



Global EHS - Excavation Standard

CONTROL INFORMATION

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1 Purpose

This document is to outline specific requirements and adequate protection measures which should be in place during any excavation work, for protection of existing underground services and working personnel. This standard is applicable to both manual and machine excavation.

2 Scope

Items	Details
Site(s) Impacted	All Micron Sites
Target Audience	Micron team members and contractors involved in excavation activities, Micron team members who manage and coordinate excavation work, and contractors who perform excavation work in Micron.
Applicability	This document applies to all excavation activities in both Operations and Construction Areas. It also applies to both machine and manual excavation.

3 Roles and Responsibilities

Roles	Responsibilities
Site EHS	- Administration of program, necessary oversight. - Review the requirements and subsequent changes of this standard and identify actions to ensure the requirements are effectively implemented - Evaluate continuous compliance to the updated requirements of this standard at least once every 3 years or more frequently (when risk of noncompliance is present) and implement actions to correct deficiency(ies) identified during the compliance evaluation process
Micron Host, Micron Facilities Manager, or Micron Construction Project Manager	- Ensure contractor or vendor companies comply with this standard. - Work with EHS representatives to ensure that contractors and vendors are appropriately briefed and trained on Micron site EHS requirements before allowing excavation work to begin. - Authorize commencement of excavation work after verification of correct documentations, inspection reports, confirmation of working method.
General Contractor Project/ Construction Manager	- Ensure contractor or vendor companies comply with this standard. - Work with contractor EHS representatives to ensure that contractors and vendors are appropriately briefed and trained on Micron site EHS requirements before excavation work begins. - Authorize commencement of excavation work after verification of correct documentations, inspection reports, confirmation of working method.
Supervisor-In-Charge	- A Supervisor-In-Charge shall be appointed for each excavation work project. - Owns the planning, reviewing of method statement, JHA/RA, managing and coordinating all phases of the excavation work. - Ensure excavation work is being carried out as per plan and all conditions stated on Excavation Permit are complied with.
Excavator Operator	Responsible for the safe operation of the excavator, be familiar with the excavation plan, understand instruction given by Supervisor-In-Charge especially with regards to underground services.

Roles	Responsibilities
	- All excavator operators shall comply with authority requirement on training and licensing. When this is not covered by local legislation, it will be the responsibility of the contractor management to ensure that a competent person is assigned as excavator operator. The excavator operator should stop work and report to Supervisor-In-Charge whenever: - Any unknown underground service is found, - Any underground service is damaged, - Any unsafe, or potentially unsafe condition occurs, for example, side collapse.
Approving and Issuing Authority	The person who approves and issues the Excavation Permit.

4 Terms and Definitions

Terms	Definitions
Daily Inspection	An inspection performed by the Supervisor-In-Charge daily before excavation can be continued, or work inside the excavated area can be proceeded.
Excavation	Excavation is a process of digging, including driving piles or any other objects into the ground, regardless by human or by machine.
Excavation Checklist	Checklist which will be used by Supervisor-In-Charge to perform the daily inspection.
Excavation Permit	A permit system, either via paper or electronic, that must be completed before any work can commence with specific work method, job specified RA/JHA.
Machine Excavation	This is referring to any excavation using mechanical/electrical force. Driving of piles into the ground shall be included as mechanical excavation.
Manual Excavation	No mechanical/electrical forces are allowed. All excavations shall be carried out by using hand tools.
Supervisor-In-Charge	A person appointed to be the Overall-In-Charge of the entire excavation work.
Trial Excavation	This is excavation to expose known or suspected underground services or other potential obstacles to excavate. Approving Authority shall determine method of excavation. E.g., machine excavate the top 2 meter and manually excavate the last one meter.
Underground Master Drawing	A drawing which shows all underground services which should include but not limited to water piping, gas piping, cables.
Underground Services Detection	Detection of underground services and determination of its approximate depth. This is the process whereby all underground services will be located, marked, and depicted on a drawing.

5 References

Internal References	Link
Global EHS - Construction Contractor EHS Minimum Performance Requirements	2W4373RQWREN-1568922467-118
Global EHS - Contractor EHS Requirements	2W4373RQWREN-1568922467-123
Global EHS - Work At Heights Standard	2W4373RQWREN-1568922467-48

Internal References	Link
Global EHS - Confined Space Program Standard	2W4373RQWREN-1568922467-146

External References	Link
Nil	Nil

6 Standard

6.1 Trigger Depth for Excavation Permit

- All excavation works more than 0.3 meter in depth require an Approved Excavation Permit has been issued.
- The above requirement applies to all type of excavations, such as trial holes excavation, manual and machine excavation, and driving of any objects into the ground.

