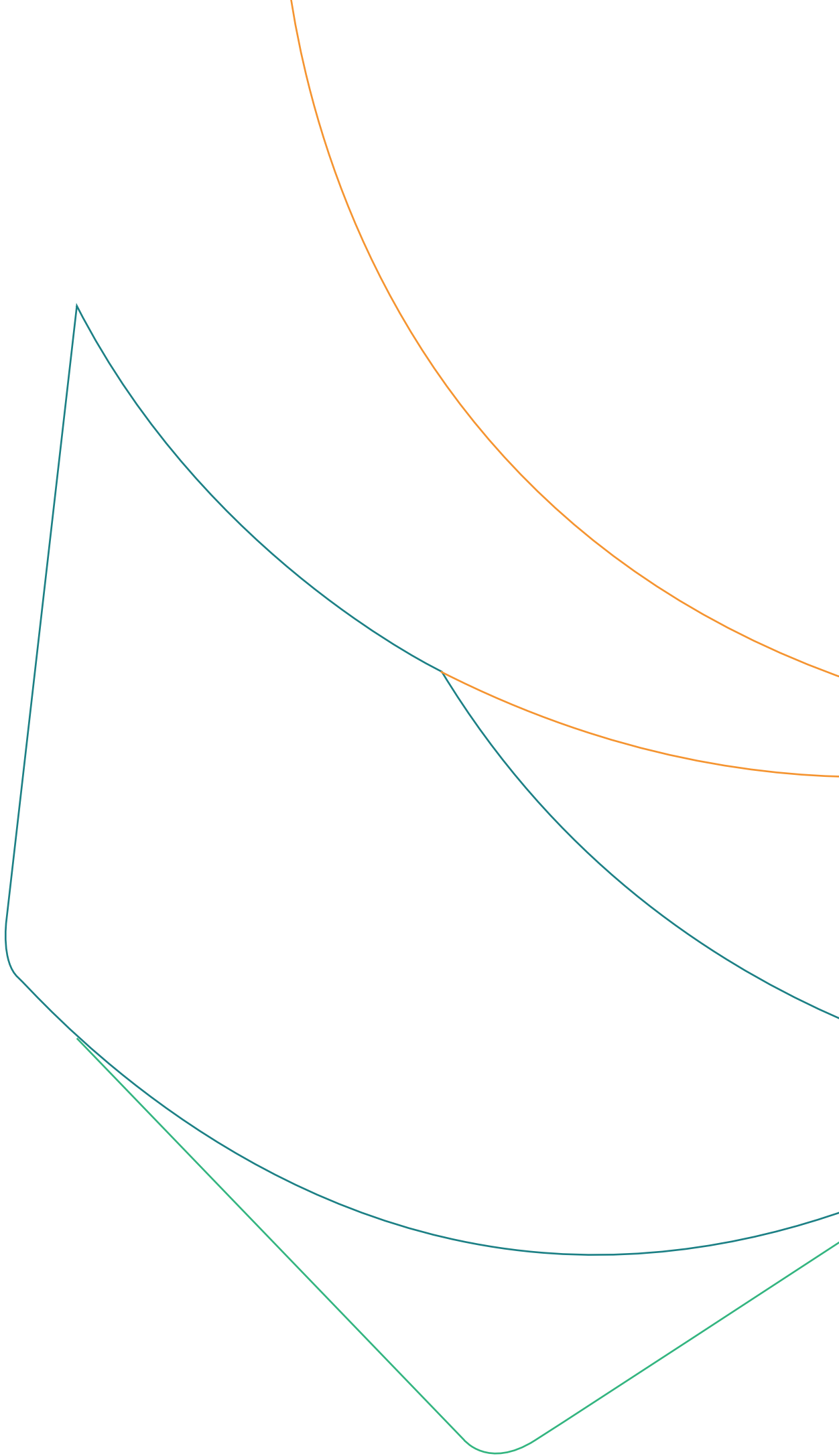




National Council for
Occupational Safety & Health

Guidance Manual for Excavation Works

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Introduction

Excavation works are among the essential activities in construction, infrastructure, and utility extension projects. However, they are also considered some of the most hazardous operations due to the potential for cave-ins, injuries, or damage to existing underground facilities such as electrical, water, and sewage lines, in addition to the risks associated with operating heavy equipment and changing field conditions.

