CHAPTER- 16

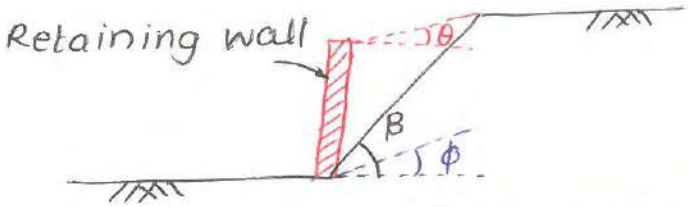
Retaining Wall

CONTENTS

16. Retaining Wall

16.1 Introduction:

Retaining wall is provided to retain earth at an angle steeper than angle of repose.



$\beta > \phi$ (Unstable)

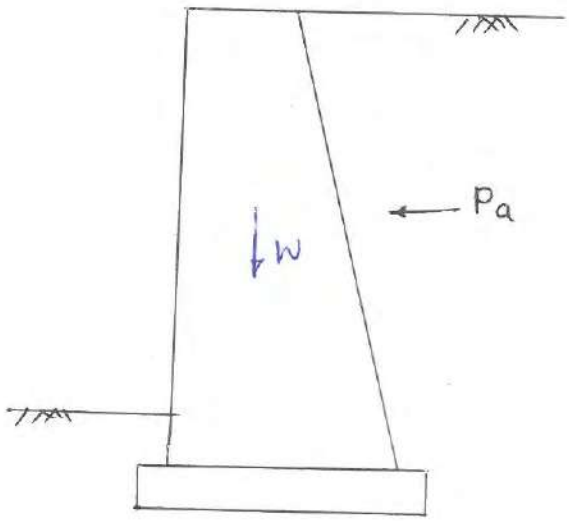
$\theta \leq \phi$ (Stable)

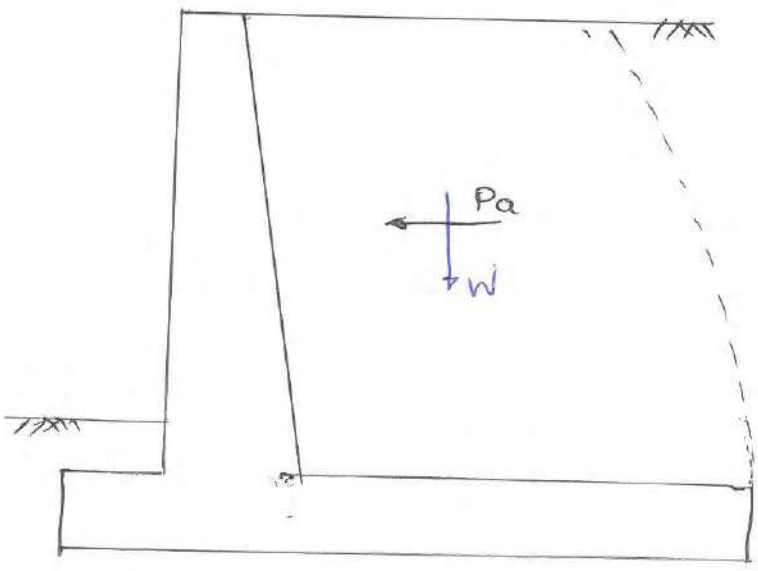
Where,

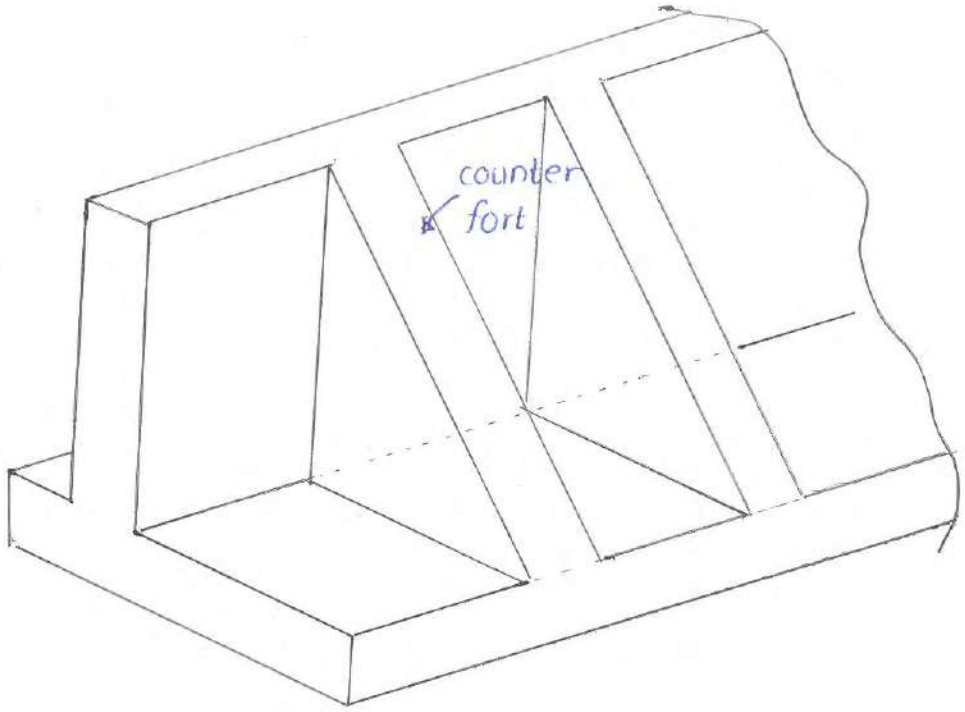
ϕ = Angle of repose.

