HEALTH AND SAFETY AUTHORITY

Code of Practice For Avoiding Danger From Underground Services

Second Edition January 2010

Our vision:
A national culture where all commit to safe and healthy workplaces and the safe and sustainable management of chemicals

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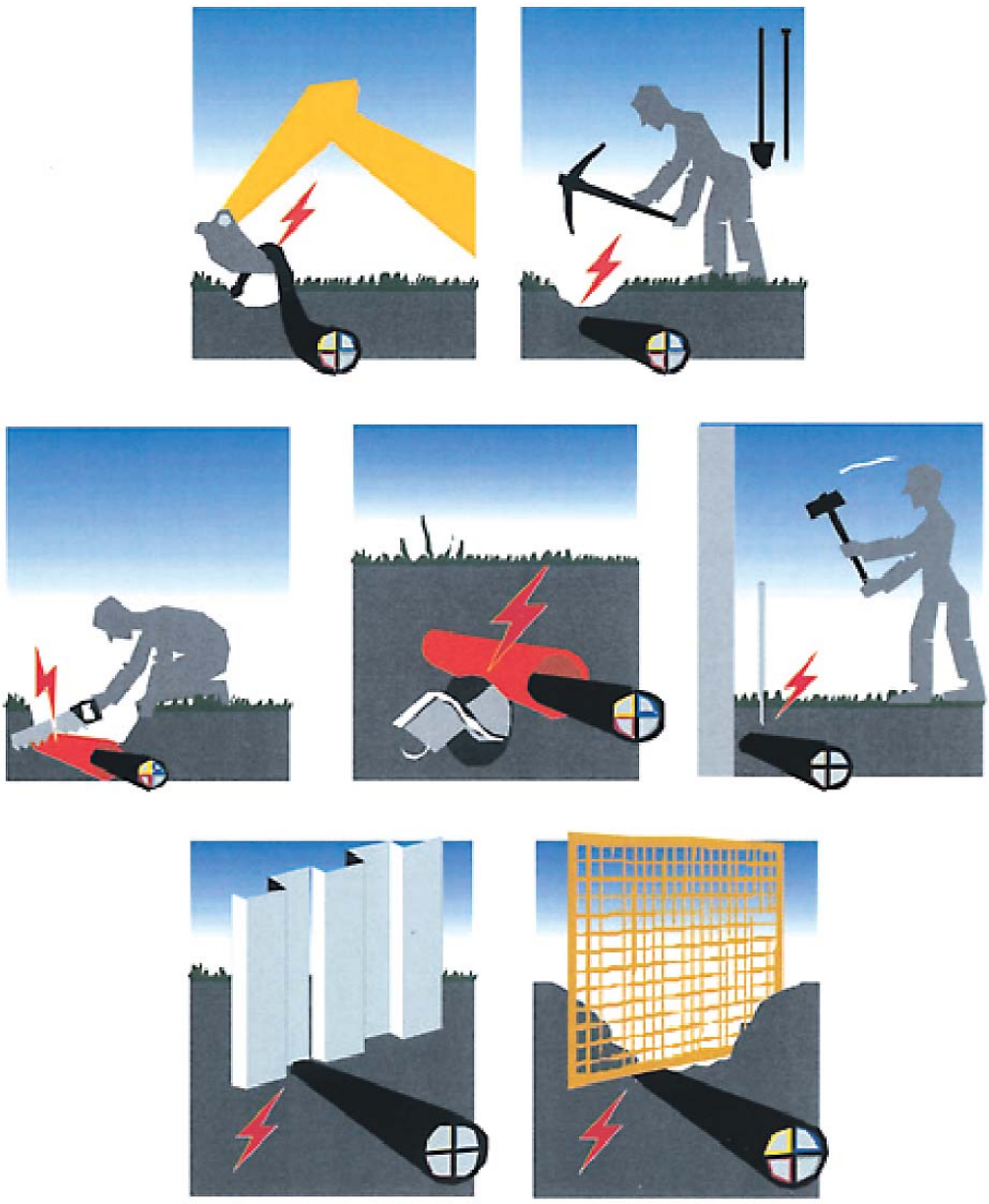

Foreword

The Health and Safety Authority (by virtue of Section 60 of the Safety, Health and Welfare at Work Act 2005), following consultation with the statutory Advisory Committee on Construction Safety, and with the consent of Mr Dara Calleary TD, Minister of State at the Department of Enterprise, Trade and Employment, has issued a Code of Practice entitled *Code of Practice for Avoiding Danger from Underground Services*.

The Code of Practice provides practical guidance as to the observance of Part 5 of the Safety, Health and Welfare at Work (Construction) Regulations 2006 (SI No. 504 of 2006) as amended by the Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2008 (SI No. 130 of 2008) and the Safety, Health and Welfare at Work (Construction) (Amendment) (No.2) Regulations 2008 (SI No. 423 of 2008) which, inter alia, requires that adequate precautions are taken in any excavation, shaft, earthwork, underground works or tunnel to avoid risk to persons at work arising from possible underground dangers. Such dangers include underground cables or other distribution systems, the circulation of fluids and the presence of pockets of gas, and appropriate investigations to locate them must be undertaken before excavation begins. The Code of Practice also provides practical guidance as to the observance of Sections 19 and 20 of the Safety, Health and Welfare at Work Act 2005 in respect of relevant excavation work.

The aim of the Code of Practice is to improve the level of safety with which excavation work is carried out. In particular, it aims to reduce the incidence of damage to underground services and in doing so to minimise risk to personnel who are involved in this work.

This Code of Practice comes into effect on Monday 11th January 2010. It replaces the Code of Practice for Avoiding Danger from Underground Services issued by the Authority in 2005 in accordance with the Safety, Health and Welfare at Work Act 1989.

Notice of the issue of this Code of Practice was published in the Iris Oifigiúil of Friday 8th January 2010.

Robert Roe
Assistant Chief Executive

1.0 Introduction

1.1 Background

This Code of Practice (COP) replaces the Code of Practice for Avoiding Danger from Underground Services issued by the Authority in 2005 and is the result of a joint initiative between the Health and Safety Authority, Construction Industry Federation, Irish Congress of Trade Unions, key utility companies/service providers and local authorities that are involved in the provision and maintenance of vital underground services. This COP takes into account legislative changes in the Safety, Health and Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (Construction) Regulations 2006.

The aim of this COP is to improve the level of safety with which excavation work is carried out. In particular, it aims to reduce the incidence of damage to underground services and in doing so to minimise risk to personnel who carry out this work.

1.2 Status of the Code of Practice

This COP is published by the Health and Safety Authority under Section 60 of the Safety, Health and Welfare at Work Act 2005 and with the consent of the Minister of State at the Department of Enterprise, Trade and Employment.

This COP is intended to provide practical guidance to utility/service providers, clients, designers, planners, project supervisors (both design process and construction stage), contractors, safety representatives and any personnel who are involved in work where there is a risk from underground services.

A failure to observe any part of this COP will not in itself render a person liable to civil or criminal proceedings. However, where the COP gives practical guidance on the observance of any of the relevant statutory provisions, compliance or non-compliance with those provisions may be admissible as evidence in criminal proceedings. The requirements of this COP are without prejudice to the general obligations placed on employers and others by the current Safety, Health and Welfare at Work Act, Construction Regulations and other associated occupational safety, health and welfare legislation.

1.3 Scope of the Code of Practice

This COP gives recommendations and practical guidance on how to carry out excavation work safely in the vicinity of underground services. In this context 'excavation' means any work that involves penetrating the ground at or below surface level.

Excavation carried out in the vicinity of underground services includes work associated with a new or existing building that may involve the risk of damaging underground services. It encompasses all excavation work carried out on roadways, streets, footpaths and other open areas where there is a likelihood of buried underground services.

This COP also contains guidance on how to prevent future damage to services that are currently being installed.

2.0 General

2.1 Introduction

Electricity cables, gas pipes, water pipes and sewers, if damaged, may pose a direct danger to personnel who are working on the site. Damaged telecommunications cables may also be hazardous, although direct risk of personal injury is rare.

If an electricity cable, telecommunications cable, gas pipeline or water main suffers any impact or any damage, however slight, the incident must be reported to the network operator without any undue delay. Refer to Appendix 5, item 12.

2.2 Electricity cables

Injuries that result from damage to live electricity cables are usually caused by the explosive effects of arcing current and by any associated fire or flames that may follow when the sheath of a cable and the conductor insulation are penetrated by a sharp object such as the point of a tool, or when a cable is crushed severely enough to cause internal contact between the sheathing and one or more of the conductors. Typically, this causes severe and potentially fatal burns to the hands, face and body.

Some high-voltage electricity cables (e.g. 38kV and higher voltage) are filled with oil and, if damaged, the oil may auto-ignite and create an explosion or fire. Injuries may also be caused by the explosive effects of cable materials being vaporised by large currents. There is also a risk of electric shock when underground services are damaged.

Incidents may also arise from cables that have been damaged, but have not been reported to the relevant utility/service provider and, therefore, have not been repaired. In such circumstances nearby services such as plastic gas pipes may be at risk from damaged live electricity cables, which could create explosions or increase the risk of fire.

2.3 Gas pipes

Damage to gas pipes can cause leaks and may lead to high-pressure gas being released, with associated flying debris, noise, fires or explosions. There are two types of damage:

- Damage that causes an immediate leak following a pipe rupture. Those most likely to be at risk are the personnel carrying out the work and others in the immediate vicinity.
- Damage that causes a leak some time after the event. For example, damage to a pipe wrapping or surface may occur while work is being carried out and this damage may lead to a leak at a later date. Damage may also occur after the work has been carried out. For example, poor reinstatement may leave a pipe inadequately supported or subjected to unequal forces. Those most likely to be at risk are members of the public.

Refer to Section 10 and Appendix 2 for requirements.

2.4 Water pipes and sewers

While damaged water pipes are less likely to cause an injury, a jet of water emanating from a high-pressure main could injure people or damage adjacent underground services. In addition, a water leak from an underground pipe could wash away subsoil, thereby reducing support for adjacent services, roads and structures. There is also a risk of flooding trenches or low-lying areas such as nearby basements.

Sewers are generally gravity fed, but some sewage is pumped at pressure. While the main risk to people associated with damage to sewers is the possibility of contamination, these pipes may also emit gases such as methane or hydrogen sulphide. At certain concentrations, methane may be flammable.

Water mains and sewers require ongoing maintenance to ensure that they function effectively; clear access should always be maintained to pipes, especially near flanges, valves, manholes etc. The laying of gas pipes or electricity cables in parallel above or in immediate proximity to a water main or sewer substantially increases the risk of injury to the crews who may have to carry out subsequent maintenance tasks.

2.5 Telecommunications cables

Although damage to telecommunications cables may be very expensive, generally there is no direct risk of personal injury. However, damage to cables can pose a risk to the general population served by these cables. A breakdown in service can result in isolation from essential services such as fire brigade, ambulance and gardaí. Therefore, it is imperative that all precautions necessary are taken to avoid damaging telecommunications cables. If damage does occur, it must be communicated to the utility/service provider without delay. In case of damage to a fibre optic cable, it is advised that an individual should never look into either end of a severed fibre optic cable as laser light might damage eyesight.

