

Underground and overhead services

EBRD briefing note



European Bank
for Reconstruction and Development

BN01

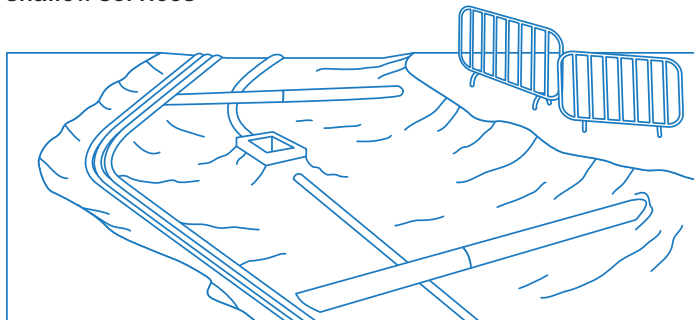
July 2021 - Version 1

This briefing note outlines a good international practice approach to managing work close to underground and overhead services. It does not constitute legal advice or replace professional advice from national labour inspectorates and/or other competent authorities. We strongly encourage our clients to seek information from these entities to ensure that the contents of this briefing note do not conflict with or contradict any legal requirements. The European Bank for Reconstruction and Development (EBRD) is not responsible for the content of any external references.

Introduction

Striking and damaging underground and overhead services is common in excavation work. Serious and often fatal injuries can result from hitting gas, electrical and water services, in addition to significant disruption to public services and critical business operations.

Figure 1. Typical excavation, with a number of crisscrossing shallow services



Risk assessment

A risk assessment should be carried out prior to any work near overhead services or any ground disturbance. While this generally pertains to mechanical excavation, it is also recommended when hand digging, driving pins and rods into the ground, or positioning heavy loads that could damage potential services below (for example, crane outrigger stabiliser pads). Contractors should conduct a risk assessment to identify potential hazards, decide who may be at risk, evaluate those risks and decide on suitable precautions.

Overhead services are often struck by cranes, excavators or tipper trucks, or by people carrying long objects, such as scaffolding poles.

The main services at risk or in the immediate work area may include:

Electrical cables: When an electrical cable is struck, it may cause a short circuit, followed by an explosion and fire. Electric shock is less common, but just as dangerous. The arc flash from a large electrical cable can reach temperatures of more than 5,000°C. These cables may be supplying power to properties, traffic signals, street lighting or road signs. Arc

flashes, explosions and fires from damaged electrical cables can also cause damage to other services attached to the same pole, such as communication and data cables.

Water pipes and district heating: Water can be held in pipes under significant pressure and, in the case of district heating, at high temperatures. A damaged water pipe can burst, turning small parts of pipe, the surrounding soil and stones into deadly projectiles. They can also trigger sudden floods and cause open excavations to collapse, resulting in potentially significant property damage. If a repair is not fixed correctly, drinking-water supplies can become contaminated and unfit for human consumption.

Gas pipes: Gas, like water, can be held under significant pressure and a sudden release can cause injury to anyone in the immediate area. Gas can also rapidly ignite, causing flash fires and explosions if an ignition source is found.

Communication cables: When communication cables are struck, while not immediately dangerous to those in the surrounding area, the damage tends to result in a loss of connection to internet and phone services. This can prevent contact with emergency services and cause severe disruption to homes and businesses. The cost of repairing damaged communication cables can also be significant, especially if the cable is fibre optic.

Identifying the services present

Before any work commences, contractors should conduct a risk assessment to identify whether work can **avoid** ground disturbance. If not, then prior to carrying out work, they should contact all service providers to request information and drawings on the locations of their equipment and any guidance they may have on working near their services. Responsibility should be assigned for acquiring the information from service providers, interpreting the drawings and locating the services on site.