In the interest of ensuring the safety of workers, protecting property, and maintaining work progress in accordance with the highest occupational safety standards, this Excavation Safety Guidance Manual has been developed to serve as a reference for workers and supervisors in this field. It aims to unify the concepts and preventive procedures required during the execution of all types of excavation works—whether shallow, deep, or adjacent to existing structures.



General Guidelines:

1. Ensure that all unwanted objects and debris surrounding the excavation area are removed before starting the work.
2. Verify that there are no underground utilities within the excavation area—or identify them if present (such as electrical cables, sewage lines, telephone lines, etc.)—before starting excavation to avoid potential hazards.
3. Determine the type of soil, as understanding its characteristics helps in selecting the appropriate types of supports required to prevent soil collapse onto workers.
4. Ensure that the site supervisor or safety officer conducts an inspection before starting work and on a daily basis to confirm that the excavation is free from hazards.
5. Confirm the presence of a stable and clearly marked access and exit point for the excavation to allow easy movement of workers, especially for excavations that are 1.2 meters (4 feet) deep or more.
6. Make sure that warning signs are placed to alert drivers if there is traffic movement near the excavation area.
7. Ensure that reflective and illuminated warning lights or signs are placed for traffic visibility during nighttime operations.
8. Prevent sand or stones from falling into the excavation by covering it at the end of daily work if necessary.

Excavation Hazards:

1. Soil collapse.
2. Oxygen deficiency inside the excavation.
3. Workers falling while entering or exiting the excavation due to the absence of a stable, reinforced, and suitable access/egress point.
4. Exposure to toxic gases within the excavation.
5. Exposure to insects or reptiles.
6. Failure to verify underground utilities before excavation—such as electrical cables, sewage lines, and telephone conduits—may result in accidental contact or damage, creating significant hazards to workers' safety.
7. Tripping over equipment or excavation debris due to not removing them.

Some Causes of Excavation Collapse:

1. Not using supports on the sides of the excavation.
2. Using unsuitable supports.
3. Using supports with defects.
4. Not moving excavation debris to a safe distance of at least 2 feet from the excavation edges or removing it completely.
5. Changes in weather conditions.
6. Not verifying the soil type and not applying the necessary sloping.
7. Not ensuring a safe distance when using and operating heavy equipment near the excavation, which must be positioned at least 6 feet away from the edges.

Excavation Protection Systems:

There are three basic protection systems in excavation work that prevent soil collapse inside excavations and help make them safer for workers. Each system is used depending on the soil type in the work area, as follows:

1. Sloping or benching systems.
2. Side support (shoring) systems.
3. Shielding systems.





Types of Soil:

There are multiple types of soil, and knowing them helps determine which basic protection system should be used in excavation work—such as sloping, shoring, or shielding—to prevent soil collapse. OSHA’s standard classifies soil into a simplified system consisting of four groups:

1. Stable Rock:

It is defined as a natural solid mineral that can be excavated with vertical sides and remains intact for the entire period it is exposed. Examples include granite and sandstone.

2. Type A Soil:

Cohesive soil with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater.

3. Type B Soil:

Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf.

4. Type C Soil:

Cohesive or granular soil with an unconfined compressive strength of 0.5 tsf or less. Examples include gravel, sand, submerged soil, or soil from which water freely flows.

Soil Testing and Identification:

There are several tools and methods used to test soil and identify the dominant types in work areas. These tests help determine the appropriate excavation protection system to use. Among these methods are:

1. Pocket Penetrometer:

It provides a direct reading. It is a spring-operated device used to determine the unconfined compressive strength of saturated cohesive soil. Once inserted into the soil, the gauge gives an immediate reading.

2. Visual Test:

If the excavated soil appears in the form of lumps, it is considered cohesive. If it breaks easily and does not remain in lump form, it is considered non-cohesive.

3. Thumb Penetration Test:

The method involves pressing the thumb firmly into the soil sample.