2.6 Accumulation of gases

Flammable and toxic gases from sewers and other services may enter and accumulate in service ducts, particularly if ducts have been damaged. Such gases may also accumulate in chambers and manholes and may pose a risk to personnel who are carrying out work in these areas. The gas may also be transported in these ducts to nearby structures where the risk of explosion may be even greater.

Where entry into a confined space is necessary, the requirements identified in the Confined Space Code of Practice must be complied with.

3.0 Role of the client

3.1 Introduction

Clients play a very important role when it comes to safety and health on construction projects. The Safety, Health and Welfare at Work (Construction) Regulations 2006 define a 'client' as a person or organisation on whose behalf a construction project is carried out, in the furtherance of a trade, business or undertaking, or who undertakes a project directly in the course or furtherance of such trade, business or undertaking. Homeowners are not included under this definition.

The Construction Regulations place duties on the client. One of these duties is the appointment of a competent project supervisor design process (PSDP) and a competent project supervisor construction stage (PSCS) for every construction project. Project supervisors co-ordinate the management of health and safety with regard to the design and construction of the project. This duty does not apply when a client is having routine maintenance, cleaning, decoration or repairs carried out because of the low level of construction-related risks and routine nature of the works; however, if these works involve a particular risk, if more than one contractor is used or if the work will take longer than 30 working days or 500 person days, then project supervisors must be appointed.

Clients have a legal duty to be reasonably satisfied that the appointed project supervisors to carry out the work are competent to do so and will dedicate sufficient resources to the project to comply with their legal safety obligations.

3.2 Information from clients

Clients or their agents have a duty to pass on any relevant information relating to underground services that may be in their possession to the PSDP or the PSCS. This information should be as up to date as possible. The client should also make available a copy of any Safety File that is relevant to the construction work that is about to be undertaken.

3.3 Other duties that may apply

In accordance with Section 15 of the Safety, Health and Welfare at Work Act 2005, it is the duty of each person (or company) who has control to any extent of any place of work, or any part of a place of work, to take such measures as are reasonable for them to take to ensure, so far as is reasonably practicable, that the place of work is safe and without risk to health. In certain cases, this provision may be applicable to clients who commission projects that will involve carrying out excavation work near underground services.

Section 17 of the 2005 Act specifies duties to be complied with by persons who commission or procure construction work. Such persons must appoint in writing a competent person or persons to ensure, so far as is reasonably practicable, that the project is designed and is capable of being constructed to be safe and without risk to health.

4.0 Design process roles

4.1 Definition of designer

'Design' covers the preparation of drawings, design details, specifications and bills of quantities. A 'designer' is defined as any person who is involved in such work.

4.2 Project supervisor design process

All designers' work should be co-ordinated by a project supervisor for the design process (PSDP). The PSDP has a duty to prepare and provide to the project supervisor for the construction stage (PSCS) a preliminary safety and health plan if the project is expected to last more than 30 days or 500 person days, or if it contains a 'particular risk', as defined in the Safety, Health and Welfare at Work (Construction) Regulations 2006. One such 'particular risk' is working near high-voltage power lines (i.e. voltages greater than 1.0 kV), including overhead lines and underground cables.

The preliminary safety and health plan must contain an overall description of the project, its proposed timescale and appropriate information relating to other work on the site. It must also specify any work related to the project that will involve 'particular risks'.

Unforeseen circumstances may arise during the execution of the project and may result in a design change. This may in turn have safety, health and welfare implications. The PSDP has a duty to co-ordinate the designers in relation to the safety, health and welfare implications of any change in the original design.

The PSDP must prepare a Safety File for the project and present it to the client when the project is complete.

Where new services are being laid it is important that they do not prevent access to existing services. Any risk to crews carrying out maintenance on the existing services caused by the laying of new services must be identified at an early stage and minimised as far as is reasonably practicable.

The Principles of Prevention must be applied at all stages of the design process.

4.3 Use of plans during design

Where possible, the designers should obtain up-to-date maps and records of all potentially hazardous underground services in order to allow them to consider, at the design stage, the risks posed by those services. Plans and maps should be made available to prospective contractors at tender stage or contract negotiation stage. Before beginning any work on a site, the contractor should be satisfied that the drawings supplied contain the most up-to-date information available for the area in which the works are to be carried out.

4.4 Underground services and building work

4.4.1 Relocating underground services some distance away from the proposed construction site may provide a reasonably practicable means of avoiding the risk of causing damage to these services. Any request for the relocation of services should allow for sufficient time for the relevant utility/service providers to evaluate such proposals and carry out their work.

Buildings and other permanent structures should not be erected over underground services because this may create additional risks for construction workers and could prevent future access to those services. If it is not possible to avoid erecting a structure over an underground service, arrangements should be made with the relevant utility/service provider to relocate the service if this is practicable.

4.4.2 Other options to relocating the services may include:

- Repositioning structures or parts of structures to ensure that contact with underground services is avoided while the work is being carried out.
- Arranging for the supply contained within the underground services to be disconnected during the work.
- If neither of these options is practicable, then choosing methods to avoid contact, such as using ground beams to protect the service(s), may present a reasonably practicable option.

4.4.3 Designers should take into account any ancillary work that may be required, including the erection of perimeter fencing and walls or the construction of roadways. Early identification and planning are essential if risks are to be controlled.

4.4.4 Where new services such as electrical or gas supplies are being installed, it may be possible to reduce risks by not installing or commissioning these services until other ground works and installation works have been completed.

4.5 Underground services in paths and roadways

4.5.1 The options facing designers who are planning a new service in a roadway may be more limited. In order to select a route that avoids contact with existing services, it is important to have access to the most up-to-date information about those services. One option is to choose a route that has a low density of underground services. For example, a cable television duct might be routed at the side of a road, if that site has a reduced cable density. Designers of gas pipelines should also be aware of the requirements contained in IS 328:2003 Code of Practice for Gas Transmission Pipelines; IS 265:2000 Installation of Gas Service Pipes and IS 329:2003 Code of Practice for Gas Distribution Mains.

4.5.2 Having reduced the risks to a level as low as is reasonably practicable by design, information should be provided by the designer(s) about the risks that remain. In most cases the best way of informing those physically excavating in the vicinity of underground services is by providing the information on drawings, ensuring that the information given is the best available.

5.0 Construction stage roles

5.1 Project supervisor construction stage

The role of a project supervisor construction stage (PSCS) is to co-ordinate the project from a health and safety perspective. The PSCS must also develop the safety and health plan, which should outline how the management of the safety, health and welfare of on-site personnel is to be achieved. In addition, the PSCS must facilitate safe access to the site and co-ordinate the overall implementation of safe working procedures.

5.2 The contractor

All contractors on site must co-operate with the PSCS to allow the PSCS to comply with his or her statutory obligations and all contractors have a duty to co-operate with each other on issues concerning health and safety. The contractor must also supply accurate information in a timely fashion to the PSCS to allow for the preparation of the Safety File.

Contractors must carry out a site-specific risk assessment. They should also ensure that their employees have adequate training and that any plant or machinery is, so far as is reasonably practicable, safe and does not pose a risk to health. Contractors should also put in place measures to ensure that the health and safety of personnel employed by them will not be adversely affected by the work being carried out.

Sections 6 to 13 of this COP set out practical measures for protecting the safety, health and welfare of employees and non-employees while excavation work is being carried out in the vicinity of underground services.

5.3 Utility/service providers

All undertakings that have underground services should ensure that their records and maps are maintained as accurately as possible. They should make these records readily available to designers and contractors, as appropriate (see Section 7.3).

In circumstances where a utility/service provider is asked to provide permanent services for a building development, that company will be acting in the role of contractor. Therefore, while it is on site, it will be required to comply with any directions given by the PSCS. However, in circumstances where the provision of services is physically separated and demarcated from the site, then the utility company may assume the role of client for the purposes of the Safety, Health and Welfare at Work (Construction) Regulations 2006.

The utility/service providers should make all reasonable efforts to facilitate clients, designers and contractors to manage the safety risks arising from work activities close to underground services.

5.4 Employees

Safe systems of work must always be adhered to. All workers on site must take reasonable care to protect their own safety and the safety of others who might be affected by their actions. They must not engage in any behaviour likely to endanger health and safety on site. They should report without delay any defects in the safety and health regime that might endanger anyone in the workplace.

Employees must also attend training and assessments as might reasonably be prescribed by their employers with regard to health and safety and they must not misrepresent the level of training which they have attended.

6.0 Safe system of work

6.1 Introduction

Underground utility networks are a common feature in both rural and urban areas and their presence should be assumed until proved otherwise. The guidance given in this COP aims to minimise the risk involved in work that may expose persons to inadvertent contact with underground networks. It sets out a safe system of work that is based on obtaining as much information as possible about buried services before excavation or other ground penetration work begins and using that information to ensure that the work is carried out safely.

6.2 Basic elements

In the context of this COP, a safe system of work is defined as having three basic elements:

- **Plans:** Plans or other suitable information about all buried services in the area should be obtained before excavation work begins (see Section 4 and Section 7.4). This material should be passed on as early as is reasonably practicable by the designer through the project supervisors to the contractor who is tendering for, or is negotiating the carrying out of, the works.

  Plans that were used at the design stage and at the tendering stage may be out of date by the time excavation work begins. Therefore, before beginning any such work, the contractor should check that the plans supplied are the most up to date available.

  Account should also be taken of possible indications of the existence of underground services such as the presence of houses or other buildings, lamp posts, illuminated traffic signs, pit covers or evidence of reinstated trenches. However, the absence of such indicators does not necessarily mean that underground services do not exist.

- **Locators:** Suitable cable- and pipe-locating devices should be used in conjunction with any available plans to determine as accurately as possible the position of metallic underground services in or near the proposed work area. It should be noted, however, that these devices do not detect plastic pipes (see Section 8).

- **Safe digging practices:** Excavation work should be carried out carefully and should follow recognised safe digging practices (see Section 9).

These key elements – plans, locators and safe digging practices – complement each other and all three should be used when working near buried services. Using one element alone is not enough.

6.3 Employees

Employees should receive adequate instruction and training in the above procedures (see Section 14). A suggested job aid for workers' information is set out in Appendix 5. It is particularly important that anyone who is using a locator should have received thorough training in the use and limitations of that particular type or model of device. Most manufacturers will provide such training, and employers should ensure that this is adequate for their employees' needs.

Under the Safety, Health and Welfare at Work (Construction) Regulations 2006 (as amended) persons carrying out certain named tasks – including locating underground services, signing, lighting and guarding on roads and assisting in the implementation of health and safety at roadworks – are required to be in possession of a relevant and valid Construction Skills Certification Scheme (CSCS) card. Training and instruction requirements are dealt with in Section 14.

