

HEALTH AND SAFETY  
GUIDANCE NOTE

# UNDERGROUND SERVICES



**NFU Mutual**  
Risk Management Services

## INTRODUCTION

Underground services can be present anywhere and unless you know exactly where they are, there is always the risk of making contact with them when you are carrying out activities that penetrate the ground (e.g. excavation, post ramming etc.).

Damage to underground services can cause fatal or severe injuries, as well as significant disruption and environmental damage. It can also delay the work being carried out, potentially resulting in considerable additional costs, including potential fines.

## WHAT ARE UNDERGROUND SERVICES?

Underground services include all underground pipes, cables and equipment associated with electricity, gas, water (including piped sewage) and telecommunications; as well as other pipelines which transport a range of petrochemical and other fluids. Underground structures such as railway tunnels etc. are not included.

The description ‘underground service’ includes both:

- The mechanism by which the service is carried (such as the cable, pipe, conduit or duct); and
- Any of its associated equipment (such as a junction box, branch, or siphon valve).

When excavating at, or below, ground level, it is always safest to assume that underground services are present.

## WHAT ARE THE RISKS ASSOCIATED WITH UNDERGROUND SERVICES?

Workers who have to carry out excavation or other ground penetration work can potentially come across any, or all, of the various kinds of buried services and equipment. The following table lists the key risks associated with the various service types.

| Service Type                                | Potential for Damage   | Main Risks   |
|---|--|--|
| Electricity cables and associated equipment | <ul style="list-style-type: none"> <li>• Penetration of the cable by a sharp object.</li> <li>• Exposure of cable conductors resulting from abrasion.</li> <li>• Crushing damage.</li> </ul>       | <ul style="list-style-type: none"> <li>• Electric shock.</li> <li>• Explosion from arcing current.</li> <li>• Fire as a result of explosion.</li> <li>• Risk of secondary damage and / or additional risk (e.g. secondary explosion from simultaneous damage to gas service).</li> </ul>   |
| Gas supply pipes and associated equipment   | <ul style="list-style-type: none"> <li>• Penetration, abrasion or crushing etc., that allows gas to escape.</li> <li>• Immediate gas leak or damage that causes a leak at a later time.</li> </ul> | <ul style="list-style-type: none"> <li>• Asphyxiation.</li> <li>• Fire.</li> <li>• Explosion.</li> <li>• Travel of gas into a duct, chamber or other property (unseen explosive risk).</li> </ul>  |
| Water pipes and associated equipment        | <ul style="list-style-type: none"> <li>• Penetration, abrasion or crushing etc., that allows water to escape.</li> </ul>   | <ul style="list-style-type: none"> <li>• Injury from being struck by high pressure water jet and/or physical objects such as stones or soil being carried within the water.</li> <li>• Flooding and filling of excavations or confined spaces, drowning.</li> <li>• Secondary risks from contact with other services (e.g. electricity or contaminated substances).</li> </ul> |
| Drainage and sewerage systems               | <ul style="list-style-type: none"> <li>• Penetration, abrasion or crushing etc., that allows contents to escape.</li> </ul>  | <ul style="list-style-type: none"> <li>• Similar risks as for high pressure water, in pumped or pressurised sewerage systems.</li> <li>• Contamination.</li> </ul>   |
| Telecomms cables and associated equipment   | <ul style="list-style-type: none"> <li>• Damage to cables (as for electricity).</li> <li>• Damage to ducts carrying cables.</li> </ul>   | <ul style="list-style-type: none"> <li>• Direct personal risk normally low.</li> <li>• Secondary risk of flammable or toxic gas entering damaged duct and travelling or accumulating elsewhere.</li> </ul>   |
| Pipelines                                   | <ul style="list-style-type: none"> <li>• Physical damage that allows contents to spill.</li> </ul>   | <ul style="list-style-type: none"> <li>• Risk dependent upon contents.</li> <li>• Being struck (as for water) in the case of high pressure systems.</li> <li>• Fire or explosion of flammable contents.</li> <li>• Asphyxiation from gases.</li> <li>• Poisoning from toxic contents.</li> </ul>   |



## WHAT ARE MY LEGAL DUTIES?

There is various legislation that applies to underground services work including; The Health and Safety at Work etc. Act 1974, The Management of Health and Safety at Work Regulations 1999, The Construction (Design and Management) Regulations 2015, The Provision and Use of Work Equipment Regulations 1998, The Electricity at Work Regulations 1989, The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013, The Gas Safety (Management) Regulations 1996, The Pipelines Safety Regulations 1996 (and 2003 amendment), New Roads and Street Works Act 1991, Electricity Safety Quality and Continuity Regulations 2002 and the Fire and Rescue Services Act 2004 - and the equivalent regulations in Northern Ireland and Scotland.

