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EAST DUNBARTONSHIRE COUNCIL HEALTH & SAFETY PROCEDURE

Avoidance of Underground Utility Services and Overhead Power Lines

SP42

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DOCUMENT CONTROL AMENDMENT RECORD

Date	Issue No	Amendment	Person Responsible for Amendment
Sept 2023	**01**	Initial issue	Colin Hannigan

Definitions of terms used:

The following definitions expand on, but do not replace, those contained within the Construction, Design and Management Regulations (2015).

Client: Organisations or individuals for whom a construction project is carried out. The client may be an asset owner, utility provider or developer or a site.

Designer: are those, who as part of a business, prepare or modify designs for a building, product or system relating to construction work. A designer may also be a client or contractor.

Contractor: are those who do the actual construction work and can be either an individual or a company. Contractor includes Principal Contractor and any sub-contractor.

Underground service: Any utility service such as gas, electric or water, or any pipeline which transfers a substance above atmospheric pressure, or cable used for the transmission of electricity or data. It is normally below the adjacent ground level, but may emerge into the open or above ground for short sections of its length. It does not include drains, sewers, culverts, manholes, inspection chambers, storage tanks, unsealed pipes or tunnels.

Abbreviations used within this procedure:

USAG:	Utility Strike Avoidance Group
SWUK:	Street Works UK
CAT:	Cable Avoidance Tool
GENNY:	Signal Generator
LV:	Low Voltage
HV:	High Voltage
EHV:	Extra High Voltage
RAMS:	Risk Assessments & Method Statements
SSoW:	Safe System of Work

1. Introduction

The following guidance has been produced to ensure the continuity and consistency of East Dunbartonshire Council (EDC) technical services in the implementation of utility service avoidance techniques and to reaffirm the importance of EDC health and safety policies, procedures and processes for underground utility service and overhead power line avoidance within our authority; managing the works to reduce the likelihood of service strikes and injury to any persons whilst ensuring legal compliance.

Due to the wide variety of works undertaken by EDC, the risk of coming into proximity to buried utility services is high. It should always be assumed that with works that require the breaking of ground live utilities services are present unless it has been proven otherwise.

In terms of context, currently in the UK annually, there are circa 12 deaths and 600 serious injuries directly through damaging / encountering live underground utility services. A particular concern is those strikes where electrical services have been damaged during a hand dig and by persons who, by nature of the activity, are in close proximity to live services.

Contact with underground gas services creates the potential for fire or explosion, while domestic 230v electrical copper sheathed cables have no physical protection. Both must be treated with the utmost respect.

Underground utility service strikes are attributable to one or more of three basic elements not being effectively applied, these being:

- **PLANNING** the work
- **LOCATING** and **IDENTIFYING** buried utility services
- Safe **EXCAVATION** techniques.

Definitions	
High Voltage Electric	• Electricity cables that carry voltage over 1000 volts (<1kV)
Medium / High Pressure Gas	• Medium pressure mains operate between 2-bar and 7-bar and can be constructed from steel, polyethylene, cast iron or ductile iron pipe. • High Pressure Gas Mains operate at 7-bar and above and are normally constructed of steel

Potential Hazards	Risks
Gas	Pressurised and flammable, explosion and fire
Water	Pressurised, trench collapse and drowning
Electricity	Electrical current arcing, electric shock, burns
Telecommunications	Collapse onto, whiplash
Pipelines	Toxic, contamination, pressurised,
Sewage	Contaminant - polluter

Note: All works detailed in this Safety Procedure should be carried out in accordance with the requirements detailed in the Health and Safety Executive's Guidance, links below:

HSG 47: Avoiding danger from underground services.

Guidance Note GS6: Avoiding danger from overhead power lines.

East Dunbartonshire Council regard working near or with underground services as **HIGH RISK.** As such, all services should be assumed to be 'live' until disconnected and proved otherwise.

Where pre-construction work identifies underground utility services, the service commissioning or completing the work should contact the EDC Health and Safety Team to assist the service management team with a review of risk assessments and method statements specific to the task prior to works taking place.

2. ROLES AND RESPONSIBILITIES

CHIEF EXECUTIVE

The East Dunbartonshire Council (EDC) Chief Executive has ultimate responsibility for health and safety and for making sure that suitable and correct resource is provided to ensure Services can fulfil their responsibilities correctly, meeting both internal compliance and regulatory requirement.

It is important to acknowledge that the Chief Executive's responsibilities are shared, in that the Deputy Chief Executive, Executive Officers and Service Managers will be responsible and accountable within their own areas of responsibility.

DEPUTY CHIEF EXECUTIVE

The Deputy Chief Executive has a delegated responsibility for making sure this management Procedure is implemented in respect of premises under the control of or otherwise, occupied by EDC Place, Neighbourhood and Corporate Assets.

EXECUTIVE OFFICERS & MANAGERS

The Executive Officers and Service Manager must ensure the following:

- Adequate resources and competent person(s) are allocated to support the implementation of this Management Procedure and relevant associated Health and Safety legislation.
- Nominated person(s) are supported in implementing the measures of this Management Procedure to comply with relevant Health and Safety legislation.

HEALTH AND SAFETY TEAM

The EDC Health and Safety Team and the Technical Compliance Team will advise service management in fulfilling their duties in regards to the implementation of this management procedure and associated regulations and guidance.

In particular, the Health and Safety Team shall:

- Advise the Executive Officer, Service Manager, Team and Squad Leaders in fulfilling their duties.
- Work with teams to provide feedback about actions and control measures that may need to be taken to prevent harm and protect employees.
- Provide and reinforce training and education on health risks associated with certain tasks
- Monitor compliance with this management procedure and the associated regulations and guidance by carrying out periodical audits and inspections and issuing subsequent reports detailing any possible gaps or issues that need to be addressed.

3. Types of Services

3.1 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.

3.2 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 sometime 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 later.

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.

3.3 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.