6.4 Procedures

The organisation and arrangements necessary for avoiding danger from underground services should form part of employers' statutory Safety Statements. Written, site-specific risk assessments of the work being undertaken should be carried out and may include the appropriate use of the relevant Safe System of Work Plans (SSWP).

7.0 Use of plans in the preparation of projects

7.1 Introduction

Up-to-date plans of all potentially hazardous underground services in the area should be obtained before excavation work begins. Where possible, providers of all relevant underground services should be consulted. It should be noted that there may be more than one service provider in a particular catchment area for certain types of utility. For example, while most electricity cables under roads and other public areas are owned by ESB Networks, many electricity cables are the property of local authorities and are used for providing services such as public lighting, traffic lights and so on.

7.2 Emergency works

In the case of emergency* works it may not be possible to obtain all requisite up-to-date plans prior to beginning excavation work. In such situations, all other aspects of safe digging practice should be complied with (see Section 9) and the work should be carried out in the same manner as if there were underground services on the site.

7.3 Availability of plans from utility/service providers

7.3.1 Utility/service providers should make available either up-to-date, readable plans that show the recorded line and depth (where known) of all underground services in the proposed work area, or they should provide other suitable information that achieves the same objective. The inclusion of a symbol key will generally be necessary to help the recipient understand the plans.

7.3.2 Utility/service providers should do everything that is reasonably practicable to ensure that such information is made available to enquirers. They are likely to receive many routine applications for information and they should consider how best to make this information available at short notice. In cases where utility/service providers have reservations about releasing copies of plans for commercial or security reasons, they should offer an alternative method of co-operation. For example, they might send a representative to the site to communicate the requisite information to designated contractor personnel only.

7.4 Use and limitation of plans

Plans vary in scale, content and style and adequate instruction and training in how to read and interpret them should be given to anyone who needs to use them.

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* If the question arises in criminal or civil proceedings as to whether works were emergency works, it is for the person alleging that they were to prove that this was the case. Clients and contractors should not use 'emergency' work as an excuse to justify a failure to plan properly when starting work without plans or other suitable information about underground services in the area.

Plans may give an indication of the location, configuration and number of underground services on a particular site. However, they are rarely drawn accurately to scale and, even if they claim to be accurate, they should not be relied upon in order to obtain accurate distance measurements. Errors may have been made during drafting or the scale may have been altered during reproduction, particularly if the original data was obtained from a microfiche slide or a digital map. Accuracy may be further limited because:

- Use of low-scale maps may not give a reasonable indication of location or configuration of underground services. Where possible use 1:500 in preference to 1:1000.
- The position of reference points (e.g. the kerb line) may have changed since the plans were prepared.
- The re-grading of a particular surface area may mean that the depths shown on the plan are no longer correct.
- Fixtures such as cables may have been moved without the knowledge of the utility/service provider.
- In many cases service connections are not marked.
- Services that appear as straight lines on a map may, in fact, be laid out in a snake-like formation; excessively long cables may have been laid in horizontal loops outside substations and switch rooms.
- Plans may show spare ducts.
- The routes of older services in particular may not have been recorded and so the absence of records should never be taken as proof that the area in question is free of underground services.

To determine the actual position of services and the depth of these services on site, safe digging practices must be used at all times. Such practices include the use of detection equipment and the hand digging of trial holes as required. See Section 9.

8.0 Cable- and pipe-locating devices

8.1 Position of services

The position of any services in or near the proposed work area should be pinpointed as accurately as possible by means of a locating device. This device should be used in conjunction with plans and other relevant information (see Section 8.2) as a guide to the possible location of services and to help interpret the signal.

8.2 Types of locating devices

The main types of locator available are:

- **Hum detectors:** (e.g. a cable-locating device set on power mode) are receiving instruments that detect the electromagnetic field radiated by live electricity cables, which have a current flowing through them. However, these instruments will not detect service connection cables to unoccupied premises or street lighting cables during the daytime, as little or no current will be flowing through those cables at that time. They may also fail to detect some well-balanced high-voltage cables that generate little magnetic field. It should be noted that the absence of current in a live cable does not in any way alter the risk of injury to a person if the cable is damaged.

- **Radio frequency detectors:** (e.g. a cable-locating device set on radio mode) are receiving instruments that respond to low-frequency radio signals, which may be picked up and re-emitted by cables and long metallic pipes. If radio frequency detection is used, other metallic objects may re-radiate the signal and results may vary appreciably according to locality, length of the buried cable or pipe, distance from the termination and geographical orientation.

- **Transmitter-receiver instruments:** With these instruments a small portable transmitter or signal generator is connected to a cable or pipe, or placed very close to it, so that the signal is induced into it. The receiver then detects that signal. Usually, some part of the cable or pipe will need to have been located in advance of the operation in order to ensure that the transmitter is positioned correctly. Transmitter-receiver instruments generally require more skill to operate than other types of locators. They may, however, provide useful information in difficult situations where using other locator equipment has not proved successful. In addition, they can provide a depth-measuring facility.

- **Metal detectors:** Conventional metal detectors will usually locate flat metal covers, joint boxes and so on, but may well miss round cables or pipes. They can be a useful tool for finding inspection points, which may provide connection points for a transmitter for use of transmitter-receiver instruments.

- **Ground-penetrating radar:** Such devices are capable of detecting anomalies in the ground, which may indicate the presence of an underground service. However, the sole use of this method would not determine the precise nature of the service and it should be used in conjunction with maps and other information about the services and ground conditions present. It is also preferable that this technique is used together with more conventional forms of locating device.

Most commercially available instruments use more than one of these techniques and may also include a depth-measuring facility.

8.3 Locating the service

The degree of confidence with which buried services may be detected depends on a number of factors such as the characteristics of the devices being used; the type and depth of the service; the magnitude of any electric current carried by the service cable; the effects of other cables and metal pipes close by; and the training, skill, hearing and experience of the operator.

A locator may not be able to distinguish between cables or pipes running close together and may represent them as a single signal. If two cables or pipes are sited one above the other, it may not detect the lower one. For that reason, frequent and repeated use of the locator should be made during the course of the work.

A locator may not detect plastic pipes or other non-metallic ducts and services unless:

- A metallic tracer wire has been laid with the pipe, which enables a signal transmitter-receiver to be used. Plastic gas, water, sewage pipes and fibre optic cables are the most likely type of non-metallic services to be encountered and some of these may have been laid with metallic tracer wires.

- A small signal transmitter is inserted into and then pushed along the pipe. This is a sophisticated technique and is not likely to be appropriate for many sites.

A locating device should always be used in accordance with the manufacturer's instructions, including being calibrated at regular intervals and not being used outside the specified date. A locating device should be checked regularly and maintained in good working order.

The line of any identified services should be noted and marked with waterproof crayon, chalk or paint on paved surfaces. Any residual markings should be erased after excavation, as far as possible.

On grassed or unsurfaced areas, wooden pegs should be used. Steel pins, spikes or long pegs, which could damage services laid at shallow depth, should not be used.

Under the Safety, Health and Welfare at Work (Construction) Regulations 2006, persons carrying out the task of locating underground services are required to be in possession of a Construction Skills Certification Scheme (CSCS) card. This is dealt with in more detail in Section 14.6.

9.0 Safe digging practices

9.1 Excavating

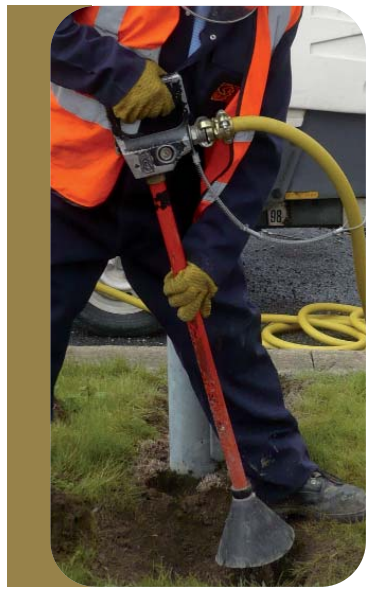
Once plans and a locator device have been used to determine the position of underground services, excavation may proceed. This work should be carried out carefully, following recognised safe digging practices.

Trial holes should be dug using hand tools to confirm the position of any buried services. Special care should be taken when digging above or close to the assumed lines of any such services. Hand-held power tools are the main source of danger to personnel and they should not be used too close to underground services. (See Appendices 1 and 2 for advice on appropriate safety margins for electricity cables and gas pipelines respectively.)

Hand tools, incorrectly used, are a common cause of accidents. However, if they are used carefully and if the approximate position of services has been determined through the use of plans and locators, these tools may provide a satisfactory method for exposing underground services. Every effort should be made to excavate alongside the service rather than directly above it. Final exposure of the service by horizontal digging is recommended as the force applied to hand tools may be controlled more effectively.

In particular:

- Spades and shovels should be used rather than other tools. They should not be thrown, or spiked into the ground. Rather, they should be eased in with gentle foot pressure.
- Picks, pins or forks may be used with care to free lumps of stone and other materials and to break up hard layers.
- Picks should not be used in soft clay or other soft soils in areas close to buried services.



Particular care should be taken in cases where gas leak search techniques, such as barholing, are used. Refer to Bord Gáis guidance material for advice. Similar precautions should apply when piles or earth rods are being driven into the ground.

Alternative excavation methods such as hydro or air digging tools and vacuum excavation may be used in certain circumstances. However, a detailed, site-specific risk assessment will need to be carried out first to estimate the specific risks associated with the use of these techniques, such as the presence of gas, spark ignition and injuries from ejected soil.

9.2 Damaged services

If an underground service suffers damage, no matter how slight, the utility/service provider should be informed immediately.

In the case of electricity cables, gas pipes, fibre optic telecommunications cables or high-pressure water mains, arrangements should be made to keep personnel well clear of the area until the damage has been repaired or otherwise made safe by the utility/service provider.

9.3 Identification of services

Failure to identify underground services correctly can cause accidents. Correct identification may prove difficult as the utility/service providers may have used a wide variety of materials and colours over a number of years. It is important to remember that colours may appear differently under poor or artificial lighting. In addition, ducts may well contain any one of a number of services, irrespective of the type or colour of the duct.

Some services are very similar in appearance and the following approaches should be adopted until such time as their identity has been positively confirmed:

- The housing for some water pipes and a significant proportion of electricity cables and telecommunications cables are made from black plastic. If a black plastic-covered service is encountered, it should be assumed to be a live electricity cable until proved otherwise. A small percentage of directly buried electricity cables are red in colour, these should not be mistaken for red-coloured electricity cable ducting.

- Iron and steel water pipes may look very similar to gas pipes. Therefore, if any iron or steel pipe is uncovered, it should be handled as if it is a gas pipe.

- Some services run in ducts, which may make these services difficult to identify. Where red ducts are uncovered, the services inside those ducts are likely to be electricity cables of modern installation and they should be treated as such. Where yellow ducts are uncovered, they are likely to be gas pipes and should be treated as such. Black and orange ducts have been used as standard colours for electricity cables in the past and they should be handled as if they contain electricity cables.