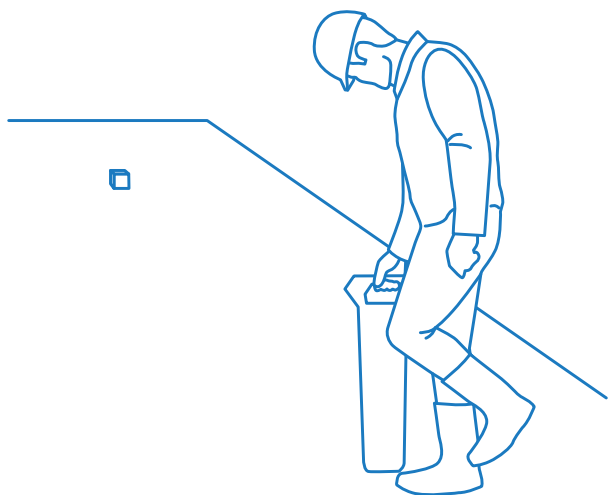
Surveys

Service providers' drawings can be inaccurate or lack information, so companies should still conduct surveys prior to commencing work. They should not rely on service providers' drawings alone for accurate information.

Companies should first undertake a visual survey of the planned work area to identify any possible services. Things to look for include scarring or signs of previous excavation, manhole chambers, and pipe or cable entry points to residential or commercial properties.

Surveys should also be carried out using a cable avoidance tool (CAT) and signal generator (genny). These are electromagnetic detectors that can identify metal pipes and cables. Only trained workers should use this equipment due to its limitations, such as its inability to detect plastic pipes and certain electrical cables. The ground should be clearly marked to indicate the location of pipes or cables to assist the excavation team. With service drawings and accurate work instructions, the excavation team should be able to avoid any underground services.

Figure 2. A genny should be used with a CAT to accurately trace services



Where there are no service drawings, but significant services are expected to be present in a planned excavation area, a full survey should be undertaken by a professional company. Although this may be expensive, it will allow work to progress more quickly and, more importantly, in safety.

Trial holes

Mechanical machinery and powered hand tools should generally not be used within 500 mm of a live service. Where this is not possible (if a cable is encased in concrete, for example), the service owner/provider should be contacted and asked to isolate the service or provide information on what specific rules the contractor should follow.

Where there is a suspected underground service, a trial hole or trench should be dug by hand across the assumed route to confirm its location. Where trial holes are required under concrete or asphalt, powered hand tools should not be used directly above the service, but to one side, allowing the team to dig under the concrete by hand to identify the location of the service. Many of the services struck are positioned just below the surface.

Vacuum excavation

Some companies have access to vacuum excavation machines. These are similar to liquid-clearing machines and specifically designed to work by lifting soil from the ground using a vacuum. In addition to being a safer alternative to mechanical excavation, vacuum excavation equipment can be much more efficient than hand digging.

Personal protective equipment (PPE)

When carrying out hand excavation near a live service, insulated tools made from materials such as fibreglass (plastic) or wood should be used to prevent the risk of electric shock. Damaging electrical cables usually causes an explosion and fire and many lives have been saved by the use of arc flash-resistant or fire-retardant protective equipment and clothing.

Permitting

Many organisations use a permit-to-work system to check that the necessary steps have been taken before allowing work to commence. The permit confirms that service drawings have been sourced, a risk assessment has been prepared, a CAT survey has been carried out and that workers have the correct equipment and PPE.

Overhead services

Risk assessment

Before work begins, companies should conduct a survey to identify whether there are any overhead services. If there are services above the work area, the owner or provider should be contacted to determine how to proceed safely. A risk assessment should be carried out prior to the start of work and should consider the following:

Can work be moved? If the installation is new, it may be possible to move the work to an area that does not have overhead services. This may not be possible when working on existing equipment.

Restricted height equipment: An exclusion or safety protection zone should be set up with the help of the service owner or provider and machinery selected that cannot physically reach the overhead service.

Isolation: Isolation is especially important around electrical cables. If contact is possible, the owner or provider should be contacted and the electrical supply turned off for the duration of the work.

