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PE Civil Exam Review Guide: Geotechnical Depth
Preview Edition

Errata

(updated 4/10/2021)

This document will be updated regularly.

CHAPTER 1: Site Characterization

(1) p. 1-23: In the solution of Example 1.6, there are two typographical errors. In the second sentence under Sample A, Table 1.4 should be Table 1.5. In the second sentence under Sample B, PI = 23 should be PI = 13. The corrections appear below in red boxes.

Sample A

The major component is sand (75%), the minor component is gravel (23%), and fine, which is coarse silt, is trace (2%).

Major component: All sand sizes are > 10%. Therefore, from Table 1.5, classification is cf S.

Sample B

The major component is fine (85%) combined clay and silt (minus No. 200 sieve) with PI = 23, the minor component is sand (12%), and gravel is trace (3%).

Major component: From Table 1.6, when PI = 13, soil is classified as C and $.

(2) p. 1-32: There are errors in the Sample B portion of the solution to Example 1.8. The corrections appear below in red boxes.

Use Figure 1.14. Follow the flowchart. Fines 8% → 5% - 12%
For $C_u = 19$ and $C_c = 2$
To get the type of fines, use the Casagrande plasticity chart (Fig. 1.16).
Plot LL = 20, PI = 15. The intersection point will be in the CL or OL zone. The soil is inorganic. Therefore, the soil is CL.

CHAPTER 2: Soil Mechanics, Laboratory Testing, and Analysis

(1) p. 2-10: In the second sentence of Section 2.1.3, there is a typographical error. "Were" should be "where." See the correction below.

2.1.3: Atterberg Limits [1,2,3]

As the moisture content of a slurry of fine-grained soil gradually decreases, the soil passes from a liquid state to a plastic state, from a plastic state to a semisolid state, and finally from a semisolid state to a solid state. The moisture contents or limits where these transitions occur were created by Atterberg (1911) [4] and were

(2) p. 2-27: In the second sentence on the page, there is a typographical error. "Is" should be "in." See the correction below.

Volume change also affects the stress response. Particle rearrangement during compression results in a gradual increase in shear resistance until volume change is complete and a maximum deviator stress is attained. In dilative behavior, closely packed particles roll up and over one another until volume change is

(3) p. 2-45: There is an error in the solution for Example 2.11. See the correction below.

Then the total vertical stress at point A after the addition of fill is:

$$\sigma_v = \sum \gamma_i z_i + \Delta\sigma_v = \boxed{5 \text{ ft} \times 125 \text{ lb/ft}^3 + 10 \text{ ft} \times 130 \text{ lb/ft}^3} + 360 \text{ lb/ft}^2 = 2{,}285 \text{ lb/ft}^2$$

CHAPTER 3: Field Materials Testing, Methods, and Safety

(1) p. 3-4: There is a typographical error in last line of the solution of Example 3.2. The 2 should be 12. The answer remains the same. See the correction below.

The total number of trucks required is:

$52{,}164 \times 10^3/(12 \times 10^3) = 4{,}347$

CHAPTER 7: Problematic Soil and Rock Conditions

(1) p. 7-10: The solution and answer of Example 7.4 are incorrect. They should appear as follows.

Example 7.4: Corrosive Soil

Underground utilities made of ferrous materials are subjected to corrosion when soil electrical conductivity is:

A. low and pH level is high.
B. high and pH level is low.
C. high and pH level is high.
D. low and pH level is low.

Solution

The most favorable condition for ferrous materials to corrode is when the electrical conductivity of soil is high and the pH level is low (acidic).

Answer: B

(2) p. 7-14: In Example 7.6, "sulphate" should be "sulfate" in answer choice C and solution point C.

CHAPTER 8: Retaining Structures

(1) p. 8-8: At the top of the page, replace "For a vertical wall and horizontal backslope" with "For vertical walls with a horizontal backslope and no wall friction." In Equation 8-7, replace K_a with K_p.

