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İşin Adı : Mersin-Adana-Osmaniye-Gaziantep Yüksek Standartlı Demiryolu Hattı
The Name of : İnşaatı ile Elektromekanik Sistemlerinin Temini
the Job : Construction of Mersin-Adana-Osmaniye-Gaziantep Hight Standard Railway Line
With Supply Of Electromechanical Systems

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1. PURPOSE

To ensure the safe management and control of excavation works during the execution of the activities carried out in the Mersin-Adana-Osmaniye-Gaziantep High Standard Railway Project.

2. SCOPE

Developed to determine the minimum requirements for the Mersin-Adana-Osmaniye-Gaziantep High Standard Railway Project; It can be developed according to the legal regulations of the working area, employer expectations and international standards.

3. IMPROVEMENT

Persons who detect ambiguity and inconsistency in this document can report their requests and suggestions using the "APPENDIX- 1 FEEDBACK FORM" in APPENDIX 1.

4. REFERENCES

MAOG-RECU-GN-GNL-IS-GNL-PRG-0002-0 Hazard and Risk Management Procedure
MAOG-RECU-GN-GNL-IS-GNL-PRG-0008-0 Work Permit Procedure
MAOG-RECU-GN-GNL-IS-GNL-PRG-00013-0 Construction Machinery and Equipment Procedure
MAOG-RECU-GN-GNL-IS-GNL-PRG-00022-0 Electrical Safety Procedure
MAOG-RECU-GN-GNL-IS-GNL-PRG-00015-0 Procedure for Working at Height
OSHA Safety and Health Regulations for Construction 1926 Subpart B Excavations
Trenching and Excavation Safety, OSHA Publication, 2015
Occupational Health and Safety Guide in Canal Excavations, ÇASGEM / AÇSHB
Occupational Health and Safety Law No 6331
Occupational Health and Safety Regulation in Mining Workplaces
Regulation on Health and Safety Conditions in Usage of Work Equipment
Occupational health and safety regulations in construction works
Occupational Health and Safety in Narrow Section Excavations, Directorate of Occupational Health and Safety Institute, 2012

5. RESPONSIBILITY

5.1. Project Manager

The MAOG Project Manager is responsible for meeting the following requirements in order to manage the hazards and risks associated with excavation works. These responsibilities are:

- Making work planning by taking into account all the effects caused by the workplace and neighboring structures and continuing the excavation works in accordance with this procedure,
- Determining the entire area, including the underground structures, on the project, acting in coordination with the infrastructure and superstructure groups, and planning including backfilling,

- Ensuring the necessary coordination to ensure safe working methods in accordance with this procedure,
- Ensuring that rescue planning is made to be implemented in emergency situations, making the necessary equipment ready,
- Establishing the necessary organization for the monitoring, surveillance, inspection and review processes at the beginning of the excavation and afterwards,
- Ensuring the effective implementation of the excavation work permit system,
- Provision of necessary labor and equipment for safe excavation work,
- Carrying out the activities to determine the risks arising from the moving vehicle - equipment traffic and to plan the activities to reduce it, defined in the MEPI (Mobile Equipment People Interface) Guide defined in the MAOG-RECU-GN-GNL-IS-GNL-PRG-00017-0 Traffic Management Procedure,
- Ensuring the compliance of the excavation work, the construction equipment that will work in the excavation area with the requirements of the MAOG Project, preventing the work of those who do not comply, and providing emergency training to all excavation workers.

5.2. Earthworks Chief / Responsible

The responsibilities of the Earthworks / Supervisor are as follows:

- Organizing the initiation meeting with the HSE unit before the infrastructure subcontractors start work,
- Planning and maintaining all works related to excavation works, including backfilling, in accordance with the defined plan (Construction Method, etc.),
- Checking and confirming whether there are overhead lines and underground facilities in the area, controlling interactions with neighboring structures,
- Ensuring daily control of the excavation area,
- Indication of the excavation area on the project,
- If possible, the work should be carried out during working hours during the day, and if it is necessary to do it at night, the lighting facilities in the area should be provided,
- Checking the relevant work permit requirements and ensuring that they are fulfilled, giving the necessary approvals,
- Ensuring safe entry/exit opportunities to the excavation work area,
- Monitoring the supply and placement of rigid barriers to the area to be excavated
- Ensuring that material stock areas are far from overhead lines,
- Taking decisions to continue the excavation work after situations that will affect the excavation stability such as precipitation and ensuring that the excavation works are carried out in accordance with this procedure,
- Monitoring the work of the Infrastructure Engineer / Technician,
- Determination of service roads in the excavation area,
- Ensuring that the employees in the excavation area receive emergency training related to excavation,
- Ensuring that the works under its responsibility are carried out in accordance with Ronesans Occupational Health and Safety rules,
- Ensuring that employees such as operators and flaggers in the work area do not work without receiving training according to Renaissance procedures,
- Work equipment, such as maintenance and periodic inspection, whose work is not completed, is not allowed to operate.

