IOTA
ENGINEERING AND CONSTRUCTION LTD

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## SAFE WORK PRACTICES IN SUBSTRUCTURE WORKS.

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# SAFE WORK PRACTICES IN SUBSTRUCTURE WORKS

## Areas of focus

1. Excavation types, hazards & risk control & management
2. Cost of Excavation safety

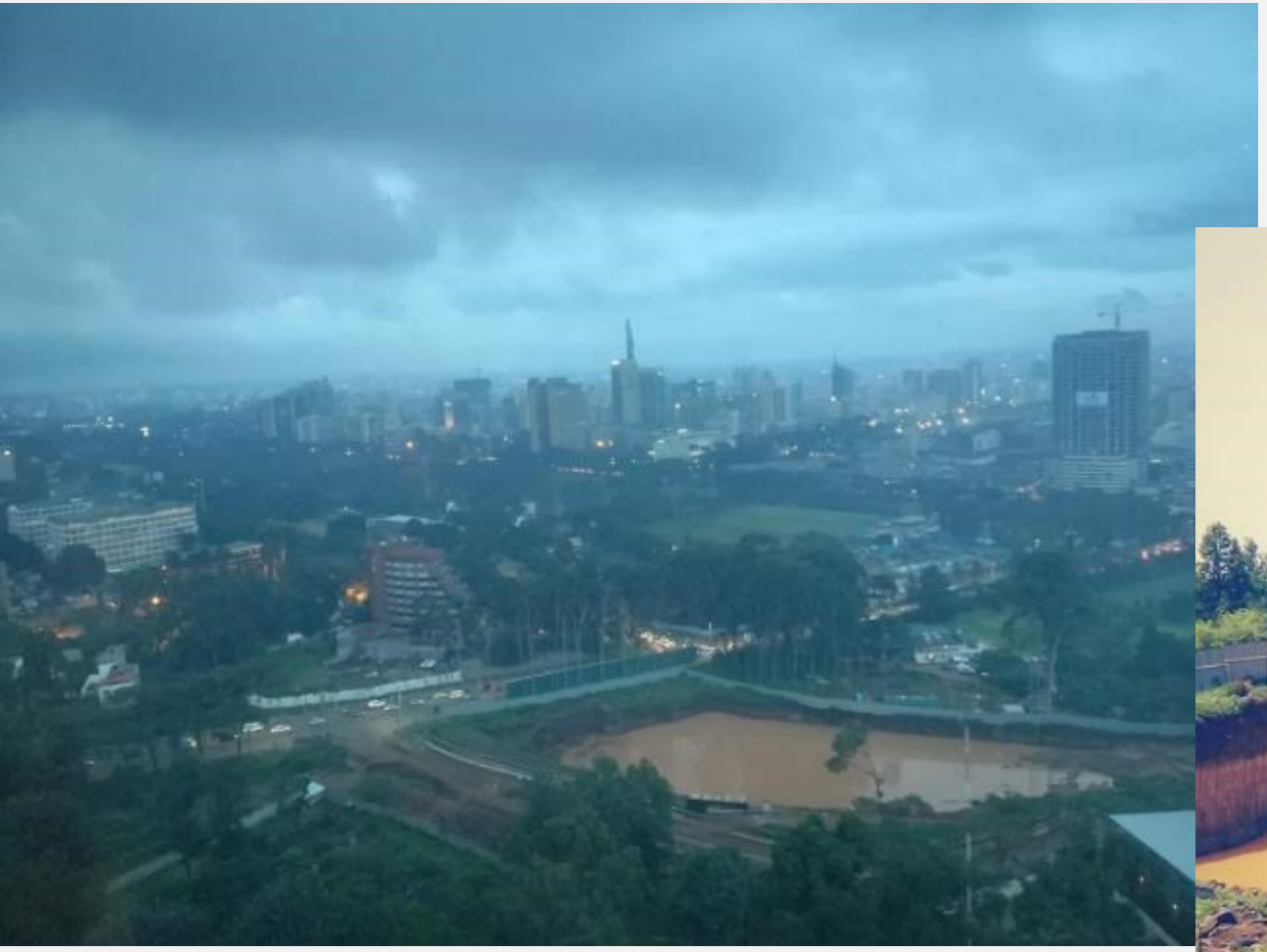
# EXCAVATION HAZARDS, RISK CONTROL & MANAGEMENT

## Common excavation types

1. Trench excavations
2. Deep & large basement & pit excavations

## Trench & Basement Excavation Hazards and risks:

- Collapse of excavations
- Falls and falling objects
- Excavated material or other objects falling on workers
- Exposure/injury to underground services or overhead services
- Influence of adjacent structures
- Incidents involving vehicles and other mobile equipment
- Water inrush
- Risks of working in confined spaces
- Safe access for people and mobile equipment



**Water inrush and unprotected slopes**

Trees’ falling hazards/ risks

# Collapsed excavated sites

## Structures collapse into excavated sites

## Structures collapse into excavated sites

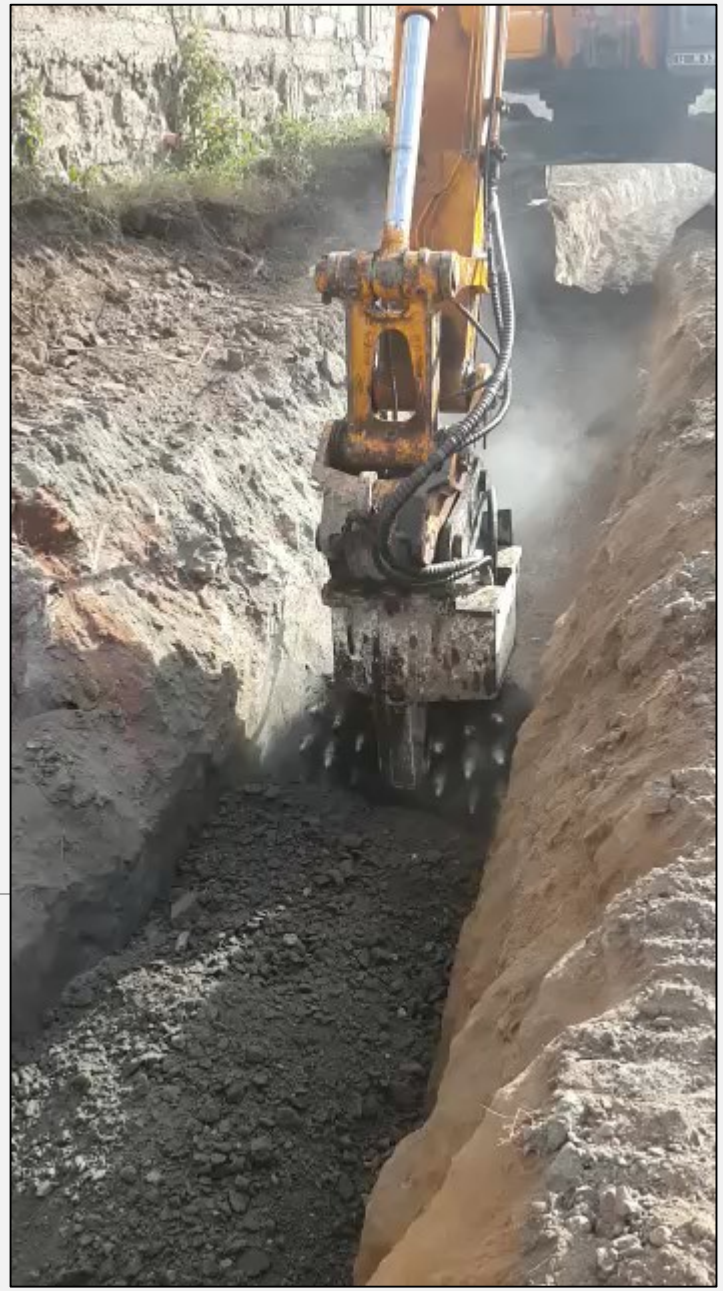
# Common Excavation types

## 1. Trench excavations

# Common Excavation types

Trench excavations (Deep)

