Work in the vicinity of ground cables and an overhead system
OPERATING INSTRUCTIONS

These instructions have been created to cover working near ground cables and an overhead system and handling cables in the electricity distribution network owned by Oulun Energia Sähköverkko Oy.

There are several network operators operating in the Oulu region, and the regulations and instructions of the relevant cable owner must be taken into account when planning work.

OULUN ENERGIA
SÄHKÖVERKKO

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1 GENERAL

Damage to electricity network cables, as well as careless handling, always poses a serious risk of injury to the digger, electricity users, and the safety of third parties, and it causes power outages to thousands of customers annually.

Oulun Energia Sähköverkko Oy (OES) has buried on the ground:

- approximately 50 km of high-voltage cables (110 kV)
- approximately 1000 km of medium-voltage cables (10 and 20 kV).
- approximately 3000 km of various low-voltage cables (400/230 V).

The share of ground cables is growing annually. In addition, there are control cables, copper conductor cables, water and district heating pipes, gas pipes, and cables belonging to other operators such as data communications.

The annual cost of repairing damage caused by excavation work is considerable. The cost must always be paid by the party that has caused the damage.

The location of the cables and overhead lines must be determined in advance, as well as the location of all other infrastructure in the working area, such as pipes, communication network cables, etc. Careful planning, cable locating services, and examining maps help to avoid most accidents.

Moving or handling electric power network components (overhead systems, pole stays, cables, distribution cabinets) without the consent of the network operator is prohibited.

2 INSTRUCTIONS

2.1 Planning the work

While planning the work and before applying for placement permits, existing ground infrastructure must be accounted for to prevent applying for placement permits or planning excavations for areas with existing infrastructure; placing fibre optic cables or other telecommunications cables over electricity network cables anywhere but in junctions is forbidden even at the lowest digging depths.

Before the excavation work can begin, you must determine the location of the cables and other infrastructure owned by OES and its impact on safe working practices. Those who receive an excavation permit must acquire cable maps, available free of charge from Oulun Energia's map service, and, if necessary, request a cable locating service. You must request the cable locating service at least five working days before you need it. The map service does not disclose information about cables owned by private entities.

Cable locating services are not carried out for route planning, only to ensure the safety of excavation work in the immediate vicinity of cables.

Cable locating services are not carried out on the basis of zone notices; the party requesting the locating service must use cable maps to indicate the exact location of the excavation site in relation to the location of the cables and the service only points to the areas where there is a safety risk or risk of property damage.

An urgent request for the cable locating service or a request for a location outside of the immediate vicinity of existing cables is subject to a charge by the contractor providing the service.

If the excavation work starts or ends in the vicinity of cables with a charge of over 1 kilovolt, it must be reported to the network operator's operating centre in order to ensure the safety of the digger and any third parties in the event of an accident.

The persons in charge, the work equipment, and the diggers must have the direct telephone number to the network operator's operating centre, +358 (0)44 703 3220, in order to ensure a quick response in the event of an accident. Customers are only provided the network operator's fault service number, +358 (0)8 5584 3222.

Moving and handling live cables always requires an electrical engineer.

There must always be a comparison made between the cable locating service and the location of the cable on the cable map and, if necessary, the actual location of the cable must be verified with the network operator.

If the cable that was indicated during the locating service cannot be found in the excavation area when manually digging, a new cable locating service should be requested.

If there are cables at the excavation site, the digger must contact the OES operating centre to

determine whether the cables can be de-energised during digging and whether the work area needs support in protecting the cables. Queries must be made at least ten working days before starting the work or any necessary change in activation.

The cables are the property of the network operator and cannot be handled or moved without the permission of the network operator, and live cables must always be handled by an electrical engineer.

Under no circumstances should live cables be left unprotected in the excavation pit. There must be an agreement on their protection with the operating centre. If a cable cannot be de-energised and it remains above ground, it must be protected with a Class A protection tube and marked with *energised* signs or a cable protector strip and all persons working in the area must be aware of which protected cables are energised.

The holder of the excavation and placement permit is responsible for the costs of de-energising the cables as well as moving and protecting them. If the excavations expose cables that are not on the cable maps, the digger must immediately contact the OES operating centre to determine further measures to be taken.

2.2 Excavation work in the transmission line area of a 110 kV overhead system

OES has acquired a landowner limited right of use for its 110 kV cables. The limited right of use, i.e., the transmission line area, is composed of a 20–28 metre-wide right of way and bordered by 10-metre-wide border zones where tree height growth is limited to prevent the trees from hitting the conductors when they fall.