5.3. Earthworks Engineer / Technician

Earthworks Engineer / Technician shows the excavation area on the project. Performs work as planned. It fulfills the technical requirements of the excavation work. It ensures the fulfillment and continuity of safe access opportunities in the excavation work area. It ensures that emergency response vehicles are available during excavation work. It does not allow those who do not receive emergency training on excavation to work in the excavation area.

It ensures that the works are carried out in accordance with the project Occupational Health and Safety rules. Excavation works are carried out in accordance with this document.

It continuously monitors the air and soil changes during operation. Makes the necessary drainage work for water entry into the excavation area. It ensures that pumps and similar equipment are available for pumping water from the excavation.

At the beginning of the excavation and monthly period, it checks the excavation area with the "Annex - 2 Excavation Safety Control Form".

5.4. Earthworks Foreman

The Earthworks Foreman fully complies with the instructions given to him to manage the hazards and risks related to his work. At the beginning of the working hours, it checks the workspace. It controls the excavation area with the "Annex - 3 Excavation Area Weekly Control Form" in a weekly period. It ensures that the relevant physical precautions are taken in the work area. It does not work other than the excavation work plan notified to it. It does not allow the use of unauthorized equipment in the field. Ensures that Ronasans disciplinary sanctions are applied against those who use vehicles without seat belts and those who are detected to use unauthorized vehicles. It ensures the application of a barrier/barrier around the excavation area and the transport of the material from the excavation to a safe distance.

5.5. Heavy Duty Equipment Operator

The duties and responsibilities of all heavy machinery operators are as follows, although not limited to the items listed below:

- Before starting work before each shift, it performs daily heavy-duty machine controls according to the MAOG-RECU-GN-GNL-IS-GNL-PRG-00013-0 Construction Equipment and Equipment Procedure. Completes pre-shift checklists.
- He informs the Construction Equipment Manager / Responsible when there is a problem that he cannot solve with the heavy-duty equipment he is working with.
- It does not disable safety equipment, breakers and warning systems in any way while using heavy-duty equipment.
- Uses heavy-duty equipment in compliance with the manufacturer's instructions and project rules.
- Complies with the project site speed limits.
- Wears the seat belt when using heavy-duty equipment.
- It does not use heavy-duty equipment back and forth except in compulsory situations. In case of necessity, it acts in a controlled manner by controlling all security requirements accompanied by a "flagman".
- At the beginning of each shift, if it is defined in the relevant local legislation and/or if deemed necessary by the Project Management, it receives a stamped and signed work card from the construction site doctor for alcohol and blood pressure control.

He is responsible for using the heavy-duty equipment he uses by following the safe working instructions specified in this document.



5.6. Flagger

By maintaining constant eye contact with the operator in the area where the construction machinery and equipment are working, the flaggers:

- Guiding the operator to make safer maneuvers by widening the field of view,
- Warning pedestrians who may approach the impact area of construction equipment or equipment and directing them to safer routes,
- It is responsible for regulating the flow of traffic in which other vehicles and people will pass through the area where the construction machinery and equipment are working.

5.7. Project / Operation HSE Manager / Chief

Project HSE Manager / Chief is responsible for coordination and monitoring of this document in order for the enforcement thereof in all sites and activities. Project HSE Manager / Chief is also responsible for:

- Using this document as a basis for creating the relevant project / operation procedures,
- Providing training to the employees and subcontractors in the scope of this document,
- Ensuring coordination with the directors / supervisors in charge of activities in the site / operations for enforcement of this document, and
- Monitoring whether the efficiency and contents of this document are enforced properly, reviewing, and contacting the Group Company Coordination / Manager / Director and/or Corporate HSE Management Department in case revision is needed

5.8. Headquarter E&S Manager:

- Responsible for managing infrastructure and superstructure projects regarding environmental and social governance issues and member of the Executive E&S Committee on behalf of the REC

5.9. PIU (Project Implementation Unit)

- **PIU Department Manager (Superstructure / Civil Engineer)** will be responsible for overseeing the implementation of all health, safety and social measures, as specified within the disclosure package of the Project, and regular reporting to AYGM PIU.
- **PIU Physics Engineer** who is responsible for supervising health and safety for the Project.

