Tremie Concrete seal design

Tremie concrete   140 pcf
Water   62.4 pcf
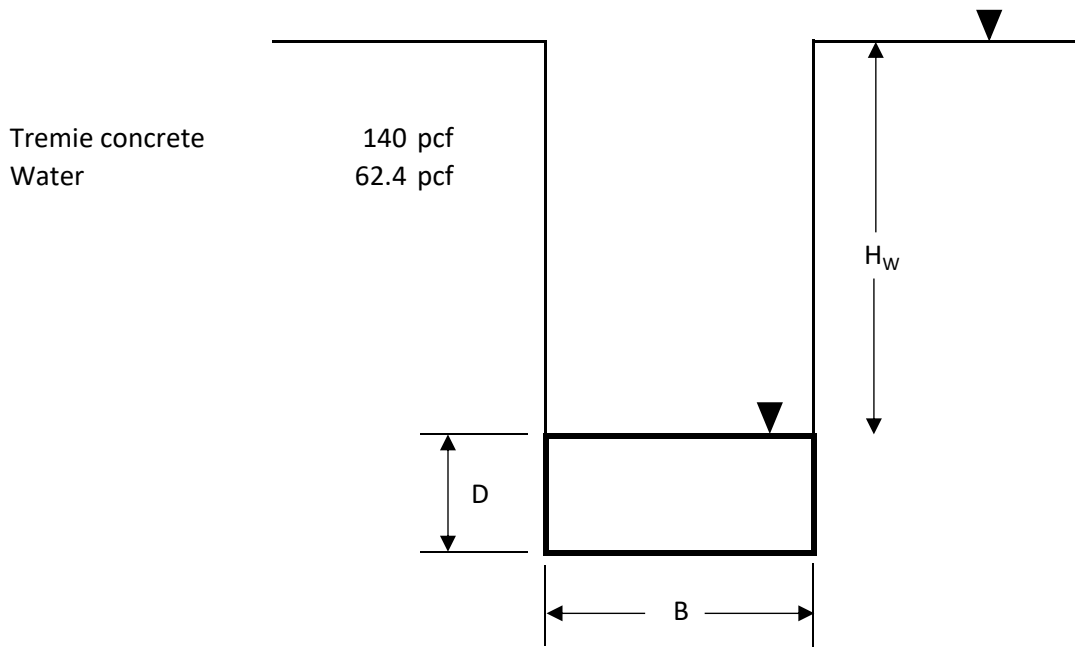
Enter parameters:

H_w =   12 ft   A =   736 ft^2
B =   16 ft
L =   46 ft   (Length of cofferdam into the page)

Pile information: HP10x57
N =   21 ea   Pile perimeter, "p" =   59.75 in
d =   9.99 in   4.979 ft
t_w =   0.565 in
b_f =   10.225 in
t_f =   0.565 in

Thickness of tremie "D" required: Factor of safety desired =   1.5

Uplift force =   551117 lbs   With factor of safety =   826675 lbs   (acting over area "A")

Based on tremie concrete alone: D =   14.47 feet

Based on tremie concrete and piles method 1: F_b =   20 psi   2880 psf
                                                    (F_b taken between 5 to 30 psi depending on source)

Resistance per pile = F_b p D
                        (tremie)   (piles)
     826675   =   57114   D   +   301140   D
     826675   =   358254   D

                 D =   2.31 ft

Based on tremie concrete and piles method 2: F_b =   36 psi   5184 psf

Resistance per pile = (F_b) (p) (D), or (F_b) (p) (d)   if D < d, use D

if D ≥ d, use d

Minimum "D" is 24 inches, or 2 feet

Method 2 uses a maximum bonding depth of "D" or "d", since D will be taken as 24" minimum, "d" will control.

Total pile resistance =   451258 lbs

Net left over for tremie =   826675   -   451258   =   375417 lbs

375417   =   57114 D

D =   6.57 feet

Gudance for Method 2:

The assumed weight of the concrete shall be 140 lb/ft³. The resistance force due to friction on the pile shall be equal to $F_b Dp$, if $D < d$, or $F_b dp$, if $D \geq d$, where F_b is the allowable friction, or bond, stress, d is the H-pile-section depth or the pipe-pile diameter, p is the perimeter, and D is the depth of the seal slab. The allowable service-load bond stress between the steel H-pile or pipe pile and the seal concrete shall be taken as 36 psi.