6.2 Application of Excavation Permit

- Contractors should apply Excavation Permit with approved work method statement, JHA/RA, and attaching drawings of the intended scope of work. As much as possible, approved construction drawing of scope of intended excavation should be super imposed on the underground services master drawing.
- The Approving Authority should assign appropriate representative to check and confirm underground condition as stated in Section 2 of the Excavation Permit.
- Upon confirmation of underground condition and based on recommendation of his assigned representative, the Approving Authority can proceed to approve and issue the Excavation Permit.

6.3 Requirements

- Underground services detection shall be carried out prior to any excavation unless otherwise stated by the Permit Approving and Issuing Authority.
- Underground drawing shall be made available to the contractor performing the underground detection work.
- Local authority or underground services provider should be consulted on the services location and up-dated latest drawing. If necessary, invite them for field verification.
- When underground services detection is a requirement by legislation, the Permit Approving and Issuing Authority shall issue instruction complying with the legal requirement.
- For deep excavation, underground detection shall be repeated at every 1.5meter depth before excavation can be continued. This will ensure accurate underground information can be made available to the team so that excavation plan can be revised, and incident avoided.
- The proposed excavation area must be clearly marked out on the ground before the start of any excavation.
- Suitable edge protection in the form of hard barricade shall be erected before the work commences, with one side open for excavator operation and truck movement. Such edge protection should be placed at a minimum of 1 meter away from the edge of excavation. The open side shall be closed off at the end of each work shift, or when the excavation is completed.
- Excavated soil should be transported to a designated stockpile area. Storage of excavated soil near or beside the excavation is not appropriate as it will increase pressure onto the shoring. Vehicles required for transporting such soil will also create vibration and pressure to the excavation and shoring.
- As much as possible, excavator should act as the buffer between excavation and transportation trucks in order to reduce unnecessary pressure and vibration to the excavation.
- No worker should be inside the excavation when excavator is in operation. If worker is required to station inside the excavation for purpose such as checking level and set-up markers, coordinate with

operator on area couldn't be seen by the operator, all associated risks shall be carefully assessed, recorded in JHA/RA, and briefed to worker involved. Supervisor-In-Charge shall supervise closely.

- Excavation more than 1.5 meters in depth must be properly shored, sheeted, braced, benched, or sloped to 45° unless otherwise stated by Approving Authority on the Excavation Permit.
- All shoring, sheet support, or bracing shall be extended to the bottom of the excavation.
- If the depth of excavation exceeds 4 meters, the shoring and supporting system shall be designed by a qualified engineer with approved drawing for installation.
- If the excavation encounters soft/unstable soil condition, the Supervisor-In-Charge with assistance from EHS and Civil Engineer, should stop the excavation and re-assess the situation. Depending on the assessment, contractor can be instructed to provide engineered supporting system mentioned above even the depth is less than 4 meters.
- During the hours of darkness, sufficient numbers of warning lamps must be provided to indicate any excavations area, especially on and along roadways and walkways.
- Excavated soil shall be placed at least 2 meters away from the excavation area. Whenever possible, excavated soil shall be moved away to a designated stockpile area.
- Ladders shall be provided for workers to enter and exit the excavation. Such ladder must extend from the bottom of excavation to at least 1 meter above the top of excavation. When the depth of excavation exceeded 1.2-meters, proper entry/exit facility (e.g., by scaffolding) must be constructed to facilitate safe entry and exit for workers.
- Sufficient numbers of entry and exit provisions must be provided without more than 15-meters lateral travel.
- When there is a need for people to cross over trenches, ditches or any other excavation, proper walkway, bridge with guardrails shall be provided by the Contractor who own the excavation work.
- All work area, including the bottom of the excavation, shall be kept free of construction debris and stagnant water at all times.
- Dewatering equipment and system shall be in-place to keep the excavation free from stagnant water. More equipment should be prepared for country having raining season which could resulted in continuous rain for many days and weeks.
- In areas where the natural underground water level is above the planned depth of the excavation, well points/pump dewatering system should be installed to lower the water level prior to excavation.
- Operating radius of the excavator from excavation to transportation trucks should be controlled to prevent unauthorized entry. Banksman should be deployed for controlling trespassing and vehicle movement.

6.4 Backfilling and Shoring Removal

- Backfilling work shall comply with specification, and contract requirements of Project. Soil condition shall be considered in method and equipment selection for backfilling work.
- It should be the responsibilities of Micron Host, Facilities Manager, Micron Project/Construction Manager, or Project/Construction Manager of General Contractor to ensure specifications and requirements for backfilling are included in the contract and make available to the supervisor-in-charge and contractors.
- Workers should take care to prevent any impact loading to installed services during backfilling.
- In general, soil is typically backfilled in layers or lifts.
- Each layer should be properly compacted to project requirement before next layer of backfilling.
- Soil use for backfilling should be free of debris, stone, and rocks.
- The sequence for removing shoring should be the opposite of installing the shoring.