- Electricity cables may also be installed in concrete pipes, steel pipes and in plastic ducts in a range of colours. Where there is any doubt about the identity of an exposed service, it should be treated as if it is an electricity cable or gas pipe until proved otherwise.

- Telecommunications cables may be installed in concrete pipes, smooth black ducting or grey corrugated ducting.

All cables should be assumed to be live until disconnected and proved to be safe. Contractors should obtain written confirmation of disconnection from the utility/service provider before removing a redundant service or arrange for the utility/service provider to remove the service.

All new buried plastic piping should meet the requirements of Irish Standard (IS) 370:2007 for new installations (see Appendix 6). For example, new ducts installed since 2005 for electricity cables (where the voltage exceeds 125V) should be coloured red. See also Appendix 1 for other relevant specification details.

While colour coding is intended to give an indication of which service is contained within the buried plastic piping, caution must be exercised until the precise nature of the service has being confirmed.

9.4 Support to exposed services

Services uncovered in an excavation may need to be supported and should never be used as handholds or footholds by personnel when climbing out of an excavation.

9.5 Back-filling

Back-filling of any excavation should be carried out carefully. Warning tiles, bricks, tapes and any other protective materials that are lying above the services should be replaced in their original position unless an expert adviser confirms that the original position was incorrect. If the original position turns out to have been incorrect, then the warning tiles and other materials should be placed above the services to which they refer.

Warning tape should not be used for any other purpose (such as guarding an excavation trench) and waste tape should not be left in the excavation area when it is back-filled.

Fill material that contains items such as large pieces of rock and hardcore should not be used as this could cause damage to the services.

For specific advice on back-filling in the vicinity of gas pipes (i.e. where long-term damage is a particular hazard) see Appendix 2. Alternatively, utility/service providers may provide direction and advice on how to back-fill trenches in which their services have been exposed.

9.6 Burial of existing services

If underground services have been found to be too shallow, or if the plans or other information have proved to be inaccurate, the relevant utility/service provider should be informed – preferably before the excavation is back-filled. The utility/service provider should then amend its records accordingly.

9.7 Protection against burns

Burns are the main injuries that result from damage to live electricity cables, or from fire or explosion following a gas leak. Burns are likely to be most severe where skin is not covered and therefore, based on a site-specific risk assessment, appropriate skin cover for hands, arms, legs and upper body should be used.

The wearing of protective clothing should never be used as a substitute for a safe system of work.

9.8 Insulated digging tools

Where excavation work is being carried out near live cables, the use of insulated tools is strongly recommended. Generally, tools such as shovels, spades or picks should have insulated fibreglass or wooden handles. Fibreglass crowbars are also available and these should be used where feasible. If this is not feasible, then the crowbars should be fitted with insulated handles.

10.0 Safe systems of work for trenchless methods

Increasingly, trenchless methods are being used for the laying or renovation of underground pipes and cables, particularly in cases where it is necessary to avoid disturbing surface areas. The most widely used techniques are impact-moling, pipe-bursting and auger-boring. Care should be taken when using trenchless methods to avoid colliding with, and thereby damaging, other services. With moling and pipe-bursting it is also important not to work too close to other services as displaced soil may escape into nearby pipes or ducts.

As moling takes place underground, the actual path taken is unseen and not guaranteed, the pertinent risks associated with moling must be taken into account at both the design and construction stages. Possible damage using trenchless methods includes damage to structures and damage to other services.

Consideration must be given to the location of all services present and may involve appropriate consultation with the relevant utility/service providers. Competent planning, organisation and implementation will be required before and during trenchless works. The recommendations for safe digging practices outlined in Section 9 must be referred to.

Plans, locators and trial holes should be used to determine the position of existing services. The path of the equipment to be used should then be calculated accordingly. In order to avoid danger and allow sufficient clearance for the maintenance of existing services, the general guideline is that the minimum clearance between adjacent services should be either 300mm or one and a half times the diameter of the pipe being laid, whichever is the greater. For electricity cables, gas mains, telecommunications cables and water mains, clearances for maintenance work should be a minimum 300mm in all directions. Trenchless methods (moling/directional drilling) must not take place within ten metres of a gas pipeline unless the gas network operator has been consulted.

In certain circumstances, clearances may need to be varied. Therefore, contractors should take into account factors such as the construction of adjacent plant; ground conditions; bore diameter; the accuracy and reliability of the technique/equipment being used; and whether the other plant is parallel or crossing the proposed line. In addition, the requirements of nearby utility/service providers may need to be taken into account.

Moles are prone to deflection from their planned course and, if there are existing services in the vicinity, a mole-tracking device should be used. Where trenchless methods are being used, all equipment which is electrically bonded to the mole should be earthed at all times in case the equipment strikes a power cable and this causes it to become live. As an additional precaution, an equipotential mat can be used for the operator to stand on.

The use of no-dig technology carries its own risks. Several recorded examples exist where, unknown to the installing contractor, a new service such as a gas main had been pushed through a sewer pipe, resulting in a blockage in the sewer pipe. The subsequent use of clearing techniques such as jetting machines by the sewer maintenance teams put these crews at risk when they unknowingly cut through the gas pipe.

11.0 New housing developments

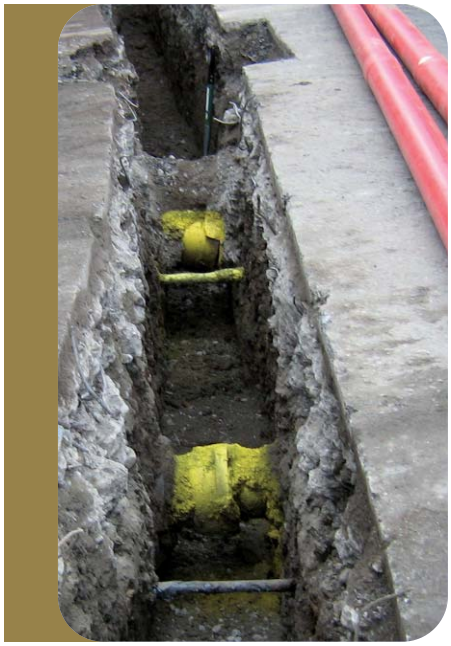
Underground services that are located within the confines of partly completed new housing developments are especially prone to damage from the numerous site operations that may need to be carried out.

The construction of a single trench may help to control the position and separation of underground services. Where services are laid on a partly developed site, special arrangements may be required for their temporary protection at vehicle/plant crossing points.

Close liaison should be maintained between the developers, their contractors and the utility/service providers. A marked-up plan of the estate, showing the up-to-date position of underground services (including any variations from planned routes) should be kept on site and referred to in advance of carrying out excavations or other ground penetration works.

12.0 Installation of new services near existing services

New underground services often have to be laid in ground that already contains other services. Where it is reasonably practicable to do so, the utility/service provider that is planning the new installation should aim to position it in such a way that it is separated from all existing underground services by an adequate distance. Guidance on the requisite distances to be maintained may be found in the UK publication *National Joint Utilities Group (NJUG) Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus 2007*. The Irish Standard for colour code for buried plastics piping (IS 370:2007) should be referred to (see Appendix 6). Every effort should be made to comply with these standards (unless otherwise noted in this COP) or other equivalent standards of good practice for new installations in order to minimise risk to personnel now or at some future date.



Where the installation of a new service is likely to obstruct access to an existing service for more than a few metres, then all reasonably practicable measures should be used to avoid this situation. In particular, the practice of laying multiple ducts directly above other services should be avoided.

In circumstances where it is not possible to comply with the recommended services separation standard, because of underground services congestion or some other factor, the relevant utility/service provider must be contacted and as great a separation as is reasonably practicable should be maintained.

Designers and contractors must be aware that if placing services in parallel to existing utilities that are closer than the specified distances, unacceptable risks may be introduced, particularly to persons who at a later stage may require access for utility maintenance.

Unless formal agreement has being obtained from the utility/service provider or the relevant person representing the utility/service provider there should be no circumstance where access is restricted to existing services. Access to services is essential for maintenance work and possible emergency response.

13.0 Demolition sites

Special difficulties may arise in the case of service terminations in a derelict property or on a demolition site.

Contractors who plan to engage in demolition work have a duty to give adequate notice to the relevant gas, electricity and water authorities of their intention to carry out this work. Demolition should not begin until the relevant authorities have confirmed in writing that the supply has been disconnected or some other appropriate safeguarding action has been taken.

As noted in Section 4, there is an onus on the PSDP who is co-ordinating the design team to identify hazards associated with the existing environment, including known hazardous underground services.

Underground services on industrial or commercial sites may be the property of the site occupier. A contractor who is planning to demolish buildings or plant on such a site should contact the site occupier or the site owner to ensure that all relevant services are isolated before demolition work begins.

Even where supplies have been disconnected, contractors should be aware that:

- Services that run through a site may not be providing a service to that site.
- Bottle-ended or pot-ended cables must be treated as live unless confirmed otherwise.
- Some services may not have been recorded on the original plans and, consequently, may not have been identified or disconnected.

14.0 Training and instruction

14.1 Introduction

Digging close to underground services is potentially dangerous. Both the workers and the supervisors who are involved in this activity need an appropriate level of knowledge, skills and experience in order to ensure that the work is carried out safely. Anyone who does not possess these attributes should work under the close supervision of someone who does have the requisite experience and competencies.

14.2 Provision of information and instruction

Prior to work commencing on site all employees/operatives must be given appropriate information and instruction, through induction, toolbox talks or other equivalent means of communication. The information and instruction provided may include all or some of the following, as appropriate:

- Completion and communication of a relevant Safe System of Work Plan.
- Site-specific risk assessments.
- Operating procedures.
- Permits to work procedures.
- Relevant drawings, maps and other related information.

14.3 Training for supervisors and operatives

In accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006, operatives must satisfactorily complete the one-day Safe Pass safety awareness programme. However, this is an introductory course in construction safety and does not in itself provide sufficient training in relation to the hazards and risks involved in digging close to underground services.

Personnel* who are involved in either the supervision or carrying out of excavations in the vicinity of hazardous underground services should be appropriately trained in one or more of the following areas, as required:

- Planning of the work.
- Legislation.

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* These include workers who manually work on excavations in streets, utility/service provider employees who manually work on excavations and those directly supervising these workers. Excavator drivers may be excluded if they received sufficient relevant training on an excavator driving course. However, if they are involved in excavation outside the excavator, they should receive the stipulated training.

- Risk assessment.
- Liaison with utility/service providers.
- Use of plans and drawings from the various utility/service providers.
- Appropriate use of cable- and pipe-locating devices.
- Location of underground services (CSCS, see Section 14.6.1).
- Identification of services.
- Safe digging practices.
- Personal protective devices.

Refresher training will be required periodically depending on the work being carried out by personnel.

Employees should not refuse reasonable offers of training; they should co-operate with their employers regarding training and they should make relevant documentation demonstrating receipt of training available for inspection as appropriate.