For vertical walls with a horizontal backslope and no wall friction, the Rankine and Coulomb equations both reduce to the following:

$$K_a = \frac{1 - \sin\phi}{1 + \sin\phi} = \tan^2\left(45 - \frac{\phi}{2}\right) \qquad \textbf{Equation 8-6}$$

$$K_p = \frac{1 + \sin\phi}{1 - \sin\phi} = \tan^2\left(45 + \frac{\phi}{2}\right) \qquad \textbf{Equation 8-7}$$

(2) p. 8-15: In the problem statement for Example 8.4, there is a missing phrase (highlighted below). The second sentence should read as follows:

Determine the resulting lateral stress applied to the back of the wall at the center of the loaded area at depths of 2.5, 5, 10, and 15 ft.

(3) p. 8-18: In the solution to Example 8.5, there are a few errors. Please see corrections to the end of the problem below.

Check eccentricity.

$$e = \frac{B}{2} - \frac{M_R - M_o}{\sum V} = \frac{B}{2} - \frac{W\overline{x} + (P_A)_v\overline{x} - (P_A)_h \times H/3}{W + (P_A)_v}$$

$$e = \frac{14 \text{ ft}}{2} - \frac{(19{,}198 \text{ lb/ft} \times 5.744 \text{ ft}) + (10{,}538 \text{ lb/ft} \times 10 \text{ ft}) - (10{,}177 \text{ lb/ft} \times 20 \text{ ft}/3)}{(19{,}198 \text{ lb/ft} + 10{,}538 \text{ lb/ft})} = 2.03 \text{ ft}$$

Compare the eccentricity with the criteria for foundations on soil.

$$\frac{B}{6} = \frac{14 \text{ ft}}{6} = 2.33 \text{ ft} > 2.03 \text{ ft} \quad \text{OK}$$

The wall meets the eccentricity criteria, but does not meet the criterion for sliding resistance Thus, the base width should be increased along with other changes to the geometry.

(4) p. 8-51: In the solution diagram for Example 8.11, there is a typographical error: 18.34° should be 18.43°.

(5) p. 8-52: There are some typographical errors in the solution to Example 8.11. The corrections appear in red boxes below.

$$p_s = \tfrac{1}{2}\gamma_R 0.7 H k_a \tan\beta = 0.35\gamma_R H k_a \tan\beta = 0.35 \times 128\ \text{lb/ft}^3 \times 24\ \text{ft} \times 0.352 \times \tan \boxed{18.43} = 126.1\ \text{lb/ft}^2$$

Calculate the active lateral earth pressure at midheight of the wall.

$$p_a = \gamma \frac{H}{2} k_a = 128\ \text{lb/ft}^3 \times \frac{24\ \text{ft}}{2} \times 0.352 = 540.7\ \text{lb/ft}^2$$

To calculate the inertia force, divide the mass into areas representing the wall backfill (A_1) and the backslope fill (A_2).

$$A_1 = \tfrac{1}{2} H^2 \tan\alpha = \tfrac{1}{2}(24\ \text{ft})^2 \tan 28 = \boxed{153.1\ \text{ft}^2}$$

Making use of the law of sines, calculate the maximum height of the backfill wedge.

$$h = H \frac{\sin\beta \sin\alpha}{\sin(\psi - \beta)} = 24\ \text{ft} \times \frac{\sin 18.43 \times \sin 28}{\sin(62 - 18.43)} = 5.17\ \text{ft}$$

Calculate the area.

$$A_2 = \tfrac{1}{2} h H \tan\alpha = \tfrac{1}{2} \times 5.17\ \text{ft} \times 24\ \text{ft} \times \tan 28 = 33\ \text{ft}^2$$

Calculate the inertia force, noting that the areas just calculated are per foot of wall.

$$P_I = (A_1 + A_2)\gamma_R \frac{a}{g} = (\boxed{153.1\ \text{ft}^2} + 33\ \text{ft}^2) \times 128\ \text{lb/ft}^3 \times 0.2 = \boxed{4{,}764}\ \text{lb/ft}$$