- Before removal of any horizontal support such as struts or jacks, the area should be backfilled to the level of such struts or jacks.
- Workers working on the removal work shall be protected by the vertical up-right which should be the last to remove.
- Supervisor-In-Charge should work with the team to develop a safe removal plan for shoring.

6.5 Supervisor-In-Charge

The Supervisor shall:

- Understand the scope of the excavation work so as to plan a proper and sufficient underground services detection when required.
- Ensure work instructions and safety requirements stated on the Excavation Permit are clearly instructed to the team involved in excavation work.
- Before starting any excavation, inspect and ensure equipment use, including excavator, shoring materials, materials to be used for barricade, etc., are all in-place and in good and safe working condition.
- Arrange a trial excavation to expose underground services when required and develop plan to protect exposed underground services before actual excavation is started.
- Ensure proper support and protection for existing underground service is properly installed.
- Conduct an inspection on the condition of excavation daily before work and after inclement weather.
- In the event of any unknown underground object is detected, stop the work and report to Approving Authority immediately.
- Brief and ensure Excavator operator understand the work plan and condition of underground services.
- Instruct and ensure excavator operator carry out daily inspection on his excavator prior to starting work.

6.6 Emergency Response

All excavation and work in excavated pit/trench shall be notify to ERT at the start and end of the shift.

For major construction project managed by General Contractor, it will be the duty of General Contractor management to maintain a record of active excavation activities and works inside excavated pit/trench.

In the event of an emergency, e.g., side collapse, shoring fail and give way, damages of underground services, stop work and report to:

- Micron site ERT and Micron Host
- For major construction project, report to EHS of General Contractor who may requests assistance from Micron ERT when necessary.
- General Contractor shall then report to Micron Host and EHS.
- Isolate the area and wait for further instruction.
- Micron/Micron Contractor should conduct an investigation to determine the cause of the emergency situation and implement corrective actions prior to reauthorization of the excavation permit.
- Supervisor-in-Charge shall consider the preparation of certain tools and equipment for emergency purpose. For example, knowing there are water lines near-by which require a special tool for valve opening and closing, it could be helpful to have this prepared on site.

6.7 Approving and Issuing of Excavation Permit

- Micron Host or Facilities Manager who will be the Approving and Issuing Authority should assign his staff to check and confirm on items listed in Section 2 of the Permit.
- Upon confirmation of Section 2, with an approved Method Statement, JHA/RA, and the work was deemed safe to proceed, the Approving Authority can proceed to approve and issue the Excavation Permit.
- If trial holes are required, the Permit should only be issued for the scope of trial holes. Final Excavation Permit can only be issued after completion of trial holes and necessary protection measures and working methods had been confirmed.
- In the event of a green field construction project, the Project Manager of General Contractor will be the Approving and Issuing Authority.

6.8 Special Conditions

- When the underground services master drawing or result of underground detection shows that there is presence of underground services inside or close to the proposed excavation area, trial holes excavation shall be carried out to expose the underground services.
- Owner of the known underground system shall be consulted to determine if a SIPP is required before any excavation can start.
- These trial holes are essential to determine the exact depth and routing of these underground services. At least two trial holes are required for each underground service.
- When the excavation exceeds 1.2 meters in depth, the Approving Authority should request Site EHS or the construction project EHS team to conduct an assessment to determine if the excavation shall be classified as a Confined Space.
- If the excavation is classified as Confined Space, Micron Confined Space Requirement shall apply.
- The project team shall conduct an assessment to determine if there are any fall hazards within barricade of excavation which fall under Work at Height Policy of Micron.
- Micron Work at Height policy and requirement shall apply as necessary.
- No machine excavation shall be allowed within a 1-meter radius of any known Underground services.
- For excavation more than 1.2meter in depth, underground soil condition and water table should be checked before the excavation plan and shoring method is finalized. This information can be obtained from historical data, local government agency, or by conducting a soil investigation.
- For excavation more than 2m in depth with unstable soil condition, a watchman should be assigned to monitor works in the excavation.
- For excavation more than 1.5m in depth with unstable soil condition and circumstances pose a cave-in hazard to workers, trench box should be used in-lieu of traditional shoring method. A trench box should be:
 - Capable of withstanding the soil pressure and depth rating in the event of a cave-in.
 - Install and use as per manufacturer's configurations.
 - The Supervisor-in-charge should use the data provided by the manufacturer to determine if a trench box is appropriate for the excavation work.
 - The space between the trench box wall and the side of excavation should be kept as small as possible. If there is any sign of cave-in, the space should be backfilled immediately.
 - Self-fabricated trench box should be according to the design of a professional engineer.
 - For excavation work more than 4m in depth, all trench boxes shall be certified by a professional engineer regardless of self-fabricate or approved manufacturer product.