**Trench excavations (seeking to maintain excavation walls integrity for safety)**



**Rock trenching for Sewerage and foul water drainage Works Near a railway line.**

# Excavation types

## 2. Deep & large basement excavations

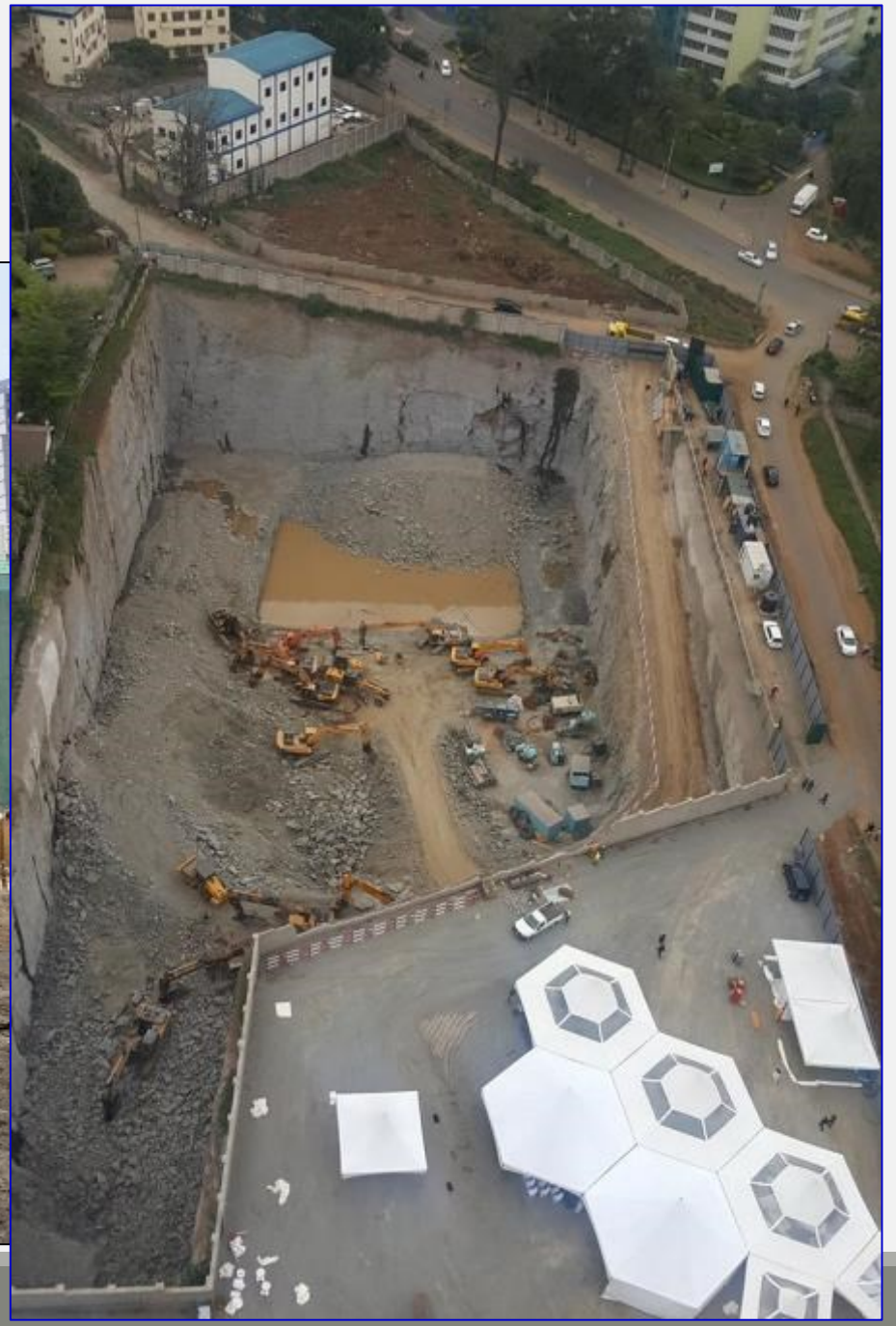
# Excavation types

## 2. Deep & large basement excavations cont'd


24m deep

# Excavation types

## 2. Deep & large basement excavations cont'd

# Control measures for Excavation collapse

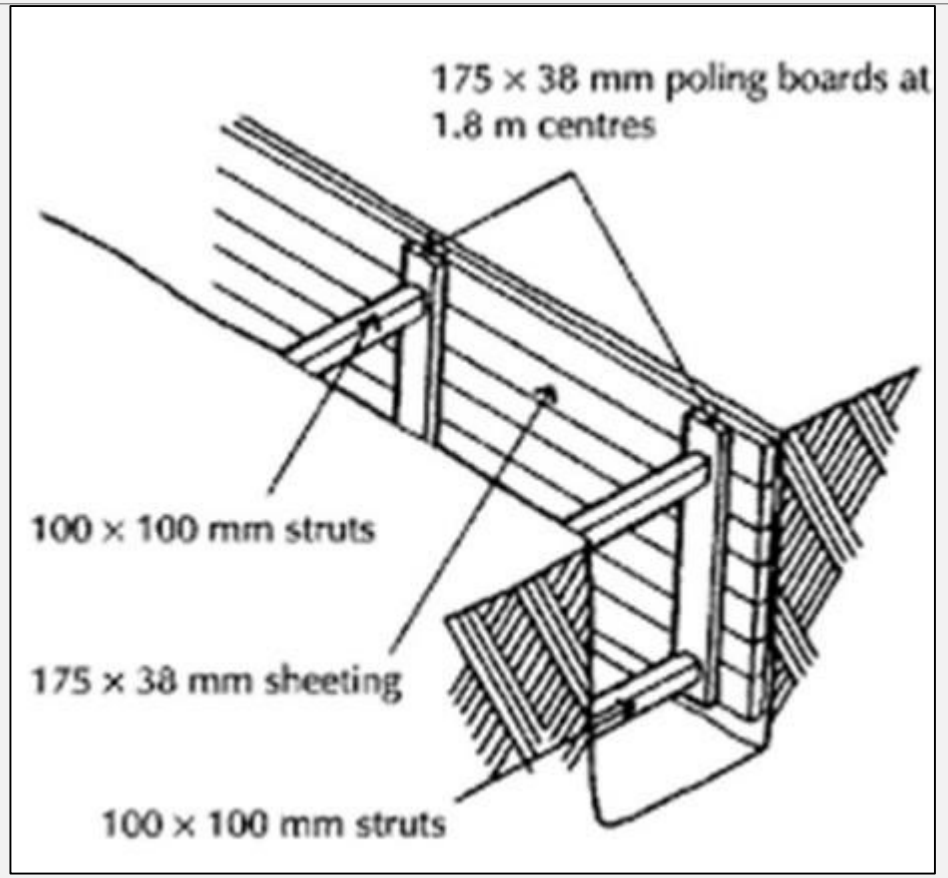
## 1. Shoring

Common shoring methods include:

- Planking & strutting
- Battering
- Soldier Piles and timber laggings
- Soldier piles and anchors/soil nails and shotcrete membrane
- Soil Nails and Shotcrete
- Sheet piles
- Contiguous Bored Piles/Secant Piles
- Sheeting & bracing
- Rock bolting

