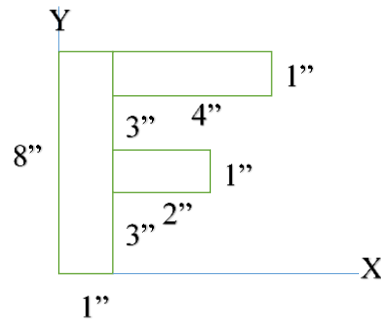


Combined Bank Assistant Engineer/ Senior Officer (CE) 2023

Date 09-06-2023

1. Describe slump and their types.

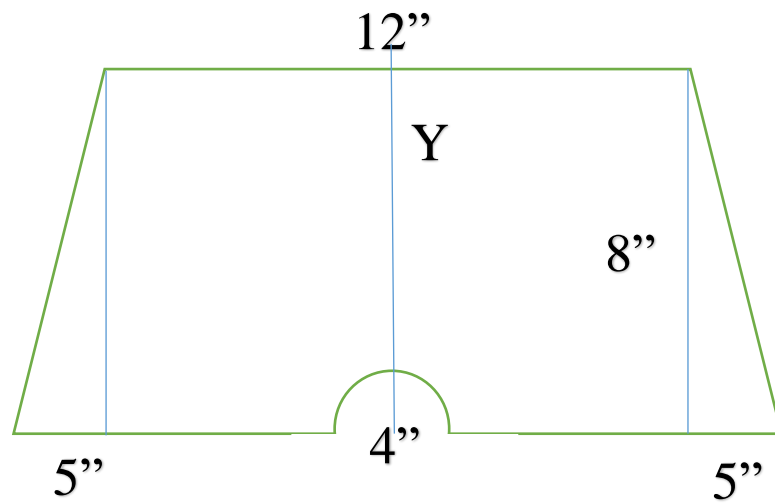
2. Determine centroid of following Shaded area in fig 1.



3. What are the functions of bedding under storm water drains?

- (i) To enhance a uniform support under pipes in order to reduce the bending moment longitudinally;
- (ii) To increase the load-supporting strength of the pipes;
- (iii) For pipes with spigot and socket joints, it enables pipes to be supported along pipe lengths instead of pipe sockets. Otherwise, uneven stress may be induced and it may damage the pipes;
- (iv) To provide a platform for achieving correct alignment and level during and after construction.

4. Determine Moment of Inertia of shaded area about y-axis in fig 2.



5. In Compaction test, field compaction results exceeds 100%. Can engineer agree with it?

6. What are the advantages of assigning the central pier and the abutment as fixed piers?

- i) For abutment pier to be assigned as fixed pier while the bridge is quite long, the longitudinal loads due to earthquake are quite large. As the earthquake loads are resisted by fixed piers, the size of fixed piers will be large and massive. In this connection, for better aesthetic appearance, the selection of abutment as fixed piers could accommodate the large size and massiveness of piers. Normally abutments are relatively short in height and for the same horizontal force, the bending moment induced is smaller.
- ii) For the central pier to be selected as the fixed pier, the bridge deck is allowed to move starting from the central pier to the end of the bridge. However, if the fixed pier is located at the abutment, the amount of movement to be incorporated in each bearing due to temperature variation, shrinkage, etc. is more than that when the fixed pier is located at central pier. Therefore, the size of movement joints can be reduced significantly.

7. What are the advantages of top-down construction?

Top down construction is the reverse method of bottom-up construction in which the permanent structure is built from top to bottom of the basement along with deep excavations.