NOTE: Isolation should only be carried out by the owner of the overhead services and never by unauthorised or unqualified persons.

Signs and height restrictors: Signs and height restrictors should be put in place and be clearly visible on site to warn mobile machinery operators and vehicle drivers of overhead services.

Exclusion or safety protection zones

Exclusion or safety protection zones should be set up around overhead services to prevent equipment or other objects approaching the overhead service accidentally. The safe distances should be set by the service owner or provider. However, electricity can arc or jump significant distances between cables and conducting objects, so exclusion or safety protection zones around electrical cables are based on their voltage.

NOTE: The service owner or provider must be contacted to confirm safe distances, which may vary from country to country.

Common standards for safe distances are:

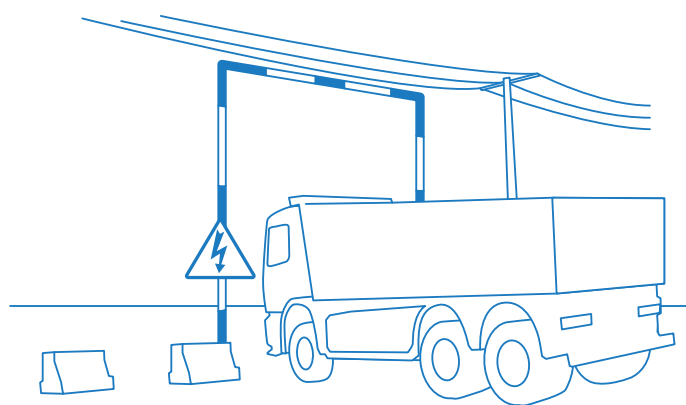
Table 1. UK Energy Networks Association “Look Out, Look Up!” safe-distance guidance

VOLTAGE	SAFE DISTANCE (metres)
<1,000 volts	1 m
≤33 kilovolts	3 m
≤132 kilovolts	6 m
>132 kilovolts	7 m
Local community	Local community

Source: Energy Networks Association (n.d.a).

Exclusion or safety protection zones can be set up with signs and visual barriers, also known as goal posts, and are especially important at site entrances for visiting drivers.

Figure 3. Typical vehicle warning system with goal posts for access under overhead lines



Goal posts should be non-conductive, made from timber or plastic, and painted in colours such as red and white that make them visible to drivers and operators of vehicles and mobile machinery. Goal posts can easily be made with barrels or drums filled with ballast and, again, painted to make them visible. They can also be easily relocated to other areas of a site as work progresses.

Equipment

Smaller excavating equipment may be needed to carry out work to ensure it does not breach exclusion or safety protection zones. Some excavators have limiting devices, which prevent the boom or arm of an excavator being extended upwards into the exclusion or safety protection zone. These can be electronic, but some are simple metal chains fixed to the boom or arm of the excavator to restrict movement. Such devices will limit and restrict any lifting operations.

The vehicles at greatest risk are tipper trucks. Companies should choose tipping areas away from overhead services to prevent drivers from entering exclusion or safety protection zones or making contact with overhead cables.

Summary

Before carrying out any excavation work or disturbing the ground, check the following:

- ▶ Have the service owners or providers been contacted and shared information on the location of their equipment?
- ▶ Has the company looked at the potential to avoid working near services?
- ▶ Have desktop and electromagnetic (CAT and genny) surveys been carried out on site?
- ▶ Does the service need to be isolated prior to any work?
- ▶ Has the team been instructed not to use powered hand tools or mechanical equipment within 500 mm of a service?
- ▶ Are work teams aware that only hand digging is permitted close to a live service?
- ▶ Are work teams issued with non-conductive tools and fire-retardant overalls to work around services?
- ▶ Is a permit-to-work system in use to check all necessary steps have been taken and that work is authorised to begin?
- ▶ Are there any overhead services?
- ▶ Can equipment with limited height or height restrictors be used? Can exclusion or safety protection zones with warning signs be set up at safe distances?

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