14.4 Site-based direct managers/supervisors

Those involved in direct management and supervision of site-based work require relevant competencies to deliver safety standards on site. They will need health and safety training in order to:

- Assess and prioritise the risks on a particular project.
- Design safe systems of work that are appropriate to specific site conditions.
- Prepare clear, simple safety method statements that can be used and understood by site workers.
- Check that suitable personal protective clothing and appropriate equipment has been provided and is being used correctly.

14.5 Role of the project supervisor construction stage in training

As part of their duty to co-ordinate site safety, the PSCSs must have a system in place for checking that on-site operatives have been appropriately trained, even if those operatives are not their employees. The PSCS should have a system in place for ensuring that all craft and general construction workers on site have an up-to-date Safe Pass card and appropriate Construction Skills Certification Scheme (CSCS) cards where required.

14.6 Construction Skills Certification Scheme

The Construction Skills Certification Scheme (CSCS) is managed by the National Training Authority, FÁS. This scheme is backed up by legislation, in particular Schedule 4 of the Safety, Health and Welfare at Work (Construction) Regulations 2006. The regulations list tasks which are common to the construction industry. If a task is listed in the schedule then you must hold a CSCS card to carry out that task on a construction project. Some of the common CSCS tasks in relation to avoiding dangers from underground services are set out in the sections below.

A large number of underground services are located under roads (including footways, cycle tracks, roadways etc.). Carrying out construction work on or near a roadway brings additional hazards, the most obvious being live traffic. The Safety, Health and Welfare at Work (Construction) (Amendment No. 2) Regulations 2008 (SI No. 423 of 2008) sets out the requirements for protecting workers and the public when working on roads.

For further information on the CSCS, contact FÁS on 1800 611 116 or log on to www.fas.ie.

14.6.1 Locating of underground services (CSCS): The 2006 regulations require persons carrying out the task of locating underground services to be in possession of a CSCS card. Contractors must ensure that underground services are located before excavation begins. This task and the methods involved are dealt with in detail in Section 8.

14.6.2 Signing, lighting and guarding (CSCS): Where any construction work which obstructs the roadway (part of the road where vehicles travel) or where pedestrians, people with disabilities or cyclists are diverted on to the roadway due to construction work, there must be on that site at all times when road signing, lighting and guarding is being installed, modified or removed, at least one person who has been issued with a valid construction skills registration card relating to signing, lighting and guarding on roads. In general this relates to works which interfere with the roadway traffic. Furthermore, the works both on and off the roadway must also be supervised by a competent person who has been issued with a valid construction skills registration card relating to signing, lighting and guarding on roads.

14.6.3 Assisting in the implementation of health and safety at roadworks (CSCS): When construction works on roads are in progress you must have a person on site who has been issued with a valid construction skills registration card relating to 'assisting health and safety at roadworks', where the person possessing a valid signing, lighting and guarding CSCS is not present. In general this relates to work which does not interfere with the roadway traffic.

Further Information

For further information on 14.6.2 and 14.6.3 please refer to *Guide to the Safety, Health and Welfare at Work (Construction) (Amendment No. 2) Regulations 2008 (SI No. 423 of 2008)* available as a download at www.hsa.ie.

HEALTH AND SAFETY AUTHORITY

Appendices

Appendix 1:	**Electricity cables**
Appendix 2:	**Gas pipelines**
Appendix 3:	**Water pipes and sewers**
Appendix 4:	**Telecommunications cables**
Appendix 5:	**Suggested job aid for workers on a safe system of work for digging**
Appendix 6:	**Summary of IS 370:2007**
Appendix 7:	**Useful contacts**

Appendices 1 to 4 give advice on matters relating to each of the five main types of underground services (gas, electricity, sewerage, water and telecommunications). This is additional information and should be read and used in conjunction with the advice contained in the main text.

Appendix 5 gives a suggested job aid for workers on a safe system of work for digging.

Appendix 6 provides a summary of IS 370:2007, the colour code for buried plastic piping.

Appendix 7 provides a listing of useful contact details.

Appendix 1: Electricity cables

Plans

A1.1 The electricity service providers should be consulted wherever possible and all relevant plans obtained. (Note: While most electricity cables are owned by ESB Networks, many underground cables are the property of local authorities and are used for the provision of services such as public lighting, traffic lights and so on. Other underground cables may be the property of public bodies or private companies.)

A1.2 The representation of underground cables on plans may vary depending on the density of the underground networks (i.e. the number of cables running in close proximity), the scale of the plans and local historical recording conventions. Advice for interpretation should be sought from the issuing office. It should be noted that low/medium-voltage cables and high-voltage cables may be shown on separate plans.

Cable-locating devices

A1.3 While hum detectors (e.g. cable-locating devices set on power mode) are the easiest devices to use, they do not respond to unloaded or direct current cables. Furthermore, they may fail to detect lightly loaded low-voltage cables (such as those used for street lighting) and well-balanced high-voltage cables. A locator with a radio frequency detection mode may detect these cables and, therefore, should be used for additional back-up checks.

In some situations it may be possible to use a generator (genny) to induce a traceable signal on to a cable and this signal can then be used to trace the position/depth of the cable at locations remote from the genny using a cable detector.

A1.4 Even where a locating device does not give a positive reading, there may still be cables present and these may still be live.

A1.5 If a cable that is recorded on a plan cannot be located, appropriate assistance or advice should be sought. If digging has to start before such assistance or advice has been obtained, extreme care should be taken.

Safe digging practices

A1.6 In the vast majority of cases there will be no permanent surface markers or other visible signs to indicate the presence of a buried cable. Even if no cables are shown on plans or detected by a locator, a close watch should be kept for any signs that might indicate their presence.

A1.7 Underground cables are normally laid in trenches between 400mm and one metre deep. However, depths should never be assumed. Cables are often found just below the surface. As a result, therefore, even shallow excavations may present a source of danger. This factor should always be borne in mind, particularly if the ground has been disturbed or if there are cellars or other structures such as bridges in the area, which may have prevented cables being laid at standard depths.

A1.8 Cables may have been laid in any of a number of different ways – directly in the ground with a bed or surround of fine soil or sand; in earthenware or concrete pipes; in pitch-filled cast iron formers; or in plastic pipes or ducts. Occasionally they may be encased in steel pipes, or a covering of tiles, bricks, slabs, timber boards or coloured plastic marker tape may be laid above them. However, such coverings may have been disturbed and moved subsequently and should not be relied upon to give an accurate indication of cable position. These factors further emphasise the importance of using safe digging practices.

A1.9 During digging work, a careful watch should be kept for evidence of cables and repeat checks should be made with a locator to determine more precisely the position of any cable. Note: a cable should be considered positively located only after it has been safely exposed. Even then, digging should proceed with care, as there may be other cables, particularly high-voltage cables, nearby or lower down.

A1.10 Occasionally, cables are terminated in the ground by means of a seal or some other form of external mechanical protection. These pot-ended or bottle-ended cables should always be treated as live and should not be assumed to be abandoned or disused. They may be difficult to detect with locators even when live.

A1.11 When joints on electricity cables are encountered, they should be treated with extreme care. The joints may be enclosed in cast iron, earthenware or plastic casings. They need proper support and should never be disturbed, except following consultation and agreement with the utility/service provider.

A1.12 The use of hand-held power tools to break up paved surfaces often leads to accidents. Where practicable, such power tools should not be used within 500mm of the indicated line of a cable buried in or below a hard surface. Where power tools have been used to break away the surface from the indicated line of the cable, it should then be positively located by careful hand digging under the hard surface. The material under the hard surface should be removed gradually until the cable is exposed. If the cable is not exposed, then it must be assumed to be embedded in the hard surface. Where possible, a cable locator should be used as a depth guide down the side of the excavation.

The 500mm safety margin may be reduced:

- Where congestion of buried cables renders it impracticable.

- Where surface obstructions limit the space available; but only if the line of the cable has been positively identified by plans and confirmed by a locator.

Because it may be difficult to confirm depth, hand-held power tools should never be used over the cable unless either:

- The cable has already been exposed by digging under the surface to be broken out and is at a safe depth (at least 300mm) below the bottom of the hard surface material.

or

- Physical precautions have been taken to prevent the tool striking the cable. Advice on the safe use of hand tools is given in Section 9.

A1.13 Excavating close to electricity cables buried in concrete is dangerous. For this reason alone electricity cables should not be buried in concrete and the utility/service providers should ensure that their employees and contractors are aware that this practice is unacceptable.

A1.14 Using mechanical means to break up concrete can cause damage to cables. If the cable is live, anyone present is likely to be injured.

A1.15 Alternative routes should be carefully considered as a means of avoiding cables that are buried in concrete.

A1.16 Where it is necessary to break away or disturb the concrete in which a cable is embedded, the utility/service provider should be asked to disconnect it from the supply, or an alternative safe method of excavation should be agreed with the utility/service provider before excavation work begins. It is important to note that the use of powered hand tools close to cables is likely to represent the greatest risk of injury.

A1.17 Where a buried cable has been disconnected from the supply to allow for safe excavation, it is essential that liaison should be maintained between the parties involved to ensure that the work has been completed and that workers have cleared the site before the cable is reconnected.

A1.18 Where mechanical excavators are being used in an area likely to be in the vicinity of underground cables, the work should be arranged in such a way as to ensure that damage to cables is avoided. In addition, all personnel should be kept well clear of the excavator bucket while digging work is going on.

Drivers should be instructed to remain in the cab if a cable is struck. If the driver has to leave the cab, he or she should jump clear of the machine, rather than climb down, to avoid the risk of electrocution. A designated person should be assigned to guard the excavator and ensure that no person enters the area or touches either the excavator or the cable until the utility/service provider has made the damaged cable safe.

A1.19 The most common injuries resulting from cable accidents are flash burns, splatter burns from molten metal or ignited oil and electrical burns. Burns are likely to be most severe where skin is not covered and therefore, based on a site-specific risk assessment, appropriate skin cover for hands, arms, legs and upper body should be used.

A1.20 Accidents sometimes occur after underground cables have been exposed. Cables should not be used as handholds or footholds by anyone climbing in and out of the trench. Where a cable that is exposed for more than one metre crosses a trench, support should be provided. If the exposed length is less than one metre, support should still be considered if joints have been exposed or if the cable appears otherwise vulnerable to damage. If advice or help is needed, the cable service provider should be contacted.

Suitable precautions should be taken to prevent damage from ongoing work in the excavation area (e.g. by use of physical means such as timber boards or sand bags). Cables that are lying at the bottom of an excavation area should be protected by nail-free wooden planks, troughing or some other suitable means. Care should be taken not to use materials or equipment that could damage or penetrate the outer sheath of the cables. Cables should not be moved aside unless the operation is supervised by the utility/service provider. Precautions should be taken to prevent access to exposed cables by children or other unauthorised personnel.

A1.21 Hard or sharp materials, such as pieces of rock, large stones, hard-core or surplus concrete, should not be tipped into open cable trenches. Advice on back-filling cable trenches should be obtained from the cable service provider. As a general rule, all exposed cables should be back-filled with a 75mm minimum surround of compacted sand. Disturbed tiles and bricks should be replaced and new yellow-coloured warning tape should be placed above the excavated area.

