PE-Civil: Three Practice Exams for the Morning Breadth Section

(120 Questions with Solutions)

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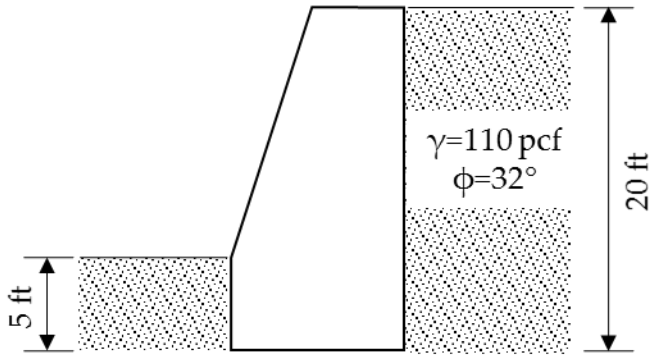
A concrete gravity retaining wall weighs 14,000 lb/ft and supports a sandy soil. The coefficient of friction between concrete and soil is 0.4. The factor of safety against sliding, including the effect of the passive lateral force, is most nearly



(a) 2.1 (b) 2.5 (c) 1.4 (d) 1.7

Solution:

Active lateral force

$$K_A = \tan^2\left(45° - \phi/2\right) = \tan^2\left(45° - 32°/2\right) = 0.307$$

$$P_A = \frac{1}{2} K_A \gamma H_A^{\,2} = \frac{1}{2} \times 0.307 \times 110 \times 20^{\,2} = 6{,}754\, lb/ft$$

Passive lateral force

$$K_P = \tan^2\left(45° + \phi/2\right) = \tan^2\left(45° + 32°/2\right) = 3.255$$

$$P_P = \frac{1}{2} K_P \gamma H_P^{\,2} = \frac{1}{2} \times 3.255 \times 110 \times 5^{\,2} = 4{,}476\, lb/ft$$

$$\textit{Factor of safety} = \frac{\mu W + P_P}{P_A} = \frac{14{,}000 \times 0.5 + 4{,}476}{6{,}754} = 1.7$$

Answer: D