

# Unit 7 - Week 5

## Course outline

How does an NPTEL online course work?

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Week 5

● Design of Reinforced Soil Retaining Walls - Simple geometry & Sloped backfill Soil

● Design of Reinforced Soil Retaining Walls including Seismic Forces

○ Design of Reinforced Soil Retaining Walls - Stability check for Pullout & Rupture

○ Design of Reinforced Soil Retaining Walls supporting a Bridge Abutment

● Case Study on construction of Very High Tiered Reinforced Soil Walls

○ Quiz : Assignment 5

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● Additional Documents

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## Assignment 5

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2020-03-04, 23:59 IST.**

A reinforced soil retaining wall is constructed of steel strips. The details of the system are as follows:

Height of the wall = 8 m with horizontal backfill soil.

Properties of backfill and reinforced soil are  $c = 0$ ,  $\phi = 30^\circ$ ,  $\gamma = 20 \text{ kN/m}^3$ . Assume that the allowable bearing pressure on the foundation soil is 300 kPa.

The steel strips are 50 mm wide and 6 mm thick. The yield strength of the steel is  $415 \text{ N/mm}^2$ . Apply a reduction factor of 1.1 on the yield strength of steel strips. The design life of the structure is 120 years. Assume that the steel strips are galvanized and the structure is a land based structure.

The steel strips are placed at horizontal spacing of 0.5 m c/c. There are totally 11 number of reinforcement layers at the following depths from the surface (z): 0.25, 1.0, 1.75, 2.5, 3.25, 4, 4.75, 5.5, 6.25, 7.0, 7.75m

The permanent surcharge on the wall is 25 kPa and the live load surcharge is 18 kPa. A bridge abutment is supported on the wall with a footing width of 2 m, placed at a front distance of 1.5 m. The vertical load on the footing is 500 kN (treat it as permanent load) and the horizontal load is 45 kN/m.

For simplified calculations, assume that the surcharge acts on the entire surface area and reduce the vertical bridge abutment load. The reduced bridge abutment load =  $500 - (25+18)(1.5+2) = 349.5 \text{ kN}$ .

Answer the following questions:

1) What is the cross-sectional area of the steel strips at the end of design life? 1 point

- 300mm<sup>2</sup>  
 291mm<sup>2</sup>  
 218.25mm<sup>2</sup>  
 258.56mm<sup>2</sup>

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
218.25mm<sup>2</sup>

2) What is the vertical pressure due to bridge abutment load at a depth of 1.75 m? 1 point

- 93.2 kPa  
 83.38 kPa  
 69.9 kPa  
 125 kPa

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
93.2 kPa

3) What is the vertical pressure due to bridge abutment load at a depth of 5.5 m? 1 point

- 61.8 kPa  
 51.8 kPa  
 55.9 kPa  
 75 kPa

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
55.9 kPa

4) What is the minimum length of the reinforced soil block to achieve a factor of safety of 1.5 against lateral sliding? 1 point

- 8 m  
 6.5 m  
 7.25 m  
 9.5m

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
6.5 m

5) For the above length of the reinforced soil block, what is the factor of safety against overturning? 1 point

- 2.4  
 3.4  
 3.1  
 4.1

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
3.4

6) What is the minimum length of the reinforced soil block required to reduce the bearing pressure to 300 kPa? 1 point

- 6.5 m  
 7.75 m  
 8 m  
 9 m

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
8 m

7) What is the lateral earth pressure coefficient for internal stability calculations at a depth z=2.5 m from the surface as per BS-8006 code? 1 point

- 0.50  
 0.43  
 0.333  
 0.53

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
0.43

8) What is the force in the reinforcement at z=1m due to the horizontal load of 45 kN/m? 1 point

- 9.30 kN  
 8.65 kN  
 4.65 kN  
 5.25 kN

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
4.65 kN

9) What is the total force developed in the reinforcement at a depth (z) of 7 m (L=6.5m)? 1 point

- 75.20 kN  
 37.60 kN  
 86.25 kN  
 10.45 kN

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
37.60 kN

10) What is the pullout capacity for the reinforcement at depth (z) of 7m (L=6.5m). 1 point

- 22.6 kN  
 18.8 kN  
 45.1 kN  
 84.0 kN

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
45.1 kN