites

8.7.1. Where plant houses, governor houses, substation sites or other special structures have to be erected within the development, early access to the sites is important. Developers and utilities should ensure:

a. The necessary wayleaves, easements and land acquisitions are completed in sufficient time.

b. Appropriate measurements, lines and levels etc. are in place by the agreed program date.

8.8. Commissioning of Apparatus

8.8.1. Where chambers and / or surface boxes are installed by the developer on behalf of a utility, the developer should ensure that they are set in the correct position in accordance with individual utility specifications prior to the completion of footway, carriageway and other surfaces. Damaged or incorrectly installed chambers or boxes should be immediately reported by the developer to the appropriate utility.

8.8.2. Each utility has specific processes which have to be undertaken prior to the commissioning of apparatus. These processes vary in duration and should be coordinated accordingly by the developer.

9. Low Carbon Technologies

9.1. District Heating

9.1.1. District heating is an energy network which generates heat at a centralised hub (often referred to as an Energy Centre), using various energy sources to heat water to a temperatures typically between 60-85°C (some transmission networks may operate up to 105°C but unlikely found during street works in the public highway), this heated water is then distributed through highly insulated flow and return pipes to residential and commercial premises where internal heat exchangers provide the properties with space heating and hot water.

9.1.2. The flow and return pipes can be plastic or steel and installed within an insulated carrier pipe containing either a single or twin flow/return heat pipes (see Figure 6).

9.1.3. Heat loss and absorption to the surrounding ground is minimal due to the flow and return pipes being housed in a larger diameter carrier pipe with the annulus filled with high-performance foam insulation. This results in the ground adjacent to the apparatus subject to no more additional heat than the normal insitu temperature.

9.1.4. Currently there is no unique colour coding for district heating pipes (although they are typically black or grey) and limited above ground indictors of heat networks. Additionally, there are no external indicators on properties such as meter a meter box as they are incorporated into a combined internal meter/boiler system (referred to as a Heat Interface Unit).

9.1.5. District heating should be installed with a suitable buried marker system displaying 'Heat Network' or 'District Heating'.

9.1.6. If digitilised as-laid drawings are unavailable through normal channels for suspected district heating apparatus, contact the local highway authority or housing developer initially who can provide details of the asset owner.

9.1.7. District heating is often installed in new development sites in place of gas apparatus, however there are occasions of developers installing hybrid gas/district heating network model across the build. There are also some retro fit installations of district heating network in the public highway.

Where this is suspected, communication must be made with the highway authority to ascertain asset ownership.

9.1.8. At the time of this publication, district heating asset owners are not statutory undertakers and do not have the same legislative powers regarding supply. Therefore, installation and maintenance of district heating apparatus placed in the public highway is undertaken using a street works license issued by the relevant highway authority under Section 50 of NRSWA.

Figure 7 - Schematic of Typical Polyethylene District Heating Twin Flow/Return pipe

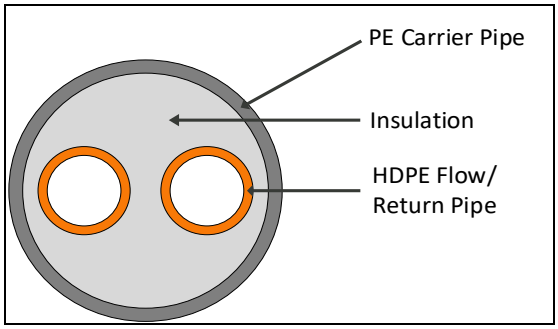


Figure 8 – Typical Polyethylene Single Carrier pipes with exposed compression fitting

Glossary

Apparatus / Asset (Utility)	Equipment such as distribution and transmission mains, pipes, ducts, valves, stop taps, chambers, cabinets, transformer chambers (etc.), including any structure for the lodging of apparatus.
Apparatus / Asset (HA)	Public highway infrastructure such as roads, pavements, bridges, highway drains, street lighting, road signs, etc.
Cable	An insulated wire (or wires) having a protective casing and used for transmitting electricity or telecommunication signals.
Carriageway	A way, constituting of / comprised in a highway, being a way (other than a cycle track) over which the public have a right of way for the passage of vehicles.
Cycle Track	A way, consisting of / comprised ia highway, over which the public have a right of way on pedal cycles with or without a right on foot.
District Heating	District heating is an energy network which distributes hot water from a centralised boiler installation, to provide heat for multiple buildings such as individual houses, multiple occupancy buildings and schools/hospitals etc.
Duct / Ducting	Structure (usually cylindrical) used to convey and protect apparatus.
Fiber Optic	The use of very thin glass or plastic fibers through which light can be transmitted to carry information from a source to a receiver, especially for telecommunication, television and information technology systems.
Footpath	A highway over which the public have a right of way on foot only, other than such a highway at the side of a public road. Excludes footway.
Footway	A way comprised in a highway which also comprises a carriageway, being a way over which the public have a right of way on foot only.
GRP	Glass Reinforced Plastic, a superior strength plastic pipe material for transporting gasses and fluids.
HA	Highway Authority, government organisation responsible for maintaining the public highway infrastructure.
High Voltage (HV)	Electricity cables over 11000 volts (≥11kV)
Low Voltage (LV)	Electricity cables up to 11000 volts (<11kV)
Mains	Asset structure, typically cylindrical >50mm diameter, used to convey water, gas or oil.
Major Accident Hazzard Pipeline	Pipeline that transports dangerous chemicals, gasses or fluids which have potential to cause a major accident if mismanaged.
Pipe	Longitudinal structure (usually cylindrical) used to convey water, gas or oil.
PE MDPE HDPE	Polyethylene is a hard plastic pipe with some flexibility allowing the pipe to traverse slight bends, commonly used for pipe distribution of gas and water pipelines. There are variances in PE pipe construction which increase the strength and wear resistant properties, MDPE medium density and HDPE high density.
Portable	Equipment light and small enough to be easily moved

PVC	Polyvinyl Chloride is a hard plastic pipe with little flexibility, commonly used for duct systems but also some clean and waste water pipe pipelines.
Risk Assessment	A process which identifies and evaluates hazards by risk potential, focusing on removal of hazards or reducing risks with control measures.
Service Connection	Pipes or cables between distribution mains and individual premises.
Service strip	A designated strip of land adjacent to a carriageway or footway for positioning of apparatus.
Sub-duct	Longitudinal structure (usually cylindrical) laid inside ducts, used to carry smaller diameter cables such as telecoms copper or fiber optic.
SWUK	Street Works UK - trade association representing utilities and contractors on street works issues.
Tiles	Impact resistant cover constructed of earthenware, concrete or polyethylene, used for protecting underground apparatus.
Utility	An undertaker by statute that has a legal right to provide and maintain customer supplies (e.g. communications, electricity, gas, water)
Verge	A strip of land which may form part of the public highway alongside a carriageway or footway, which may contain apparatus.

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