3.4 Telecommunication 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 police.

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 investigate either end of a severed fibre optic cable as laser light might damage eyesight.

3.5 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.

4. Planning the Work

The Construction (Design and Management) Regulations 2015 places clear responsibilities on Clients, Principal Designers (PD) and Principal Contractors (PC).

The Client is the person having construction work carried out for them and is responsible for making suitable arrangements for managing a project.

This includes making sure that:

- Other duty holders are appointed;
- Sufficient time and resources are allocated;
- Relevant information is prepared and provided to other duty holders;
- The principal designer and principal contractor carry out their duties;
- Welfare facilities are provided.

East Dunbartonshire Council will **always** be the client for the works they require, and on occasion will carry out works for other clients.

4.1 Pre-Start

Communication and engagement with all relevant parties which results in a proper and approved design, and the planning of high-risk operations leading to a general overall planned approach to the construction work can be achieved by considering the following process.

4.2 Services Designs

Plans or other suitable information about all buried services in the area should be obtained before excavation work begins. This material should be passed onto the PC tendering for the works as early as is reasonably practicable by the PD for the project.

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 PC 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.

No works should begin without an agreed utilities design having been supplied.

4.3 Services Pre-Start & Progress meetings

Where works require excavation near utility services or where there is a requirement for simultaneous operations between EDC and a utility service provider, it is recommended that the service provider attends Pre-start and regular meetings to ensure co-ordination and communication between all parties.

4.4 On-Site Service Recording

The EDC service manager must ensure that any provided service drawings are kept current. The drawings should be marked up to reflect the route of each of the installed

utilities (power, water, gas, telecom, and broadband / fibre) and clearly highlight the extent of each service which has been made live.

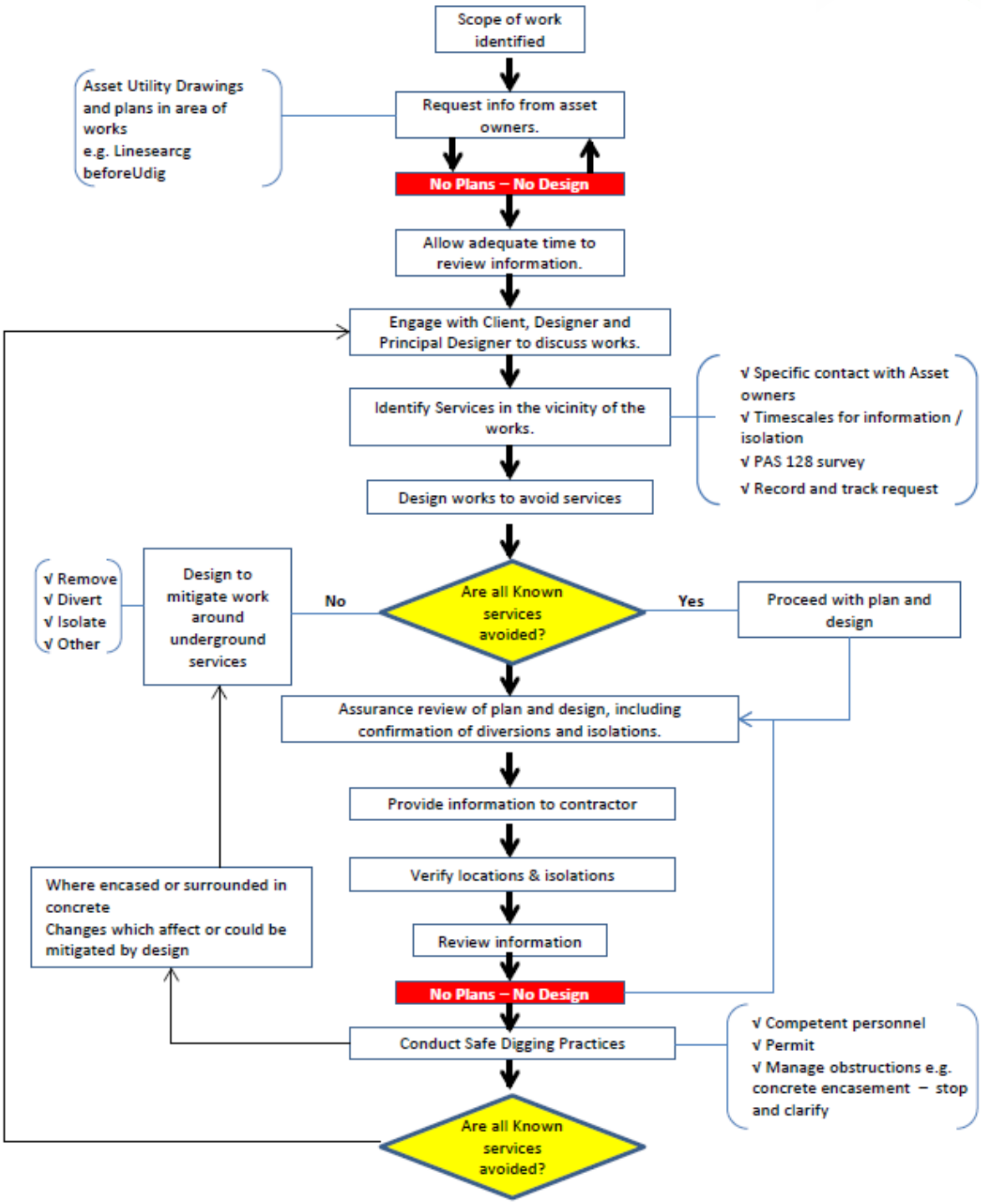
4.5 Post Site Start Up: Planning the Work

Service Identification Records and any as laid/built details to be supplied by the asset owner, drawings to be colour, current and at suggested scale of 1:500 or greater, where detail is requested, photographic records to also be provided where possible.

Underground service identification and location must be clearly scoped (recorded site visits) and priced, with competent sub-contractor with competent supervision and workforce appointed.

