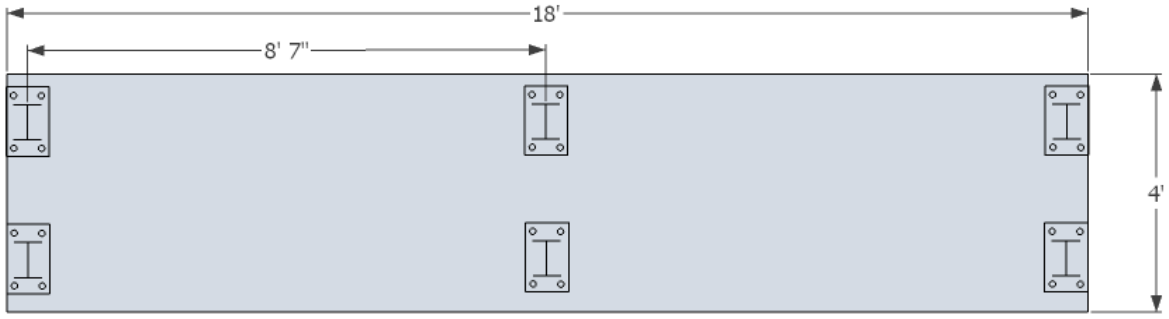

Problem: Calculate the maximum safe depths that the given shield can be used for various soil types.

Given:

Span Length: $L := 9ft$

Section Height: $H := 24in$

Ultimate Steel Strength: $f_y := 36000\frac{lb}{in^2}$

Factor of Safety: $FS := 1.25$

Type A Soil Factor: $A := 25\frac{lb}{ft^3}$

Type B Soil Factor: $B := 45\frac{lb}{ft^3}$

Type C Soil Factor: $C := 60\frac{lb}{ft^3}$

Section Dimensions:

Length of "a": $L_a := 24in$

Height of "a": $H_a := \frac{5}{8}in$

Solution:

Calculate Composite Moment of Inertia:

Section Areas: $A_a := L_a \cdot H_a$ $A_a = 15 \cdot in^2$

Section Centroid Distance From x-axis: $y_a := \frac{1}{2} \cdot H_a$ $y_a = 0.31 \cdot in$

Section Moment of Inertia: $I_a := \frac{1}{12} \cdot L_a \cdot H_a^3$ $I_a = 0.49 \cdot in^4$