A1.22 Any damage to an electricity cable should be reported immediately to the cable service provider and work should not be undertaken in the vicinity of a damaged cable until the service provider has investigated its condition. (Some cables may automatically 'trip out' when damaged, but these may be re-energised at any time unless the cable service provider is notified of the damage.)

Recommended standards for new underground electricity cable installations on new developments and in existing roads and streets

A1.23 Buried electricity cables may be laid either directly in the ground or they may be installed in impact-resistant ducts or pipes. As a general guideline, new cables should be installed at depths of approximately 450mm in footpaths and driveways and at greater depths of approximately 600mm when installed in road carriageways or grassed areas. However, local conditions may dictate that these depths vary, particularly where pipes and cables cross, or where underground structures or other obstructions are crossed. Depths may also vary at entrances to buildings, beside street furniture and at underground link disconnection boxes. Deviation from the recommended standards outlined above should only occur if local conditions make compliance impracticable. If cables are buried at shallower depths than those recommended, then this should be noted on the record drawings.

The clearance in all directions between underground electricity cables and other services should be approximately 300mm. With the exception of crossing points, services should not be laid above electricity cables. This is because, following installation, continuous access will be required for the repair of faults or the installation of new service connections. These connections are usually jointed live in the case of low-voltage mains cables.

While there is no agreed industry standard in Ireland governing the relative lateral positioning of services in footpaths, general guidance may be found in the UK publication *National Joint Utilities Group (NJUG) Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus 2007.* Efforts should be made to comply with this standard, or other equivalent standards of good practice in relation to the positioning of new installations.

Colour marking and strength specification of ducts for underground electricity cables

A1.24 All new underground ducts laid for the installation of electricity cables of 125V or greater must be **RED** in compliance with IS 370:2007 (see Appendix 6) and must carry the warning: **DANGER ELECTRICITY CABLES**. They must also conform to the deformation and impact resistance requirements and all other requirements as set out in the 'Material Specification' (see Section A1.25).

A1.25 Material specification for red uPVC and MDPE ducting for the installation of underground electricity cables

	MAINS CABLE DUCT	HOUSE SERVICE CABLE DUCT
Duct outside diameter (mean)	125.0mm – 125.4mm	50mm
Duct type	uPVC, 6m lengths; Spigot and socket type	MDPE, 6m straight lengths or 50m coils
Duct rating	Normal duty per EN 50086 – 2 specification	750N – EN50086 – 2
uPVC quality	100% virgin material	100% virgin material
Duct colour – outside	Red – BS Type 5252 04E53 – 04E56	Red as for 125mm Minimum 1mm thickness of colour
Duct deformation requirement	Must pass EN50086 – 2 <5% deformation requirement for 450N loading on 200mm sample	Must pass EN50086 – 2 - :1996 <5% deformation for 750N loading on 200mm sample
Impact resistance	Per 50086 – 2 12 samples; 5kg striker: 570mm fall height:>28 Joules – no crack in at least 9 samples	As for 125mm
Duct minimum wall thickness	The larger of the two criteria: (1) Wall thickness to pass 5% deformation /impact requirement above and (2) Minimum wall thickness of 3.8mm (required for cable pulling	Duct wall thickness based on 750N loading test
Duct end; spigot end	Spigot: plain end bevelled to allow easy jointing of duct on site, minimum thickness of plain end to be 1.3mm, bevel length 5mm	Duct ends bevelled to allow jointing of duct on site
Circumferential mark on plain pipe end for correct push-in distance	Circumferential mark required to indicate Correct push-in distance for duct jointing for spigot and socket joints. Location: 105mm – 110mm to suit socket length below	Clear circumferential mark required to indicate correct push-in distance for duct jointing using standard 50mm couplers
Duct ovality including socket	2.00mm max.	1.4mm max.
Eccentricity of socket relative to duct	None allowed and no angle allowed between socket centre line and the duct longitudinal axis to avoid ripping cable sheath during cable pulling	None
Duct inner surface	Smooth, low-friction surface completely free of ripples, sharp edges and protrusions. Friction coefficient <0.28	As for 125mm ducting Friction coefficient <0.28

	MAINS CABLE DUCT	HOUSE SERVICE CABLE DUCT
Legend content:	'DANGER ELECTRICITY CABLES'	'DANGER ELECTRICITY CABLES'
Repetition rate/gap between legend	150mm max gap between adjoining legends	150mm max gap between adjoining legends
Colour of legend, size of lettering	Black NOTE: 3 lines of 20mm @ 120°	Black 2 X 8mm – 10mm height @ 180° apart
Batch No./name of manufacturer and date of manufacture	6mm minimum lettering size	6mm minimum lettering size
Red colour fastness	One year minimum required so as to provide 12-month storage period at builders' providers premises One year outdoor weathering test required or suitable accelerated colourfastness test	One year minimum required so as to provide 12-month storage period at builders' providers premises
All bends for 125MM duct	All angles: radius = 1.2m minimum for 22, 45 and 90° material as per pipe specification above. (3.8mm minimum thickness)	
Bend ovality	2mm max (same as for pipe)	
Couplers for 50mm OD duct		Slip or rubber gasket type with no internal obstructions/sharp edges. A centering ridge is required that does not protrude

Appendix 2: Gas pipelines

A.2.1 General requirements

Natural gas, which is highly flammable, is transported in a network of polyethylene and steel pipes at pressures up to 85 bar. Damage to a gas main may result in large volumes of gas escaping into the atmosphere in an uncontrolled manner. Even if there is no smell of gas, any damage to a gas pipe should be reported, regardless of how minor the damage might appear. An immediate repair may prevent an accident at a later stage due to a stress failure at the location of the original minor damage.

Most underground gas pipes are the property of gas transmission or distribution companies. One notable exception to this is private 'metered' estates, which may have gas piped to users from a bulk liquefied petroleum gas (LPG) tank. In such cases, the service provider should be able to supply the requisite information. Estates that comprise privately owned dwellings do not normally have a site owner or manager. In such circumstances information may be obtained from the LPG supplier, whose name and telephone number (manned twenty-four hours each day) should be displayed in the bulk storage vessel compound. The risks associated with leaking LPG are even greater than those associated with leaking natural gas as it is heavier than air and does not disperse as readily. In addition, it can travel great distances below ground level before accumulating at low levels.

All personnel who are involved in carrying out work near underground gas plant should observe the specific requirements set out by the gas network operator. Network operator staff or representatives must have access to underground and above-ground plant at all times. Unauthorised repairs to gas pipes must not be made. If there is any doubt about the need to carry out repairs, the advice of the relevant gas network operator company should be sought.

Natural gas pipeline infrastructure in Ireland may be categorised as transmission pipeline or distribution pipeline.

A.2.2 Transmission pipelines

See Section A.2.4 for requirements common to both transmission and distribution pipelines:

Transmission pipelines operate at internal pressures between 7 bar and 85 bar. They are the primary spine pipelines that transfer gas throughout the country. They are constructed from steel with a black or concrete coating and may have marker posts at intervals along their length, particularly at field boundaries and road crossings.

- Transmission gas pipelines are generally between 150mm and 1000mm in diameter and coated in yellow and/or encased in black wrapping.

If a transmission main is identified within ten metres of any intended excavations (including vertical boring), then work must not proceed until the gas network operator has been consulted. See greater distance requirements in relation to special operations in Section A.2.2.7.

The network operator should be consulted before commencement of excavation works within ten metres of any large pressure reduction plant, i.e. above-ground gas installation (AGI) or district regulator installation (DRI), as shown on the map records.

Bord Gáis 'Dial Before You Dig' enquiries: 1850 427 747.

A.2.2.1 Locating the transmission pipeline: The gas network operator should arrange for locating and marking out of the pipeline as well as for the supervision of the digging of any trial holes necessary to confirm the position of the pipeline.

A.2.2.2 Orientation and location: Where a new service is to cross either above or below an existing transmission gas pipeline, the normal minimum distance between the outside of the pipeline and the service to be installed should be 600mm.

In special circumstances this distance may be reduced at the discretion of the network operator's engineer. At such crossings both the pipeline and the new service should be suitably supported to prevent any future settlement and the back-fill should be packed and consolidated to the satisfaction of the network operator's engineer (see Section A2.2.6).

As a general rule, no new service should be laid parallel to an existing transmission gas pipeline. However, in special circumstances (e.g. motorways) a new service may be laid parallel to an existing pipeline provided that there is adequate clearance (normally 600mm) between them and provided that the service is not laid in parallel either directly above or below the existing pipeline.

A.2.2.3 Cathodic protection: Transmission gas pipelines are cathodically protected. Where a new service is to be laid and similarly protected, the network operator (once notified) is obliged to carry out interaction tests to determine whether its system is adversely affected.

A.2.2.4 Pressure testing: Hydraulic testing of other installations (e.g. high-pressure water mains) should not take place within eight metres of an existing transmission gas pipeline unless precautions have been taken to mitigate the effects of a possible burst. These precautions may include the use of pre-installation tested pipe, sleeving, barriers etc. as agreed with the gas network operator's engineer.

A.2.2.5 Excavation: Where it is necessary to excavate below a transmission gas pipeline, the pipeline must during all stages of the operation be supported to the satisfaction of the gas network operator's engineer. On completion, permanent supports should, if necessary, be constructed to avoid future settlement.

Mechanical excavation by powered tools is not permitted within a distance of three metres and the use of hand-held power-assisted tools should not be permitted within 1.5 metres of a transmission gas pipeline or associated equipment. Consideration may be given to a relaxation of these limits provided that prior notice of the excavating methods to be used is given to the network operator and the safeguards to be employed are agreed between all parties.

To avoid damage during construction work, exposed gas pipelines must be protected as directed by the network operator's engineer.

A.2.2.6 Back-filling: Parties responsible for the new works should give the gas network operator at least forty-eight hours notice of their intention to back-fill under, over or near an existing transmission pipeline. The gas network operator's representative must be in attendance during all back-filling operations and advise on the suitability and degree of consolidation of back-fill material around the pipeline. Any damage to the coating of the transmission gas pipeline, even if minor in extent, must be brought to the notice of the gas network operator so that any necessary repairs may be carried out before back-filling is completed. The gas network operator must make repairs as efficiently and as quickly as practicable.

A.2.2.7 Special operations: *Explosives* must not be used within 400 metres of gas transmission pipelines (30 metres for distribution pipelines), without prior consultation with the gas network operator.

Piling and/or demolition works; the gas network operator must be consulted before any piling is carried out within 15 metres of an existing gas pipeline.

A.2.3 Distribution pipelines

Distribution pipelines operate at internal pressures less than 7 bar. They transmit gas at medium pressure (more than 100 mbar and less than 7 bar) or low pressure (less than or equal to 100 mbar) and are mainly constructed from polyethylene (PE).