5. Design & Planning Process to Avoid Underground Services

The following process describes good practises for planned work.



6. Locating and identifying buried utility services

Buried utility services require to be located by competent workers, using a calibrated "Genny" and "CAT" (cable avoidance tool) with services effectively identified and marked out on the surface.

Genny and CAT operators MUST have the correct skills, knowledge, and experience to competently locate and identify buried services.

NOTE: Existing plastic services can only be located by hand digging or by introducing a traceable signal upon the service pipe using a signal generator. Some new GAS pipes can have a metallic strip inserted that bounces back a signal, but they are rare.

Once the underground services have been located and demarcated by the attending competent person, referring to utility service drawing plans and using the applicable CAT & Genny to determine the position of underground services, excavation may proceed adopting recognised safe digging practice. - as per HSG47 Guidance.

Marker paint will be used to mark out the service route by the attending competent person to delineate the underground services present, varied paints may be adopted if so required to denote differing services – red – blue – yellow – white etc.

In cases where abundant services are present, in a built-up area, it may be prudent to adopt vacuum excavation methods, or alternatively adopt air picks about electrical and gas services, to avoid impact upon them.

The initial locating of buried services is to be undertaken by use of trial holes, to establish thier location and permit a signal to be attached if so required (gas, water, small bore cables etc.) these trail holes should be dug using insulated hand tools to confirm the depth and position of any buried services.

Exceptional care must be taken when hand digging above or close to the assumed lines of any such services. Effort is to be made to dig parallel and not directly above any service, and then expose the service from the side working upward above it, to expose it. Service suspension must be provided as the service is dug if digging beneath it is a requirement of the dig formation. Do not permit services to sag, electrical armour can break, joints can fail etc. Not stepping on exposed services permitted.

Caution to be noted when digging trial holes and locating services, do not assume cover depth is constant along the service length – repairs may have been undertaken, these are seldom recorded, spurs can come off from an old service and not be recorded

Hand-held power tools / breakers and excavator buckets are the main source of danger to personnel, and they should not be used too close to underground services.

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 using

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.

6.1 Safe Excavation

In terms of hierarchy, always first consider non-invasive methods of excavation, such as suction excavation.

The N03 Permit to Dig issued to Dig Supervisor **MUST** be present in vicinity of dig.

Hand dig trial holes undertaken using insulated hand tools to safely and accurately confirm location of services, continually checking/verifying and re-marking location of services as the dig progresses.

Hand Dig and machine Dig are two separate methods, and must not be authorised/allowed on the same permit

Permit to Machine Dig **only** issued on confirmation of known identification/location, and then **only** if requisite safe distances of separation can be achieved **(See Appendix 2).** Where the requisite safe distances cannot be achieved an appropriate documented and agreed SSOW must be in place.

Any exposed services to be adequately protected, where potential for damage is present, mechanical lifting /movement of materials above un-protected live services is strictly prohibited.

Appropriate temporary pedestrian plates installed over service excavations as necessary. Backfill to be undertaken in sanded layers, with marker tape/tiles installed progressively, in line with NJUG specification.

As built/laid service detail to be overlaid onto notional/intended service drawing, with appropriate evidential photographs taken, where possible to support.

7. The Dig Supervisor

Within every team of people who are required to excavate, or work within an excavation on or near underground utilities, an individual must be appointed as the person responsible for implementing the safe system of work. This person on site will be known as the Dig Supervisor.

The Dig Supervisor will be identifiable by wearing a high visibility vest with Dig Supervisor printed on the back.

The Dig Supervisor must be competent and adequately trained for the task being undertaken and appointment formally by the Team Leader in charge of site operations.

The individual **must** be briefed and be fully aware of the significance of being employed in this role on EDC Projects.

The training associated with the Dig Supervisor role **MUST** include and in addition to the above; safe identification, safe digging techniques and the necessary action(s) required in the event of an emergency.

Additionally, the Dig Supervisor must hold the NRSWA Supervisor card when working on or the immediate local of the public highway.

The Dig Supervisor MUST ensure that:

- The conditions of any permit to break ground/excavate are followed
- Safe digging techniques are fully applied
- The ground is scanned for utilities as work proceeds
- Exposed utilities are supported/protected as necessary
- ALL Work is **stopped** if any circumstances change.

The Dig Supervisor MUST be in attendance **when** work is carried out on or **near** underground utilities.

All Work MUST stop if the Dig Supervisor is NOT in attendance.

8. Breaking Ground

Any breaking of ground requires the completion of the Permit to Work **'N03 Permit to Dig'** prior to work commencing. This should be raised in every situation where contact with underground services is possible, i.e., hand dig, and separately mechanical dig – including inserting fence pins or any other task where ground surface will be penetrated. Where only the top 50mm of tarmac is being removed, the N03 Permit to Dig can be omitted **only** where a suitable risk assessment has been completed.

The purpose of the permit is to ensure:

- All known services have been located
- Sufficient trial holes have been dug to identify the routes taken by each service
- There is sufficient clearance between the proposed excavation and the existing services to ensure safety
- Where appropriate sufficient arrangements have been made to provide support and /or traffic management at the utility excavation
- All operatives and supervisors involved are competent, aware of the risks associated with underground services excavations and the need to comply with any conditions set out on the permit.

Only once all the above conditions can be met, the N03 Permit to Dig' should be issued, the permit should identify:

- A set period during which it is valid
- A specific excavation, or section of excavation to which it applies and be accompanied by a drawing (or other documentation) giving clear information on where and at what depth existing services will be found as well as details of the trial holes
- Details of the precautions to be taken
- The level of supervision required
- The type of machinery that can be used during the work including any restrictions on its use
- Actions to be taken in an emergency
- A requirement to stop work and seek advice if either an additional service is found, or services are not found to be in the positions identified on the permit.

