

MODULE CODE: M4X01858
TITLE: Civil Engineering Technology 1
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LEVEL: 4
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JACS CODE: K210
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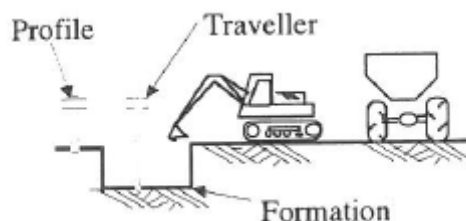
Date: 15.10.2018 (2)

2 Excavations

- 2.1 Confined Excavations
- 2.2 Deep or Battered Excavation
- 2.3 Open or Bulk Excavation
- 2.4 Rock Excavation
- 2.5 Earthmoving Calculation

2.1 Confined Excavations

- 360° Excavators (back-hoe)
- Loading time
- Cycle time

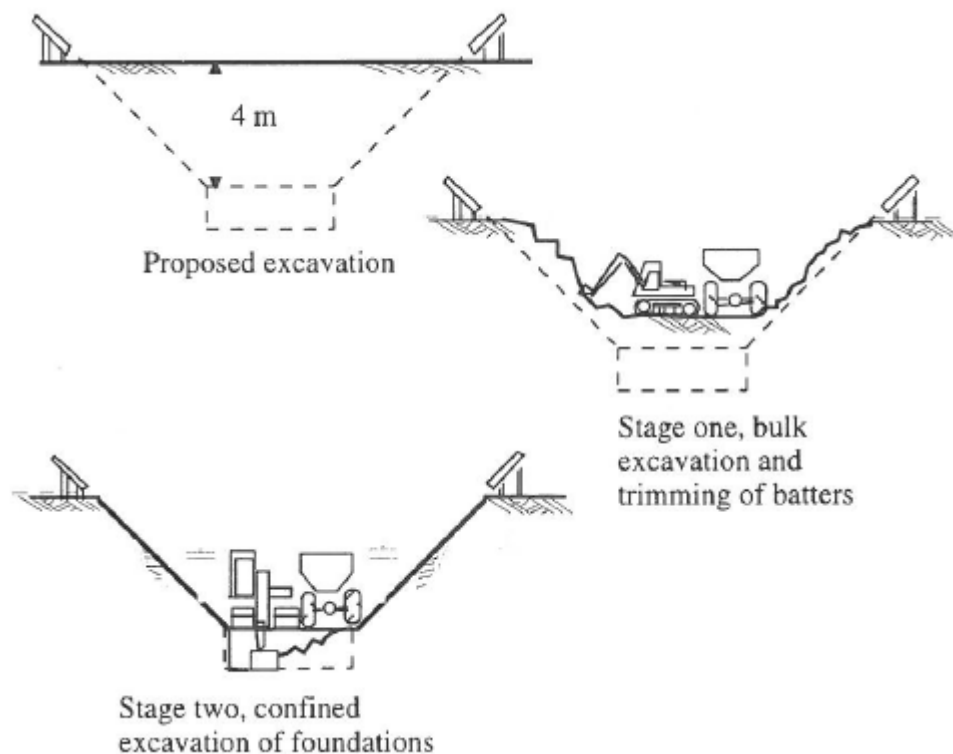


- Setting out
 - Sand (paint) lines,
 - Profile boards
 - Travellers
- Formation level

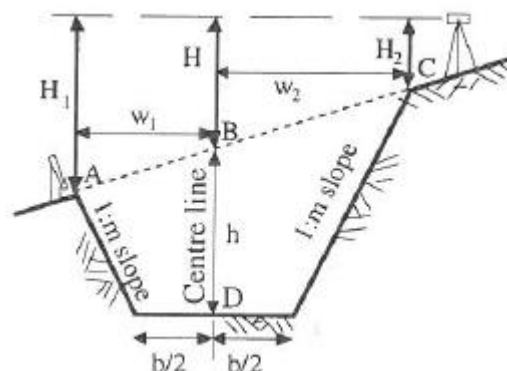
2.2 Deep or Battered Excavations

- Needed when deep and/or soil needs to be stabilized against collapse
- Batter = slope of the excavation, usually described as 1-in-2 (= for 2 metres horizontal travel the slope rises by 1 metre)
- Slope will vary depending on the soil type being excavated

- Could be cheaper than supporting the side walls with piles and props
- Disadvantages
 - Large earth moving operation required
 - Large land area required
 - Ramps needed to get the machinery in and out
- Also called an “open cast” excavation
- Two stages:
 - Bulk excavation up to the top of the confined excavation required
 - Confined excavation for the foundation