5.10. Executive Environmental and Social Management Committee

- **Executive E&S Committee Project Manager (Department Head / Branch Manager / Head of Department)** will be ultimately responsible for overseeing the activities undertaken by the AYGM/TCDD specialists (listed below), overseeing the implementation of mitigation measures and management procedures specified within the disclosure package of the Project, and overseeing the preparation and implementation of a CESMP, which will be based on this ESMP.
- **Executive E&S Committee Environmental, Health and Safety, and Social (EHSS) Manager (Specialist / Engineer)** will be responsible for overseeing all matters that relate to environment, health, safety and social aspects of the Project. Also, s/he will be appointed to be responsible for supporting the implementation of the SEP, by conducting regular consultation with affected communities on any concern regarding the Project. CLOs will also have responsibility for disseminating the Project disclosure package as described in the SEP. They will also conduct regular inspections of records relating to grievances received and their resolution. S/He will report regularly to AYGM PIU.

Further technical staff may be required during the course of the Project, who will be assigned internally by the AYGM, either by means of permanent or temporary basis until the completion of relevant tasks under the Project whilst they undertake their current responsibilities

6. DEFINITIONS AND ABBREVIATIONS

Project: Mersin-Adana-Osmaniye-Gaziantep (MAOG) High Standard Railway Project

Slime: Clay mud. Dark, sticky mud, usually clayey, containing various organic substances.

Trench Excavation: Excavation of trenches less than 0.60 meters wide.

Deep Trench Excavation: Excavation of trenches with a depth of more than 4.50 meters.

Landslide: At the edge of the excavated area, as a result of the loosening of the soil due to certain reasons, it suddenly separates and slides towards the excavated area or falls.

Excavation: Material such as soil, stone, gravel from the excavated area.

Trench Coating System: Prefabricated components designed to support the vertical faces of trenches.

Ditch Excavation: A type of excavation that is carried out on all kinds of ground for various purposes and whose length is significantly longer than its width. Narrow excavations for drinking water, irrigation water, wastewater, drainage and gas pipes, telephone and electricity cables.

Shoring: System used to hold and support excavation faces and thus prevent landslides.

Work Equipment: Any machine, tool, plant and installation used in performing work.

Level: Workplaces in the form of steps created with certain intervals, elevations and slopes in open pits.

Caliche: Sedimentary rock formed by bonds combined with hardened natural cement calcium carbonate, combined with other materials such as gravel, sand, clay and alluvium.

Slip Strength: The greatest slip stress that the soil can withstand without causing collapse.

Excavation: A man-made hollow, pit or void, made on any ground for various purposes, by removing the soil from its location by hand or by machine.

Cohesion: The force that holds similar particles together within the soil structure.

Lem: A mixture of clay, sand and silt.

Strength: The ability of materials to protect their form and other properties by resisting various external factors.

Operator: Employee or employees assigned to use work equipment.

Sheet pile: Vertical member made of wood, reinforced concrete or steel installed and driven along the excavation line to support the excavation face and assist in the drainage of groundwater generated during excavations in unfavorable ground conditions.

Palette: A flat area between two slopes made to increase the stability of slopes.

Curtain: A section of shoring in contact with the ground and supported by connecting and reinforcing beams or breast beams to hold excavation faces.

Risk assessment: It means the works required to be performed in order to identify the internal and external hazards, analyse and grade the factors which turn such hazards into risks and the risks arising from such hazards, and determine control measures,

Risk: Any possibility of occurrence of any dangerous incident or exposure(s) and combination of severity that this incident or exposure(s) may cause.

Shallow Trench Excavation: Excavation of trenches up to 1.25 meters deep.

Stability: The ability of objects to resist damage.

Slope Stage, forehead and slope on their faces.

Hazard: Potential situations or sources that can lead to physical injury, illness or death, property and environmental damage, loss of reputation, or any combination thereof.

Hazardous Atmosphere: Explosive, flammable, toxic, corrosive, oxidizing, irritating, anaerobic, toxic or otherwise harmful atmosphere that can cause death, illness or injury to persons exposed to it.

Ground: The granular material containing water and air, forming the outer part of the earth, formed as a result of weathering, dispersal and weathering of rocks.

7. IMPLEMENTATION

7.1. Competence Requirements and Evidence and Acceptance of Competence

At Ronesans, only employees with the competency specified in this procedure are involved in excavation work. The minimum competency requirements for the designated tasks are defined below.

