



ENERGINET

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WORKING IN EXCAVATIONS



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PREFACE

At Energinet, we take your safety seriously when you are working for us.

Energinet performs a lot of work in and near excavations both when establishing new stations and establishing new cables and pipes in the ground.

There is a huge risk associated with working in and near excavations, including among other things the risk of being buried and the risk of falling to a lower level.

This leaflet informs you of how to work safely in and near excavations at Energinet's construction sites and facilities. It contains information on which rules you must follow, which precautions you must take and what you need to be aware of in order to work safely in and near excavations.

The contents of this leaflet apply when you are working:

- On establishing a new excavation (though not the actual excavation work)
- In an excavation
- Near an excavation

The leaflet can also be used as inspiration in the design phase when planning an excavation.

Regardless of whether your work is to establishing an excavation or whether you are already working near or in an established excavation, it will be relevant to be aware of and consider the issues reviewed in this leaflet before you start.

This leaflet only deals with work in and near excavations and is thus distinct from other related issues such as excavation work and work near cables in the ground. Reference is made to other materials for your information on these issues, including:

- The Danish Working Environment Authority's rules and guidelines regarding excavation work
- The trade association BFA's Sector Guideline on excavation work in connection with construction and installations.

If you find that something does not live up to the requirements presented in this leaflet, or if there is anything you are in doubt about, you must contact your supervisor, health and safety representative or health and safety coordinator responsible for your work and wait until the conditions have been met, before starting your work.

This leaflet is a translation of the original Danish. If in doubt, ask your contact person at Energinet.

WORKING IN OR NEAR AN EXCAVATION

Work for Energinet must, first and foremost, be carried out in line with the Danish working environment legislation, which of course also applies to work near and in excavations.

Tasks performed in and near excavations must be responsibly planned and, before the work can be carried out, a description of method, including an associated risk

assessment, must be prepared. Work will be carried out on the basis of that method statement and risk assessment. The method statement and risk assessment must clarify how the work will be performed, the risks associated with the task and how these risks will be eliminated or reduced as much as possible.



In the risk assessment of the task, the following issues must be taken into consideration:

ISSUE	AUXILIARY QUESTIONS – EXAMPLES
Nature of the task	What is to be done? How is the work to be carried out?
Risks associated with the task	Is there a risk of: <ul style="list-style-type: none"> • Earth wall collapse? • Falling down? • Exposure to chemical and/or biological substances? • Proximity to high-voltage transmission lines? • Drowning? • Dropping large prefabricated elements? • Having to work in confined spaces? • Contaminated soil? • Exposure to ionised radiation? • Collision with vehicles? • Members of the public entering the site?
The work site	Relevant questions in relation to excavation work: <ul style="list-style-type: none"> • Is there an access road to and from the excavation and what is its condition? • Is there an access road down into the excavation and what is its condition? • Is there a metre-long gap along the edge of the excavation? • Has the excavation been secured against collapse and do safety measures meet requirements? • Is there a barrier around the excavation and does it meet the requirements? • What is the working area in the excavation like? Is there sufficient space, is the base stable, etc.?
Weather conditions	Do weather conditions entail any particular risks: <ul style="list-style-type: none"> • Rain (mud, slippery surfaces, collapsing sides) • Thunder (lightning) • Low temperatures and frost (slippery surfaces) • High temperatures (dust, dehydration)
Rescue/emergency preparedness	Can the injured person be rescued from the excavation? Can rescue services access the scene of the accident? Is there a task-specific emergency response plan? Is there an address, GPS coordinates or an exact location reference for the work?

ACCESS ROAD TO AND FROM EXCAVATION

There must be an access road to the excavation you will be working in or near.

In some situations, both an access road for vehicles and an access road for pedestrians are required, while in other situations only an access road for vehicles is required or an access road for pedestrians is required.

In case of both vehicle and pedestrians traffic to and from the excavation, both an access road for vehicles and an access road for pedestrians must be provided. There must be a physical separation between vehicles and pedestrians.