The soil and the trees in the transmission line area are the property of the landowners, and thus excavation work also requires the permission of the landowners.

When planning excavation work in a transmission line area, you must contact the network operator.

Electricity pylons have earthing conductors buried 0.5 to 0.7 metres deep. If an earthing conductor is damaged, the digger must immediately contact the OES operating centre, tel. +358 (0)44 703 3220. A repair is easiest when the pit is still open and the excavator is present. A dangerously high potential difference can form between broken copper conductor cables, leading to severe electric shock.

For Finland’s transmission system operator Fingrid Oyj’s overhead systems (110–400 kilovolts), as well as power transmission lines owned by other parties, contact the owner of the cables. There may also be a roaming agreement between Fingrid Oyj and a local network operator to share ownership of a power transmission line.

2.3 Cables owned by various entities

There are also cables owned by other entities in the OES network area. The person in charge of a worksite must always contact the cable owner in good time before undertaking any excavation work.

When digging on private property, you must contact the owner or proprietor of the property to determine the existence of possible private cabling. There may also be cables owned by OES on private property. You must determine their location before starting excavation work.

2.4 Displaying and marking cables on the ground

The customer must request cable maps for the area from their owners to ensure the location of the cables and pipes. An OES cable map is valid for one month. When requesting the cable locating service, the customer must have a printed cable map or the ability to display it on a device with sufficient resolution.

Oulun Energia's map service is located at Nahkatehtaankatu 2. You may request an electronic cable map from the map service. The map service also provides district heating maps.

The map service will provide guidance on the content of the map (symbols, voltage levels, etc.) if necessary. The person requesting a cable locating service or a representative appointed by them must be present during the locating service.

If excavation work cannot be carried out at a sufficient safety distance from cables and the cable map shows cables belonging to the network operator in the immediate vicinity of the excavation site, you should request a cable locating service. A free cable locating service is not available for the planning of the route of an excavation; the excavation site must already be determined, and the necessary permits obtained.

Cable locating services are carried out five working days before demand; urgent locating services are invoiced. Destia Oy, a contractor of OES, is responsible for the cable locating service.

There must always be a representative of the person requesting the cable locating service present or it will not be carried out. OES's cables are marked on the topsoil with blue paint.

The customer must hold on to the cable location information and markings for the entire time they need them. If the markings have worn out before the digging starts, the customer must request a new cable locating service.

The customer will be charged for any subsequent locating services due to a delay of the customer requesting the service.

2.5 Prior notice and establishing meetings

Before establishing relatively large worksites with numerous cables, you must, at the request of

the worksite, conduct a survey to determine how each cable is to be handled, what the excavation distance is, and any other necessary measures to be taken at the worksite.

Representatives of the facilities that own the cables must be present at the survey. For Oulun Energia Sähköverkko Oy, a representative must be agreed upon in advance.

2.6 Cable excavation distances

OES buries cables used for the distribution of electricity without any separate mechanical protection at least 0.7 metres deep. A deviation in cable depth does not relieve the excavator of the liability for damages.

Mechanical digging 1 m closer to a charged cable of over 1 kilovolts (commonly a 10 and 20 kilovolt medium-voltage cable) is forbidden. Mechanical digging 0.5 m closer to a lateral charged low-voltage or signal cable of over 400 volts is forbidden. Mechanical digging 1.5 m closer to a lateral high-voltage cable of over 110 kilovolts is forbidden.

2.7 Considerations when digging

Special care must be taken in excavation work and earthwork, as well as in the sounding of soil. Due to external factors such as road soling, trench cleaning, frost, and other construction work, cables may have moved closer to the surface or to a different location from their original placement. In this case, the depth of the buried cables is not certain. If necessary, contact the network operator. Due to the aforementioned factors, the warning tape may also have been removed. It may not have been installed at all.

Disused cables should be treated the same way as cables in use.

If a cable that was indicated during the locating service cannot be found in the excavation area when digging by hand, a new cable locating service should be requested before mechanical excavation begins.

The digger is responsible for the damage they cause, and the costs are always charged to the person causing the damage. Incidents are subject to an incident investigation and if necessary, reported to the Finnish Safety and Chemicals Agency (Tukes) and the Regional State Administrative Agency (AVI).

2.8 Trial pits and mechanical excavation.

Before starting any mechanical excavation work, all cables must be manually dug out to ensure the direction and depth of the cables. The mechanical excavation distance is at least one metre from the cables.

For 110 kV cables, the mechanical excavation distance is at least 1.5 metres from the edge of the cable channel. In junctions, contact the network operator.