If a suitable safety margin cannot be established between the proposed excavation and the existing services, then work must be restricted to hand digging

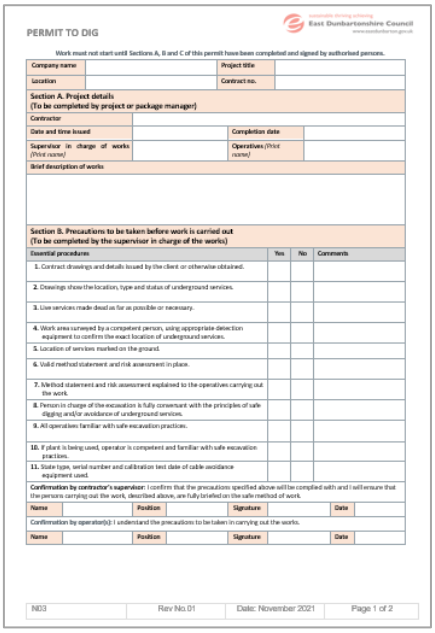
Ideally the permit should be formally issued at the work location where the ground will be disturbed.

The permit **MUST** be completed by a competently trained member of the management team with the attendance of the Dig Supervisor, Roads Supervisor and / or Groundwork Supervisor. An up-to-date utility drawing **MUST** also be issued with the permit for the area, ideally attached to the permit.

Any progression from a hand dig to a machine dig requires that a new and separate permit be issued, this is also required if a change in circumstance, scope of work or unplanned work is identified. **STOP** work and review the process.

A copy of the permit must be retained by the dig supervisor at the work area.

All personnel involved in carrying out the work **MUST** be briefed, named and "signed-on" to the Permit to Work / N03 Permit to Dig **(Fig1)**



PERMIT TO DIG

East Dunbartonshire Council

Work must not start until Sections A, B and C of this permit have been completed and signed by authorised persons.

Company name		Project title	
Location		Contract no.	

Section A. Project details
(To be completed by project or package manager)

Contractor			
Date and time issued		Completion date	
Supervisor in charge of works (Print name)		Operatives (Print name)	
Brief description of works			

Section B. Precautions to be taken before work is carried out
(To be completed by the supervisor in charge of the works)

Essential procedures	Yes	No	Comments
1. Contract drawings and details issued by the client or otherwise obtained.			
2. Drawings show the location, type and status of underground services.			
3. Live services made dead as far as possible or necessary.			
4. Work area surveyed by a competent person, using appropriate detection equipment to confirm the exact location of underground services.			
5. Location of services marked on the ground.			
6. Valid method statement and risk assessment in place.			
7. Method statement and risk assessment explained to the operatives carrying out the work.			
8. Person in charge of the excavation is fully conversant with the principles of safe digging and/or avoidance of underground services.			
9. All operatives familiar with safe excavation practices.			
10. If plant is being used, operator is competent and familiar with safe excavation practices.			
11. State type, serial number and calibration test date of cable avoidance equipment used.			

Confirmation by contractor's supervisor: I confirm that the precautions specified above will be complied with and I will ensure that the persons carrying out the work, described above, are fully briefed on the safe method of work.

Name		Position		Signature		Date	

Confirmation by operator(s): I understand the precautions to be taken in carrying out the works.

Name		Position		Signature		Date	

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Fig 1

The N03 Permit to Dig **MUST** be closed/canceled out on completion and appropriately filed.

8.1 Vacuum/Suction Excavation

Alternatives to mechanical excavating should be considered where possible e.g. vacuum extraction.

Vacuum excavation operates by the suction power created by an on-board fan system (twin, triple or quad fan power options) this allows the flow of air to draw material up through an intake nozzle/hose depositing the spoil into a contained storage container. This enables the machine to be able to safely excavate the material around buried services without coming into contact or damaging utility services.

Benefits of Vacuum/Suction Extraction

There are numerous benefits which can be achieved by undertaking the vacuum excavation method these are listed below:

- Minimise utility/service strikes
- Maximises safety of personnel in vicinity of activity
- Minimalises manual handling

- Reduced size of excavation – minimises waste
- Faster and more efficient than conventional hand dig or mini excavators
- Faster excavation compared to open cut, especially in difficult ground conditions
- Reduced reinstatement costs
- Less risk of damage to tree roots
- Plant and personnel maintained at a safe distance
- Can work within a restricted area
- Removes spoil contained within the unit for easy transportation off site
- Reduces the number of personnel involved.
- Dig supervisor not required

Further Guidance: **CPA Safe Use of Suction/Vacuum Excavators**

8.2 Hand Excavation

A competent Dig Supervisor **must** be in the vicinity of the excavation and oversee the competent Dig Squad are hand digging in the correct manner and using insulated tools.

All personnel associated with the Dig **must** have been briefed and understand the requisite safe digging techniques, as detailed in the RA/MS.

All workers **must** be familiar with the N03 Permit to Dig and must be signed onto it.

- The location of all services should be confirmed by trial holes before any excavation works commence;
- Cable avoidance tools **must** always be used in conjunction with the generator;
- All equipment used to locate cables should be in good working order and calibrated as appropriate;
- All tools used where electrical services may be encountered should be insulated;
- The use of ground penetrating pins is **not** permitted within 1m of known live services;
- If a change in circumstance, scope of work or unplanned work is identified **stop** work and review the process.

8.3 Machine Dig

Once the presence of all underground utility services has been fully established, it may be possible to issue a permit to dig for machine excavation; this however can **only** be done, if the requisite safe clearances can be created/established, in line with the specific service owner's requirements.

NO MACHINE DIG WITHIN 500MM OF KNOWN SERVICES

All workers involved in the activity **must** be engaged with and signed onto a new separate N03 Permit to Dig (including the machine operator).

The relevant RA/MS must be in place for the digging activity and the machine operator **must** have a copy of the N03 Permit to Dig located on his person/within the machine.

Where mechanical excavations are planned, the work should progress slowly, and regular checks be taken by the operator, banksman and Dig supervisor.