The pipeline is predominantly yellow in colour, but may have brown or black stripes. Mains gas pipelines usually run parallel to property in the footpath, grass verge or road and range in size from 63mm to 315mm diameter. Service gas pipelines are connected to mains and run to a meter position at the property and range in size from 20mm to 63mm diameter.

Note: There is a limited use of steel pipes in areas like bridges or where only shallow depths can be achieved

Bord Gáis 'Dial Before You Dig' enquiries: 1850 427 747.

A.2.4 Requirements common to both transmission and distribution pipelines

Requirements under A.2.2 take precedence in the vicinity of transmission pipelines.

A safe system of work must always be followed – refer to Section 6.

Work involving piling, demolition, directional drilling, use of explosives or hot works may require special precautions to be taken.

A.2.4.1 Planning and obtaining utility maps: It is imperative that early contact is made with the gas network operator to obtain a gas network map and that this is made available to operatives on site for the duration of any works. The responsible person should ensure that operatives on site understand the map and are continually informed of any updates.

A.2.4.2 Identifying distribution mains and services: Where the presence of gas mains which operate at pressures greater than 7 bar is indicated (i.e. a transmission pipeline), the gas network operator must be consulted before work begins.

The depth of cover from gas distribution mains laid in a roadway is normally 750mm. For those laid in a footway it is normally 600mm. The depth of cover for gas service connections is normally 450mm in both roadways and footpaths. However, at entry points to buildings, the depth of cover for a service connection may be 375mm. It is important to note that these depths are merely a guide and pipes may be found at shallower levels. For example, pipes such as those passing over cellars or in the vicinity of bridge structures may have been laid at shallower levels, or the depth of cover may have been reduced after the pipe was installed due to other works such as road alterations being carried out in the area.

Polyethylene mains may have been inserted into redundant cast iron or ductile iron gas mains. Marker tiles may have been used above gas pipes, for example where they have been laid at a shallow depth in bridge structures or above cellars.

Polyethylene mains may have a coloured plastic marker tape above them. The presence of gas plant may also be indicated by valve boxes and marker posts. Marker posts/plates are sometimes used to indicate the position and size of valves or siphons on gas mains. However, such markers may have been disturbed and should not be relied upon as an accurate indicator of pipe position.

Plans do not normally show the position of service connections. Their existence should be assumed and it may be possible to estimate the probable line of the service connection pipe from the gas meter boxes/cabinets, house entry points, service risers and gas valve covers, or from the point of entry to the premises. Older buildings may have no visible signs of a service, as the service may run directly into the building underground, with the meter fitted internally. In these cases a check should be made inside the building to identify the service route to the meter position.

A.2.4.3 Safe digging practices and avoidance of pipeline impact:

(i) Excavations near gas pipelines: Where gas pipes cross, or are parallel and close to excavations, changes in back-fill may cause differential ground settlement and increased stress in the pipe. Where pipes are parallel and close to excavations, the degree of risk depends on the depth of the excavation, the distance of the pipe from the excavation and the type of soil. If an excavation is likely to affect support for a gas pipe, the gas network operator should be consulted. If gas pipeline or gas plant relocation is necessary, the gas network operator should be contacted to arrange diversion before work begins.

The network operator should be consulted before commencement of excavation works within ten metres of any large pressure reduction plant, i.e. above-ground gas installation (AGI) or district regulator installation (DRI), as shown on the map records.

(ii) Pipe locators: Before excavation, locator devices that use radio frequency detection or transmitter-receiver technology should be used to help locate metallic gas pipes. However, it should be noted that the majority of distribution gas pipelines are made of polyethylene and cannot be traced by such devices. This factor further reinforces the importance of using plans and safe digging practices.

(iii) Road construction work: If road construction work is being carried out close to the top of a gas pipe, the gas network operator should be consulted to give guidance on specific precautions to be taken.

(iv) Mechanical excavators: Mechanical excavators pose the highest risk and **should not** be used within three metres of a gas transmission pipeline or within 0.5 metres of a gas distribution pipeline.

Gas pipes may have projections such as valve housings, siphons and stand pipes and these will not be shown on the plans. In order to allow for these projections, mechanical excavators should not be used within the distances identified above.

(v) Hand-held power tools: Hand-held power tools may damage buried gas pipes and they should be used with care until the exact position of an underground pipe has been determined. They should not be permitted within 1.5 metres of a transmission gas pipeline or associated equipment.

(vi) Hand digging: Plastic gas pipes should be located by hand digging before mechanical excavation begins. It may also be necessary to use this method to locate metallic pipes if their position has not already been determined by a pipe-locating device. The use of hand digging is particularly important for service connection pipes, which will not be marked on plans. The recommended method is to dig a trial trench along the road near the kerb, or on the footpath, where the depth of the service connection pipes is likely to be at its shallowest. Once the position and depth of the pipes have been determined, work may proceed.

(vii) Special operations: *Explosives* must not be used within 400 metres of a gas transmission pipeline (30 metres for a distribution pipeline), without prior consultation with the gas network operator.

Piling and/or demolition works; the gas network operator must be consulted before any piling is carried out within 15 metres of an existing gas pipeline.

(viii) Crossing points: In cases where heavy plant and other machinery may have to cross the line of a gas pipe during construction work, the number of crossing points should be kept to a minimum. These points should be clearly indicated and crossings at other positions along the line of the pipe should be prevented. Where the pipe is not adequately protected by an existing road, crossing points should be suitably reinforced with sleepers, steel plates or a specially constructed reinforced concrete raft. The gas network operator will advise on the type of reinforcement necessary.

(ix) Hot work: If hot work, such as welding or laying hot bitumen, is to be carried out adjacent to gas pipes or installations and there is any risk of that work affecting the integrity of a pipe or pipe surface, the gas network operator should be consulted. Gas pipelines, their protective coating and above-ground plant must be protected against damage by heat transfer, sparks or naked flames.

(x) Uncovering a gas pipe during excavation: If a gas pipe with a damaged wrapping is uncovered during excavation work, the gas network operator should be informed so that repairs may be carried out to prevent future corrosion and leakage.

Pipe restraints or thrust blocks close to gas mains should never be removed.

(xi) Positioning of structures in the vicinity of gas pipelines: Manholes, chambers or other structures should not be built over, around or under a gas pipeline or gas plant. Work should not be carried out that results in a reduction of cover or other protective measures without prior consultation with the gas network operator.

(xii) Use of concrete or other hard material: Concrete or other hard material should never be placed or left under or near any gas pipe as this could cause pipe fracture at a later date. Concrete back-fill or slabbing should not be used within 300mm of a gas pipe or associated connections.

(xiii) Back-filling distribution pipelines after excavation work: If a gas pipe is uncovered during excavation

work, the back-fill should be adequately compacted, particularly beneath the pipe itself. This measure is designed to prevent any settlement that could subsequently damage the pipe. The back-fill should comprise fine material or sand and should not contain stones, bricks, lumps of concrete etc. It should be suitably compacted to give comparable support and protection to that provided before excavation. Power compaction should not take place until a 200mm cover of selected fine-fill is in place.

Any protective measures, such as marker tape or marker tiles, should be reinstated.

A.2.5 In the event of damage to a gas pipeline

In the event of damage to a gas pipeline, work should cease immediately and the following precautionary measures should be taken:

- Do not turn any electrical switches on or off (e.g. ignition switches).
- Do not operate any plant or equipment.
- Move people away from and upwind of the affected area.
- Restrict employee and public access to the affected area.
- Prevent smoking, the use of naked flames, the use of mobile phones and other ignition sources in the vicinity of the leak.
- Report the leak/damage immediately to the gas network operator emergency number.
- Provide accurate information on your location and the nature of the incident.
- Do not attempt to repair the damage.
- Do not cover up a damaged main or service pipeline, this may lead to the gas travelling through ducts, sewers, chambers or voids and potentially building up inside a premises or confined space.
- Do not turn off any gas valves in the road or footpath (you may be causing further problems by doing so).
- Assist the gas network operator emergency personnel as required to safeguard life and property.

It is critical that any damage to gas pipelines, even if the pipe does not appear to be leaking, is reported to the gas network operator.

Bord Gáis Emergency Number: 1850 20 50 50.

Appendix 3: Water pipes and sewers

The appropriate records office should be contacted and the location of all sewers, water mains, kiosks, meters and wiring/cable ducting should be determined before any excavation work begins. The location of mains on drawings should be taken as approximate. In general, if there is a sewer or water main (diameter greater than or equal to 300mm) in the vicinity, then the appropriate service provider engineer should be contacted in order to co-ordinate the excavation work.

Mains runs must be marked out before excavation begins.

During excavation, in addition to the safe digging practices previously outlined in this COP, the following precautions should be taken:

- If a water main spans a road cutting or similar excavation, then the main must be adequately braced so that no movement takes place.
- If a pipe anchor is exposed, then excavation must cease and the appropriate engineer must be contacted.
- Fittings (ferrules, air valves and so on) should not be interfered with.
- Excavation in the vicinity of mains must be carried out by hand in order to avoid damage to the pipe.

If the pipe in question is a high-pressure trunk main, then the following additional precautions must be adhered to:

- No personnel should be positioned inside the trench while the mechanical excavator is operating, in case a high-pressure break occurs.
- Continuous inspections are essential in order to determine whether the next excavation level is clear.
- If any leak is discovered, then the service provider must be contacted immediately and the area sealed off to keep it safe and to prevent members of the public from gaining access.

In relation to the installation of new services, in particular gas or electricity services near existing water or sewer mains, the following additional precautions are recommended:

- No new service should be laid above or along the length of an existing water main or sewer.
- Where the new services have to cross a water main or sewer this should be done at right angles as far as is reasonably practical.
- New installations should always avoid blocking access to valves, flanges etc., where subsequent maintenance may be required.
- Where a new service is likely to limit access for future maintenance to the service, contact with the relevant local authority should be made in advance of the works.

Appendix 4: Telecommunications cables

Pre-planned work

A4.1 The cable providers should be consulted wherever possible and all relevant plans obtained. (Note: While most telecommunications cables are owned by eircom, many underground cables are the property of local authorities or private companies.)

A4.2 The representation of underground cables on plans may vary depending on the density of the underground networks (i.e. the number of cables running in close proximity), the scale of the plans and local historical recording conventions. Advice for interpretation should be sought from the issuing office.

Cable-locating devices

A4.3 While using cable-locating devices to locate underground telecommunications cables you must understand the limitations of each operating mode and the need to use both power and radio modes to locate the underground service.

A4.4 Even where a cable-locating device does not give a positive reading, there may still be cables present. Cable-locating devices will not detect fibre optic cables.

A4.5 If a cable that is recorded on a plan cannot be located, appropriate assistance or advice should be sought. If digging has to start before such assistance or advice has been obtained, extra care should be taken to avoid damaging the cable.

Safe digging practices

A4.6 In the vast majority of cases there will be no permanent surface markers to indicate the presence of a buried cable. Frequently, however, the presence of marked communications manhole covers or other street furniture will indicate the presence and general run of telecommunications cables. Even if no cables are shown on plans or detected by a cable-locating device, a close watch should be kept during excavation for any signs that might indicate their presence.