Table 1: Competency Matrix

Position	Professional competence	Experience	Vocational training
Earthworks Chief / Responsible	Graduated from Engineering Faculties of Universities (preferably Map or Civil Engineering departments).	At least 5 years in excavation / infrastructure works.	At least 1 day of theoretical training on safety in excavation / infrastructure works from a person or institution approved by Ronesans in the last 2 years
Earthworks Engineer / Technician	Graduated from Civil / Survey Engineering or Technician departments of universities.	At least 2 years in excavation / infrastructure works.	At least 1 day of theoretical training on safety in excavation / infrastructure works from a person or institution approved by Ronesans in the last 2 years.
Earthworks Foreman	At least secondary school graduation.	At least 5 years in excavation / infrastructure works.	At least 1 day of theoretical training on safety in excavation / infrastructure works from a person or institution approved by Ronesans in the last 2 years.
Heavy Duty Equipment Operator	At least secondary school graduation. Driver's Licence Operator certificate suitable for the relevant construction equipment class.	At least 1 years in excavation / infrastructure works.	At least 4 hours of theoretical training to be given by the HSE Trainer / Legal Occupational Safety Specialist on safety in excavation / infrastructure works.
Flagman	At least primary level graduation. If legally required, the flagman's certificate issued by the country's legal authorities.	At least 3 years in the field of working with construction machinery and equipment.	A flagship training lasting at least 4 hours, repeated once a year, containing the theoretical and practical parts by a competent person or institution, conveying the hazards and control methods of construction machinery and equipment, the requirements of this procedure, the duties and responsibilities of the flaggers, and specific guidance methods.

For proof of competence and acceptance by MAOG Project Management, the following must be provided.

Professional competence

The original or certified copy of the relevant secondary or higher education diploma or graduation certificate.

The original or a copy of the relevant professional qualification certificate.

If there is a professional qualification requirement in the legislation of the relevant country, the original or a copy of the defined professional qualification document.

Experience:

A document showing that you have worked in the relevant task or field (SGK statement, etc.) or a working document or reference letter, stamped and signed by the authorized person, on the letterhead of the institution where he/she worked.

Vocational training:

It is as if it were the original or original copy of the certificate containing the content, duration, date, participant name, information of the educational provider, or signed by the stamped and authorized person on the letterhead of the educational provider institution, which contains the same information and confirms that it has participated in the training by the educational provider institution.

In addition, the infrastructure foreman and heavy-duty equipment operator who will work in excavation works must have physical and mental health qualifications suitable for the job.

7.2. Risk Management

7.2.1 Assessment of Risks

Considering the type of activity carried out during the excavation works, the risk management tool is determined and implemented according to the MAOG-RECU-GN-GNL-IS-GNL-PRG-0002-0 Hazard and Risk Management Procedure.

In the risk assessment to be carried out, at least the following hazards and risks are taken into account. These are;

- Landslide.
- Employees fall in excavation site
- The loads fall on the employees
- Hazardous atmosphere (smoke, oxygen deficiency, toxic, flammable and explosive gases),
- Contact with underground services and overhead power lines,
- vehicles, heavy and mobile equipment,
- narrow space,
- Entrances and exits to the excavation,
- Working near Active Highway or Railroad
- Water accumulation in excavation,
- Misuse and improper use of equipment,
- Distance to bulk and waste materials,
- Cables on the floor and sharp, heavy, blunt objects,
- Indecisions arising from persons or facilities working adjacent to the excavation,
- Buried ammunition,
- Polluted soil
- Electricity

7.2.2 Control of Risks

The method of controlling risks in excavation activities is selected according to the risk control hierarchy. The need to excavate as much as possible is eliminated. If a single control is not sufficient to reduce excavation risks to the lowest reasonably practicable, a combination of controls is used.

Based on the result of the risk assessment, all necessary safety systems and equipment, including personal protective equipment (PPE), are provided, and an emergency plan is prepared according to the size of the risk.

Table2: Risk Control Hierarchy in Excavation Works

	Control at the Source	Application of methods such as passing cables through pipes without the need for excavation.
	Substitution	Application of different non-destructive methods such as containment instead of excavation, horizontal drilling.
	Engineering solutions	Barricade of the excavation site, installation of barriers or guardrails. Compressing the excavation edges, lowering the materials that may fall by shaking.
	Administrative Controls	Procedural activities, contingency plans, work permit systems, regular inspections.
	Personal protective equipment	Use of helmet, reflective workwear, safety shoes, eye and ear protection.

7.2.3 Recovery Planning

Rescue planning is made for each excavation work. Rescue plans include at least the following topics.

- Possible dangers and possible emergencies,
- The scope and size of the work,
- The number and duties of the people who will be involved in the work,
- A safe and fast method of evacuation of workers from the excavation,
- Emergency communication method (including communication with unit leaders),
- Possibility of intervention for injured people,
- location of rescue equipment,
- gas measuring equipment point,
- Unplanned electrical contact, floods, fires, etc. natural disasters,
- The location of the nearest emergency services,
- Access to rescue vehicles and casualties,
- Map or aerial photograph showing cutoff and control points such as valves,
- Other risks identified for the relevant activity.
- While making the Emergency Response Planning, the following items should be evaluated in the plan.
- The development of the warning system is evaluated.
- The safe evacuation plan is communicated to all concerned.
- Employees trained in evacuation and rescue are available.