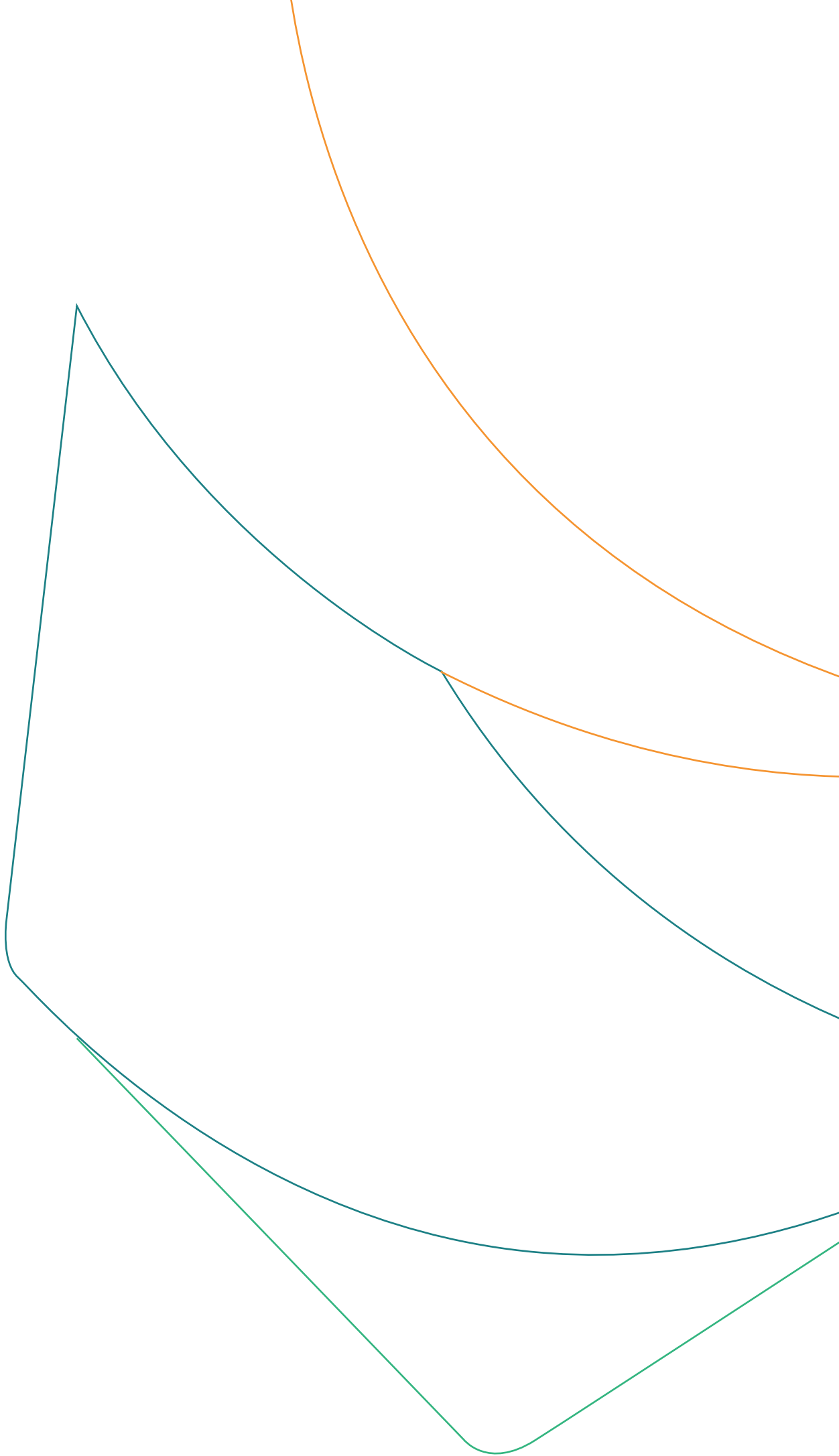
- If a deep indentation forms with difficulty, the soil is likely Type A.
- If the thumb penetrates to the depth of the thumbnail, the soil may be Type B.
- If the thumb penetrates to the full length of the thumb, the soil is likely Type C.

4. Dry Strength Test:

Try to crumble the soil sample in your hands using your fingers. If it breaks into grains, it is granular soil. Silt or clay will not break into grains but may crumble into thick chunks.

5. Wet Manual Test:

Moisten your fingers and knead the sample. Silt becomes a slippery paste when wet, indicating cohesive soil. If the soil breaks into grains, it is granular (granular soil).





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