2.9 Rocky and frozen soil

Because of shifting rocks, mechanical excavation distance may need to be increased in rocky soil from the above-mentioned distances. Use extreme care when using a concrete breaker, making sure that the breaker's wedge is not directed towards cables when working.

Frozen soil must be thawed in the vicinity of cables. In winter, the cable trench must be filled with unfrozen soil (no frozen blocks).

3 SUPERVISION

Proper handling of cables and earthing conductors is the responsibility of the digger and the party ordering the work in accordance with the instructions of the facility that owns them.

The facility that owns the cables has the right to charge the construction site for specialist help requiring resources on a case-by-case basis. You must request the network operator for a specialist in good time before starting the work. The use of a supervisor is agreed upon on an individual basis for each construction site.

4 CABLE HANDLING

Requirements for proper cable handling:

- Any, even minor, damage must always be immediately reported to the owner of the cable.
- Mechanical excavation and sounding of soil follow the instructed distances.
- Trial pit diggers must carry out their work with care.
- A digger must not move cables to another location without a pressing need. If the cables must be moved, OES will be contracted to do it.
- Do not move live cables.
- The cable protection tubes must be treated as live cables until their contents are verified. Do not damage the tubes or leave holes or damage unrepaired. An unrepaired tube will get blocked, and the cable cannot be replaced later.
- You must seal the base of the cables well. Do not leave any rocks or other objects that can damage the cables on the base or in the cables.
- The cables and their possible channelling must be checked before covering them.
- Similar measures also apply to tubing.

- The cable depths of cover must be carried out in accordance with OES's instructions.
- The cables must be supported when a cable is dug out from more than 1 m under other cables. Support must be set up while the cable is de-energised. The cables must not sag or bend while being supported. Support is provided by installing a board channel or equivalent under the cable so that the cable support has supports or trestles at 1 m intervals from the bottom of the pit.
- Under no circumstances should live cables be left unprotected at the worksite. The cables must be protected with a Class A tube (SFS-5608) or equivalent and the tube must be marked with *energised cable* signs or with a cable protector strip. All persons working in the area must be aware of which protected cables are energised.

5 SAFETY DISTANCES

Digging 1 m closer to a pole or its strut or stay in the vicinity of a medium-voltage overhead system in Oulun Energia Sähköverkko Oy's network area (10 and 20 kilovolts) is forbidden without prior agreement with the network operator.

Removal of stays or struts in a live electrical line is the work of an electrical engineer and must not be carried out by another contractor without the permission and supervision of the owner.

Safety distances:

When working in the vicinity of an overhead cable, no part of the machine, including the load, can fall below the following minimum distances to a live cable:

Voltage kV	On the side	Below	Pendent cord
≤ 1	0.5	0.5	0.5
> 1-45	3.0	2.0	1.5
110	5.0	3.0	
220	5.0	4.0	
400	5.0	5.0	

6 SAFETY INSTRUCTIONS IN THE EVENT OF A DAMAGED CABLE

6.1 Electric cables

In the event of a damaged electric cable or broken copper conductor cable, immediately leave the vicinity of the cable and contact the OES operating centre, tel. +358 (0)44 703 3220, or fault service line +358 (0)8 5584 3222. After this, follow the instructions issued by the operating centre.

Please note: In the event of cable damage, the electricity may cut out and automatically turn back on. This may be repeated several times in succession. Do not approach a damaged cable before permitted by the operating centre. There may be a dangerously high tension between the broken ends of a cable or copper conductor cable. A copper conductor cable must also always be repaired, and only an electrical engineer can extend a broken copper conductor cable.

Do not trust that the tension is broken in the event of a fault. Arrange supervision of the site of the fault until a representative of the network operator arrives. The cable is de-energised only when the network operator has taken the necessary safety precautions and given notice of them.

6.2 Telecommunications cables

Damage to a telephone or telecommunications cable may cause extensive and severe disruptions.

The light that is carried through a fibre optic cable is emitted by a laser or equivalent. Do not, under any circumstances, allow the laser beam to be directed at the eye. Do not look at the end of the fibre.

Please note: Do not touch a broken fibre cable! The light may be impossible to detect. Fibres that are difficult to detect may come loose from a broken fibre cable, but they are easily absorbed into the skin through the pores.

Copper conductor cables contain considerable tension that is fed to intermediate repeaters along the route. Do not trust that the tension is broken in the event of a fault. Approach it like an electric cable.

When a fault is reported, the owners of the cables will provide more detailed safety instructions.

6.3 Reporting

The digger is responsible for reporting and ensuring the safety of the site until otherwise notified by the network operator.

Cable or earthing conductor damage must be immediately reported to the facility that owns the cable and to the nearest supervisor.

