



**INLAND
WATERWAYS**
ASSOCIATION

GUIDANCE NOTE

*Underground
& Overhead
Services*

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First published as v.1 in 2022. This is a web-friendly document and will be reviewed and updated when the source legislation changes. Any printed version may not be the latest version and a check should be made on IWA website. IWA has interpreted the current legislation, as dated in the document, in good faith but the reader should check for themselves that it is the latest version and that they are acting within the legal framework.

INTRODUCTION

Overhead services on your site can be obvious because you can see them, but underground services are a much bigger problem. Planning of any work should include ensuring that services are located. When carrying out an excavation, make sure that the method is safe and will not affect any services.

Planning should include a desk-based service search with the utility companies, such as gas, electric, water, local authority, BT, cable TV. Use the information from these companies to mark the service locations on your plans. Remember the plans only give an indication of where the service is located, the exact position will need to be established on site.

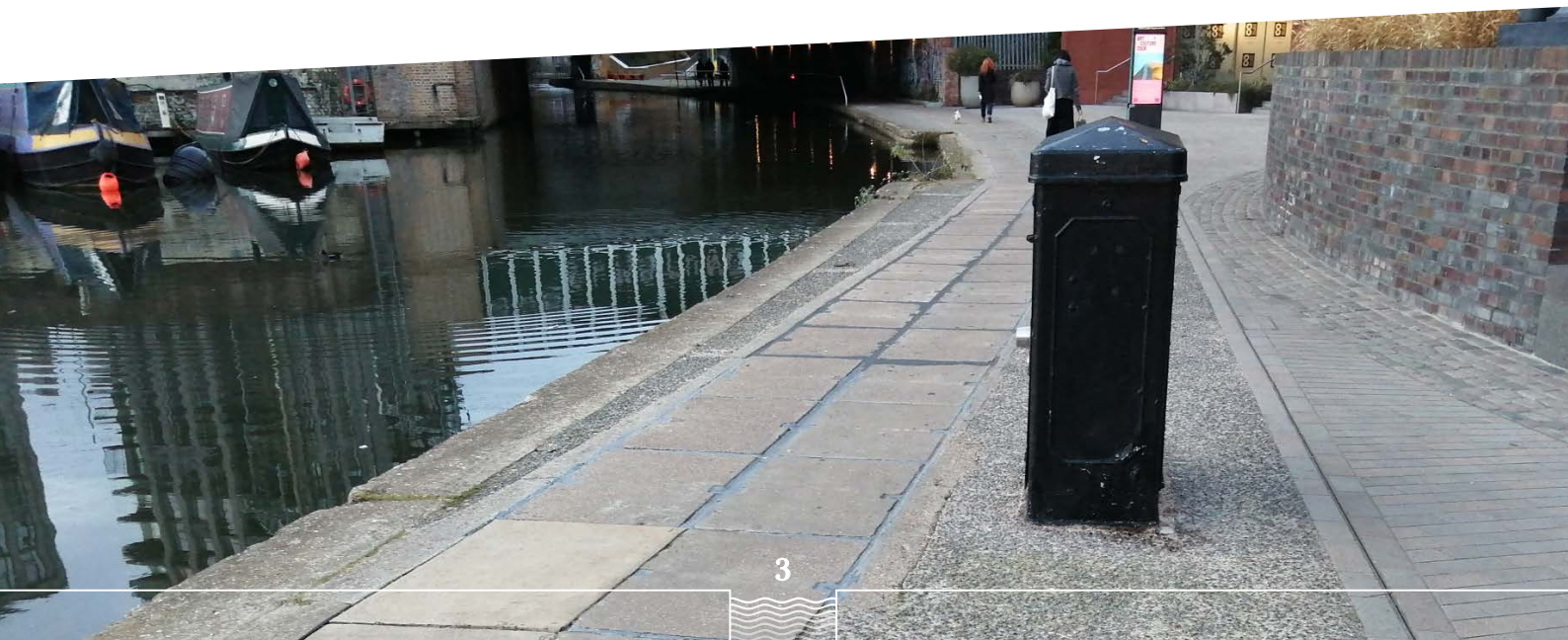
There is a national on-line service to help identify underground utilities. a link to the Plantodig service is given in useful resources on p.12.