# 1. Planking & strutting – Shallow trenches

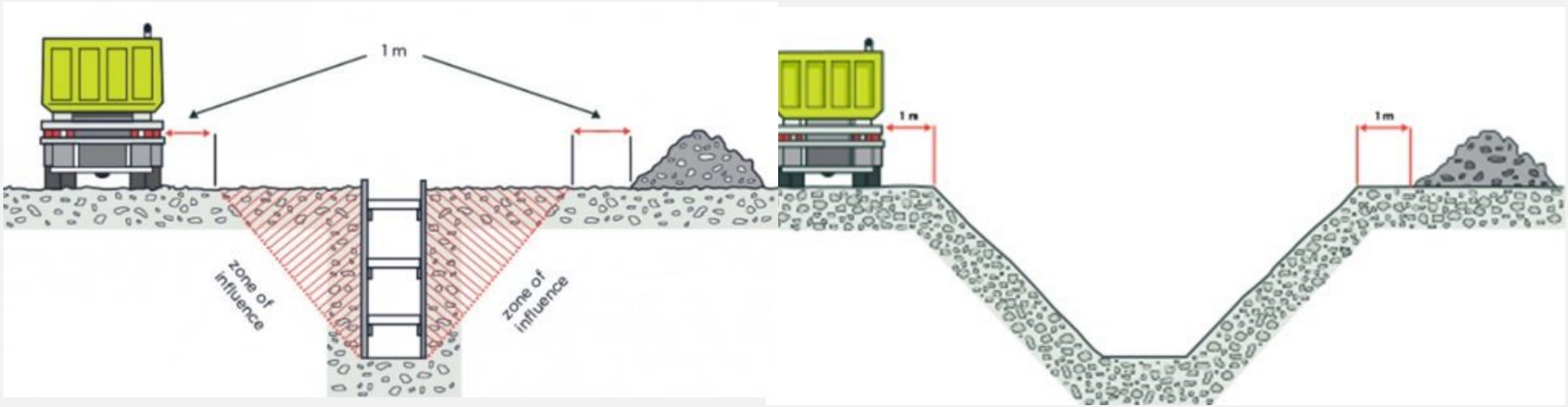
Normal for Stable grounds




Typical Plunking & strutting detail for unstable grounds

# 1. Planking & strutting – Trenches

# 1. Battering sides of excavations




Typical detail for Battering sides of deep trench excavations

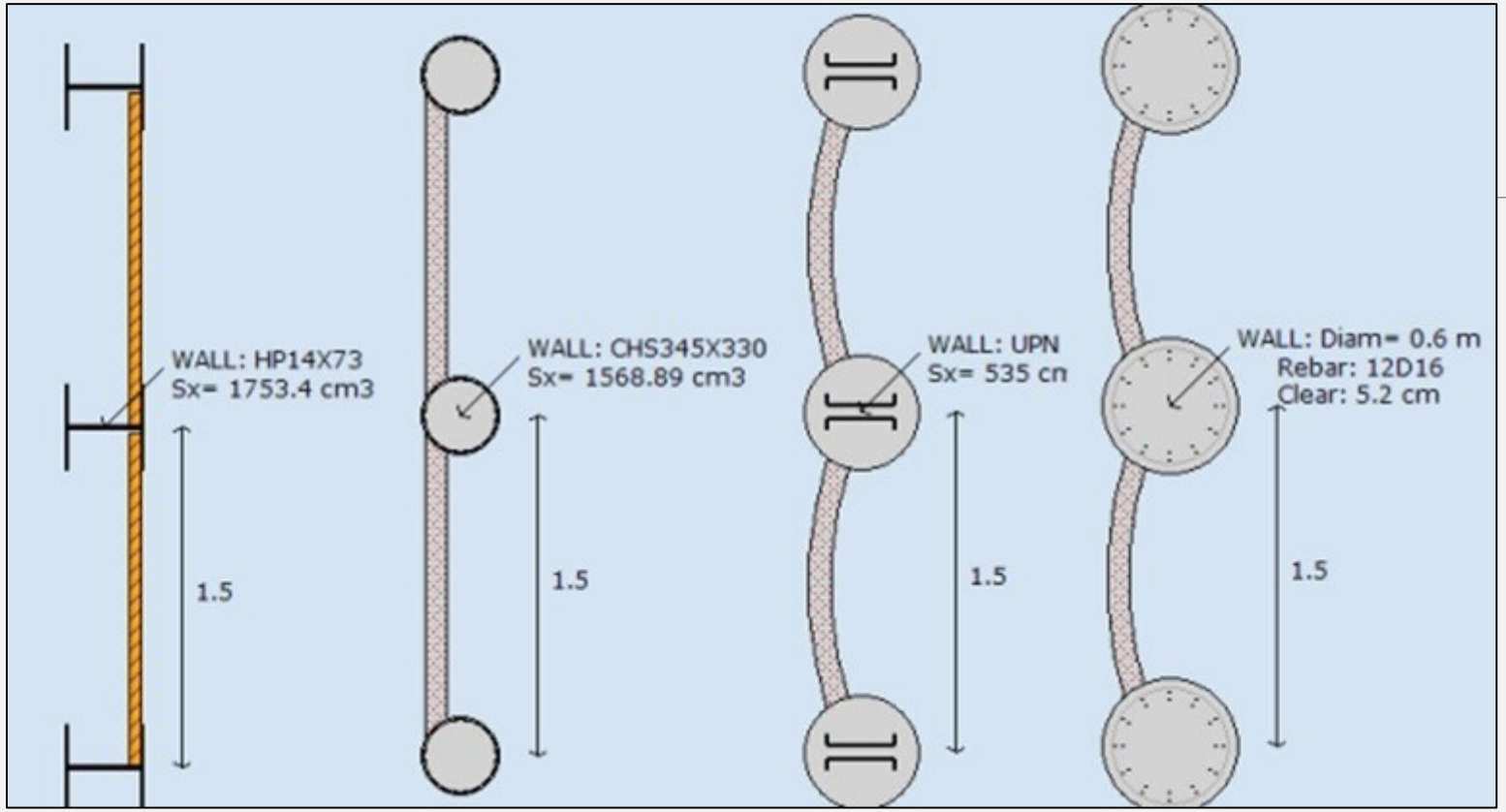
# Battering sides of excavations

Battered sides of excavated deep trenches & basements

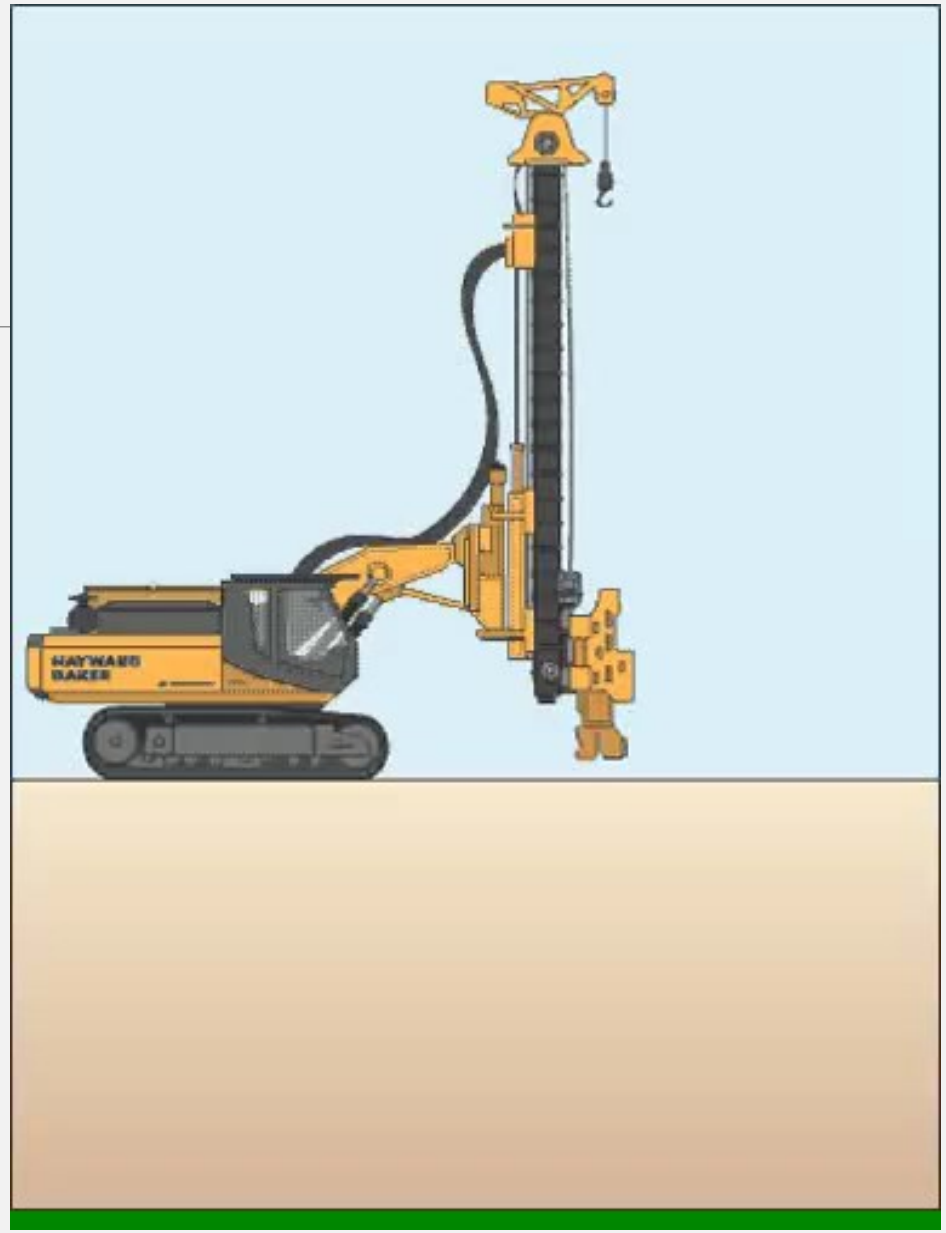
# Battering sides of excavations

Battered sides of excavated deep basements

# Soldier Piles




Typical example of various types soldier piles layouts



# Soldier Piles

Anchored Steel pipe Soldier piles with a capping beam

# Soldier Piles and Timber Laggings


I-Beam soldier piles anchored with sanchors

# Soldier Piles and Timber Laggings

I-Beam soldier piles with timber laggings

# Soldier Piles and Timber Laggings

I-Beam soldier piles and timber laggings

# Soldier Piles and Timber Laggings

Soldier piles, timber laggings & shotcrete

# Soldier Piles


Reinforced concrete soldier piles

# Soldier piles and reinforced shotcrete

Soldier piles and reinforced shotcrete

# Soldier piles and reinforced shotcrete

Soldier piles and reinforced shotcrete

# Soldier piles and reinforced shotcrete

Soldier piles and reinforced shotcrete

# Soldier piles and reinforced shotcrete a robust lateral support mechanism

Soldier piles and reinforced shotcrete

# Soldier piles and reinforced shotcrete

Soldier piles and reinforced shotcrete

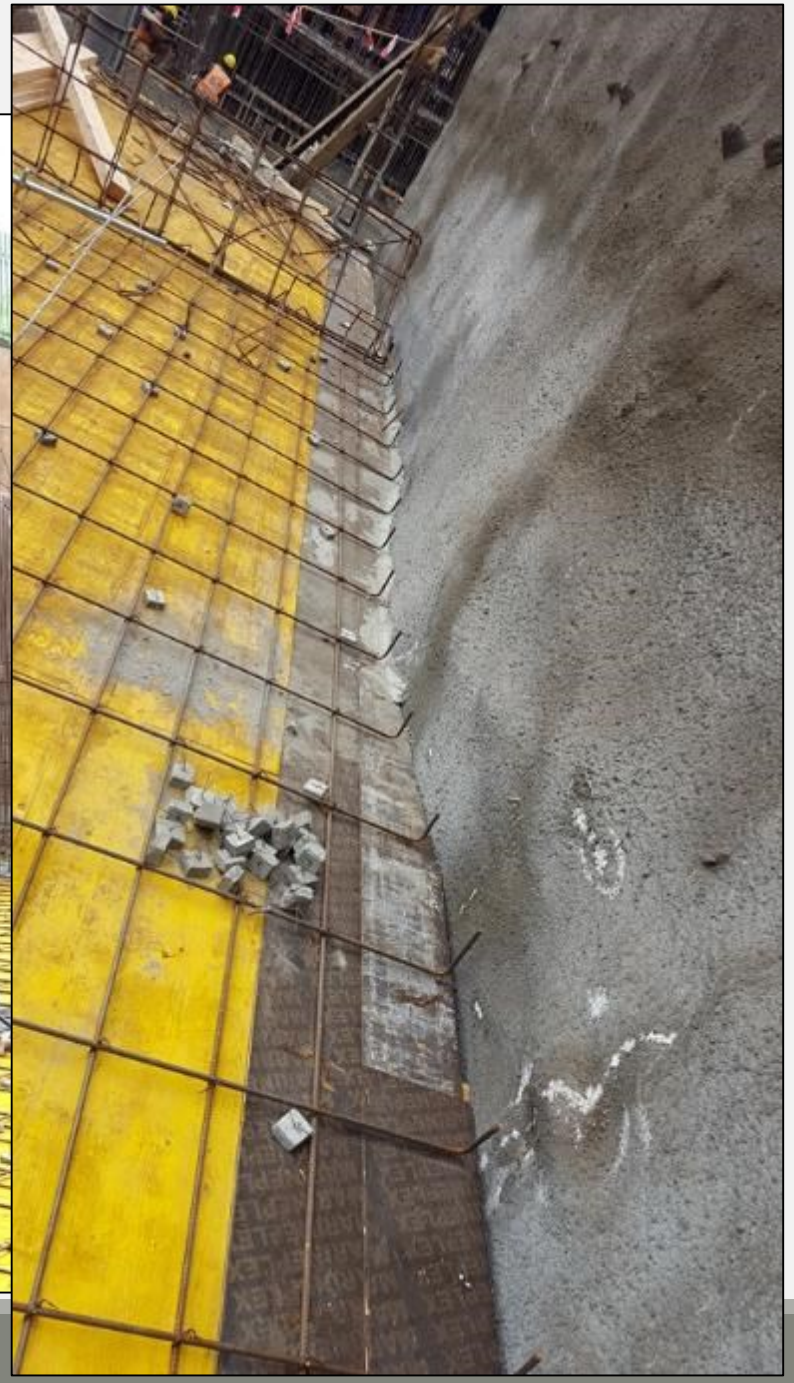
# Soldier piles and reinforced shotcrete

