Target House
Thorpe Way Industrial Estate
Banbury
OX16 4SP

Structural calculation to check design compliance with CIRIA C680

Scheme Name	Example. Attenuation Tank		
Revision No.			
Supplier	Graf	Product	Ecobloc
Surfacing	Concrete	Depth (m)	0.250

Assumptions
Backfill density of 20.0 kN/m³
Angle of shearing resistance of 40.0 degrees for slab and backfill

Tank Position
Depth to base of tank is 1.6m
Depth of tank is 1.00m
Cover above tank is 0.60m
Depth to groundwater is 0.00m

Load classification of 30/30 for Vehicles up to 30,000kg GVW eg 8 wheel bin lorry

As per CIRIA C680 surcharges and partial safety factors are applied to all the loadings to obtain the design loads.

Vertical Loads

Dead Load = 0.6 x 20 = 13 kN/m²
Surcharge (distributed load) = 10 kN/m² (for class 30/30 from C680)
Apply PSF of 1.4 to fixed load and 1.5 to variable load to obtain Design Load
Design Dead Load = 18.2kN/m²

Vertical Live Load
Wheel load for 30/30 classification is 50kN on area of 0.4m x 0.2m
Area of load spread at 0.6m depth = 0.8

Design Dead Load + Distributed Live Load = 33.2kN/m²

Therefore Wheel Load at this depth = 38.1kN/m²
Apply PSF of 1.6 for Live Load and Design Live Load = 60.96kN/m²
Total Design Vertical Load = 79.16kN/m² *

** worst case of Dead Load + Distibuted Live Load or the Wheel Loading = 79.16kN/m²*

This must be less than the ultimate short term compressive strength of the cell with a partial safety factor of 2.75 applied which = 145.45kN/m²

Therefore this design loading complies with the requirements of CIRIA C680 for Vertical Loads

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Lateral Loads at base of tank
Earth pressure on side of tank
oh = Ka(Vz+q)
Where Ka = Coefficient of shear resistance = (1 - sin a) / (1 + sin a)
a = angle of shear resistance - 40 degrees Ka = 0.217
V = density (20kN/m³)
z = depth (1.6m)
q = surcharge (10kN/m²)

Dead Load = 29kN/m²
Liveload =10kN/m²
Dead Load + LiveLoad = 39kN/m²
Lateral Pressure (Unfactored) = 8.46kN/m²
Hydrostatic Pressure = 0 kN/m²
Factored Design Lateral Pressure (PSF 1.35) = 11.42kN/m²

This must be less than the ultimate short term lateral compressive strength of the cell with a partial safety factor of 2.75 applied = 29.82kN/m²

Servicability Limit State Checks (Deflection & Creep)
The servicability of the proposed product can be assessed by predicting possible unit deflection (short Term) and creep (long term).

Design Strength (kN/m² per mm) = 40
Deflection mm = 0.95
SLS (Serviceability Limit State) = 38.1

Vertical Creep
Creep Test load = 78.1kN/m²
SLS (Serviceability Limit State) = 38.1kN/m²
Degree of Utilisation = 17.00%

We are therefore happy to confirm that the cells used in this scheme will have a design life in excess of 50 Years.

The backfill around the tanks and the first 300mm above the tank should be a well graded sharp gravel

Given the supplied information and that groundwater does not encroach above the base of the tank, uplift calculations are not necessary, and we are pleased to confirm the use of Graf cells is suitable for this application.

Regards

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