Damage to overhead systems or collisions with poles or stay structures must always be reported. The movement in the overhead lines may have already resulted in a major power outage and a broken stay could cause the pole to break or the cables to sink dangerously low over time, endangering safety.

If a cable is scratched or gets even a small dent, you must immediately report it to the OES operating centre, tel. +358 (0)44 703 3220 or +358 (0)8 5584 3222.

6.4 Liability

The location of the cables may differ from the location in which OES buried them. Third parties may have moved the cables or removed the warning tape. Cable locating devices may not always be able to determine the depth of a cable correctly, especially if there are several parallel cables underground. The absence of a warning tape or the depth of a cable does not release the digger from liability for damages.

If the cable map and the cable locating service indicate cables in an excavation site and their actual location does not deviate from the information provided by the map and cable locating service by more than a metre, the digger is responsible for the damage they cause, and the cost is charged to the person causing the damage.

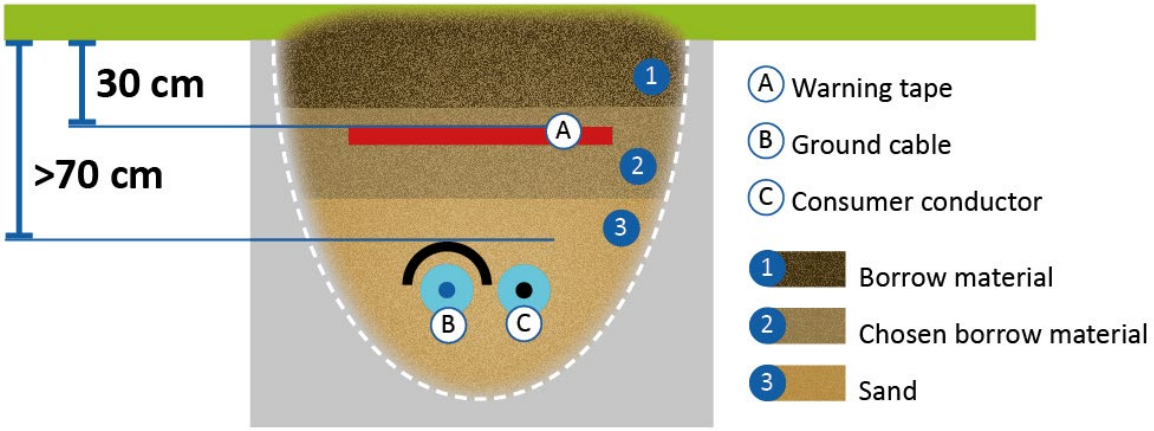
In the event of damage caused by negligence or wilful intent, the network operator and the granter of the excavation permit will also notify the insurance companies of the responsible party and file a complaint of unsafe work to the Finnish Safety and Chemicals Agency (Tukes) and the Regional State Administrative Agency (AVI).

The worksite maintains liability for cable damage even after the worksite has closed if it can be established that the procedures described in these instructions have not been followed sufficiently well.

7 FILLING THE CABLE TRENCH

When covering an open cable trench, cables without mechanical protection must be re-buried 0.7 metres deep. The warning tape of the cable must be installed 0.3 m below ground surface.

If there are materials that can damage the surface of a cable, such as crushed stone or gravel, sand must always be used to protect the cables. There should be 50–100 millimetres of sand beneath a cable. There should be a minimum of 100 millimetres of sand above a cable, followed by 300 millimetres of chosen borrow material.



8 CONTACT INFORMATION: OULUN ENERGIA AND THE CITY OF OULU EXCAVATION PERMITS

City of Oulu excavation permits +358 (0)44 703 2214
https://www.ouka.fi/oulu/kadut-kartat-ja-liikenne/kaivulupa

Oulun Energia Oy PBX +358 (0)8 5584 3300

Oulun Energia Sähköverkko Oy
Nahkatehtaankatu 2,
90130 Oulu
www.oulunenergia.fi

Operating centre +358 (0)44 703 3220
Electricity distribution fault service line +358 (0)8 5584 3222
District heating network fault service line +358 (0)8 5584 3425

