COMPLEX ENGINEERING PROBLEM : DESIGN OF STRUCTURES

End Term Project: Design of Retaining Walls, Swimming Pool and Water Tank.

Submit to; **Dr. Irfan-ul-Hassan**

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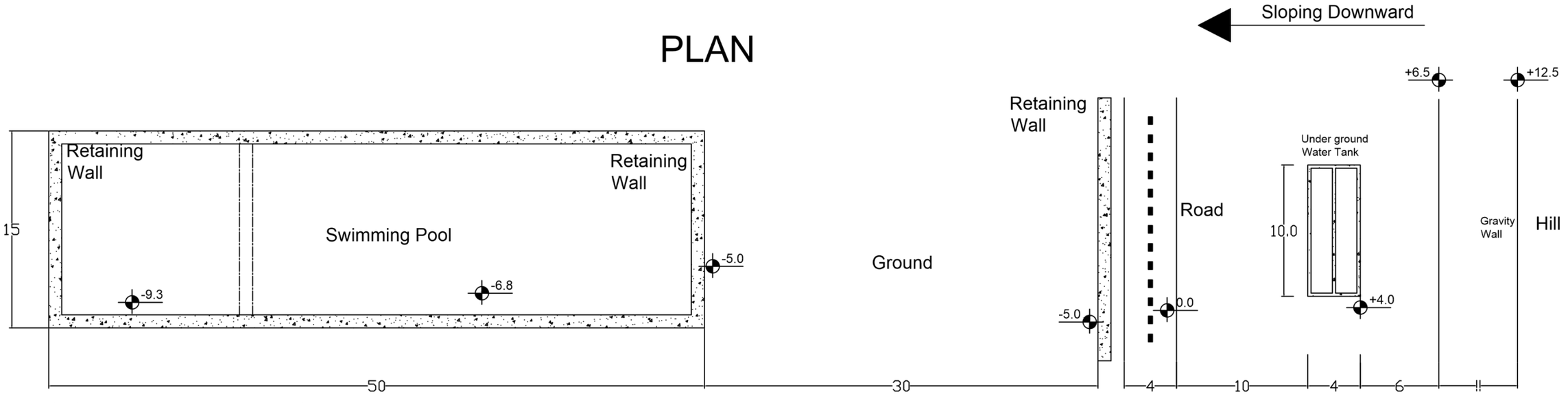
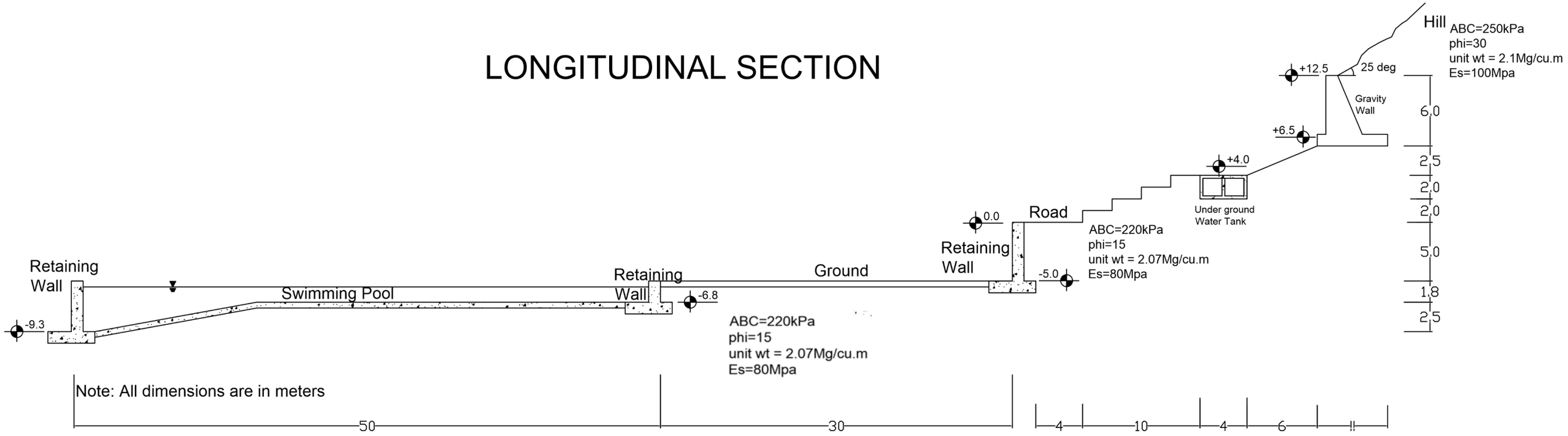
PLAN