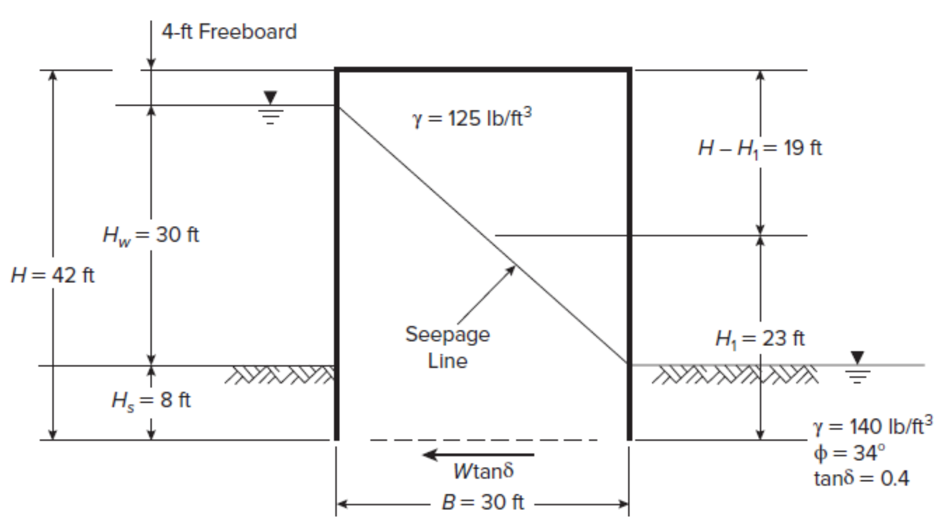
Calculate the total tie force. The inertial force is distributed equally to each reinforcement layer, and the surcharge and lateral earth pressures at the reinforcement layer are multiplied by the vertical spacing.

$$F_T = (p_s + p_a) S_V + \frac{1}{n} P_I$$

$$F_T = (126.1\ \text{lb/ft}^2 + 540.7\ \text{lb/ft}^2) \times 2\ \text{ft} + \frac{1}{11} \times \boxed{4{,}764}\ \text{lb/ft} = 1{,}767\ \text{lb/ft}$$

(6) p. 8-80: In Section 8.5.2.1: Resistance to Sliding, a sentence should be added for clarification. After the third sentence, add the following: "Inboard passive pressure is included in the example."

(7) p. 8-82: There is an error in the upper left corner of the image in Example 8.16. The corrected image appears below.



CHAPTER 9: Shallow Foundations

(1) p. 9-34: In the solution to Example 9.13, there are 4 typographical errors. The corrections are shown below in red boxes.

Solution

For this case, the rectangular area is divided into four 5 ft × 8 ft equal quadrants. The influence factor is then $4I_{mn}$ where m = 5/8 = 0.625 and $n = 8/8 = 1$.

From Figure 9.13, I = 0.14 and the vertical stress increase is:

$A\sigma_v = 4I_{mn}q = 4 \times$ 0.14 × 4 k/ft² = 2.24 k/ft²

(2) p. 9-51: The first equation in the solution to Example 9.19 is incorrect. It should read:

$$\sigma_v' = \gamma D_f = 125 \text{ lb/ft}^3 \times 3 \text{ ft} + [(125 \text{ lb/ft}^3 - 62.4 \text{ lb/ft}^3) \times\ 3 \text{ ft}] = 563 \text{ lb/ft}^2 \times 1 \text{ t/2,000 lb} = 0.282 \text{ t/ft}^2$$

In the last line of the solution (the allowable net load), " × 78.4 tons" should be " = 78 tons."

(3) p. 9-54: In the paragraph just under the figure on the page, three numbers are incorrect. The corrections are shown below in red boxes.

For the corrected blowcounts for each sublayer, find the bearing capacity index, C', for each sublayer based on the well-graded silty sand curve in Figure 9.28 as follows: 0 to 10 ft, C' = 62.5; 10 to 20 ft, C' = 72; and 20 to 30 ft, C' = 87.

CHAPTER 10: Deep Foundations

(1) p. 10-30: There are typographical errors in the variable descriptions (following "Where:") in Section 10.6.2.2. The corrections appear below in red boxes.

Where:

S_x = slope at any depth x along the pile due to lateral load Q_g and moment M_g

S_A = slope due to lateral load Q_g

S_B = slope due to moment M_g

M_x = moment at any depth x along the pile due to lateral load Q_g and moment M_g

M_A = moment due to lateral load Q_g

M_B = moment due to moment M_g

V_x = shear force at any depth x along the pile due to lateral load Q_g and moment M_g

V_A = shear force due to lateral load Q_g

V_B = shear force due to moment M_g

p_x = soil reaction at any depth x along the pile due to lateral load Q_g and moment M_g

p_A = soil reaction due to lateral load Q_g

p_A = soil reaction due to moment M_g