Example 5:

A fresh water dam has a parabolic shape \( z/z_0 = (x/x_0)^2 \) as shown, with \( x_0 = 10.0 \text{ ft} \), \( z_0 = 24.0 \text{ ft} \), and a width \( w = 50.0 \text{ ft} \). The resultant force due to atmospheric pressure can be considered negligible for this problem. Compute the following:

(a) horizontal, vertical, and resultant forces acting on the dam and
(b) line of action for these forces.

Known: Fresh water parabolic dam, \( x_0 = 10.0 \text{ ft} \), \( z_0 = 24.0 \text{ ft} \), \( w = 50.0 \text{ ft} \),

Assumptions: Atmospheric pressure is small compared to the pressure of the water, incompressible liquid, static fluid, negligible end effects

Find: (a) \( F_H \), \( F_V \), \( F_R \) (b) \( \theta \), \( z_H \), \( x_V \)

Solution:

Properties: specific weight of fresh water
\( \gamma = \rho g = 62.4 \text{ lb/ft}^3 \)

Answers: (a) 899,000 lbf, 499,000 lbf, 1,028,000 lbf, (b) 60.9°, 8.00 ft, 3.75 ft