Walkways:

- Must be accessible and kept free of water and mud at all times.
- Must be free of materials, tools, cables, etc.
- Must have a minimum width of 0.8 metres if used to transport persons carrying tools, materials, etc. along the footpath
- May have a minimum width of 0.6 metres, if used exclusively for transporting persons without tools, materials, etc.
- Must be illuminated with orientation lighting of at least 25 lux
- Must be kept clear of snow and be gritted or salted in winter weather



Roads for vehicles:

- Must be wide enough and in good enough condition that traffic can pass safely
- Must feature crossings for pedestrians, at those points where walkways cross roads for vehicles
- Must be kept clear of soil, mud, etc.
- Must be illuminated with orientation lighting of at least 25 lux
- Must be kept clear of snow and/or be gritted or salted in winter weather

ACCESS ROAD DOWN INTO AND UP OF THE EXCAVATION

There must be a safe access road down into the excavation, in the form of a staircase with railings on both sides. In some cases, a safe access road may also consist of ramps on a stable ground surface.

The guard rail must have a hand and knee rail:

- The hand rail must be at a height of 1 metre from the ground
- The knee rail must be at a height of 0.5 metres from the ground

The staircase must be at least 0.8 metres wide, if used for transportation of tools

and materials, and may be 0.6 metres wide if it is only used for persons without tools, materials, etc.

The staircase must be protected against collapsing or sliding, which can be done by fixing it at the top.

There must be an escape route up from the excavation close to the work site. This can be a ladder close to the work site. The ladder must be fixed and should protrude 1 metre above the edge of the excavation.



EXCAVATION GRADIENT

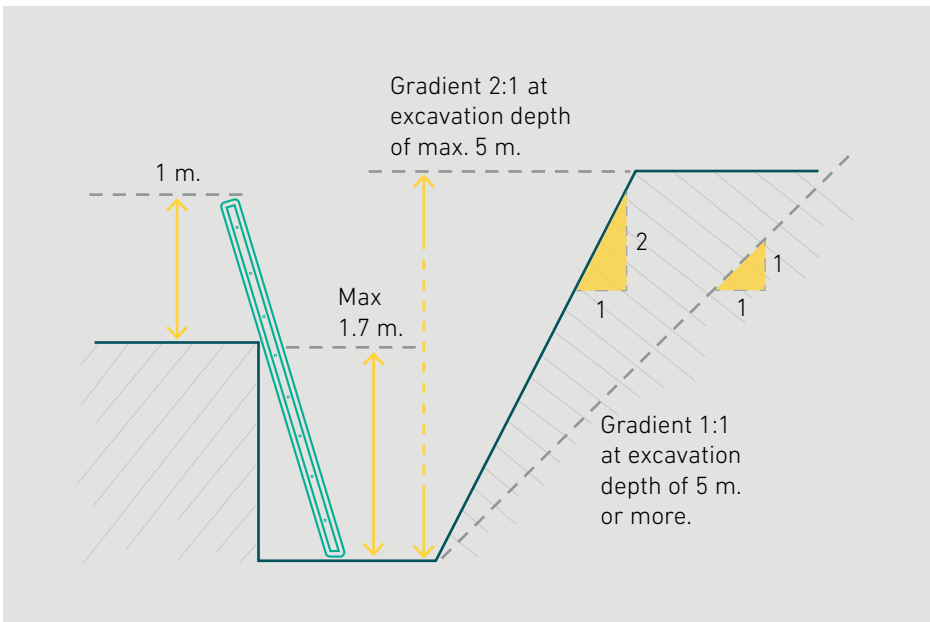
There are two types of excavation:

1. Construction pits
2. Trenches/longitudinal excavation

Regardless of the type of excavation involved, there is always a risk that the excavation may collapse.

In order to prevent slipping/collapse, a number of precautions must be taken:

- Slope ratios may be used
- Clamps and boards may be used
- Trench boxes may be used
- Sheet pile walls may be used



The rules for excavations with slopes:

EXCAVATION DEPTH	REQUIREMENTS TO SECURING OF THE EXCAVATION
Down to a depth of 1.7 metres	How to secure the slopes depends on the type of work and the stability of the soil. Where working on bended knees, if the head is occasionally down at the base of the excavation and/or if working in unstable soil, a 2:1 slope ratio (2 vertical and 1 horizontally) must be used from the bottom of the excavation to the top. Only a risk assessment, which shows that it is safe to work without ensuring the slopes, can exempt us from ensuring the excavation.
Depth between 1.7 and 5 metres	The slope ratio must be 2:1 (2 vertical and 1 horizontal).
Deeper than 5 metres	The slope ratio must be 1:1 (1 vertical and 1 horizontal).