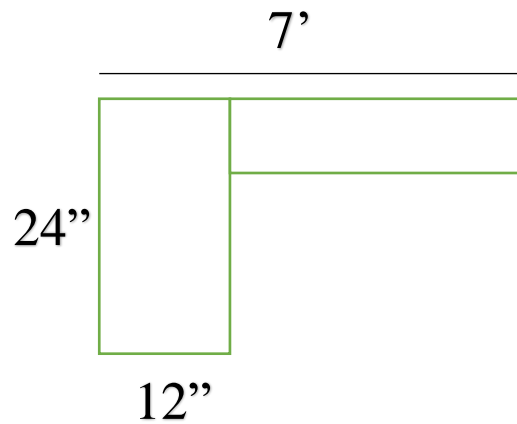
In this method, the basement floors are constructed as the excavation progresses. The basement concrete slabs act as lateral bracing for the perimeter wall system.

Advantages of Top down Construction

1. Early restoration of the superstructure is possible even before the completion of the building and the structures above ground can be carried out simultaneously with the structures below ground. This greatly reduces the time for construction.
2. Concrete diaphragm walls are more cost-effective when they can simultaneously function as a groundwater cut-off and temporary soil retention system during the excavation phase of the project and then as permanent underground walls with [load-carrying capabilities](#) for the finished structure.
3. Easier and more economical construction of roof since it can be cast on prepared grade rather than using bottom forms.
4. The structural slab act as internal bracing for the support of excavation, thus reducing the number of tiebacks required.
5. The virtually vibration-free operation minimizes the potential for ground movement and its resulting detrimental settlement.
6. It requires less width for the construction area. Reduced environmental pollution associated with pre-construction earthworks.

8. Total students are 1000. Students play chess 300, students play football 600, play both= 50. Find the students play neither.

9. Beam width 12", depth 24", cantilever total span 7 ft. $d_l=50$ psf, $l_l= 100$ psf, $f'_c=3$ ksi, $f_y= 60$ ksi. Design slab and detailing.



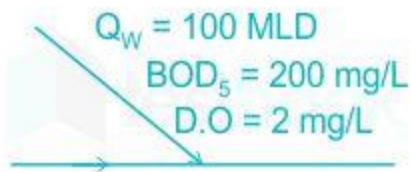
10. Wooden plank width is 8 times of thickness, flexural strength= 300psi. Uniform load 140 lb/ft. determine cross section.

11. A river has a flow of 1000 million litres per day (MLD), BOD₅ of 5 mg/litre and Dissolved Oxygen (DO) level of 8 mg/litre before receiving the wastewater discharge at a location. For the existing environmental conditions, the saturation DO level is 10 mg/litre in the river. Wastewater discharge of 100 MLD with the BOD₅ of 200 mg/litre and DO level of 2 mg/litre fall at that location. Assuming complete mixing of wastewater and river water, the immediate DO deficit.

Calculation:

Given,

$Q_R = 1000$ MLD, D.O = 8 mg/L, BOD₅ = 5 mg/L, Saturation D.O = 10 mg/L.



$$\therefore \text{D.O of the mix} = \frac{Q_R(D.O)_R + Q_W(D.O)_W}{Q_R + Q_W} = \frac{1000 \times 8 + 100 \times 2}{1000 + 100} = 7.455 \text{ mg/L}$$

$$\therefore \text{Immediate D.O Deficit} = [\text{Saturation D.O}] - [\text{D.O of mix}]$$

$$= 10 - 7.455 = 2.545 \text{ mg/L} \approx \mathbf{2.55 \text{ mg/L}}$$

12. Length= 5km, width=10ft, depth = 20in. rigid pavement. Mix ratio 1:2:4. Find quantity of cement in bags, sand, coarse and rebar in ton.

13. If concrete fail at compression test, is Schmidt hammer be used to prove the strength of concrete?

The *Schmidt hammer test* is based on the elastic rebound of hammer which presses on concrete surface and it measures the surface hardness of concrete. Since the test is very sensitive to the presence of aggregates and voids at the concrete surface, it is necessary to take more than 10 readings over the area of test.

However, it should be noted that Schmidt hammer test measures surface hardness only but not the strength of concrete. Therefore, it may not be considered a good substitute for concrete compression test.