Soldier piles and reinforced shotcrete

# Soldier piles and reinforced shotcrete

Soldier piles and reinforced shotcrete permanent retaining wall. Note the battered slopes

# Soldier piles and reinforced shotcrete



# Soil Nails and Shotcrete

Soil nails and reinforced shotcrete

# Soil Nails and Shotcrete

Soil nails and reinforced shotcrete

# Soil Nails and Shotcrete


Soil nails and reinforced shotcrete

# Soil Nails and Shotcrete

Soil nails and reinforced shotcrete

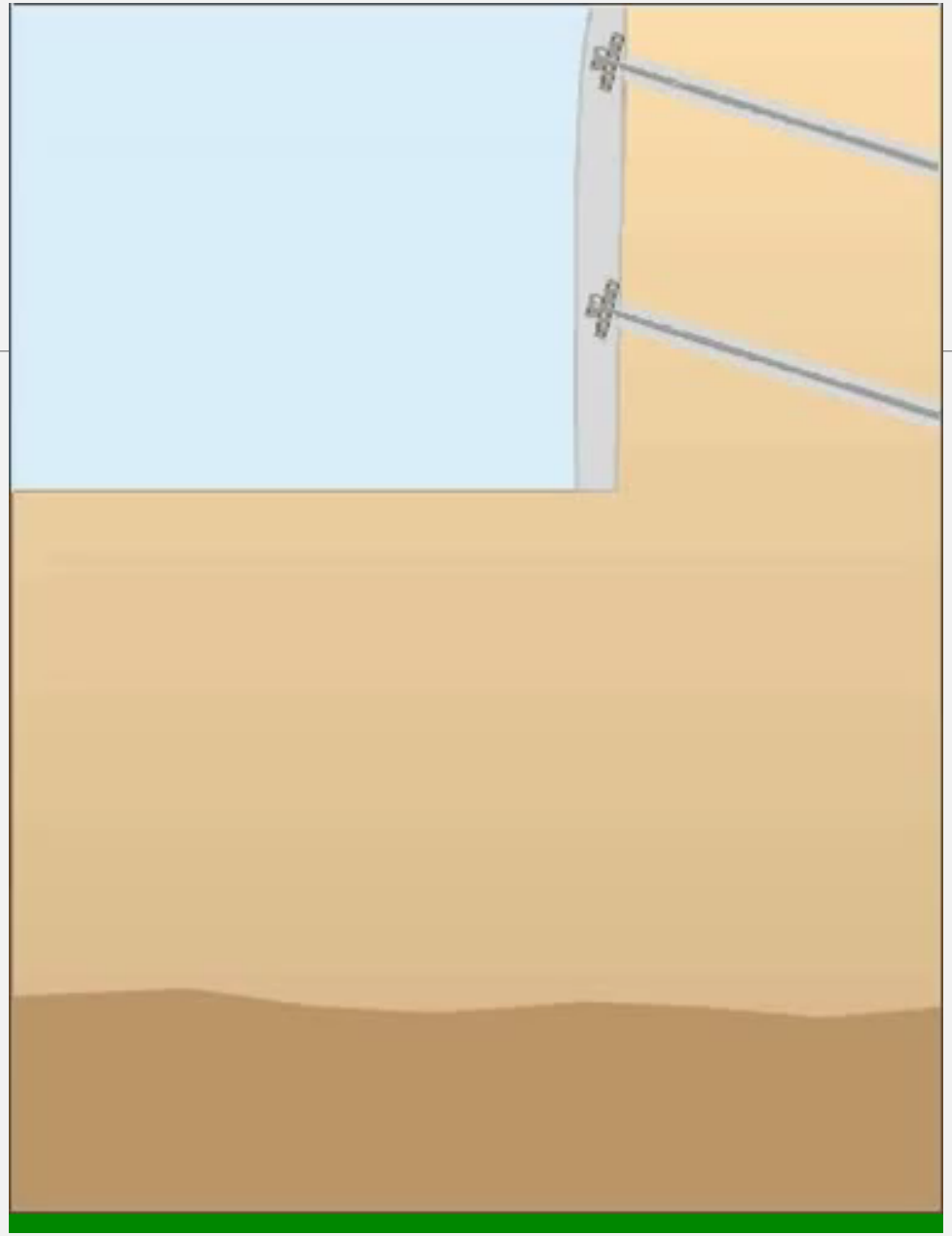
# Soil Nails, anchors  and Shotcrete membrane