8.4 Bagged Service Connection Excavation

This solution for protecting known services without backfilling the excavation involves sandbags being placed over connection points as part of the initial mains laying. These bagged positions are determined through providing the co-ordinates of each house service entry position directly lined up to the main.

The ground worker, when backfilling the mains excavation places a sandbag directly over the marked house position. This means that at the time of connection the bag can simply be lifted with no dig necessary. The connection made; the bag can then simply be cut to allow the refilling to take place.

8.5 Protection and Backfill

Services to be backfilled at requisite depth, in sand/granular material, with marker tape/tiles installed with the progression of the backfill.

Good examples of protected services

Poor examples of protected services.

8.6 Protection and identification of services within the devlopment.

Throughout the construction phase, new services should be respected and not damaged.

Utilities service trenches/excavations remaining open in the footpath or to public areas are to be effectively covered/ protected, this to protect the service and those in proximity from the excavation, services located on or adjacent to site walkways must be given additional protection.

8.7 Mechanical Excavation Utility Avoidance Wheel (Appendix 2)

When excavating within 3m of services, contact shall be made with the Asset Owner/Representative responsible for the operation and maintenance of the asset to obtain their specific requirements to develop the Safe System of Work (SSoW), and where necessary arrange for their attendance on site.

Where HV cables above 11kV are present, contact shall be made with the Asset Owner/Representative to obtain detailed drawings and agree the SSoW to be adopted.

Mechanical excavators shall not be used within 3m of HV cables above 11kV until consultation with the Asset Owner/Representative has taken place to obtain their specific requirements to develop an SSoW and recorded on the N03 Permit to Dig.

Distribution electrical networks: 33kV and under. Transmission electrical networks: Equal to or greater than 132Kv Where Distribution electrical networks: 33kV and under and Transmission electrical networks: Equal to or greater than 132Kv contact shall be made with the Asset owner/Representative to obtain their specific requirements to develop the SSoW and is to be recorded on the N03 Permit to Dig.

When excavating within 10m of pressure regulating equipment or gas storage facilities contact shall be made with the Asset Owner/Representative for the operation and maintenance of governing equipment to obtain their specific requirements to develop the SSoW and where necessary arrange for attendance/representation on site and recorded on the N03 Permit to Dig.

9. Overhead Power Lines

Every year people are killed or seriously injured when they come in contact with overhead electricity power lines.

Incidents occur when working activities are not properly planned and result in contact with power lines (for example, contact with tipping trailers, cranes and scaffolding tubes and ladders).

If a machine, scaffold tube, ladder, or even a jet of water touches or gets too close to an overhead wire, then electricity will be conducted to earth. This can cause a fire or explosion and electric shock including burn injuries to anyone touching the machine or equipment. An overhead wire does not need to be touched to cause serious injury or death as electricity can jump, or arc, across small gaps.

Overhead lines can be difficult to spot, particularly in foggy or dull conditions. Often people forget to simply **look up** to check for overhead power lines.

Most overhead lines have wires supported on metal towers/pylons or wooden poles – they are often called ‘transmission lines’ or ‘distribution lines’.

Figure 1: Example of 275 kV transmission line

Figure 2: Example of 11 kV distribution line

Figure 3: Example of 400 V distribution line

Electricity supplies above 33,000 volts are usually routed overhead, Supplies below this voltage may be either overhead or underground.

There is a legal minimum height above ground level for overhead power lines that varies according to the voltage carried. These heights are shown below:

- 400 kV 7.3 m
- 275 kV 7.0 m
- 132 kV 6.7 m
- 33 kV- low voltage 5.2 m (except for roads where the minimum is 5.8 m)

9.1 Legislative and Guidance

The law requires that work may only be carried out in close proximity to live overhead lines when there is no alternative, and only when the risks are acceptable and can be properly controlled.

Where work cannot be avoided consult the local electricity company or distribution network operator (DNO) **before** any work is started, a safe system of work and site specific risk assessment must be planned and implemented.

Power lines should be isolated and made **dead** or suitable precautions taken to prevent danger before any work takes place.

Overhead line owners have a duty to minimise the risks from their lines and must be consulted with as they will be able to advise others on how to control the risks.

The line owner will usually be an electricity company, known as a transmission or distribution network operator, but could also be another type of organisation, e.g. Network Rail, or a local owner, e.g. the operator of a caravan park.

Take practical steps to prevent danger from any live cable or apparatus. This should include the placing of substantial and highly visible barriers. A barrier is only required if access is only required from one side of the site, but if the line crosses the site, barriers will need to be placed on both sides.

If there is a danger to people with scaffold poles or other conducting objects then the barriers must be able to exclude people and mobile plant.

Electricity travels at the speed of light – more than 186,000 miles per second. The people you are responsible for do not.

Always assume that a power line is live unless and until the owner of the line has confirmed that it is dead.

9.2 Preventing overhead power lines accidents

Good management, planning and consultation with interested parties before and during any work close to overhead lines will reduce the risk of accidents. This applies whatever type of work is being planned or undertaken, even if the work is temporary or of short duration. You should manage the risks if you intend to work within 10 m, measured at ground level horizontally from below the nearest wire.

9.2.1 Eliminate the risk

The most effective way to prevent contact with overhead lines is by not carrying out work where there is a risk of contact with, or close approach to, the wires.

If you cannot avoid working near an overhead line and there is a risk of contact or close approach to the wires, you should consult its owner to find out if the line can be permanently diverted away from the work area or replaced with underground cables. This will often be inappropriate for infrequent, short-duration or transitory work.

If this cannot be done and there remains a risk of contact or close approach to the wires, find out if the overhead line can be temporarily switched off while the work is being done. The owner of the line will need time to consider and act upon these types of requests and may levy a charge for any work done.