If there are services on your site you need to check with the utility company if there are any restrictions to carrying out work near the services. Working close to or under overhead cables or pipes will require special precautions to be taken.

Your work may affect the services and the utility company may insist on a temporary or permanent diversion to allow your work to be carried out safely. The diversion work is usually carried out by the service provider or their nominated contractor and can be expensive and take a long time to plan and implement.



Visit the site and look out for signs that services might be present. Look for manhole covers and marker posts, depressions or colour changes of the surface material that might indicate a service trench.



UNDERGROUND SERVICES

The most common services are gas, electricity, water and telecommunications, but there could be drains or sewers. Striking a service, such as a high voltage cable, could be fatal. Gas leakage could cause a fire, explosion or dangerous atmosphere. Water leakage could cause flooding. Apart from the risk to health and safety the associated costs from accidentally striking a service can be considerable and could affect local businesses, residents and other places dependent on those services.

THE NATIONAL JOINT UTILITIES GROUP HAS AN AGREEMENT ON THE COLOUR CODING OF SERVICES

Recommended colour coding for underground utility apparatus	
Service (s)	Pipe or cable
Electricity, water, oil, fuel pipelines and telecoms	Black pvc
Water	Blue pvc
Water and telecoms	Grey pvc
Electricity	Red pvc
Telecoms	Natural pvc
Gas	Yellow pvc

Pipe or cable material used by the different services	
Pipe or cable	Service (s)
Cast iron	Gas and water
Steel	Gas and water
Braided steel	Electricity
Yellow steel	Gas
Copper	Water
Lead or covered lead	Water and electricity
Asbestos	Water
Hessian wrapped	Electricity

When identifying underground services you should take the following into account:

- ① Unless proved otherwise, all black pvc must be assumed to be electricity.
- ② Unless proved otherwise, cast iron and steel must be assumed to be carrying gas.
- ③ Ducts may be carrying any service irrespective of the type or colour of the duct.
- ④ Yellow pvc may be electric cable in some circumstances where it has been laid by the National Coal Board.

When checking for underground services contact public and private utilities for the existence of their apparatus and mark these on your plans. Be careful reading service plans, surface features may have changed or the service moved without authority.



On site there might be marker posts, but the lack of a marker post does not mean that a service is not present. The following items can indicate the presence of underground services:

- 1** Lamp posts.
- 2** Illuminated traffic signs.
- 3** Telephone boxes.
- 4** Concrete or steel inspection chamber covers.
- 5** Hydrant and valve pit covers.
- 6** Steel cabinets in the footway (set back) or in a verge.

Services are often installed at a shallower depth than that recommended and where services pass over a bridge or culvert they may be much shallower at these locations.

Before carrying out any excavation, check the ground for any services using a CAT (cable avoidance tool) detector and genny. They should be used together to provide a full picture, but note they will not find plastic pipes. Make sure that whoever uses the equipment is competent to use it.

On the power frequency a CAT will find most electricity cables whilst power is flowing through them unless the current is below the detection capacity. The radio frequency can detect electricity cables not picked up on the power frequency, but can have geographical limitations and will detect other metal objects. It can be used to pick up telecommunications cables of certain frequencies, but may not work on fibre optic cables. Use the transmitter and receiver method to locate services when there is no current in the services.

The genny (generator) has to be attached to the pipe or cable and will provide a signal for the CAT to track.

Once the service routes have been identified, mark them with paint, tape or markers. Do not use metal spikes as they could penetrate a cable or pipe. Don't forget that the exact position will not be known until the underground service has been exposed.



GUIDANCE NOTE

Where services are known to be on a site from utilities plans, but have not been detected by CAT and genny, a hand dug trial trench can be used to accurately locate the services. Any services encountered must be identified and the utilities should be contacted to identify their apparatus. Never assume that a service is dead, always treat it as live until it has been confirmed otherwise. The location of any services encountered must be provided for inclusion in the health and safety file.

When excavating near any service do not use power tools or excavators within 500mm of a service. Hand digging should be undertaken using insulated tools and sharp tools, such as picks or forks, should not be used. Power tools can be used to break paved surfaces, but be careful not to over-penetrate because the service may be located immediately below the paving.

In some circumstances excavation will be controlled by a permit to dig system. The permit will show what precautions need to be taken and will allow a check to be made before excavation commences. The permit will be issued by the site leader. An example form is included in the useful resources on p.12. Refer to the guidance note on Temporary Works and Excavations.

