EXAMINATION – DESIGN SPECIAL TOPICS

REFRENCES PDF

Name *

1. In column buckling analysis, what does the critical buckling load depend on? Explain *

2. Use

E = 30,000 Ksi and Fy = 50,000 Ksi, effective length factor k = 0.8

A 2-7/8" O.D. helical pile shaft, with 0.276" wall thickness, was installed to a depth of 30 feet. The pile head is assumed to be at the ground surface. The top 5 feet of soil is clay with blow count N=3. The rest of the soil profile consists of clayey soil with blow count, N, larger than 5. What is the critical buckling resistance using buckling analysis prescribed by IBC code and the buckling equation given by AISC? *

3. Assume

U_{cr} = 2.0. Modulus of subgrade reaction is 20 lb/in^3. E = 30,000 Ksi.

A 1.5" solid square helical pile shaft was installed to a depth of 25 feet. The top 10 feet of soil consists of soft clay. The rest of the soil profile below 10 feet is categorized as stiff clay. What is the critical buckling load using Davisson's method? *

4. Assume

U_{cr}= 2. E = 29,000 Ksi. Modulus of subgrade reaction, k_h = 10 lb/in^3.

A 3.5" O.D. helical pile shaft, with 0.3" wall thickness, was installed to a depth of 30 feet. The top 20 feet of soil is very soft clay with SPT blow count N value of 2 to 3, while the soil below the 20 feet depth has an SPT N-value of 5 or greater. Using the Davisson method, determine the critical buckling load and the allowable design load using a safety factor of 2.0? *

5. From your understanding of buckling analysis, what is the main difference between Davisson method and the one prescribed by IBC and AISC? *

6. Assume

E = 29,000 Ksi. F_y = 50 Ksi. Effective length factor, k = 0.8.

A 3.5" O.D. helical pile shaft with 0.276" wall thickness was installed to 30 feet deep with a final termination torque of 10,000 ft-lb. The torque correlation factor for this shaft is Kt = 7. The soil profile is as follows: the top 5 feet of soil is very soft clay with an SPT blow count N values of 2 to 3. The soil below 5 feet consists of clay that ranges from stiff, medium stiff to very stiff. The top of the pile is 4 feet above the ground. What is the allowable compression capacity of this pile assuming a safety factor of 2? *

7. Two construction sites were considered for a project. Both sites consist of clayey soil. Site A consists of clayey soil with kaolinite as its dominant mineral. Site B consists of clay with montmorillonite as its dominant mineral. Helical Pile foundations were recommended for both sites. Which site will you most likely consider expansive soil in your design and why? *

8. Assume

A shaft adhesion coefficient of 0.1 and permanent dead load is zero.

Helical piles in compression were recommended for a construction site with expansive soil. The depth of the active zone is 20 feet. The vertical swell pressure is 15,000 psf. A 2-7/8" O.D helical pile shaft is used for this project. This shaft has a torque correlation factor of Kt= 9. What minimum depth should the bearing plates be installed to in this case? Based on the capacity-torque correlation, and using a safety factor of 2 against heaving, what is the minimum installation torque required in this case? *

9. An 8-5/8" O.D. helical pile shaft was installed 10 feet deep in sand with friction angle of 34 degrees and a unit weight of 115 lb/ft3. What is the lateral resistance of this pile assuming the applied load at the tip of the pile is 1 foot above the ground? *

10. Explain why corrosion is generally considered not problematic for helical piles? What are the most common types of corrosion protective coatings of helical piles? *

SUBMIT YOUR ANSWERS