9.2.2 Risk control

If the overhead line cannot be diverted or switched off, and there is no alternative to carrying out the work near it, you will need to think about how the work can be done safely. If it cannot be done safely, it should not be done at all. Your site-specific risk assessment will inform the decision. Things to consider as part of your risk assessment include:

- The voltage and height above ground of the wires. Their height should be measured by a suitably trained person using non-contact measuring devices;

- The nature of the work and whether it will be carried out close to or underneath the overhead line, including whether access is needed underneath the wires;
- The size and reach of any machinery or equipment to be used near the overhead line;
- The safe clearance distance needed between the wires and the machinery or equipment and any structures being erected. If in any doubt, the overhead line's owner will be able to advise you on safe clearance distances;
- The site conditions, e.g. undulating terrain may affect stability of plant etc.;
- The competence, supervision and training of people working at the site.

If the line can only be switched off for short periods, schedule the passage of tall plant and, as far as is possible, other work around the line for those times.

Do not store or stack items so close to overhead lines that the safety clearances can be infringed by people standing on them.

9.3 Working near but not underneath overhead power lines and the use of barriers

Where there will be no work or passage of machinery or equipment under the power lines, ground level barriers can be erected to establish a **safety zone.** This area should not be used to store materials or machinery.

Suitable barriers can be constructed out of large, steel drums filled with rubble, concrete blocks, wire fence, earthed at both ends, and earth banks marked with posts.

- If steel drums are used, highlight them by painting them with, for example, red and white horizontal stripes.
- If a wire fence is used, put red and white flags on the fence wire.
- Make sure the barriers can be seen at night, perhaps by using white or fluorescent paint or attaching reflective strips.
- The safety zone should extend at least 6 m horizontally from the nearest wire or apparatus on either side of the overhead line. You may need to increase this width on the advice of the line owner or to allow for the possibility of a jib or other moving part encroaching into the safety zone. The electricity supplier will give specific, on-site advice on the position of safety zones.

Where plant (such as a crane) is operating in the area, additional high-level indication should be erected to warn operators. A line of coloured, plastic flags or bunting, mounted 3 – 6 m above ground level over the barriers, is suitable.

Extreme caution must be exercised when erecting bunting and flags to avoid contact or arcing with the wires, the electricity supplier will give specific, on-site advice on the positioning of high level indicators.

9.4 Safe working when passing underneath overhead power lines

If equipment or machinery capable of breaching the safety clearance distance must pass underneath the overhead line, you will need to create a passageway through the barriers, as illustrated in Figure 4. In this situation you should consider the following:

- The number of passageways is kept to a minimum;
- Define the route of the passageway using fences and erect goalposts at each end to act as gateways using a rigid, non-conducting material, e.g., timber or plastic pipe, for the goalposts, highlighted with, for example, red and white stripes;
- If the passageway is too wide to be spanned by a rigid non-conducting goalpost, you may have to use tensioned steel wire, earthed at each end, or plastic ropes with bunting attached. These should be positioned further away from the overhead line to prevent them being stretched and the safety clearances being reduced by plant moving towards the line;
- Ensure the surface of the passageway is levelled, formed-up and well maintained to prevent undue tilting or bouncing of the equipment;
- Put warning notices at either side of the passageway, on or near the goalposts and on approaches to the crossing giving the crossbar clearance height and instructing drivers to lower jibs, booms, tipper bodies etc. and to keep below this height while crossing;
- You may need to illuminate the notices and crossbar at night, or in poor weather conditions, to make sure they are visible;
- Make sure that the barriers and goalposts are maintained.

Figure 4: Typical passageway through barriers

On a construction site, the use of goalpost-controlled crossing points will generally apply to all plant movements under the overhead line.

9.5 Working underneath overhead power lines

Exclusion zones should be set up around the line and any other equipment that may be fitted to the pole or pylon. If you cannot avoid transitory or short duration, ground level work there is a risk of contact from, for example the upward movement of cranes or people carrying tools and equipment, you should carefully assess the risks and precautionary measures.

The minimum extent of these zones varies according to the voltage of the line, as follows:

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

For detailed advice about the line voltage or use of exclusion zones you should always consult the owner of the overhead power line.

- Arrange for the work to be directly supervised by someone who is familiar with the risks and can make sure that the required safety precautions are observed;
- Make sure that workers, including contractors, understand the risks and are provided with instructions about the risk prevention measures;
- Poles, Aluminium ladders and hand tools should not be able to encroach within these zones. Allow for uncertainty in measuring the distances and for the possibility of unexpected movement of the equipment due, for example, to wind conditions;
- Carrying long objects horizontally and close to the ground and position vehicles so that no part can reach into the exclusion zone, even when fully extended. Machinery (such as cranes and excavators) should be modified by adding physical restraints to prevent them reaching into the exclusion zone;
- Insulating guards and or proximity warning devices fitted to the plant without other safety precautions are not considered adequate protection on their own;
- Machinery (such as cranes and excavators) should be modified by adding physical restraints to prevent them reaching into the exclusion zone.

Work should not take place close to or under an overhead line during darkness or poor visibility conditions. Dazzle from portable or vehicle lighting can obscure rather than illuminate power lines.

10. Emergency Action Plan

A service strike emergency plan should be in place before excavations commence and should cover:

- Immediate action to take following a strike
- How to contact service owners and emergency services
- Locations of nearest hospital and first aid provision
- Who is assigned to take control of the emergency

This information should be recorded and communicated with workers.

9.1 Emergency Procedures – Machine contact with electrical cables

If contact is made with a live cable, the Dig Supervisor and Service Manager / Team Leader must clear the immediate area, suspending ALL work within 50m of the known damage.

Note: All services should be assumed to be 'live' until disconnected and proved safe.

- Contact the utility company immediately then the Health and Safety Team

10.2 Emergency Procedures – Machine contact with Gas Services

Where Contact is made with a gas line The Dig Supervisor must clear the immediate area, suspending **all** work within 50m of the known damage and contact the utility company immediately.