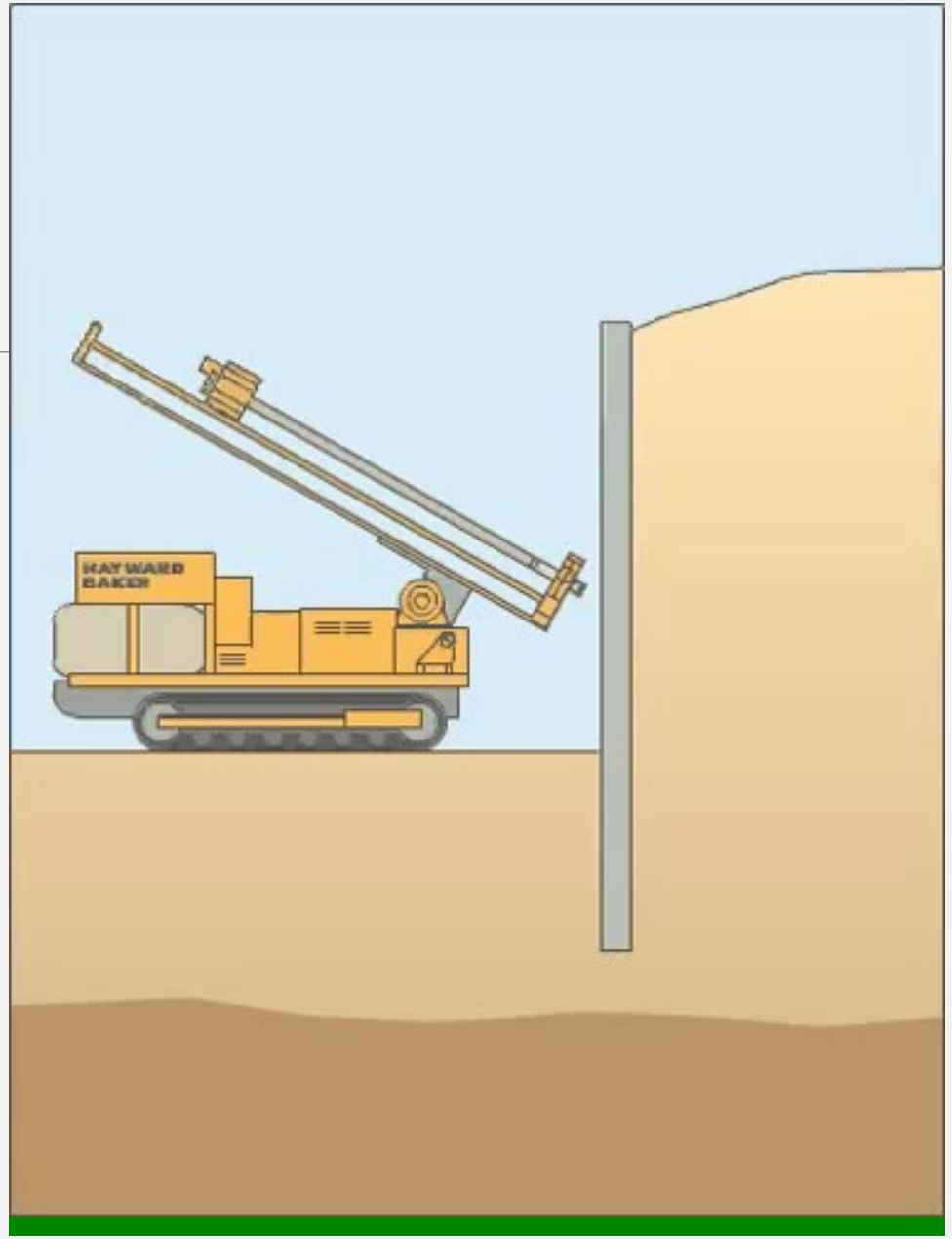
Soil nails and reinforced shotcrete

# Soil Nails and Shotcrete

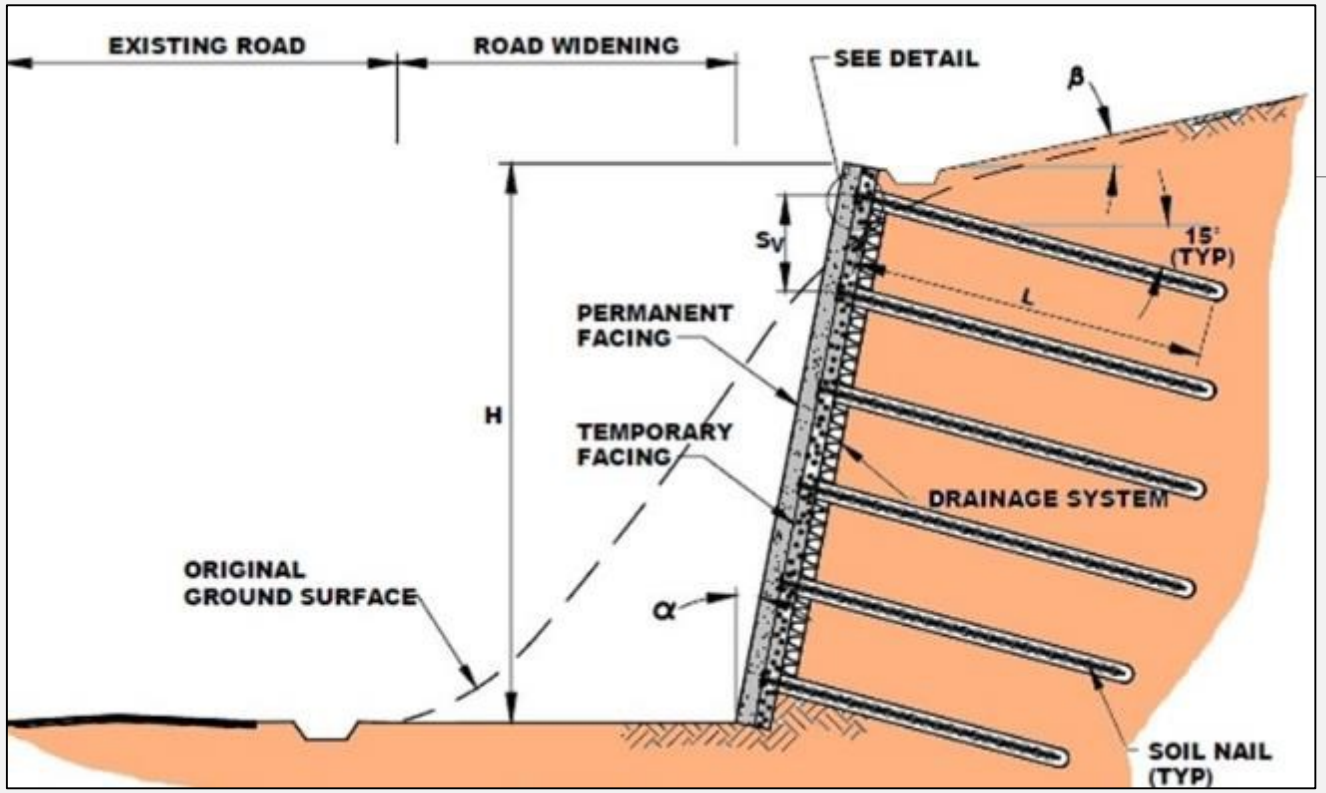

Soil nails and reinforced shotcrete

# Anchors & Soil nailing

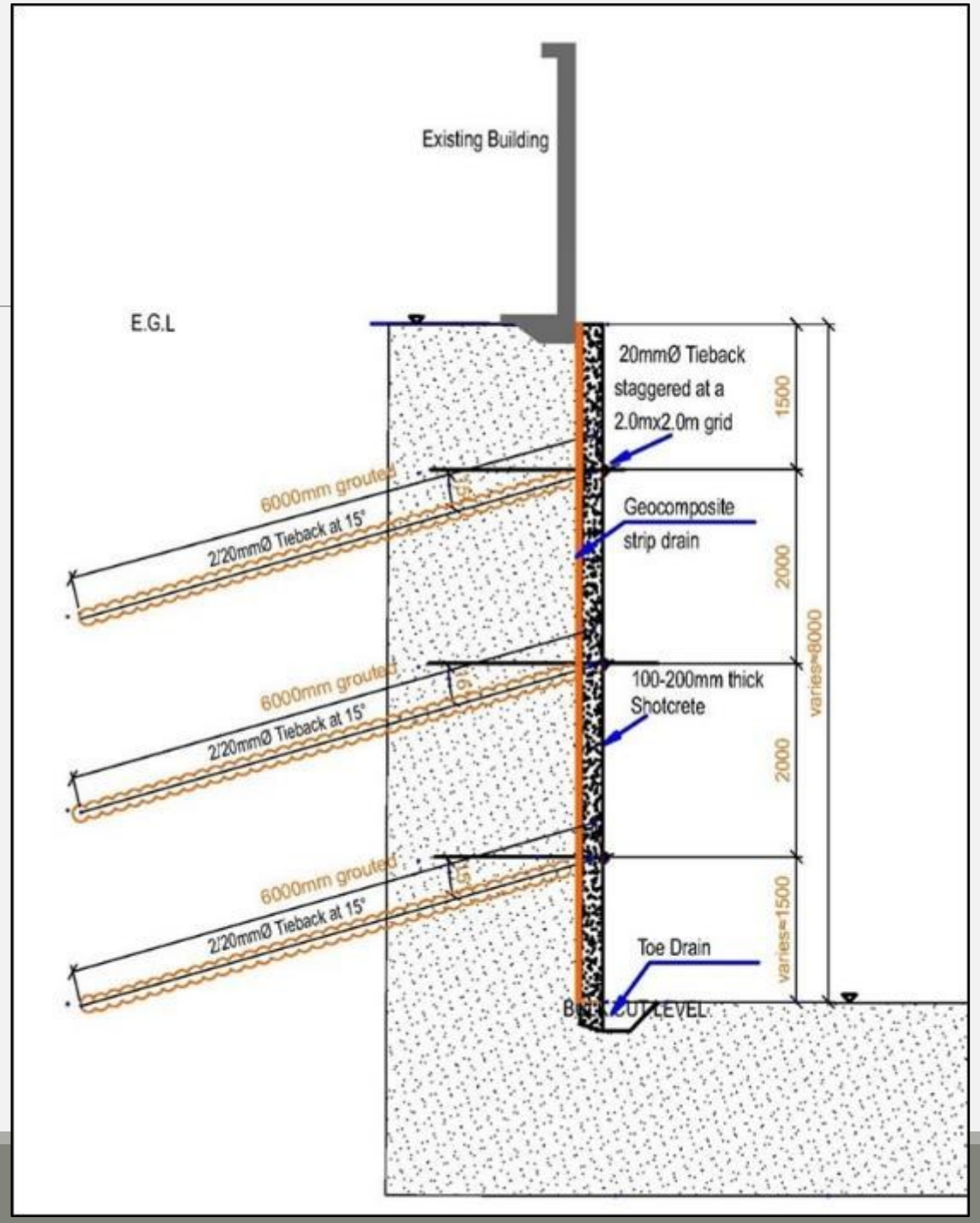




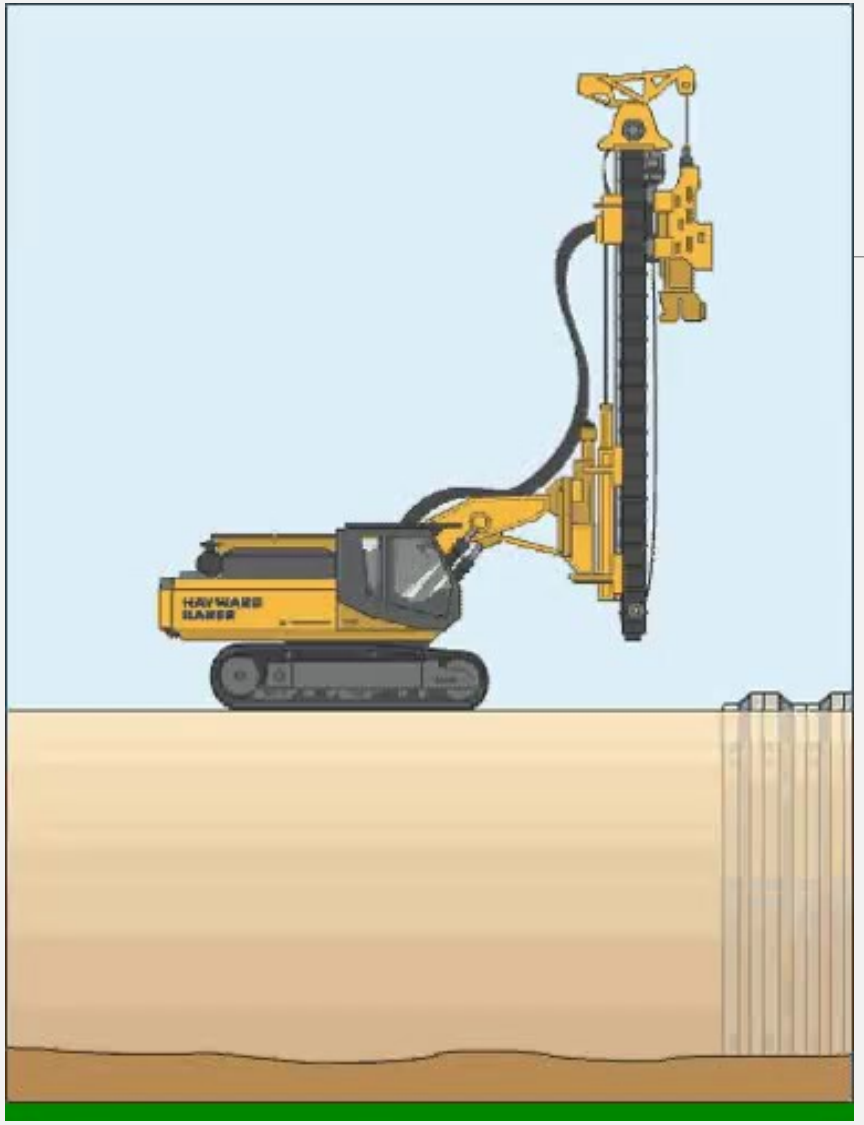
# Soil nailing




Soil nails



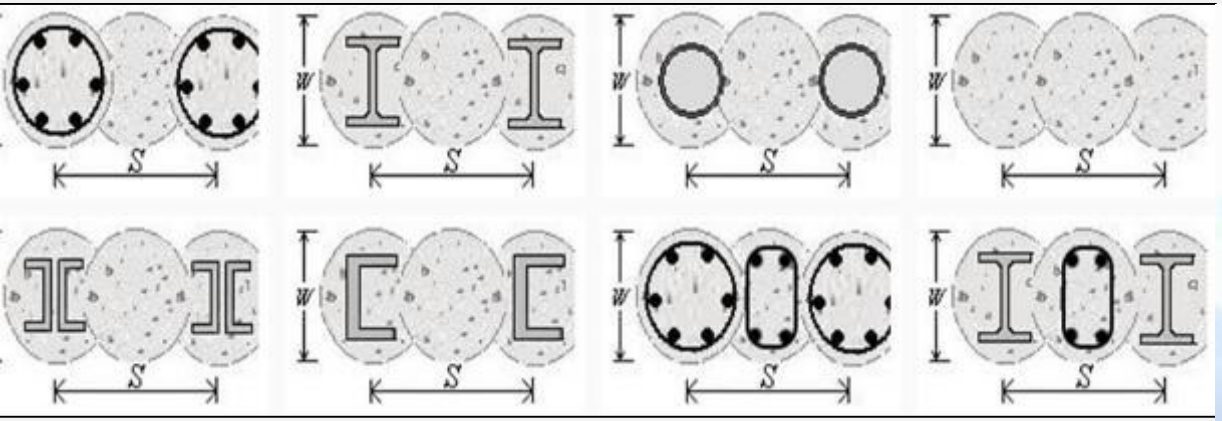
# Sheet piles

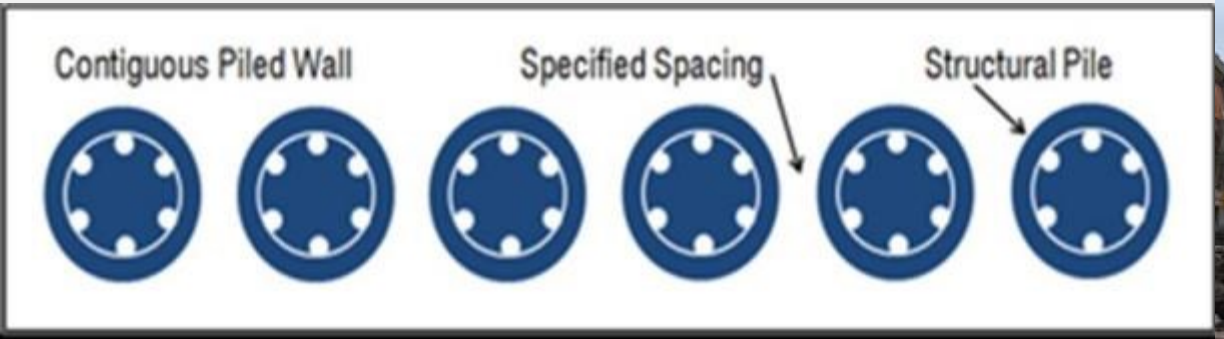