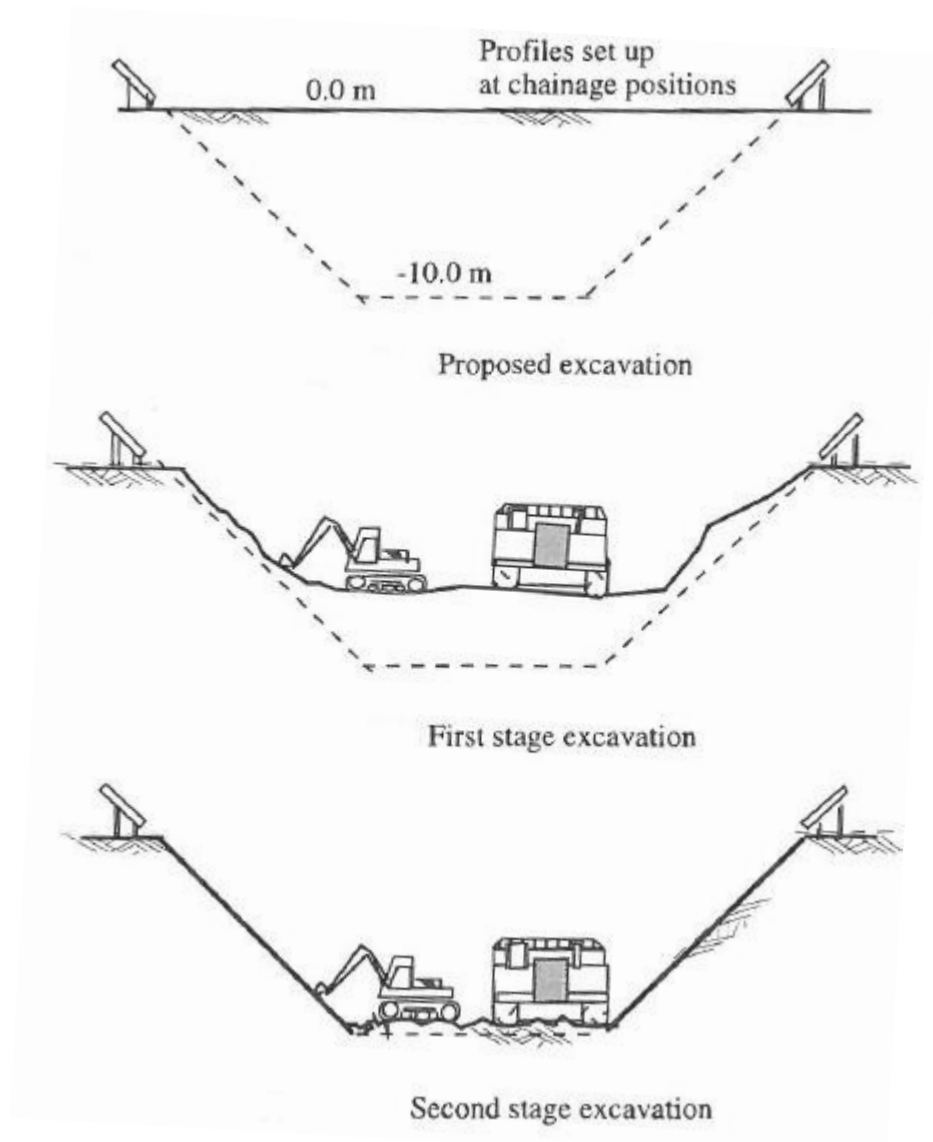


- Setting out
 - Batter rails, same angle as the slope
 - Slope distance written, banksmen measures that to determine the depth required
- Getting the setting out right



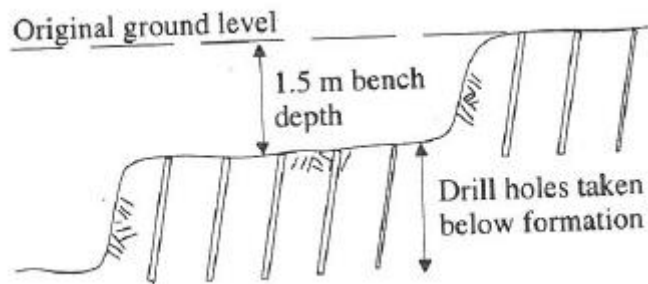
2.3 Open or Bulk Excavations

- Open excavations, carried out in two stages



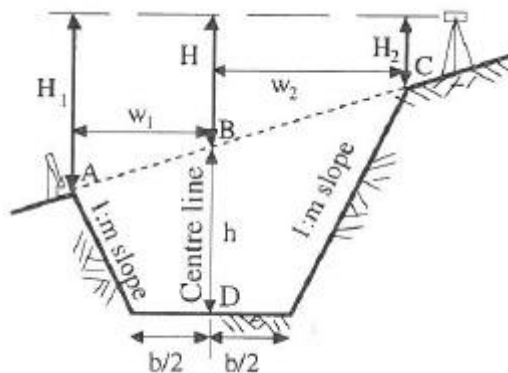
2.4 Rock Excavations

- Depends on the type of Rock
 - Weak rock – siltstone and mudstone – standard machinery
 - Hard rock – slate and sandstone – has to be ripped out (pneumatic breaker)
 - Very hard rock – granite – blast techniques (among others)
- Drilling and then driving plugs in or using the holes to freeze liquid inside to cracking the rock from inside
- Drill and blasting
 - Drilling a grid of holes
 - “charging” them with explosive, with the holes backfilled with sand/clay



- To achieve a regular surface use a secondary blast a few milliseconds delayed from the first

2.5 Earthmoving Calculation



$b = 3\text{m}$
 $h = 3\text{m}$
 $H_1 = 6\text{m}$
 $H_2 = 2\text{m}$
 $H = 4\text{m}$
 $m (\text{slope}) = 2$, that is (1-in-2)

1. Using the information provided, calculate w_1 and w_2 .
2. Use the dimensions provided and your calculated w_1 and w_2 to calculate the area shown in the cross-section
3. If the foundation required is 20m long, calculate the volume of earth to be moved with an assumed swelling of 16%. Assume the two end walls to be vertical.
4. If the earth is removed to create an embankment with a base width of 3m and a height of 0.75m, calculate the length of the embankment created with this soil. Assume an angle of repose of 30 degrees for the soil excavated.

References Used:

Warren, D.R., (1996), "Civil Engineering Construction Design and Management", MacMillan Press Ltd., ISBN: 9-780333636824