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Principle

City University has suffered several near miss accidents when buried cables have been damaged during excavation works. Apart from the increasingly high cost of disruption to our business, the potential injury from damaging buried electricity cables is severe burning or death. The aim of this guidance note is to minimise the possibility of accidents from buried electricity cables on City University sites. Rather than merely urging the excavator to dig carefully, it sets out a system of work based on obtaining as much information as possible about cables in the proposed excavation area and agreeing a safe method of work in their vicinity.

This procedure must be applied to all ground penetrations.
BEFORE EXCAVATION STARTS

Prior to any excavation works starting, discussions must take place between the Contractor and the responsible City University Engineer to identify the exact extent of the proposed excavations.

Re: C.D.M. Regulations 'Underground Services'

Whether or not the area is known to contain buried services, the excavator and the responsible City University Engineer will be expected to have gathered as much information as possible before requesting a ground scan or ground penetration permit.

A risk assessment and method statement must be completed prior to any excavation starting.

Drawings / Records

The Engineering Services Drawing Office in B130 maintains current record drawings of underground cable routes.

Ground Scans

After obtaining as much information as possible and a copy of the relevant record drawing a ‘ground scan’ will be carried out by a City University Electrical Competent Person, authorised under the site Electrical Safety Rules, to identify and confirm the position of any buried cables, pipes, ducts or other services.

The area scanned must include, at least, a two metre boundary around the proposed excavation site.

Power cables that may be in the vicinity of the excavation may include those that are not continuously energised e.g. street lighting. Wherever practical these should be energised whilst performing the scan.

Areas Free of Buried Cables And Services.

Information must be fed back to City University to enable our record drawings to be kept as accurate as possible.

If, following a satisfactory scan of an area, no cables or services are identified, the City University Electrical Competent Person will issue a City University Ground Penetration Certificate, valid for a period of one month, which will indicate any precautions to be taken by the contractor. The contractor should continue to use his own cable locating equipment to monitor excavations as they progress, to satisfy himself that the area remains safe for excavation. If a previously unknown buried cable becomes evident or is suspected after excavation work has started, the excavation work must stop at once and the responsible City University Electrical Competent Person informed.
Areas Containing Cables or Services

Road Paint on hard surfaces. Short wooden pegs on soft areas. Metal spikes must not be used.

If the ground scan confirms the presence of buried cable(s) or services the route will be clearly marked on the ground, and on a part copy of the site record drawing. The accompanying ‘Ground Penetration Certificate’ issued, will normally prohibit any excavation work within one metre of the indicated obstacle.

If excavation is necessary within one metre, either side of the marked route, the City University ‘Ground Penetration Certificate’ will be valid for a maximum of seven working days only. Wherever operationally practical the cable will be made dead for excavations within one metre.

Mechanical excavators will not be used in this instance, only suitable hand tools will be authorised. All operatives will be briefed as to obstruction and safe methods of work

ELV Cables

Underground cable ducts will be treated as if they contained cables unless it can be positively proved that they are empty. Fibre optic and communication cables are unlikely to be detected by normal scanning equipment.

Ground Penetration Certificate

The ‘Ground Penetration Certificate’ will be raised by a City University Competent Person and will clearly indicate

- Date the permit was raised.
- Expiry date of permit (supplementary permits).
- Marked up Record drawing ref. Number if attached.
- Name of person receiving the certificate.
- Further precautions to be taken e.g.,
- City University representative to be present at all times
- Hand digging
- Cables to be isolated
- Protection for exposed cables

At all times, the person carrying out the excavation must conform to the conditions stated on the certificate and the principles of 'safe digging practice'.
Where excavation work is over a large area Ground Penetrations Certificates may be issued for subsections of the entire excavation. This may be done to avoid confusion if a significant amount of information needs to be passed on. Where this is the method of control employed the limit of the excavation is to be clearly marked on attached drawings. The limit of the work will also be marked directly on the ground by means of spray paint where practical. If spray paint is not practical, e.g. soft ground, then wooden stakes should mark the boundary.
SAFE DIGGING PRACTICE

Note:

Please refer to HSG47 'Avoiding Danger From Underground Services', or up to date equivalent.

Even if no cable or service is shown on plans or detected, a close watch should be kept for any signs which could indicate the presence of a cable.

Although underground cables are normally laid in trenches between 450mm and 1m deep, they can often be found just below the surface. This should always be borne in mind, particularly if the ground has been disturbed or if there are cellars or structures in the area which may have prevented cables being laid at standard depths. Even the shallowest excavations may be a source of danger.

Services may have been laid directly in the ground with a bed or surround of fine soil or sand, or in a cement-bound sand, or in earthenware or plastic pipes or ducts, or they may have a layer of tiles, slabs or coloured plastic marker tape laid above them. Such protection may have been disturbed and moved and should not be taken as an accurate indication of a cable position.

Although high voltage (HV) cables normally have tiles or marker tapes laid over them, low voltage (LV) cables and services may be laid without separate protective cover. This lack of warning underlines the importance of safe digging practice.

Some cables have a protective layer of steel wire or tape, while others have a light serving of hessian or PVC overlaid on aluminium or lead sheaths. Plastic sheathed cables are usually coloured black or red and usually have the legend “electric cable” embossed throughout their length.