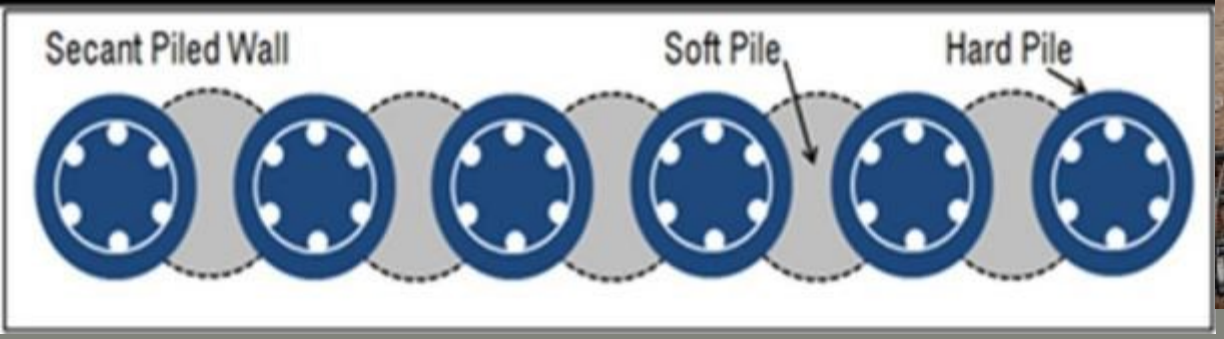
# Sheet piles

Sheet piles

# Contiguous Bored Piles / Secant Piles




# Contiguous Bored Piles / Secant Piles

Secant piles with a capping beam

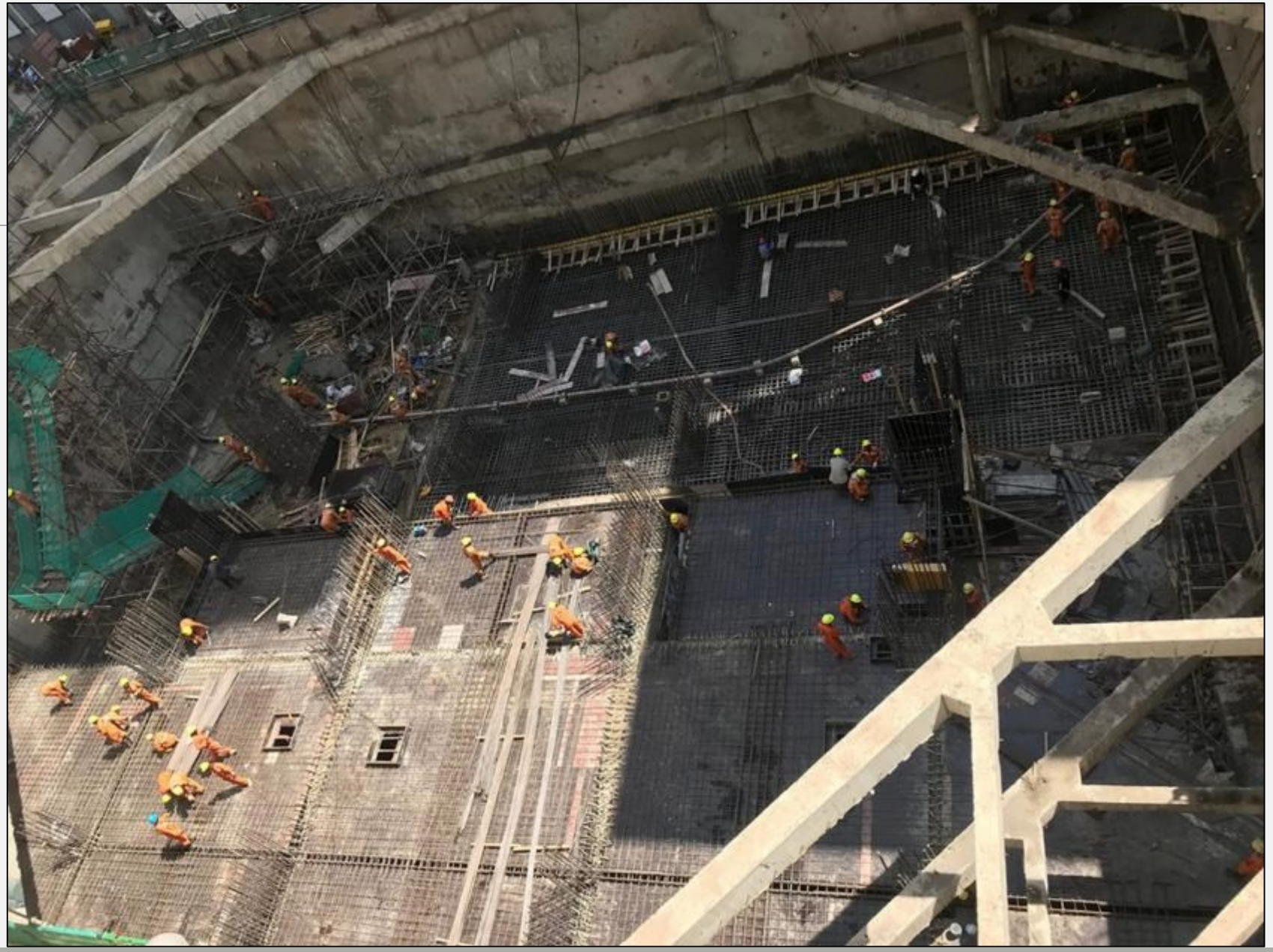
# Contiguous Bored Piles / Secant Piles

# Braced sheet pile walls

# Shoring & bracing system

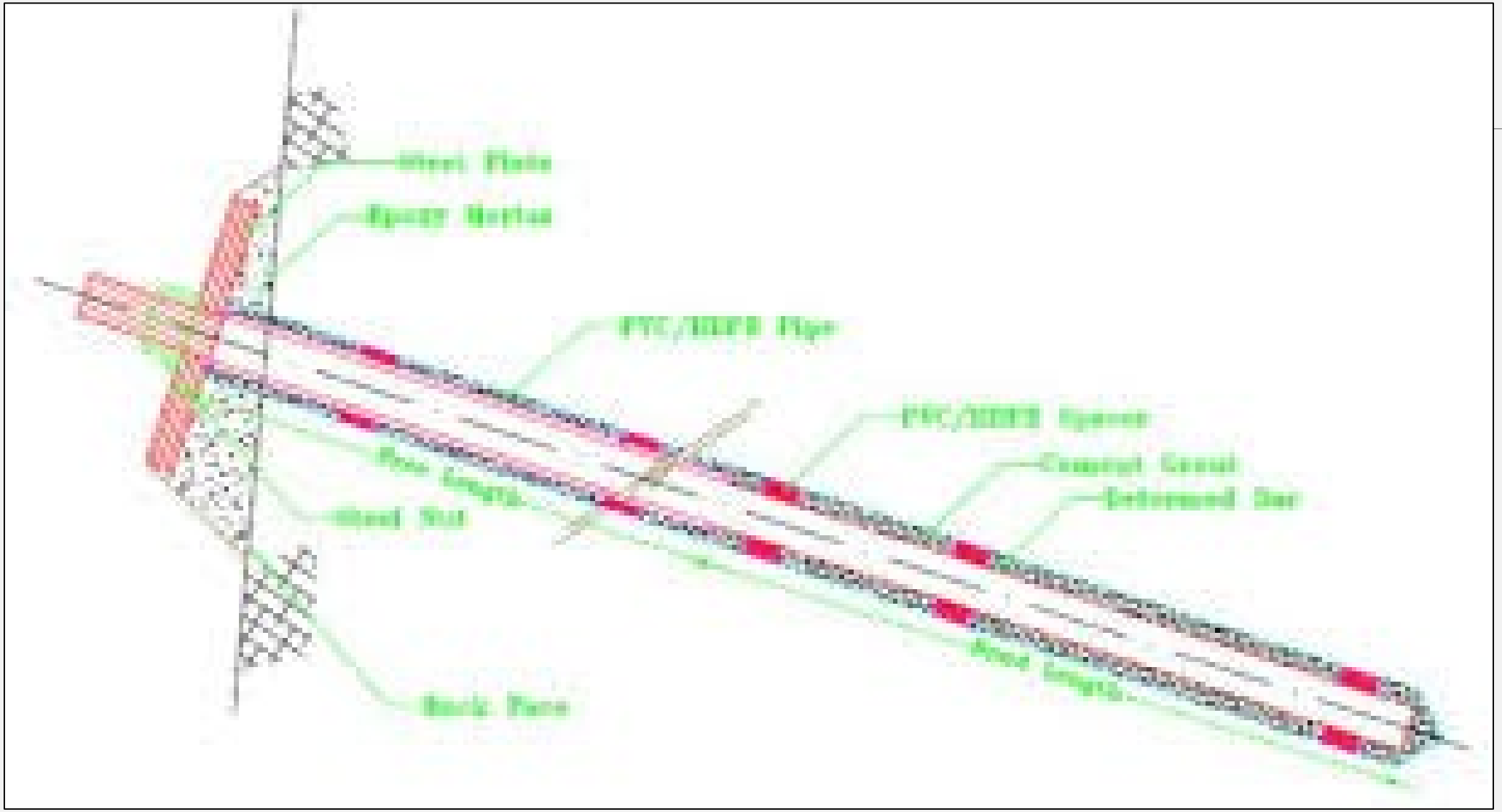
Central Bank Pension Towers

# Shoring & bracing system

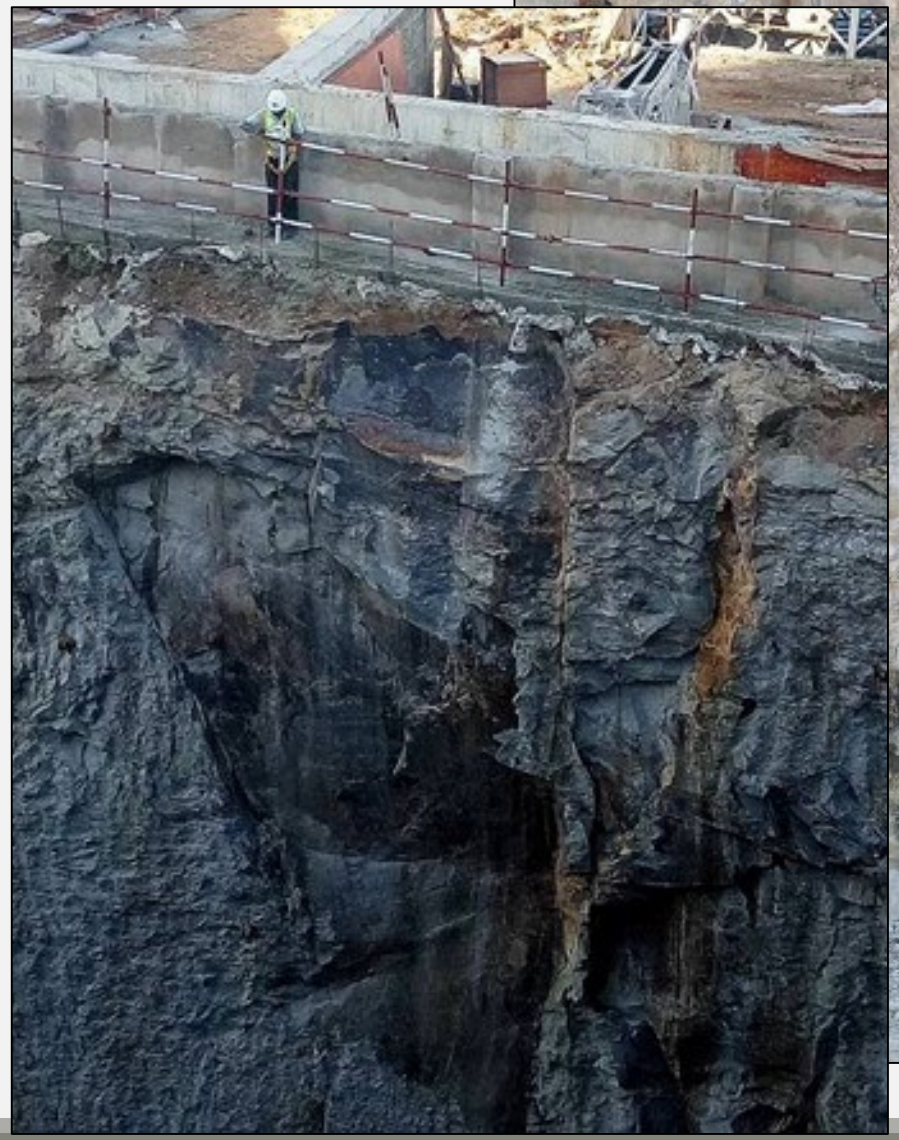