A4.7 Underground telecommunications cables are normally laid at adequate and sufficient depth in trenches but depths should never be assumed. Cables must not be laid just below the surface.

If in doubt the network provider should be contacted.

A4.8 Cables may have been laid in any of a number of different ways. In urban areas steel wire armoured telecommunications cable can be found buried directly in the ground or in ducting of various colours ranging in size from 25 to 100mm, Telecommunications cable may also be found in earthenware or concrete pipes. Occasionally they may be encased in steel pipes. Coloured plastic marker tape may be laid above the ducting.

A4.9 During digging work, a careful watch should be kept for evidence of cables and repeat checks should be made with a cable-locating device to determine more precisely the position of any cable.

A4.10 Any damage to a telecommunications cable should be reported immediately to the cable service provider. No work which involves back-filling around the damaged cable should be undertaken until the service provider has investigated its condition and carried out any required repairs.

A4.11 Recommended standards for new underground telecommunications cable installations on new developments and in existing roads and streets are to be adhered to. However, local conditions may dictate that these depths vary, particularly where pipes and cables cross or where underground structures or other obstructions are crossed. The clearance in all directions between underground telecommunications duct and other services should be approximately 300mm. With the exception of crossing points, services should not be laid above telecommunications duct. This is because, following installation, continuous access will be required for the repair of faults.

A4.12 While there is no agreed industry standard in Ireland governing the relative lateral positioning of services in footpaths, general guidance may be found in the UK publication *National Joint Utilities Group (NJUG) Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus 2007*. Efforts should be made to comply with this standard, or other equivalent standards of good practice in relation to the positioning of new installations.

Appendix 5: Suggested job aid for workers on a safe system of work for digging

WORKER JOB AID

Safe System of Work for Digging

These Guidelines apply to all work which involves penetrating the ground at or below surface level.

When working near buried services USE

- Maps
- CAT
- Safe Digging System
- Company Policies & Procedures

All 4 complement each other

Always be aware that the depth of cover may be very shallow and that there may be no bricks, warning tape or other protection in place. Always assume that there will be more services than you can find.

BEFORE You Start Digging

- ✔ **Ensure you have appropriate Utility Plans** *Remember:* service connection cables & pipes from *the main to buildings or public lights may not be shown*

Look Out For

- *Manhole Covers*
- *Valve Covers*
- *Lamp Posts*
- *Houses/Buildings*
- *Meters, Coms. Network*
- *Signs of Previous Digging*

→ *Services*

- ✔ **Always use Cable Locator (CAT) to trace all services**
- ✔ **Mark the positions of the cables & pipes** *using waterproof crayon, chalk or paint*
- ✔ **Highlight & Assess the Hazards and ensure all relevant staff are aware of the hazards, especially** when electric cables and/or gas mains are in vicinity of work area.

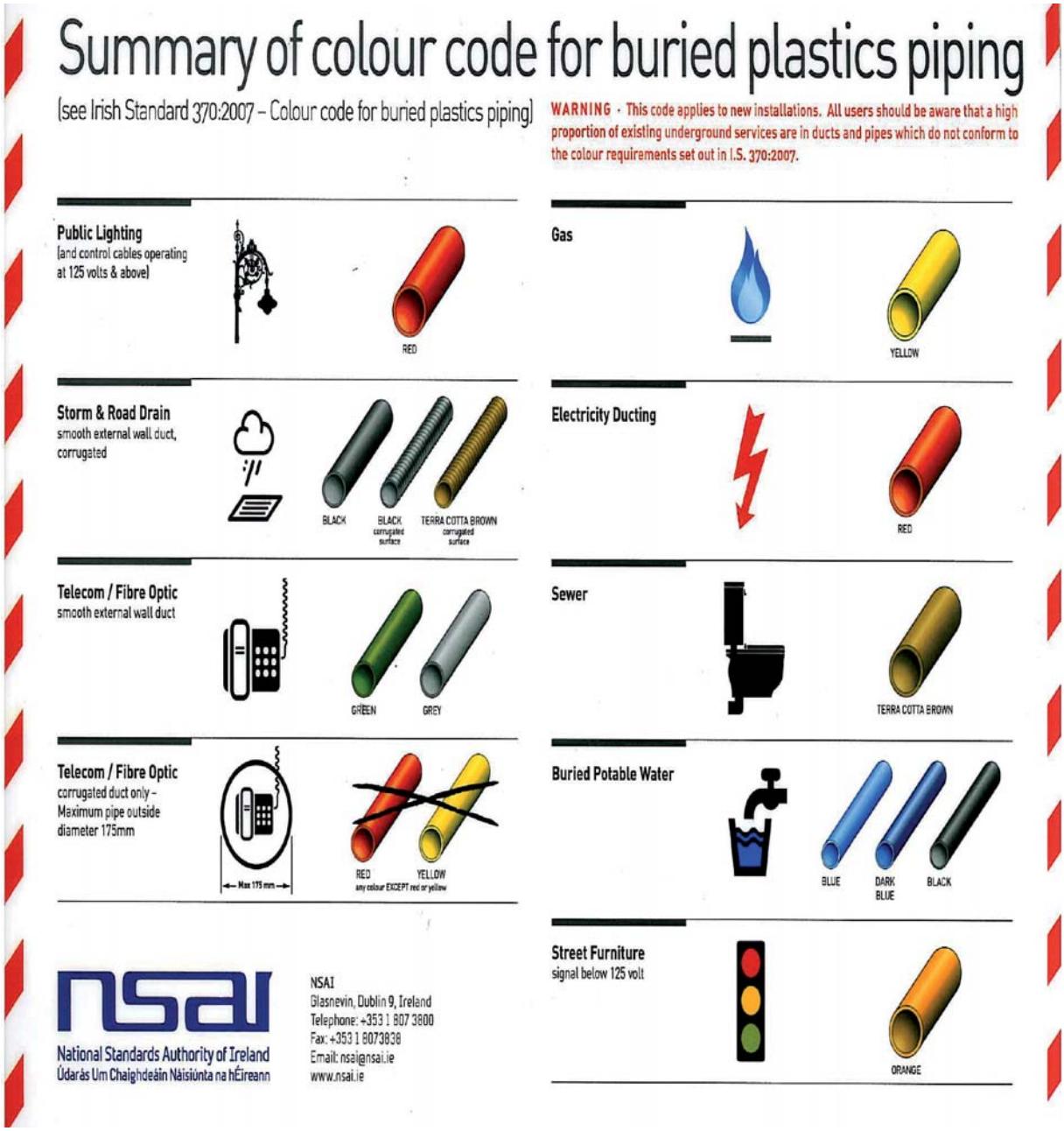
IMPACT

- Inspect Site Location. Look for indicators to services
- Mark the location of services on the surface before digging
- Plans and Maps should be available & used on site before digging
- Always assume that there will be more services than you can find
- CABLE LOCATOR should always be used (in Power & Radio modes) before starting work and throughout the course of the work
- Take Care. Where ever possible hand dig close to buried services. Observe 'SAFE DIGGING PRACTICE'

WORK USING 'SAFE DIGGING PRACTICE'

1. Where ever possible **Hand Dig** near buried services
2. Take special **CARE** using picks, pins or crowbars
3. Wear **Gloves** & other appropriate **PPE** *(Personal Protective Equipment)*
4. Do not use hand held power tools within 0.5 metres of marked position of electricity cables unless the number of services makes it impossible or surface obstructions reduce the space available.
5. Do not use hand held power tools directly over marked line of cable **UNLESS -**
   a) You have already found the cable at that position by careful hand digging beneath the surface AND it is at a safe depth (at least 300mm) below the bottom of the surface to be broken **OR**
   b) Physical means have been used to prevent the tool striking it.
6. When the surface has been broken out use CAT again to re-confirm position of services. Frequent and repeated use should be made of CAT during the course of the work.
7. Before using a mechanical excavator in the vicinity of electricity cables, trial holes should first be excavated by careful hand digging. Confirm the depth of the cable(s) at the point of work. The excavator should not be operated within a radial distance of 300mm from the cable(s).
8. When using Mechanical Excavator in the vicinity of electricity cables keep everyone clear of bucket while it is digging
9. Where an electric cable is embedded in concrete, arrange for the cable to be SWITCHED OUT before breaking off concrete.
10. Do not use exposed electricity cables as a convenient step or hand hold.
11. Do not handle or attempt to alter the position of an exposed electricity cables (unless under the direction of approved ESB personnel). Extreme care should be taken where joints have been exposed.
12. If an electricity cable, gas pipe or high pressure water mains suffer any damage, however slight, the owner should be informed immediately and people should be kept well clear of the area until it has been made safe by the owner.
13. Backfill around services with sand and use appropriate utility warning marker tape. Do not build into manhole or other structure or encase in concrete.

Appendix 6: Summary of IS 370:2007



Appendix 7: Useful contacts

ESB Networks

For all emergencies, including any damage to underground electricity cables or plant, call **1850 372 999**.

For other ESB Networks queries, including general queries in relation to underground electricity cables, overhead lines, new connections etc., call 1850 372 757, email: esbnetworks@esb.ie or see area office addresses at: www.esb.ie/esbnetworks.

For all ESB Networks map records (underground cables, overhead lines and other plant):

(a) Write to Central Site, ESB Networks, Osprey House, Lr Grand Canal Street, Dublin 2.
(b) Send a fax to 01 638 8169.
(c) Email: centralsiterequests@esb.ie.
(d) Register for access to electronic map records (make arrangements via (a) or (c) above).

All map requests should include the following information: (i) a site map/area map with geographic reference, (ii) a return postal address and (iii) a telephone contact number.

Map records that have been requested as set out above will be delivered by post. Allow up to ten days for delivery. In emergency cases, maps can be collected by special arrangement at the address at (a) above by calling 01 702 6558 or 01 702 6185.

ESB Networks provides a range of safety material, such as booklets, posters, cab stickers and DVDs addressing the issue of electrical safety. This material is free and may be obtained by calling 1850 372 757 or by email request to: esbnetworks@esb.ie. Some of this material is also available for free download from: www.esb.ie/esbnetworks.

Bord Gáis Networks

24 Hour Emergency Service:	**1850 20 50 50**
Bord Gáis Networks 'Dial Before You Dig':	1850 427 747
Bord Gáis Networks Transmission Enquiries:	021 453 4562

eircom

'Dial Before You Dig' Contact Information:

Fax: 01 7018856

Email: pdbureau@eircom.ie

Website: www.eircom.ie/dialbeforeyoudig

Notes

Notes

Working to create a national culture where all commit to safe and healthy workplaces and the safe and sustainable management of chemicals

HEALTH AND SAFETY AUTHORITY
Metropolitan Building
James Joyce Street
Dublin 1
Tel. 1890 289 389

Callers outside
Republic of Ireland
00353 1 6147000
Fax. (01) 6147020

www.hsa.ie

ISBN 978-1-84496-118-4

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