16.2 Types of Retaining Wall:

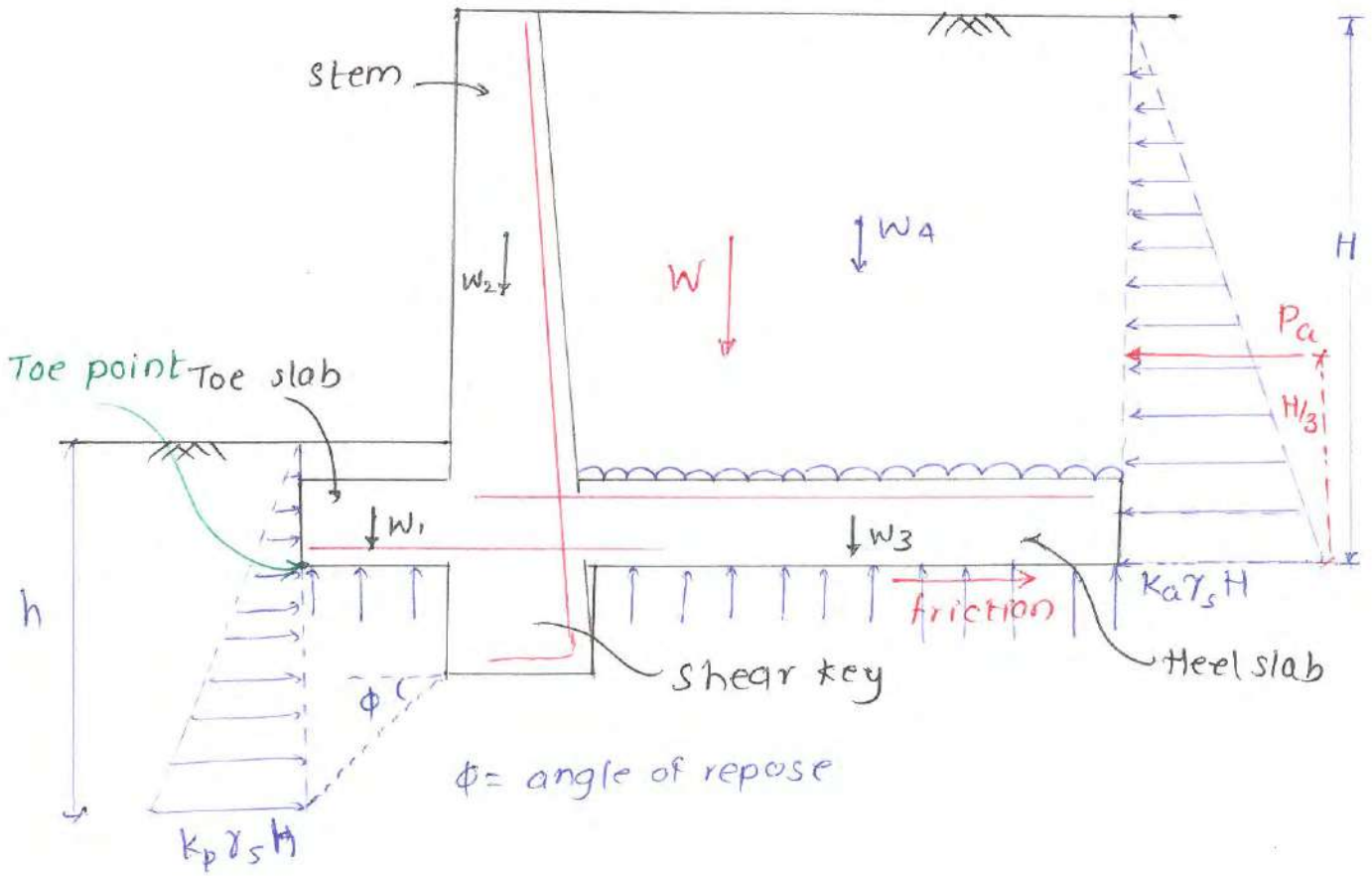
1. Gravity Wall
2. Cantilever Retaining Wall
3. Counter fort Retaining Wall
4. Buttress Relaing Wall