# Shoring & bracing system

# Rock bolting



# Rock bolting



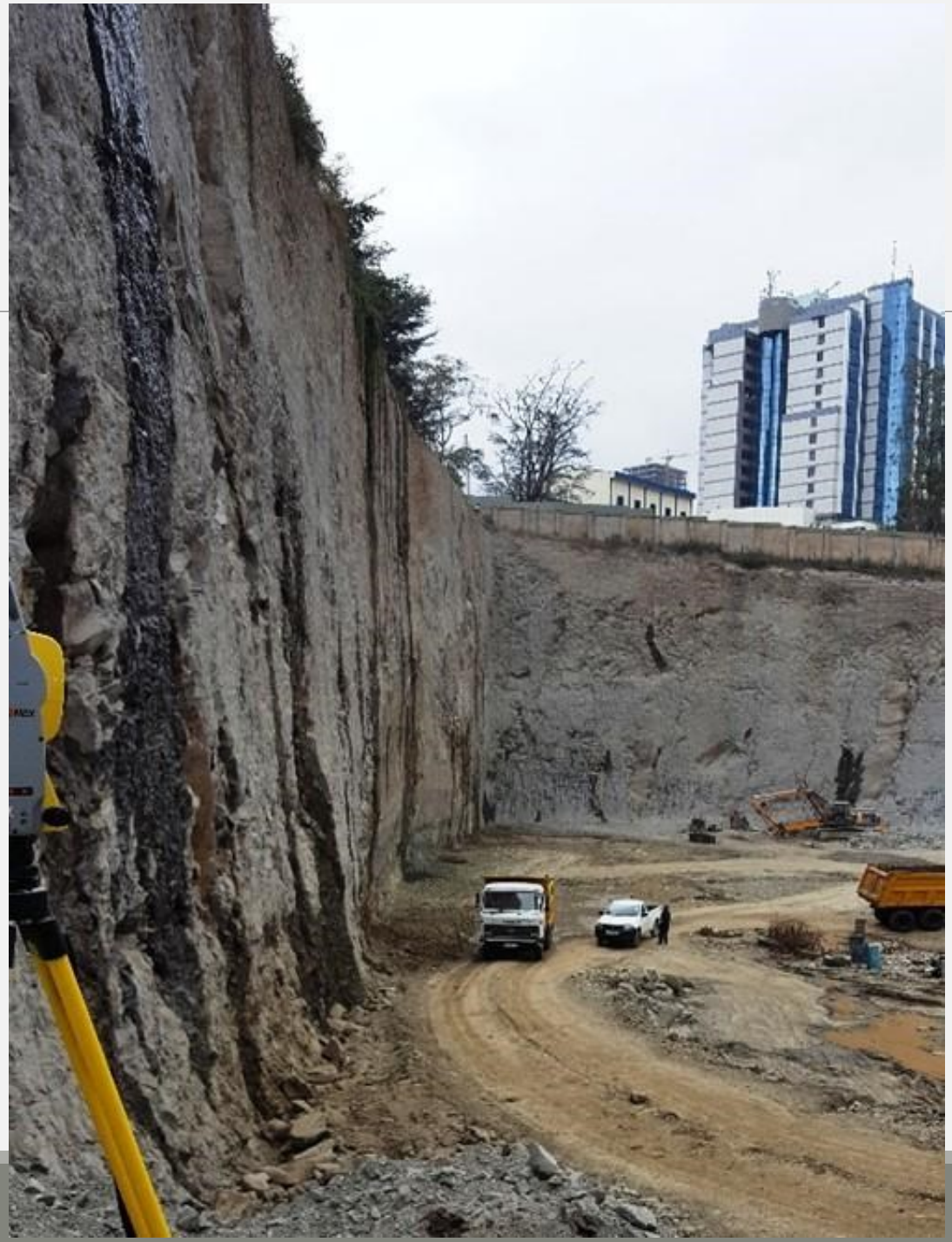
Marking of drilling points

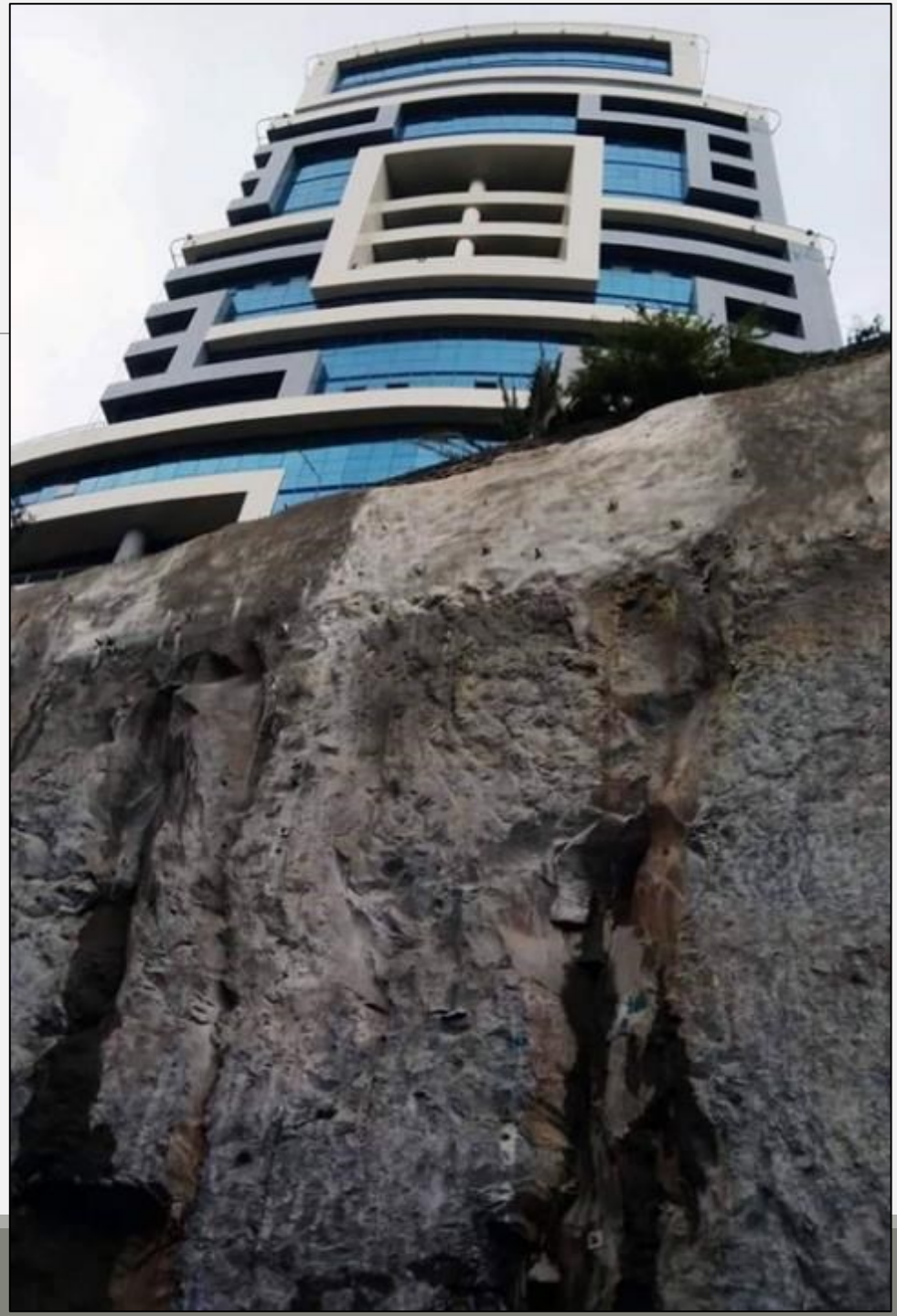
# Rock bolting

Drilling

# Rock bolting

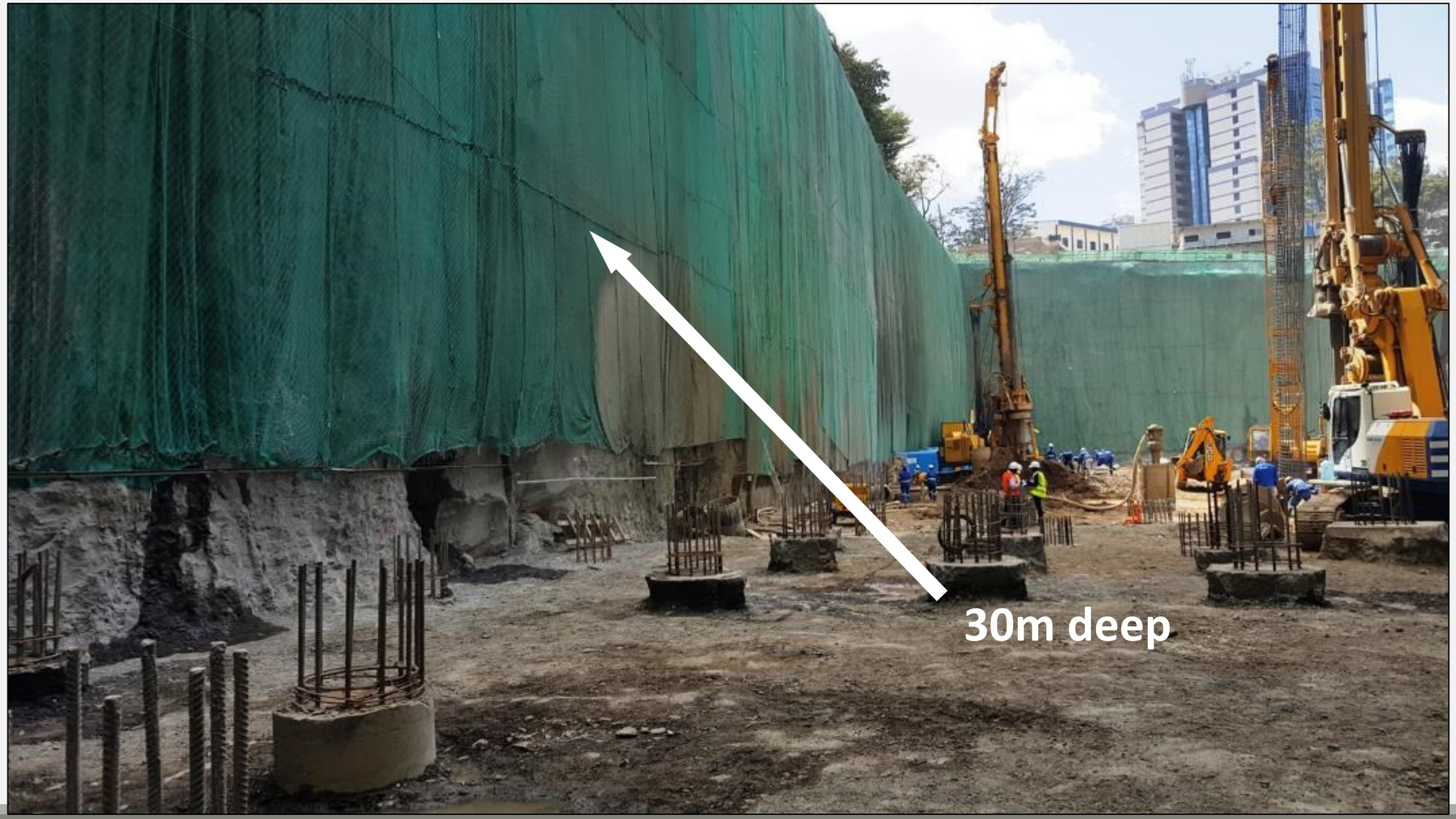
To prevent falling boulders





# Rock netting

To prevent falling boulders



# The Cost Of Ensuring Excavation Safety

- Cost of compliance to the regulating bodies
- Cost of purchasing the PPE equipment
- Cost of setting up a health and safety compliant site
- Cost of hiring a qualified health and safety officer, etc
- Cost of safety barriers, access
- Cost of dewatering
- Cost of lateral support equipment and material in the shoring systems

However the cost of non compliance is even more expensive and life claiming, hence the need for a budget towards compliance to be incorporated into the building cost.


THANK
YOU!