Damage to underground services **must** be reported to the owner and or occupier immediately. When such damage causes an emergency, call the emergency services as necessary.

If there is a dangerous situation and the emergency services have not arrived, try to evacuate the immediate area including, if necessary, the occupants of nearby properties to a safe location. As far as possible, prevent anyone from smoking and keep people and traffic clear from the area.

All incidents **must** be reported to your team leader and or supervisor immediately and an HS1a Accident and Incident Form completed and forwarded to the Health and Safety Team, and an investigation should be carried out on the incident to identify the root and contributory causes.

The Health and Safety Executive (HSE) should not be contacted until the Health and Safety Team ascertain if the service strike is a RIDDOR reportable dangerous occurrence.

In the event of a gas leak, suspected gas leak or any other emergency relating to gas, immediately phone the National Grid Gas Emergency Services on 0800111 999.

10.3 Accidental contact with overhead power lines

If someone or something comes into contact with an overhead power line, it is important that everyone involved knows what action to take to reduce the risk of anyone sustaining an electric shock or burn injuries. Key points are:

- Never touch the overhead line's wires;
- Assume that the wires are live, even if they are not arcing or sparking, or if they otherwise appear to be dead;
- Remember that, even if lines are dead, they may be switched back on either automatically after a few seconds or remotely after a few minutes or even hours if the line's owner is not aware that their line has been damaged;
- If you can, call the emergency services. Give them your location, tell them what has happened and that electricity wires are involved, and ask them to contact the line's owner;
- If you are in contact with, or close to, a damaged wire, move away as quickly as possible and stay away until the line's owner advises that the situation has been made safe;
- If you are in a vehicle that has touched a wire, either stay in the vehicle or, if you need to get out, jump out of it as far as you can. Do not touch the vehicle while standing on the ground. Do not return to the vehicle until it has been confirmed that it is safe to do so;
- Be aware that if a live wire is touching the ground the area around it may be live. Keep a safe distance away from the wire or anything else it may be touching and keep others away. Shout for help.

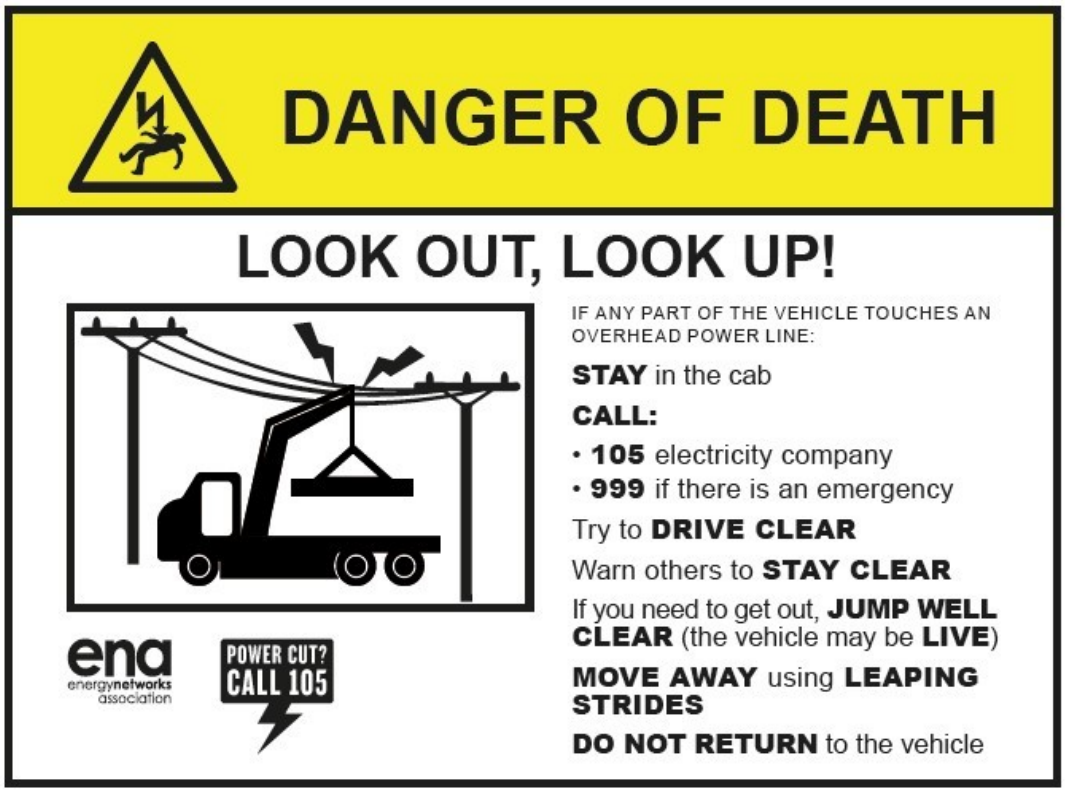


Figure 5: Example of warning notice and emergency plan

East Dunbartonshire Council have installed the above warning notice and emergency plan stickers installed in all high risk vehicles identified for instance wheel loaded shovels, tippers, cranes, excavators, mobile elevated work platforms and any other vehicle considered to be at risk.

All incidents should be recorded onto the HS1a Accident and Incident Form, and an investigation should be carried out on the incident to identify the root and contributory causes.

The Health and Safety Executive (HSE) should not be contacted until the Health and Safety Team ascertain if the service strike is a RIDDOR reportable dangerous occurrence.

MONITOR AND REVIEW

As part of the EDC Health and Safety Management System, the EDC Health and Safety Team will conduct regular audits and inspections to monitor the implementation of this management procedure.

The EDC Health and Safety Team will review this management procedure every two years from the date of signing or sooner as a result of any changes to legislation or some other event i.e. a major incident or accident.

The EDC Health and Safety Team will provide feedback in the form of a report following any audits and inspections. When necessary, the procedure will be amended and reissued with an updated version number.