16.3 Cantilever Retaining Wall:



- It becomes uneconomical if height of retained earth goes beyond 8m.
- Stem, heel and toe slab bend like cantilever.
- Thickness of any slab should not be less than 150mm
- Stem is generally tapered with maximum thickness at bottom.
- Main reinforcement of stem is provided on back face.
- Main reinforcement of heel and toe slab is on top & bottom respectively.
- Critical section for heel and toe slab are at back and front of stem respectively.
- Critical section for bending stem is at the junction of base slab and stem.
- Active earth pressure produces disturbing force and disturbing moment for sliding and overturning respectively.

$$\text{Disturbing Force} = P_a = \frac{1}{2} \times K_a \gamma_s H \times H \times 1$$

$$= \frac{1}{2} K_a \gamma_s H^2$$

Disturbing force $P_a \propto H^2$

Disturbing Moment $= P_a \times H/3$

Disturbing Moment $\propto H^3$

- Restoring moment is obtained by self wt. of retaining wall and soil above Heel slab.

Restoring Moment = $(0.9W) \times$ Perpendicular distance b/w W and toe point

Where, $W = W_1 + W_2 + W_3 + W_4$

- Restoring force for sliding is obtained from friction between base slab and soil below it. If friction is not sufficient then shear key is provided and placed in such a way that main reinforcement of stem can be extended inside the shear key for anchorage.

$$\text{Restoring Force} = \text{Friction} + P_p$$

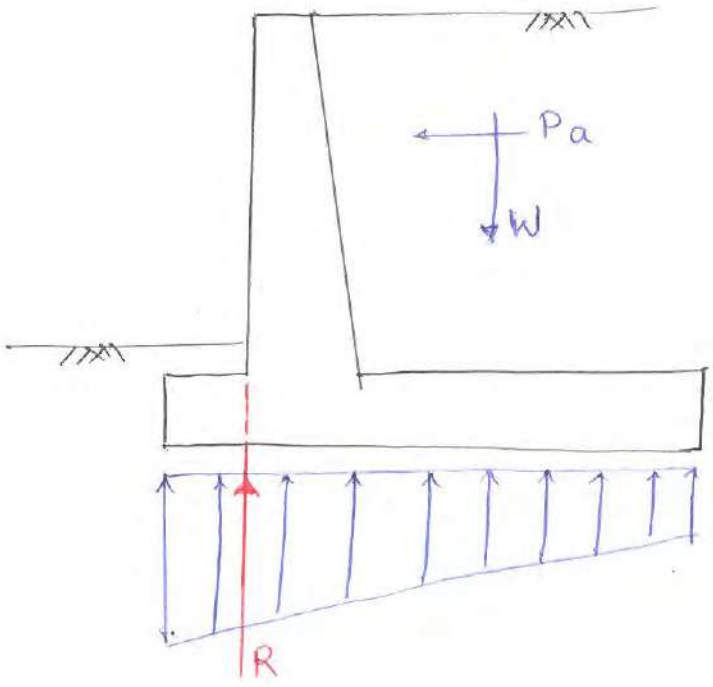
$$= \mu N + P_p$$

Where, $N = 0.9W$

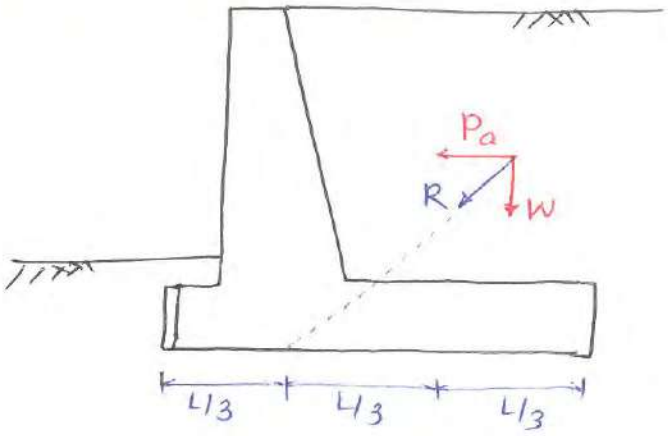
- While calculating restoring force and restoring moment only 90% of DL is considered.
- F.O.S against overturning and sliding should not be less than 1.4

$$\frac{\text{Restoring Force/Moment}}{\text{Disturbing Force/Moment}} \geq 1.4$$

- For most economical design, resultant of pressure from soil should pass through front face of stem.