- During the working period, medical personnel and appropriate vehicles are available. Necessary equipment for cutting electricity or other energy sources is kept ready.
- Other principles for emergency response planning are outlined in the MAOG-RECU-GN-GNL-IS-GNL-PLG-0003-0 Emergency Action Plan.

7.2.4 Excavation Works Within the Scope of Subcontractor / Supplier

The requirements specified in this procedure are fully implemented in the excavation works to be carried out within the scope of subcontractors and suppliers in the MAOG Project.

7.3. Excavation Work Permit

Excavations of 1.2 m and deeper in the MAOG Project are subject to a work permit. Requirements for work permit in excavation works are explained in article 7.1.6 of MAOG-RECU-GN-GNL-IS-GNL-PRG-0008-0 Work Permit Procedure. In this direction, the excavation work is evaluated by the Earth Works Chief / Supervisor within the scope of the MAOG-RECU-GN-GNL-IS-GNL-PRG-0008-0 Work Permit Procedure and it is decided to apply the "Excavation and Backfill Works Work Permit".

7.4. Types of Ground¹

Soil types are ranked in order of decreasing stability as follows.

1. Stable rock: Ground consisting of natural, solid mineral material that can be excavated vertically, in which the shape of the surfaces that remain undisturbed during excavation.
2. Type A grounds: Cohesive grounds with unconfined compressive strength of 144 kPa or more. Clay, silty clay, sandy clay, clay loam in some cases, silty clay loam and sandy clay loam are given as examples for such soils, and cemented soils such as hard layers and caliche are also included in Type A soils.
3. Type B grounds: They are cohesive grounds or coarse grained cohesionless soils where the unconfined compressive strength is higher than 48 kPa and lower than 144 kPa.

Angular gravels (resembling crushed stone), silt, silt loam, sandy loam and in some cases silty clay loam and sandy clay loam or previously disturbed soils outside of the C type soil class or meeting the unconfined compressive strength values of Type A but exposed to vibration or fissured. soils or unstable dry rocks.

4. Type C grounds: Cohesive grounds with unconfined compressive strength of 48 kPa or less, cohesionless soils containing gravel, sand and submerged sand, submerged soils, soils where water seeps freely, unstable submerged rocks or strata should be inserted into the excavation with four horizontal verticals (4H-1V). Materials in a layered system with slopes at a rate of or steeper than that of the earth are defined as type C soils.

The type of grounds is the most important factor to be known in terms of determining the strength and stability of the excavated ground and accordingly taking the necessary safety measures against dents.

Grounds in soil mechanics; It is roughly divided into two main groups as coarse (coarse) or cohesive soils and fine-grained or cohesive soils.



In coarse-grained soils, the grains are not adherent and can be seen with the naked eye. These grains; round, flat oval, angular etc. happens in forms. Coarse-grained grounds are also divided into two subgroups as sands and gravels. Gravels and sands are grouped as coarse, medium and fine, and depending on their grain arrangement, they are compact (little void) and loose (high void).

On the other hand, in fine-grained soils with cohesion, the grains are small in size, ranging from barely visible with the naked eye to being seen with a microscope. They are divided into two subgroups as silts and clays. In clay, clay and silt mixture soils, the grains are stuck to each other due to the attraction forces (cohesion) between these grains. Cohesive soils are soft when wet and hard when dry. Although clays and silts (or clayey silts) are similar to each other, they are separated from each other by simple methods in the field. Silts disperse quickly in water, while clays disperse slowly. Wet silt dries fast while clay dries slowly. Dry silt crumbles easily between fingers, while dry clay does not crumble easily. Wet clay sticks to fingers more.

7.4.1. Supporting the Ground

7.4.1.1 Less than 1.2 Meter Depth

Excavations with a depth of less than 1.2 m do not require compaction of the excavation surface as long as it does not present an unacceptable risk to workers and the bystanders. When determining this risk, the following factors are considered:

- Soil type and condition (e.g. presence of acid sulfate),
- Possibility of unauthorized access to the area,
- The need for protection and barricades,
- Exposure Time
- Proximity of heavy-duty equipment to people at or near the excavation,
- The location of the underground water level relative to the excavation floor,
- Whether the drainage of water from the ground and excavation works will affect the stability of the excavation,

In site assessment, bracing is undertaken regardless of the depth of the excavation where there is a risk of excavation collapse or where any excavation site is likely to become unstable (for example, due to ground conditions and/or material loading on the excavation edge).