- Progressively install the trench box by a “cut and lower” method. The maximum distance between the bottom of the trench box and the bottom of the trench should be no more than 0.5m. Contractor can excavate up to 0.5m under a trench box as long as there is no indication that the soil is collapsing behind the box wall.
- Workers working in a trench box must have proper access and egress. If a ladder was used, the top of the ladder must extend beyond the top of the trench by at least 1m.
- Workers cannot remain in the trench box when it is being installed, taken out, or move vertically.
- The trench box should be progressively withdrawn, as the excavation is backfilled.

7 Appendices
Appendix 1 Excavation Permit

EXCAVATION PERMIT		
1. Application		
Contractor Company:		Date of Application:
Excavation Start Date:		End Date :
Location of Excavation :		
Note: To attach drawing		
Description of Excavation work:		
Length:	Width:	Depth:
Declaration: - By signing below, I hereby undertake to supervise the work in the field and to ensure that all safety precautions, as detailed below are complied with.		
Contractor Supervisor		
Name:		Date:
Signature:		Time:
2. Underground Services Confirmation and Preventive Measures		
Piping ()	Electric/Control/Comm ()	Temp Electric Cable ()
Temp Water ()	Foundation ()	Others? ()
Mechanical excavation ()	Manual Excavation Only ()	
Trial holes required?	Yes ()	No ()
Underground Services Detection required?	Yes ()	No ()
Is this a Confined Space ?	Yes ()	No ()
Checked and Confirmed by :		
Piping In-Charge	Electrical In-Charge	Control/Comm. In-Charge
Name :	Name :	Name :
Signature :	Signature :	Signature :
Date :	Date :	Date :
Time :	Time :	Time :
Special Instructions:		
3. Approving and Issuing		
Name :	Approved: Yes () No ()	Date :
Position:	Signature :	Time :

Appendix 2 Excavation Daily Checklist

EXCAVATION CHECKLIST																
S/No	ITEMS	DATE		DATE		DATE		DATE		DATE		DATE		DATE		
		YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	
1	Valid work-permits available & displayed?															
2	Adequate warning signboards placed conspicuously at strategic locations with sufficient warning light?															
3	Road diversion signboards for employee information and convenience?															
4	Vehicles/ machinery operated by authorized person with banksman?															
5	All appropriate safety PPE worn at the site?															
6	Safety cover across road opening / over drain opening?															
7	Shoring or 45° slope provided for excavation more than 1.5 m depth?															
8	Ladders, stairways or ramps provided in the trenches?															
9	Excavated materials kept 2m away from the edge of the trench?															
10	Shoring for excavated trench, more than 4m deep constructed according to qualified engineer design and drawing?															
11	Open sides of excavation are guarded by adequate and hard barricades?															
After inclement weather :																
12	Shoring in good condition?															
13	Water being pumped out?															
Note: Immediate rectification shall be carried out for any item marked "NO". and confirm by EHS.																
Checked by:								Confirmed by:								
Sub-Contractor Construction Supervisor :								General Contractor Supervisor-In-Charge:								
Sub-Contractor EHS Supervisor :								General Contractor EHS Supervisor:								

8 Document Control

Items	Details
ECN Facility	CORP EHS
ECN Area	EHS CONST
Approval	This document is approved by: GLOBAL_EHS_SEAL_LT
Notification	Notification of changes to this document is managed through Micron's Engineering Change Notification (ECN) process to the following: <u>EHS</u> - GLOBAL_EHS - GLOBAL_EHS_MANAGERS - GLOBAL_EHS_SEAL_LT - GLOBAL_EHS_TEAM_MEMBERS <u>Facilities</u> - GLOBAL_FAC_CONSTRUCTION
Review	This document will be reviewed at least biennially (once per two years) by Global EHS / PSM through the Periodic Document Review (PDR) process.

9 Revision History

Rev	Date	Description	Requestor
0	23 Dec 2020	ECN Number: 101078523 First published standard	HAICHUANCHUA
0	03 Jan 2023	ECN Number: Not workflowed Periodic Document Review (PDR) completed. Minor spelling error, no other changes required.	HAICHUANCHUA
0	02 Jan 2025	ECN Number: Not workflowed Periodic Document Review (PDR) completed. No changes required.	HAICHUANCHUA

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