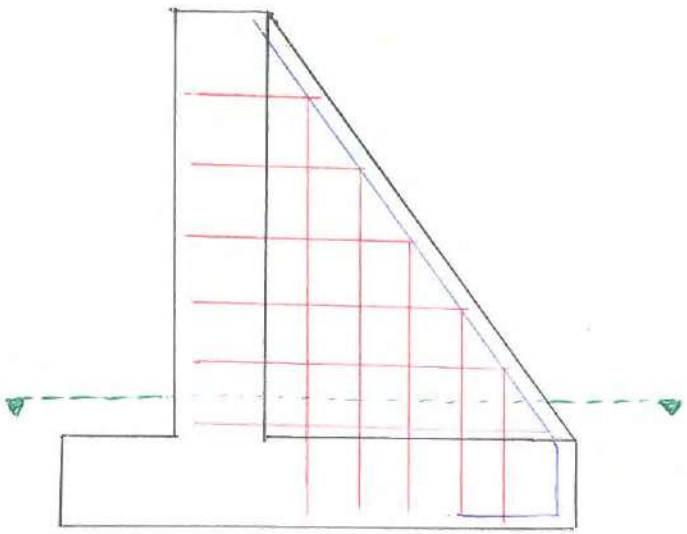
- Resultant of active earth pressure and dead load should pass through middle 3rd of base slab dimension for no lifting condition.

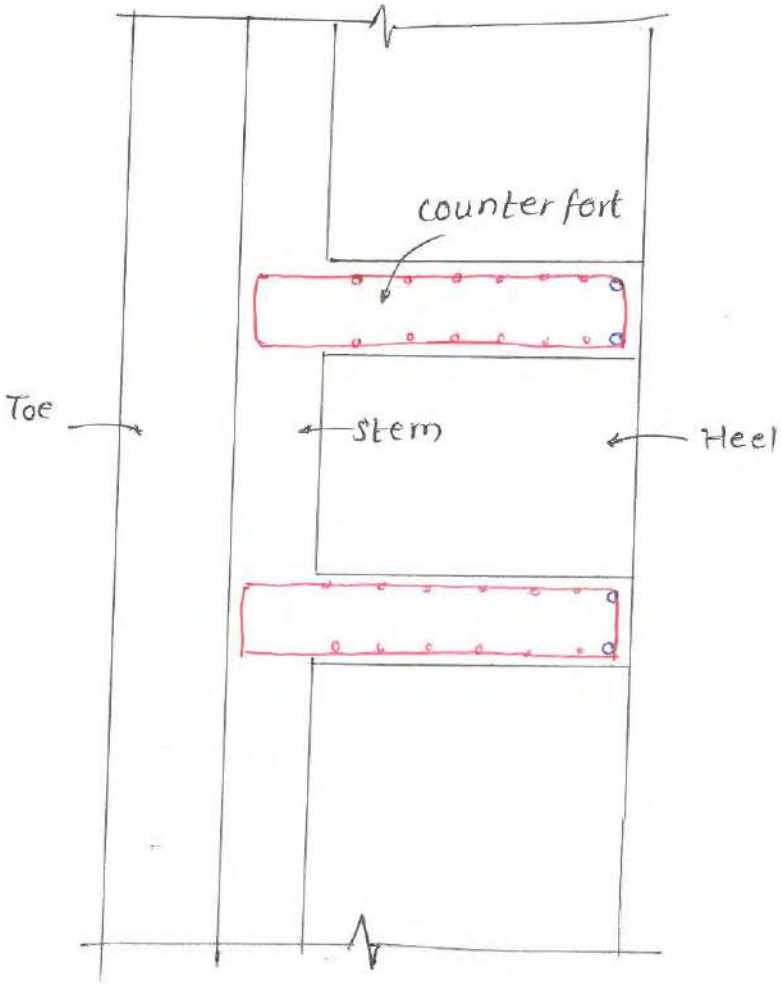


- In general length of base slab is (0.6 to 0.8) times height of retained earth
- For preliminary design, stem can be placed at 1/3rd of length of base slab.
- After every 30m, a joint is provided to take care of expansion and contraction of retaining wall.

16.4 Counter Fort Retaining Wall:

- It is provided if height of retained earth goes beyond 7 to 8 m
- Cantilever action of stem and heel slab of cantilever retaining wall is converted into continuous slab.
- Design positive and negative BM are calculated using BM coefficients
- Clear spacing between counter forts lies between H/3 to H/2.
- Counterfort is designed as T-beam and main reinforcement is provided on inclined face





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