The rules for trenches are as follows:

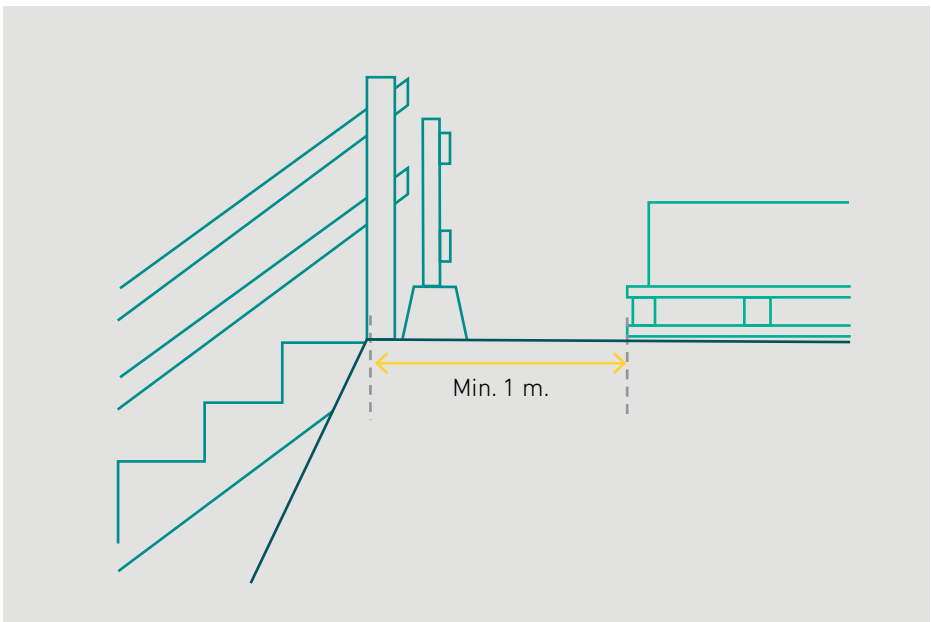
EXCAVATION DEPTH	REQUIREMENTS TO SECURING OF THE EXCAVATION
Down to a depth of 1.7 metres	How to secure the slopes depends on the type of work and the stability of the soil. Where working on bended knees, if the head is occasionally down at the base of the excavation and/or if working in unstable soil, a 2:1 slope ratio (2 vertical and 1 horizontally) must be used from the bottom of the excavation to the top or by using trench boxes. Only a risk assessment, which shows that it is safe to work without ensuring the slopes, can exempt us from ensuring the excavation. Alternatively, trench boxes can be used.
Down to a depth of 2.25 metres	Clamps and plywood boards can be used. Alternatively, trench boxes can be used.
Deeper than 2.25 metres	In addition to clamps and strong plywood boards, shoring planks must be used. Alternatively, trench boxes or sheet pile walls can be installed.

KEEPING THE EXCAVATION'S EDGE CLEAR

The edge of the excavation must be kept clear of soil, large stones, materials, tools, traffic, etc. for a minimum distance of 1 metre.

When the edge is kept clear in this way, it prevents both:

- Slipping of soil, stones, materials, etc. into the excavation
- Collapse of the excavation as a result of heavy pressure at the edge of the excavation



WORKING INSIDE EXCAVATIONS

When you are working down in an excavation pit, there are requirements for the site's working space and ground surface.

Working space:

- A work area of at least 1 metre in width, measured at knee height, is required.
 - If the excavation is deeper than 0.6 metres, and you need to be able to enter and stand alongside to work, the width of the excavation must be at least 0.6 metres; if you need to transport materials and tools, the width must be at least 0.8 metres.
- If you are to carry out work at a joining point (e.g. welding a pipe), there must be a width of at least 0.6 metres on each side of the joint and 0.7 metres below the pipe.
 - Where work is to be carried out in a trench, it must be wide enough to allow enough space and permit the work to be done safely.



GROUND SURFACE:

When working down in the excavation, there must be a good and stable ground surface. For example, gravestones or pebbles may be laid.

ACCESS ROADS:

In the event of both vehicle and pedestrian traffic in the excavation, allow enough space to carry out the work safely.

CORDONING OFF AN EXCAVATION

It must be assessed whether the excavation needs to be cordoned off, taking into account any particular risks of falling or of injury.

A barrier can prevent:

- Falls into the excavation
- The slipping of soil, stones, materials, etc. into the excavation
- Collapse of the excavation as a result of heavy pressure at the edge of the excavation

The barrier must only be interrupted where the access roads to the excavation are.

The barrier must be made of fixed railings or more lightweight boundaries.