They all contain specific requirements for managing the risk of contact with underground services.

General advice for achieving safe working near to underground services includes:

- Planning the work;
- Detecting, identifying and marking underground services;
- Using safe excavation techniques.

## WHAT TO CONSIDER WHEN PLANNING THE WORK?

Anyone planning or undertaking work that may disturb underground services must contact the owners / operators of those services for information about the location and status of the services. Those owners and operators should in turn provide any relevant information about the location of services in the work area. Service owners and operators should be prepared to help locate and identify the services (e.g. by sending a representative to the site). Plan the work with the aim to avoid underground services. Where this is not possible, develop plans to minimise the risk of damage to those services in the work area.

Other important elements of planning include ensuring that:

- Those supervising and carrying out the work have sufficient skills, knowledge and experience to do so safely;
- Safe working practices are put in place and used;
- Appropriate traffic signs are used on highways;
- Risks from other sources, such as collapse of excavations, are avoided;
- Adequate welfare facilities are available to those doing the work.

## HOW TO IDENTIFY UNDERGROUND SERVICES?

Detecting underground services will require information from those who own the services. Individuals with sufficient experience and technical knowledge should carry out a comprehensive survey of the work area using the appropriate survey tools and equipment.

For detecting services there are different levels of survey:

- Desktop study: Involves requesting and considering the service drawings from the owners of underground services. This should be done for all projects that involve excavation or penetrating the ground.
- Desktop study and site investigation: Involves using the information from the desktop study to assist a physical inspection of the site (looking for physical signs such as inspection hatches, reinstated excavations, street lights and telecoms boxes) and a survey using detection tools.
- Physical identification of the services: In addition to the above, this involves taking steps to detect and identify the underground services through trial holes to verify their location, depth and identity. It may also involve passing a tracing device through a pipe or tunnel.

The level of survey needed will depend on the nature of the work site. The decision on the necessary level of survey should be informed by an assessment of the likelihood of underground services being present, based on the information obtained for the work site.

Those doing the survey need to have sufficient knowledge and experience in the use of survey equipment and techniques. They will need to understand the limitations of the equipment, the effect of differing ground conditions on the survey results, how to survey a given area effectively, and to appreciate the limitations of plans and drawings provided by the service owners.

Once identified, note the line of any identified services and mark with waterproof crayon, chalk or paint on paved surfaces (use biodegradable paint or erase residual markings as far as possible after excavation), or with wooden pegs in grassed or un-surfaced areas, preferably to one side of the service. Steel pins, spikes or long pegs which could damage services laid at shallow depth should not be used.

## CONSIDERATIONS FOR WORKING SAFELY NEAR UNDERGROUND SERVICES

Assume all services are live until disconnected and proven safe at the point of work. Obtain written confirmation of disconnection from the owner / operator before removing a redundant service.

Determine the method or technique for excavating near underground services before work starts, taking account of:

- The nature and scope of the work;
- The type, position and status of underground services;
- The ground conditions;
- Site constraints.

Provide those doing the work with a written plan, including information about the location and nature of underground services. They should be competent, provided with appropriate personal protective equipment (PPE) and work equipment, and allowed sufficient time.

You should carefully plan and manage mechanical excavation, which is a common source of damage to services. Another person should assist the excavator driver, from a position where they can safely see into the excavation and warn the driver of any services or other obstacles. This person should remain outside the operating radius of the excavator arm and bucket.

Hand-held power tools can damage services and should be used with care until the exact position of the service has been determined. You may use them to break a paved or concrete surface above a service, unless there are any indications that the service is particularly shallow or too close to the surface to be broken up.

Hand tools are a common source of accidents if incorrectly used. However, when used carefully, they can normally provide a satisfactory way of exposing services.