Hand Tools

Hand tools used incorrectly are a common source of accidents but their cautious use can normally provide a satisfactory way of exposing buried cable once the approximate positions have been determined using plans and cable locators. Spades and shovels should be used in preference to other tools; they should not be thrown or spiked into the ground, but eased in with gentle foot pressure. Picks, pins or forks may be used with care to free lumps of stone etc. to break up hard layers of chalk or sandstone. Picks should not be used in soft clay or other soft soils near to cables.
Hand Held Power Tools

Using hand held power tools to break up paved surfaces often leads to accidents. Where practicable such power tools should not be used within half a metre of the indicated line of a cable buried in or below a paved surface. The cable should be positively located by excavating trenches half a metre from the indicated line and digging carefully by hand under the paved surface; where possible a cable locator should be used as a depth guide down the side of the excavations. If the cable cannot be found by this method it should be assumed to be embedded within the paved surface. The half metre safety margin may be reduced in certain circumstances, for example where congestion of buried cables renders it impractical, but only if the line of the cable has been positively identified by plans and confirmed by a locator. Because of the difficulty in confirming depth, hand held power tools should never be used over the line of the cable except where the cable has already been exposed by digging under the surface to be broken out and agreed physical precautions taken to prevent the tool striking the cable.

Machine Excavators

Machine excavators will not be used in the possible vicinity of underground cables. If a cable is struck, the driver should stay in the cab. If the driver has to leave the cab he should jump clear and not climb down, otherwise electrocution may result. No-one should go down into the excavation or touch the excavator until the cable has been made safe by City University.

During digging work a careful watch should be kept for evidence of cables and repeat checks with a cable locator may be necessary in order to determine the position of any cable more precisely as signals become clearer. It is important to remember that a cable is positively detected only when it has been safely exposed, and even then, digging must still proceed with care since there may be other cables, particularly HV cables, adjacent or lower down.

Cables Embedded in Concrete

Where it is necessary to break away or disturb concrete in which cables are embedded, the cables should be made dead or an alternative safe method of excavation agreed by carrying out a risk assessment in conjunction with a City University Electrical Authorised Person before work starts.

Unidentified Cables

When there is any doubt about the identity of an exposed service, it should be treated as a ‘live’ cable. Occasionally, cables are terminated in the ground by means of a seal, sometimes with external mechanical protection. These ‘potended’ cables should be treated as ‘live’ and should not be assumed to be abandoned or disused.
Exposed Cables

Where a cable exposed for more than 0.5 metre crosses a trench, it should be supported with slings or props, and suitable planks should be placed over it. Exposed cables must not be used as hand or foot holds by anyone climbing in or out of the trench. Any cables lying in the bottom of an excavation should be protected by nail-free wooden planks, troughing or other suitable means, but care must be taken not to use materials or equipment which could penetrate the outer protective sheath of cables. In addition, precautions should be taken to prevent access to exposed cables by children or other unauthorised people. If a cable has to be moved, a City University Electrical Authorised Person must be consulted.

Service Laying & Backfilling

Service laying and backfilling should be in accordance with Department of Transport ‘Specification for the Reinstatement of Openings in Highways’ or CUL approved equivalent.

City University must have an opportunity to inspect the cable and trench before backfilling starts.
CABLE LOCATING DEVICES

Cable locating devices should be used to trace the line of electricity cables before excavation starts: it may be necessary to carry out repeat tests as the excavation proceeds. Although cable locators can be used themselves to trace cables, where possible they should be used in conjunction with cable plans or similar information. This will help the operative to interpret the locator signal and hence give the maximum information to those involved with the work before digging starts.

Locating devices should always be used in accordance with the manufacturer’s instructions, and employees should receive adequate training in their use.

Live cable detectors are simple to use, but they do not respond to unloaded or direct current cables and they may fail to detect lightly loaded low voltage cables, such as those used for street lighting, or well-balanced high voltage cables.

If VLF 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 and distance from the termination, and geographical orientation.

Currently available transmitter-receiver instruments require more skill to operate and are less suitable for non-technical personnel.

A cable locator may be unable to distinguish between cables running close together and may represent them as a single cable. If two cables are sited one above the other it may not be possible to detect the lower cable.

Since the detection of cables with a locator cannot be guaranteed, the absence of a positive indication must not be taken as proof that a cable is not present, or that any cable that is present is not live.

If a cable recorded on the site plan cannot be located, appropriate assistance or advice should be sought.

Record Drawings

Upon completion of works, all underground services should be detailed on an ‘as installed’ drawing in accordance with the department of transport ‘Code of practice for recording underground apparatus’ Or CUL approved equivalent.
GLOSSARY OF TERMS

City University Electrical Competent Person
A person specifically authorised under the Electrical Safety Rules to issue Ground Penetration Certificates.

Transmitter-receiver instruments
Detects the presence of a signal induced into a cable.

VLF detector
Detects the presence of very low frequency radio signals picked up and reemitted by cables and pipes.

Live cable detectors
Detects the presence of a magnetic field around a cable carrying current.

Safe Digging Practice
Health and Safety Executive Guidance Note GS 33. 'Avoiding danger from buried electricity cables'.

Health and Safety Executive Guidance Note G 47 'Danger from underground services'.