The utility owner may need to view and approve the method of excavation and service support. High pressure gas mains need to be protected before working over them. the protection will be supervised by National Grid.

For any excavation the side supports must be sufficient to support the sides of the excavation and allow any services to be supported across the excavation. Small deflections in some services can result in cable or pipe damage. Don't use the service support as footholds, anchorage or climbing points.

Before any piling or drilling a safe system of work must be devised and any services located by hand digging first.

When backfilling over services only use material that will not damage it and don't dump or compact material in such a way that it could damage the service. Place marker tape approximately 300mm above the service. Seek advice when backfilling over gas pipes.

IN AN EMERGENCY

Any damage to underground services must be reported to the owner/occupier immediately and when an emergency situation is created, call police, fire and /or ambulance as necessary. If gas catches fire do not attempt to extinguish the flames. Some cables automatically re-energise within a short time of tripping out, do not assume the cable will remain dead.



OVERHEAD SERVICES

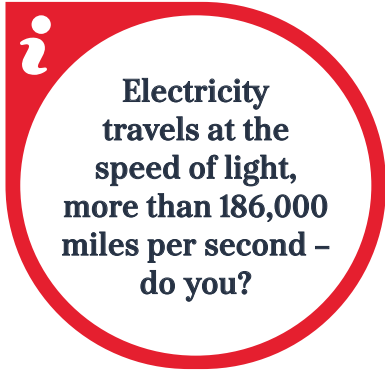
The existence of overhead services is sometimes missed because of weather conditions or because people don't look up. Work may only be carried out in close proximity to live overhead power lines when there is no alternative and the risks are assessed as acceptable and can be properly controlled. Incidents occur when activities are not properly planned and there is accidental contact or a piece of equipment gets too close and the electricity is conducted to earth.

Telephone lines can be strung overhead and may need protecting against damage during your work.

Electricity supplies above 33,000volts are usually routed overhead. There is a minimum height above ground for overhead power lines according to the voltage they carry:

- ① 400 kV – 7.3m.
- ② 275 kV – 7.0m.
- ③ 132 kV – 6.7m.
- ④ 33 kV, low voltage – 5.2m, except for roads where the minimum is 5.8m.





Electricity travels at the speed of light, more than 186,000 miles per second – do you?

Where work near overhead services cannot be avoided the local electricity company or distribution network operator (DNO) must be contacted before any work is started. A safe system of work must be planned and implemented. Other people, such as local authorities, National Grid or other electricity companies may need to be contacted.

WORKING NEAR OVERHEAD POWER LINES

Where work is carried out near, but not under, overhead lines a safety zone needs to be established and should extend at least 6m horizontally from the nearest apparatus. If cranes or other plant are operating in the area a warning at high level should also be erected. The barriers can be erected from concrete filled steel drums painted red and white and must be visible at night. The safety zone may need to be extended if any moving parts, such as excavator arms, could encroach the zone. The electricity supplier will give specific advice on the position of safety zones.

TRAVELLING UNDER OVERHEAD POWER LINES

Where plant has to travel underneath an overhead line the route must be adequately defined by fencing and goal posts erected at each end. Warning notices need to be displayed at each end on or near the goal posts. The notices and cross bars need to be illuminated at night and in poor weather. The fences and goalposts need to be maintained.

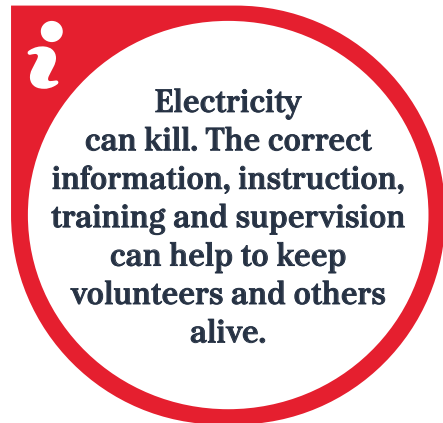
WORKING UNDER OVERHEAD POWER LINES

The owner of the overhead line should be consulted about line voltage and the use of exclusion zones.