Make frequent and repeated use of locators during the course of the work. Service location is likely to become more accurate as cover is removed. A permit system may be appropriate for particularly hazardous work. This will involve written authorisation by a responsible person, identifying the work to be done and the precautions to be taken.

A permit system needs suitable supervision and monitoring to ensure that the conditions of a permit are complied with. Further information on permit to work systems is included in the Permit to Work Guidance Note.

Once underground services have been uncovered, failure to identify them correctly is another common cause of accidents. To work safely near underground services, you must be able to recognise or identify one kind of service from another once it has been uncovered.

| Service         | Description  |
|-----------------|--|
| Gas             | Yellow ducts or pipes  |
| Electricity     | Black or red ducts and cables  |
| Water           | Blue or grey ducts; blue pipes                                       |
| Sewer Pipes     | Black ducts; various colour pipes                                    |
| Telecoms        | Grey, white, green, black or purple ducts; light grey or black cable |
| Street Lighting | England and Wales: Black or orange ducts; black cables               |
|                 | Scotland: Purple ducts and cables                                    |
|                 | Northern Ireland: Orange ducts; black or orange cables               |

In some instances a service pipe, duct or cable may be laid with an additional coloured polythene marker tape installed in the ground about 300 mm above it. The tape is placed in this way so that it will be uncovered in the event of future excavation and serve as a warning that a service is located beneath it. Some warning tapes also contain a metallic tracer strip along their length, so that when laid above plastic pipes for example, their position can be identified by electronic (metal detecting) equipment.

Despite the usefulness of the colour coding system for identification of underground services, it should be remembered that:

- Older services may not be colour coded in accordance with this ‘modern’ system;
- Services may be wrongly housed in a duct or other covering that is incorrectly coloured for that particular service (e.g. consider an electric cable that is wrongly sheathed within a white telecommunications duct);
- Dirty service equipment and / or poor light conditions (e.g. during emergency work at night) may make services appear a different colour to what they actually are.

With regards to warning tape, tile or capping methods, remember that:

- These might have become disturbed within the ground over time and therefore not accurately indicate the presence of a service below them;
- The absence of a warning tape or capping does not automatically mean that there is no service in the vicinity.

Once exposed, services may need to be supported and should never be used as handholds or footholds for climbing out of excavations.

Backfilling of excavations must properly support and protect the underground services. Concrete must not be used to encase services when backfilling.

If an underground service suffers damage during the excavation or subsequent work, inform the owner / operator. In the case of electricity cables, gas pipes, other pipelines or high-pressure water mains, arrange to keep people well clear of the area until it has been repaired or otherwise made safe by the owner / operator.

## SOME SIMPLE INSTRUCTIONS OF WHAT NOT TO DO!

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- Never allow anyone near a damaged or suspected damaged cable or joint;
- Do not handle or attempt to alter the position of a cable or joint;
- Never assume that cables run in straight lines, they may be deflected around underground obstacles;
- Do not use a mechanical excavator or powered digging tools within the vicinity of known cables;
- Never knock a road pin, or forcibly throw a spiked digging tool into the ground, without checking what is below the surface.

## INFORMATION, INSTRUCTION, TRAINING AND SUPERVISION

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All those working to expose services and those supervising them must be competent to do so. They should have had sufficient information, instruction and training to:

- Understand the risk to safety from damaging services;
- Use detection tools;
- Practice safe excavation techniques and understand the value of hand digging and the risks from using power tools or mechanical excavators.

It is important that workers are appropriately supervised. Effective supervision can help you monitor the effectiveness of the training that people have received, and whether employees have the necessary competence to do the job.

## FURTHER GUIDANCE

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- HSE Website – Excavation and Underground Services  
[www.hse.gov.uk/electricity/information/excavations.htm](http://www.hse.gov.uk/electricity/information/excavations.htm)
- HSG47 Avoiding danger from underground services  
[www.hse.gov.uk/pubns/priced/hsg47.pdf](http://www.hse.gov.uk/pubns/priced/hsg47.pdf)
- HSG85 Electricity at Work - Safe working practices  
[www.hse.gov.uk/pubns/priced/hsg85.pdf](http://www.hse.gov.uk/pubns/priced/hsg85.pdf)

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