All Team Leaders must ensure that local procedures are updated to reflect any changes to the management procedure.

REFERENCES

HSE Guidance and Regulation

- Health and Safety at Work Act 1974
- The Management of Health and Safety at Work Regulations 1999
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
- Construction (Design and Management) Regulations 2015
- New Roads and Street Works Act 1991 (NRSWA)
- Control of Substances Hazardous to Health Regulations (COSHH) 2002
- The Gas Safety (Management) Regulations 1996
- The Electricity at Work Regulations 1989
- The Personal Protective Equipment at Work 1992 (Amendment) Regulations 2022
- The Provision and Use of Work Equipment Regulations 1998
- Lifting Operations and Lifting Equipment Regulations 1998

East Dunbartonshire Council: Health and Safety Policy / Procedures

- HSP01 Health and Safety Policy
- HSP05 Management of Contractors Policy
- HSP06 Occupational Health Policy
- HSP07 Controlling Workplace Hazards Policy
- SP01 Accident & Incident Reporting Procedure
- SP13 Manual Handling Procedure
- SP15 CDM Procedure
- SP23 Working at Height Procedure
- SP27 PPE and RPE Procedure
- SP31 LOLER Procedure
- SP32 PUWER Procedure
- SP35 Accident and Incident Investigation Procedure

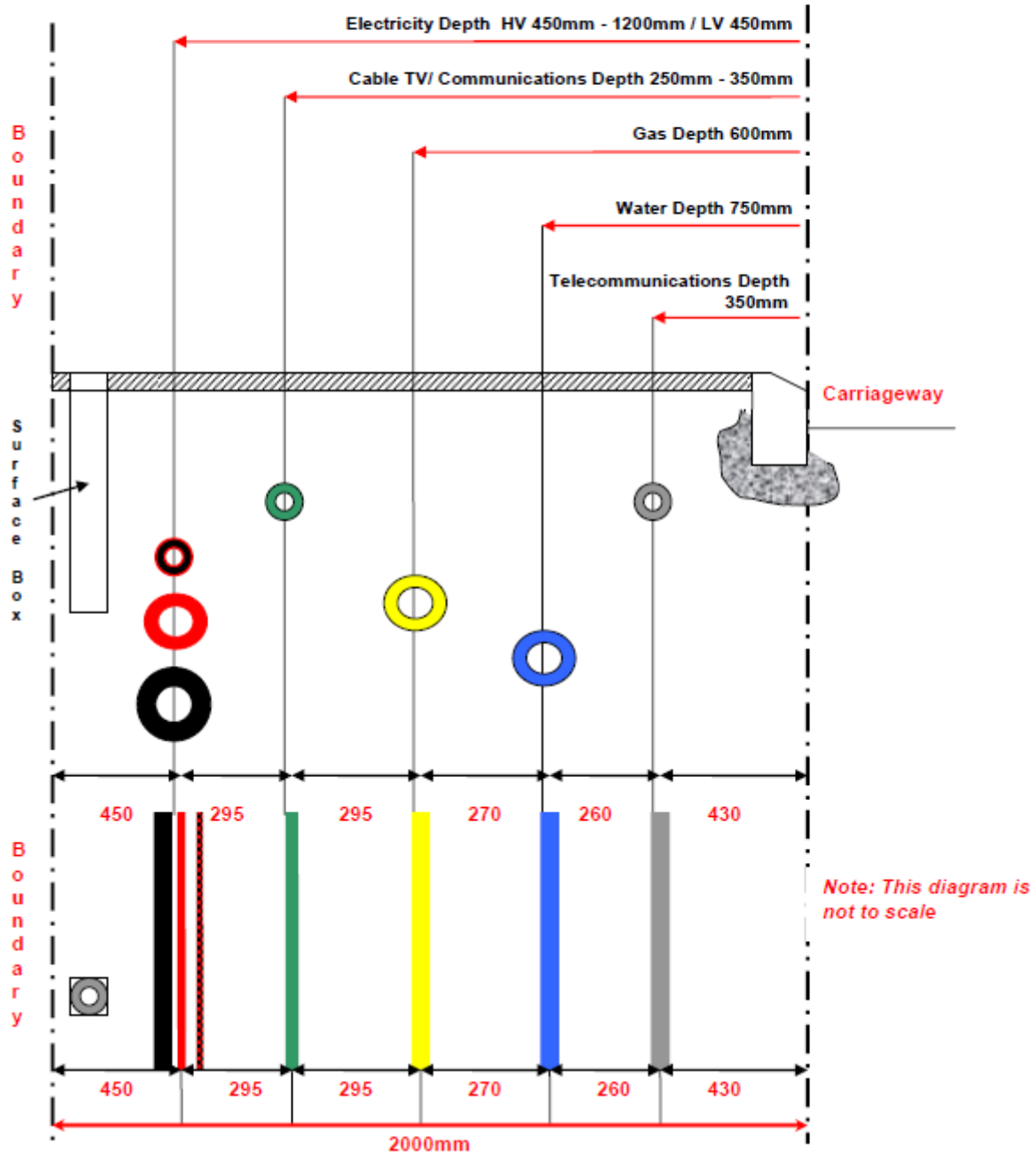
- SP38 Permit to Work Procedure

Appendix 1: NJUG Guidelines for Colour Coding of Underground Utilities

NJUG Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus

FIGURE 1 - Recommended Positioning of Utility Apparatus in a 2 metre Footway

Note – the same positioning should apply in the carriageway/service strip (if safe and practical to do so) where a development has no footway(s) available for services and/or the boundary of the property is on the carriageway (please refer to minimum depths in carriageways). For further advice please contact the asset owner.



Appendix 2: Mechanical Excavation Utility Avoidance Wheel

Note: Mechanical tools include mechanically operated, hand-tools such as compressed-air and electrical “breakers”, “half-guns” etc. as well as larger plant. Wayleaves and easement distances may be greater - Contact asset owner