



October 18, 2024

Re: 1st Baptist Church Restroom Bldg Buoyancy Calcs

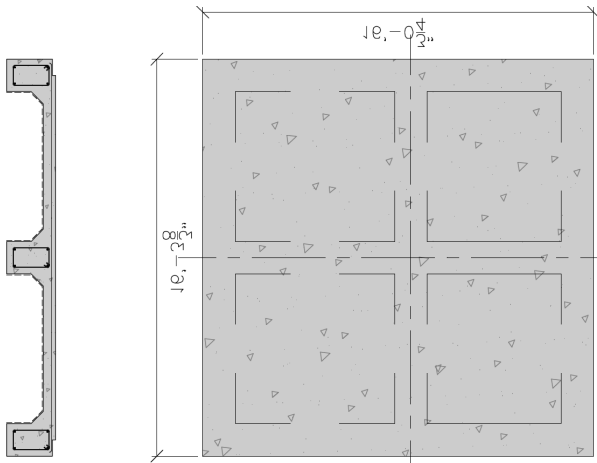
Assumptions :

Density of concrete = 150 #/ft³

Density of water (ρ)= 62.4 #/ft³

$g = 32.2 \text{ ft/s}^2$

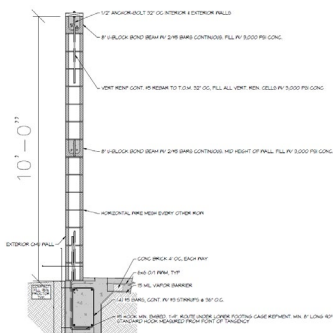
Estimate the weight of the building



The foundation weight is estimated :

$14.47 \text{ s.f.} \times 16\text{lf} = 231.5 \text{ cu ft} \times 150 \text{ \#/cu ft of CONCRETE} = \underline{34,728 \#}$

$+ 2.68 \text{ s.f.} \times (16.25 \times 3) = 130.65 \text{ cu ft} \times 150 \text{ \#/cu ft of CONCRETE} = \underline{19,597.5\#}$



The weight of the CMU filled walls are estimated :

$6.65 \text{ s.f.} \times (84.7\text{-}9 \text{ (doors)}) \text{ lf} = 503.4 \text{ cu ft} \times 150 \text{ \#/cu ft of CONCRETE} = \underline{75,510.75\#}$

The total weight of the concrete building is estimated :

$$34,728\# + 19,597.5\# + 75,510.75\# = 129,836.25\#$$

The formula for buoyancy :

$$F_b = -\rho g V$$

F_b = buoyant force

ρ = fluid density

g = acceleration due to gravity

V = fluid volume

Volume of the building below static water level (BFE) :

Natural Grade = 8.4 ft

BFE = 14.0 ft

Depth of building below BFE = 14 - 8.4 = 5.6 ft

Area of building = 16.25 x 16 = 260 ft²

Volume of displaced water = 260 ft² x 5.6 ft = 1,456 ft³

$$F_b = - [62.4 \#/\text{ft}^3] \times [32.2 \text{ ft}/\text{s}^2] \times [1,456 \text{ ft}^3] = - (-) 2,925,511.68\#$$

since the weight of the concrete bldg is less than the buoyancy force the bldg will float.

$$129,836.25\# < 2,925,511.68\#$$

Thank You,



David Dammon