Cable maps: Map service Mon-Fri 8 a.m. to 4 p.m., tel. +358 (0)44 703 3239

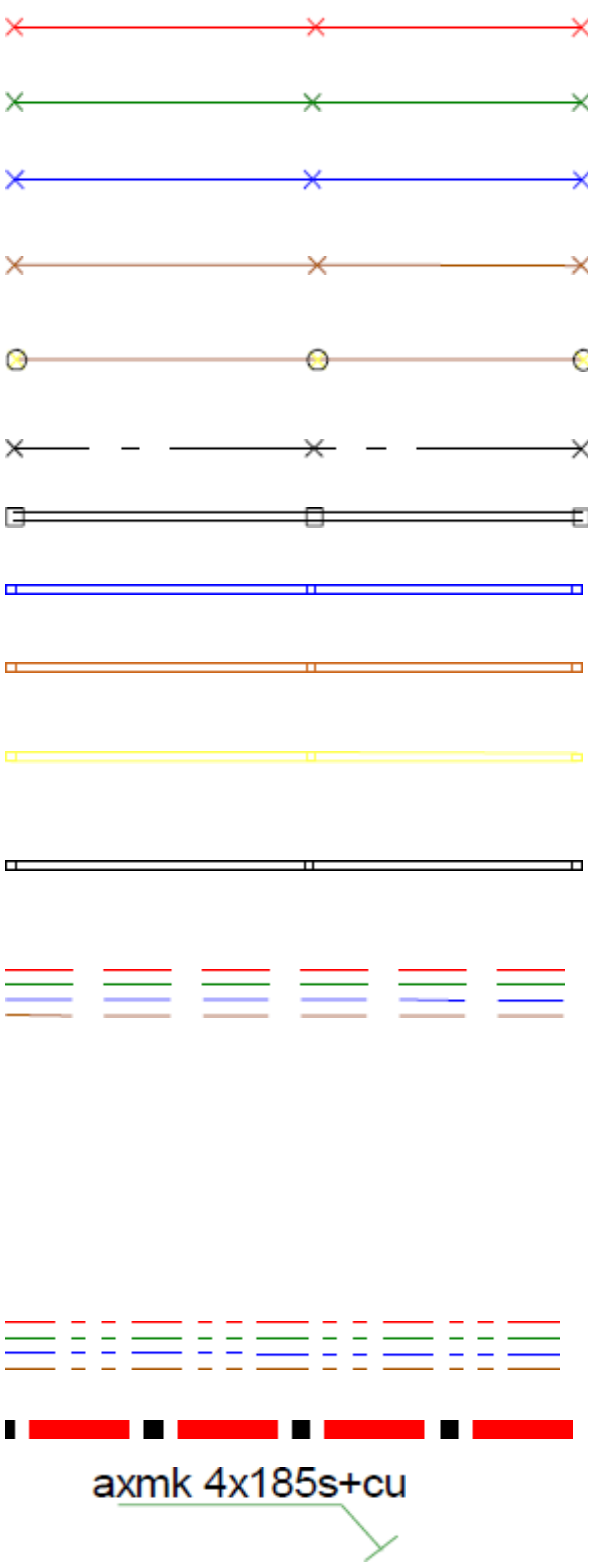
SEE PHONE NUMBERS ON CABLE MAP OR CALL:

Cable locating services: Mon–Fri from 7 a.m. to 3:30 p.m., Fri from 7 a.m. to 3 p.m., tel. +358 (0)8 8870 120

9 CABLE LOCATIONS OF TELECOMMUNICATIONS OPERATORS

In the event of damage or suspected damage (a cut in the cable sheathing, for example), the owner of the cable or the service provider designated by the owner must be notified immediately while the excavation is open. There are a lot of cables belonging to DNA in municipal service centres.

10 TRIMBLE LOCUS ELECTRIC CABLE SYMBOLS



medium voltage

low voltage

lighting cable
—owned by the City of Oulu

control cable
—owned by the City of Oulu

traffic signal cable
—owned by the City of Oulu

copper conductor cable

protection tube

OUKA kv protection tube
—owned by the City of Oulu

OUKA Lv protection tube
—owned by the City of Oulu

OUKA standard protection tube
—owned by the City of Oulu

Private protection tube
Private cables are in the same colour as other cables

Unstable cables (cable colours)

fibre optic cable

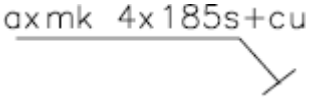
overhead lines + poles

not in use, cables (cable colours)

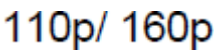
not in use, uncertain location (cable colours)

distribution area border OES (Oulun Energia Sähköverkko Oy)

cable type and reference line in the cable colour



not in use, cable type and reference line



tube diameter measurement

electricity distribution cabinet/number

distribution cabinet

property distribution board

cable points with cable colours

not in use, cables

extension with cable colours

not in use, extension with cable colours

copper conductor cable point type

cable marker pile

cable trench

traffic signal point type

junction box, etc.

low-voltage sensor well

tube point type

traffic signal support

lighting column