Note: All dimensions are in meters

LONGITUDINAL SECTION

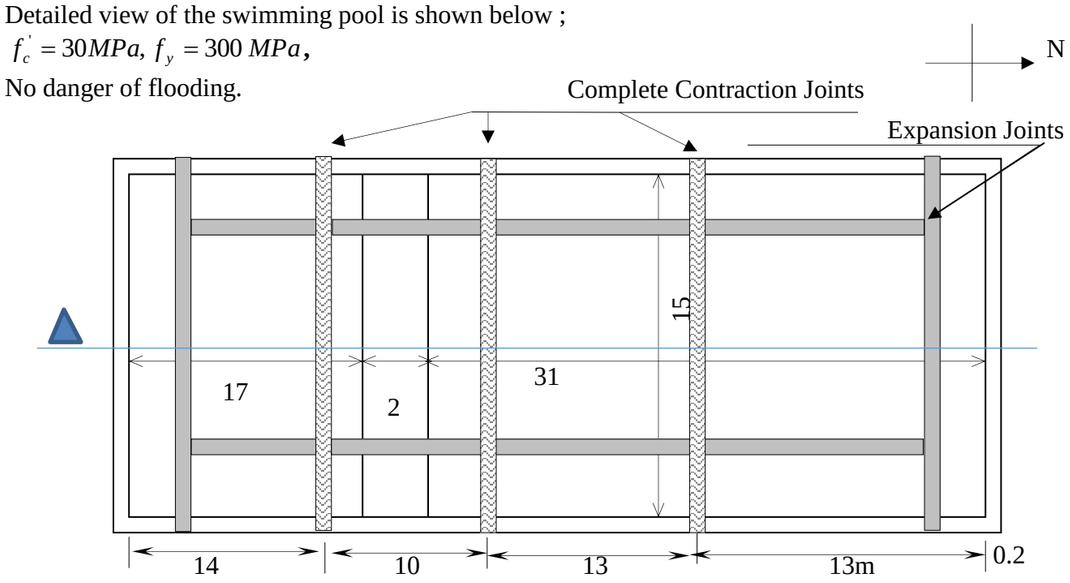


Note: All dimensions are in meters

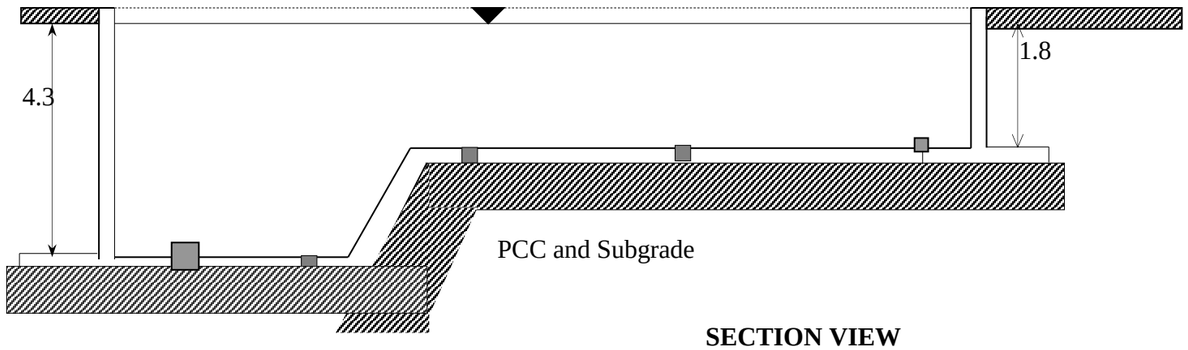
Detailed view of the swimming pool is shown below ;

$f_c^{'} = 30MPa,\ f_y = 300\ MPa$,

No danger of flooding.



PLAN VIEW



SECTION VIEW

For the project, the plan and cross-sectional views are shown in the figure. You are required to design the following structures (1) Gravity retaining wall to support the land slide in sloppy area (2) the cantilever retaining wall just after the highway (3) An in-ground water tower with two compartments which is provided upside of the pool to store the water and (4) swimming pool which is to be constructed in ground in a flat area as shown in the figure..

Problem: Completely design the project and

1) **check the stability of retaining walls, water tank and pool for critical conditions of the loading.**
2) **Design the structural components of retaining walls, pool and tank.**
3) **Plot the reinforcement details of the project.**

- Given that the coefficient of friction between soil and concrete is 0.5, and the surcharge pressure on all sides of pool is 300 kg/m^2. No surcharge on tank side.
- For concrete Coefficient of thermal expansion $\alpha=12x10^{-6}$ /ºC, T1=30ºC for concreting in summer and 20ºC for concreting in winter. T2=20, 10 ºC
- Assume all missing data yourself.

Design Procedure:

RETAINING WALL

For the retaining walls shown in the figure, with soil properties are mentioned Design

(a) Gravity Wall

(b) RCC Retaining wall

Water table well below the base. No chance of flooding.

POOL

Stability: There are two critical zones for stability: North and South end zones. Consider two loading conditions: (A) Empty pool with soil pressure from outside; (B) Full pool with no allowance for soil pressure from outside. The stability against overturning and sliding with FOS=1.5 and 1.25 respectively is just sufficient. For the present case, there is no danger of flooding and rise of water table hence floatation is not a problem.

Bearing: The critical loading condition: when pool is full of water.

Strength: The pool will be designed for two loading conditions: (A) Empty pool with soil pressure from outside; (B) Full pool with no allowance for soil pressure from outside.

All walls of pool will be designed as cantilever retaining walls with two critical conditions // and …… base slab of pool will be slab on grade.

Water Tank

Stability for water tank is not an issue, but to design the water tower we must consider the critical condition for each compartment wall.

Base slab of the tank is to be designed considering all the compartments to be full.