7.4.1.2 1.2 Meter and Over Depth

In order to prevent the risk of excavation collapse, control measures are taken in excavations deeper than 1.2 m.

In excavations deeper than 1.2 m, no work will ever be undertaken, regardless of the conditions, without a suitable scaling or shoring system.

An excavation deeper than 1.2 m is inspected by the "Earth Affairs Chief / Supervisor" as part of the planning process and its findings are reported in writing. The review includes at least the following topics:

- Ground types encountered
- If necessary, the calculations used to decide on the method of protection required and any other special considerations that need to be addressed.

This declaration is signed and followed by the "Earth Affairs Chief / Responsible".



7.5. Working Near Underground Lines and Overhead Lines

Special checks are made for work to be done near underground lines or overhead power lines. These controls include the following topics:

- The option to isolate the power line is considered.
- An authorized lookout is available.
- Warning signs and notifications are used.
- During the study, it is evaluated that the energy transfer is provided from outside the area.
- Permission is obtained from the neighboring units and those who use the energy.
- Mechanical excavation is not allowed within 2 meters of live underground installations/pipes.
- RD 7100 PL Receiver (receiver), pipe-cable routing device etc. at risky points before excavation works. controls are made with instruments.
- Mechanical excavation is not allowed within 1 meter of de-energized underground installation/pipes.

In addition to these, the following topics are also carefully examined:

The entrance of the machines that are not included in the excavation work to the excavation area is prevented. If necessary, the traffic plan is changed according to the status of the excavation.

Before any kind of excavation, it is considered that there may be electrical cables, water pipes, gas pipes, telephone lines and sewer lines at the excavation site.

Before starting the excavation, institutions and organizations related to underground services are consulted and all information and drawings regarding the locations of these services are obtained. It is also visually inspected to see if there is any trace of underground services at the site to be excavated. The received data; In cases where there is no complete certainty due to reasons such as many years have passed and a lot of work has been done at the excavation site, suitable locator devices are used to determine the location of underground services. The use of these devices is made by trained persons. The services that have been located are indicated by appropriate marking along their lines.

Within the excavation work permit system, MAOG Project Electrical Department Chief / Manager and / or responsible persons are included in the excavation work permit approval process.

Cables are clearly identified using cable finder devices. In addition, attention is paid to traffic signs and street lamps in the vicinity in order to find clues about the locations of buried cables.

Gas lines, like electrical cables, can cause serious fires and large explosions. In case of a gas leak, the relevant institution is called immediately. It is ensured that the workers evacuate the excavation in case of a rapid accumulation of gas. In addition, devices that may cause ignition, such as running vehicle engines, are immediately stopped.

Damage to the water lines causes water jets to come out of the split pipe, fill the canal with water, thus drowning the workers, damaging other underground services, and dents due to weakened excavation edges.

Since there is a flow arising from gravity rather than a pressurized flow in sewers, the main danger to be encountered in case of damage to these services is pollution.

In addition to the dangers arising from electricity, gas, water and sewerage, pipes that carry various gases such as nitrogen, argon, toxic and flammable liquids and the dangers posed by telecommunication lines, although the risk of injury is low.

As well as underground, overhead power lines pose a great danger to excavation vehicles and other equipment with long lifting/carrying arms. If possible, working under these lines is avoided or the current flowing through the lines is stopped. If these are not possible, the operator pays attention to

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the minimum distances that must be between the equipment and the power lines. These distances are specified in the Electrical Safety Procedure MAOG-RECU-GN-GNL-IS-GNL-PRG-00022-0.

A height limiter is installed when equipment that can rise, such as a dump truck, operate under overhead power lines.

However, if the equipment has come into contact with the power line despite the precautions taken, the following points should be observed:

- Should be stayed in the equipment, the equipment and the floor are not touched at the same time. Touching anything in contact with the ground can be fatal.
- Employees using ancillary equipment also stay on that equipment, avoiding simultaneous contact with the ground and equipment.
- Other workers are likewise kept away from the equipment and warned not to touch any part of the equipment.
- In order to stop the power line, the relevant institution is immediately contacted.
- If possible, try to break the contact by moving the machine while remaining in the machine. If it is not possible to break the contact, the machine is not moved until the power line is turned off (remaining on the machine).
- If an emergency, such as a fire, forces the machine to leave, it is clearly jumped with feet together. If, at the same time, one part of the body is in contact with the ground and the other part is in contact with the equipment, the current flows through the body. Never step on the ground and walk away with small steps. Big steps are not taken. Because of the voltage difference on the ground, one foot may be in a higher voltage area than the other, and this difference can kill the person.