When working under power lines an exclusion zone needs to be set up. The minimum extent of these zones varies according to the voltage carried:

- ① 1m from low-voltage lines.
- ② 3m from 11kV and 33kV lines.
- ③ 6m from 132 kV lines.
- ④ 7m from 275 kV and 400 kV lines.

Work under overhead lines must be supervised by someone familiar with the risks and may be a representative of the owner. Volunteers must understand the risk and be provided with instructions about the risk prevention measures. Work should not be carried out during darkness or in conditions of poor visibility.



Electricity can kill. The correct information, instruction, training and supervision can help to keep volunteers and others alive.



APPENDIX A: NATIONAL JOINT UTILITIES GROUP (NJUG) GUIDELINES

The following volumes constitute the NJUG Publications. They are living documents and may be amended from time to time. There is no attempt to describe any specific industry process as each utility has its own specifications and procedures.

NJUG Publications	
Current	Previous
Volume 1	
NJUG Guidelines on the positioning and colour coding of underground utilities' apparatus.	NJUG 4 & 7
Volume 2	
NJUG Guidelines on the positioning of underground utilities for new development sites.	NJUG 2, 5 & 6
Volume 3	
NJUG Guidelines on the management of Third Party cable ducting.	New
Volume 4	
NJUG Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees.	NJUG 10
Volume 5	
NJUG on-site environmental good practice guidelines.	New
Volume 6	
NJUG Guidelines on coordination, cooperation and communication.	New

The following NJUG publications have not been reviewed and have been completely withdrawn:

- ① NJUG 3 – Cable Locating Devices.
- ② NJUG 8 – Performance Guide for the Assessment of Metallic Pipe and Cable Locators.
- ③ NJUG 9 – Recommendations for the Exchange of Records of Apparatus between Utilities.
- ④ NJUG 11 – Proposed Data Exchange Format for Utility Map Data.
- ⑤ NJUG 12 – NJUG Specification for the Digitisation of Large Scale OS Maps.
- ⑥ NJUG 13 – Quality Control Procedure for Large Scale OS Maps Digitised to OS 1988.
- ⑦ NJUG 15 – NJUG/Ordnance Survey Service Level Agreement (Technical) for Digital Map Products and Services.



APPENDIX B: CHECKLIST PRIOR TO AND DURING EXCAVATION (FROM CITB)

- ① Check with all utilities and landowner before starting work.
- ② Use detection devices and keep close watch for signs of underground services (marker tape or tiles).
- ③ Services may be installed at shallower depths than the recommended minimum depth.
- ④ Markers (plastic tape, tiles, slabs or battens) may have been displaced and may not indicate the exact location of the service.
- ⑤ Some electric cables and water pipes look alike, make sure each service is properly identified before starting work.
- ⑥ Services could easily be damaged by a fork or pickaxe forced into the ground, use insulated spades and shovels to enable services to be uncovered safely.
- ⑦ Depending on the risk assessment, those that are likely to encounter services on a regular basis should wear flame resistant clothing, gloves and suitable eye protection for the task.
- ⑧ Carefully lever out rocks, stones and boulders.
- ⑨ Over-penetration of the ground or surface with hand-held power tools is often a cause of accidents.
- ⑩ If an excavator or digger has to be operated near any service, the task will need to be specifically assessed to prevent accidental damage. Where possible, no one should be near the digger bucket while it is digging.
- ⑪ Ensure the excavator operator and others excavating are informed of the presence of suspected services.
- ⑫ If the service is embedded in concrete or paving material, the owner may be able to de-energise it. Otherwise, make it safe or approve a safe system of work before it is broken out.
- ⑬ Always assume closed, capped, sealed, loose or pot-ended services are live or charged, not dead or abandoned until proved otherwise.
- ⑭ Follow the guidelines and advice by electricity, gas, water and telecommunications industries.
- ⑮ Where possible, carry out the final exposure of underground services in a way that prevents any damage (such as using a vacuum excavator or compressed air lance).



USEFUL RESOURCES:

HSE Guidance; Avoiding danger from underground services, HSG47

HSE Guidance; Avoiding danger from overhead power lines, GS6

National Joint Utilities Group (NJUG) Guidelines on the positioning and colour coding of underground utilities' apparatus

Example of permit to dig form

Plantodig

Sign up to read the full Practical Restoration Handbook and supporting resources here:
waterways.org.uk/practicalrestorationhandbook





Historic England

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