5-37. The bulk head AD is subjected to both water and soil-backfill pressures. Assuming AD is "pinned" to the ground at A, determine the horizontal and vertical reactions there and also the required tension in the ground anchor BC necessary for equilibrium. The bulk head has a mass of 800 kg.

Equations of Equilibrium: The force in ground anchor BC can be obtained directly by summing moments about point A.

\[ \sum M_A = 0; \quad 1007.5(2.167) - 236(1.333) - F(6) = 0 \]
\[ F = 311.375 \text{ kN} = 311 \text{ kN} \quad \text{Ans} \]

\[ \sum F_x' = 0; \quad A_x - 311.375 + 236 - 1007.5 = 0 \]
\[ A_x = 460 \text{ kN} \quad \text{Ans} \]

\[ \sum F_y' = 0; \quad A_y - 7.848 = 0 \]
\[ A_y = 7.85 \text{ kN} \quad \text{Ans} \]

5-45. The mobile crane has a weight of 120,000 lb and center of gravity at G1; the boom has a weight of 30,000 lb and center of gravity at G2. If the suspended load has a weight of W = 16,000 lb, determine the normal reactions at the tracks A and B. For the calculation, neglect the thickness of the tracks and take \( \theta = 30^\circ \).

\[ \sum M_A = 0; \quad -(30,000)(12 \cos 30^\circ - 3) - (16,000)(27 \cos 30^\circ - 3) - R_y(13) + (120,000)(9) = 0 \]
\[ R_y = 40,931 \text{ lb} = 40.9 \text{ kip} \quad \text{Ans} \]

\[ \sum F_x = 0; \quad 40,931 + R_y - 120,000 - 30,000 - 16,000 = 0 \]
\[ R_y = 125 \text{ kip} \quad \text{Ans} \]
5-46. The winch consists of a drum radius 4 in., which is pin-connected at its center C. At its outer rim is a ratchet gear having a mean radius of 6 in. The pawl AB serves as a two-force member (short link) and holds the drum from rotating. If the suspended load is 500 lb, determine the horizontal and vertical components of reaction at the pin C.

Equations of Equilibrium: The force in short link AB can be obtained directly by summing moments about point C.

\[ \sum M_C = 0: \quad 500(4) - \frac{F_{Ax}}{\sqrt{13}} (6) = 0 \quad F_{Ax} = 400.62 \text{ lb} \]

\[ \sum F_y = 0: \quad 400.62 \left( \frac{1}{\sqrt{13}} \right) - C_y = 0 \quad C_y = 333 \text{ lb} \quad \text{Ans} \]

\[ \sum F_x = 0: \quad C_z - 500 - 400.62 \left( \frac{2}{\sqrt{13}} \right) = 0 \quad C_z = 722 \text{ lb} \quad \text{Ans} \]