7.6. Chemical Hazards (Hazardous Atmosphere)

Gas measurement is carried out in every excavation with oxygen deficiency, dangerous atmosphere or expected and deeper than 1.2 m. Hazardous atmospheres may occur due to the presence of a landfill near the excavation and the storage of hazardous materials close to the excavation.

Environments where oxygen is less than 19.5% and more than 23.5%, situations where the flammable gas concentration is more than 20% of the lower ignition limit, and dangerous substances whose concentrations exceed the limit value are also within the scope of dangerous atmosphere.

In case of encountering a dangerous environment, the employee is not allowed to enter here.

Excavation work is started by performing the safety precautions and controls in the MAOG-RECU-GN-GNL-IS-GNL-PRG-00020-0 Confined Area Procedure.

The environment in these excavations is regularly tested and controlled. These tests are intensified if there is a working vehicle in the excavation and operations such as welding, cutting, burning are carried out. In case of emergency, all kinds of health and safety tools such as breathing apparatus and rescue equipment are available. A watcher with communication tools is kept outside the excavation area.

Irrigation is provided against dust formation in the excavation area.

7.7. Heavy-Duty Equipment Hazards:

During heavy-duty equipment work, where the work areas intersect in the excavation, one or more flaggers are assigned according to the nature of the work. There is no employee in the machine maneuver area. During the transport of the load, the machine cannot walk on the route, it is not possible to pass under the load.



While the equipment is at the edge of the excavation, there is no worker in the excavation. However, within the scope of the MAOG-RECU-GN-GNL-IS-GNL-PRG-0002-0 Hazard and Risk Management Procedure, risks are evaluated and precautions are determined.

All equipment working in the field has a cabin. Soil dumping zones to the excavation are wedged against the vehicle falling into the excavation pit.

Heavy-duty equipment has a reverse alarm. Passenger vehicles are not allowed to enter the heavy-duty equipment working area and the excavation.

Other requirements for construction machinery and equipment are specified in the Construction Equipment and Equipment Procedure MAOG-RECU-GN-GNL-IS-GNL-PRG-00013-0.

7.8. Access to Excavations

It is determined where and in what time period the workers will work in the excavation. The continuous entry/exit path is kept open. In cases where the stairs are used for access, it is ensured that it rises up to 1 meter above the upper limit of the excavation. Whenever possible, ladders are placed at the intersections or corners of excavations.

Working alone is not allowed. When the work is stopped or at the end of the shift, the entrances / exits are closed and visible markings are made.

Bored pile wells are not left uncovered. It is surrounded by a barrier and covered with material of sufficient carrying capacity. Unauthorized persons are prevented from entering the bored pile area.

If a different excavation area is to be passed within the excavation or for passing over the excavation, transitions equipped with a standard railing system with a minimum width of 80 cm are established.²

On the ramps designed for one vehicle, two vehicles cannot be found at the same time.

The entry/exit point shall be at least 7.6 meters horizontally from the excavated point.³

7.9. Bevelling and Retaining

In determining the slope angles, ground structure, climatic conditions, tremors that may occur near the excavation area, surrounding water resources and excess load forces are taken into account. Slope angles according to the above-mentioned soil types are given in accordance with the table below. In case the ground type is unknown, the maximum slope value is set to be no steeper than 1.5 horizontal and 1 vertical (1.5H-1V).

Table3Maximum Slopes Permitted by Soil Type

Ground Type	Maximum slope values allowed in excavations (H:V)
Stable Rock	Upright (900)
A type	3/4:1 (53°)
Type B	1:1 (45°)
Type C	1 ½: 1 (34°)

In cases where slope is not possible, the shoring system is applied. The material to be used in the shoring system (such as wood, steel) is approved by the MAOG Project Management and the manufacturer's instructions are taken into account. In the event that the shoring material is damaged,



an examination is made by the Earth Works Chief / Responsible and it is decided whether the material needs to be changed or not.

It is ensured that the shoring systems are installed and dismantled in such a way as to protect the workers from dents, structural collapses or getting stuck between the components of the protective system.

If the reinforced concrete shoring system is to be implemented, the project is prepared and implemented to meet the requirements of the relevant MAOG Project.