The following requirements apply to *fixed railings*:

- They must be placed at least 1 metre from the edge of the excavation
- They must have a knee and foot rail as well as a handrail
- The handrail must be at a height of 1 metre from the ground
- The knee rail must be at a height of 0.5 metres from the ground
- The foot rail must fit tightly to the ground surface





The following requirements apply to *lightweight boundaries*:

- They must be placed at least 2 metres from the edge of the excavation
- They must be at least 1 metre high
- They must be made of a durable material (e.g. chains) (tape is not an approved material)

Some tasks may need to be carried out above the excavation. When performing tasks above the excavation, you must be

protected against falling into the excavation. Stay outside the barrier when working above the excavation.

If it is not possible to set up barriers, or if you need to be closer to the edge than 2 metres (e.g. in connection with inspection work related to excavation around existing cables in the ground), you must be secured against falling in another way.

EXCAVATION IN AREAS WITH TRAFFIC

Some excavations occur near areas with traffic.

In such cases, a plan for railing and signage must be prepared for work near the area with traffic. This must be approved by the road authority, and the road authority must have issued an excavation permit and availability permit. Documentation for this must be available at the work site.

Furthermore, any traffic control and speed reduction measures must be established in accordance with the plan for railing.

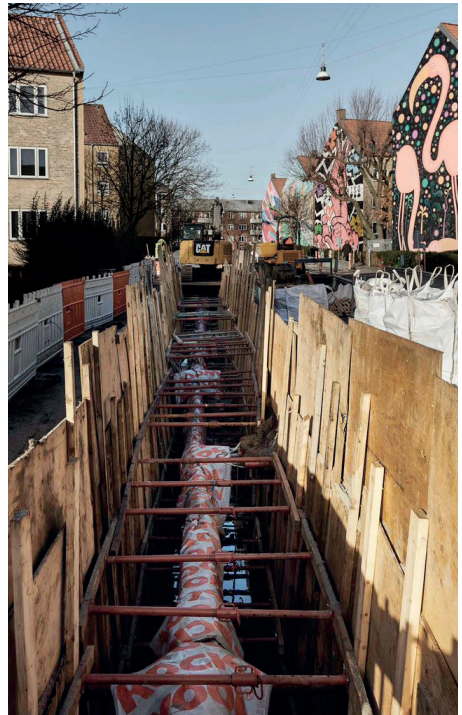
Regardless of the speed limit of the road, traffic barriers must always be set up alongside the excavation to protect people working in and near the excavation and to prevent motorists driving into the excavation. The barrier must have clear and durable markings.

A zone of at least 1 metre wide must be maintained between the edge of the excavation and the traffic.

For further information, reference is made to materials regarding work near roads:

- The trade association BFA's guide on marking roadworks etc.

- The rules of the Danish Road Directorate on work near roads





IN THE EVENT OF AN ACCIDENT

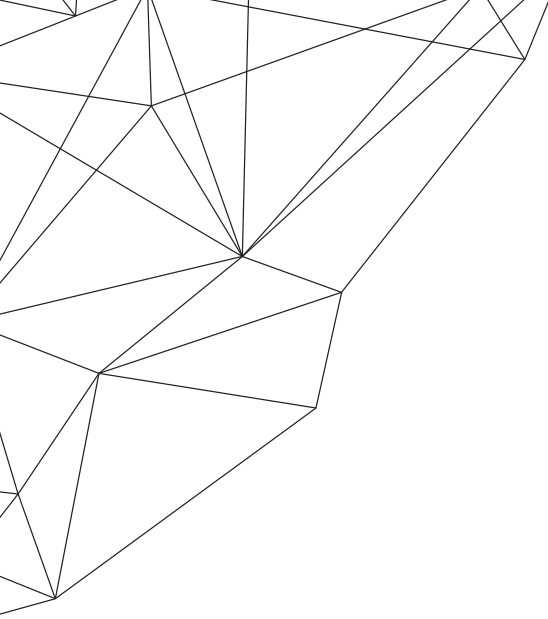
There must be an emergency response plan and an evacuation plan in case an accident occurs.

Emergency services and vehicles must be able to access the excavation.

It must be possible to rescue the injured person from the excavation.

The necessary rescue equipment, first aid equipment and first aider, if any, must be nearby.

The address, GPS coordinates or another exact location reference for the site must be known.



ENERGINET

Tonne Kjærsvvej 65
DK-7000 Fredericia
Tel. +45 7010 2244

info@energinet.dk
www.energinet.dk