The shoring system is installed as the excavation progresses, and it is installed in such a way that it rises at least 30 cm from the top of the excavation. The shoring system is checked every day at the beginning of the shift. ⁴

7.10. Barricades and Marking

It is planned to fill the excavated area as soon as possible. If there is a danger of a vehicle falling into the excavation area, the excavation area is closed with concrete blocks. In all cases, the excavation is surrounded by a standard guardrail for fall protection. Warning tape is used to define the safe area boundary, it is not sufficient for fall protection. Details for standard guardrails are specified in the MAOG-RECU-GN-GNL-IS-GNL-PRG-00015-0 Working at Height Procedure. Precautions are taken against falling into the excavation at the excavation entry points. Hard physical barriers are placed in order to prevent the operation of heavy tonnage equipment such as heavy construction equipment or dump trucks maneuvering within the excavation effect area and their suitability is checked. The excavation site is marked for hazards such as heavy equipment hazards.

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It is a value of good practice.

EXCAVATION WORKS PROCEDURE

MAOG-RECU-GN-GNL-IS-GNL-PRG-0018-0

18/09/2021

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Table4 Safe Distance of Construction Equipment to the Excavation Edge

Excavation Depth (m)	By Ground Type			
	Sandy (m)	Sandy-Clay (m)	Slime (m)	Clay (m)
1	1,5	1,25	1	1
2	3	2,4	2	1,5
3	4	3,6	3,25	1,75
4	5	4,40	4	3
5	6	5,30	4,75	3,5

7.11. Works at Night

Whenever possible, excavations are carried out during the day. If this cannot be done, the excavation area is illuminated to see the work to be done and the hazards in the area. A lighting system that will be activated against power cuts is installed. A flashing lighting system is placed on the edge of public access roads.

Appropriate and sufficient lighting is provided in the excavation area. Access roads are marked to avoid glare and deep shadows.⁵

The lighting system is protected to prevent damage. Light reflectors are placed in excavations at a distance of 5 meters from the highway.⁶

7.12. Excavation Work in Adverse Weather Conditions

No excavation work is carried out during precipitation. There is no worker in the excavation area. A closed area is established in the safe area where employees can protect themselves in rainy weather. Weather and environmental conditions before and during excavation are important factors to be considered against the risk of dents.

Since the excavation will remain open for a long time, which will cause dents with the increase in the water rate, the weather conditions are followed while planning the excavation.

After severe weather conditions such as Rain, storm, frost, snowfall, etc. , the excavation area and safety equipment are controlled by the Earthworks Chief / Supervisor.

7.13. Storage of Excavation Material

It is not allowed to store excavation material on the excavation edges. If excavation material storage is obligatory, it starts from the distance allowed to the excavation edge as a result of the Earthwork Supervisor / Supervisor's examination.

It is ensured that the materials from the excavation are stored in a way that does not pose a risk to pedestrians, vehicles and surrounding structures. In case the excavation material cannot be taken from the storage point, pressure is prevented by increasing the water content. For this, if necessary, the excavation is covered.

EN 12464-1 : In the 2011 Standard, a value of 750 lux is defined for engraving.

Good practices are a value.



7.14. Control of Excavations

It is ensured that the excavation works are subject to periodic control at the beginning of the excavation and in a monthly period with the "Annex - 2 Excavation Safety Control Form" by the Earth Works Chief / Supervisor.

The excavation area is checked and recorded in a weekly period by the Foreman of the Earth Works Chief with the "Annex - 3 Excavation Area Weekly Control Form".

Apart from these controls, the Earthworks Foreman visually checks the excavation before each shift, identifies possible hazards and takes the necessary precautions.

When at least one of the following situations occurs, additional controls are made by the Earthworks Chief / Responsible.

- In case of any landslide or shoring collapse,
- After significant precipitation that may be caused by water ingress,
- After the change in ground conditions (extremely hot weather, thaw, shaking, frost),
- After the change in field conditions (such as neighboring excavations),
- Instability condition due to overloads on the excavation edge,
- Cracks, water leakage, bottom bulge.

8. MONITORING, ASSURANCE AND VERIFICATION

Key success indicators (KPIs) of this procedure will be monitored, verified and evaluated by the relevant parties in accordance with their responsibilities set forth in the E&S Governance document, within the scope of the MAOG-RECU-GB-GNL-IS-PRG-0007-0 HSE Monitoring, Assurance and Verification Procedure.

9. RELATED FORMS

Appendix A – Feedback Form

Appendix - 2 Excavation Safety Control Form

Appendix- 3 Excavation Site Weekly Control Form



APPENDIX 1-FEEDBACK FORM

User Feedback Page			
When the user identifies an inaccuracy, error or uncertainty in the document, he notifies the person responsible for the document so that the necessary action can be taken. The user is asked to clearly state the changes he proposes and to return by filling out this page completely.			
User Name			
Document No		Date	
Page Ref.	Brief Description of Required Changes / Corrections and Reasons		
Submit Page:	this	Person in Charge or Corporate OHS – E Management Department	