

# UNDERGROUND TANK UPLIFT FORCE

(Calculations)

CUSTOMER : AL-AKARIA

GRP TANK MANUFACTURER : \_\_\_\_\_

INSTALLATION : Underground

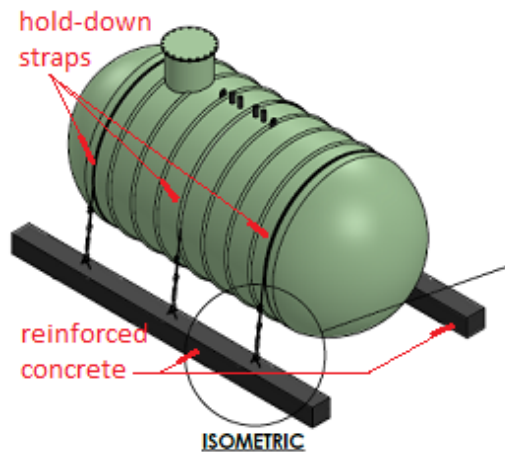
GRP TANK SPECIFICATIONS : 24CU.M. GRP Underground Water Storage Tank

## Why there is an UPLIFT force?

For buried GRP underground tank, uplift force happens when the following underground conditions exist:

1. When ground water level rise above the tank's invert.
2. The volume in liters created depending on the water level above the invert is equal to the uplift force in kgs. Example, if the height above the invert is midway of tank cylinder, the uplift force shall be 12,000 kgs.
3. And, tank is empty!

To counter the uplift force, it is necessary that an overburden above the tank equal or greater must be in placed. These overburden is the sum total of: backfill above the tank + concrete slab or asphalt slab above the tank.



**UPLIFT FORCE CALCULATIONS**

Given:

Volume of tank = 24 cu.m.

Hence, uplift force = 24 cu.m x 1000 kg/cu.m  
= 24,000 kgf

Where:

Density of water = 1000 kg/cu.m

**DOWNWARD FORCE CALCULATIONS**

Density of backfill sand = 1,602 kg/cu.m

Thickness of compacted sand backfill = 1000mm

Density of concrete slab = 2,400 kg/cu.m

Thickness of concrete slab = 200mm

Width of concrete slab = 2420mm

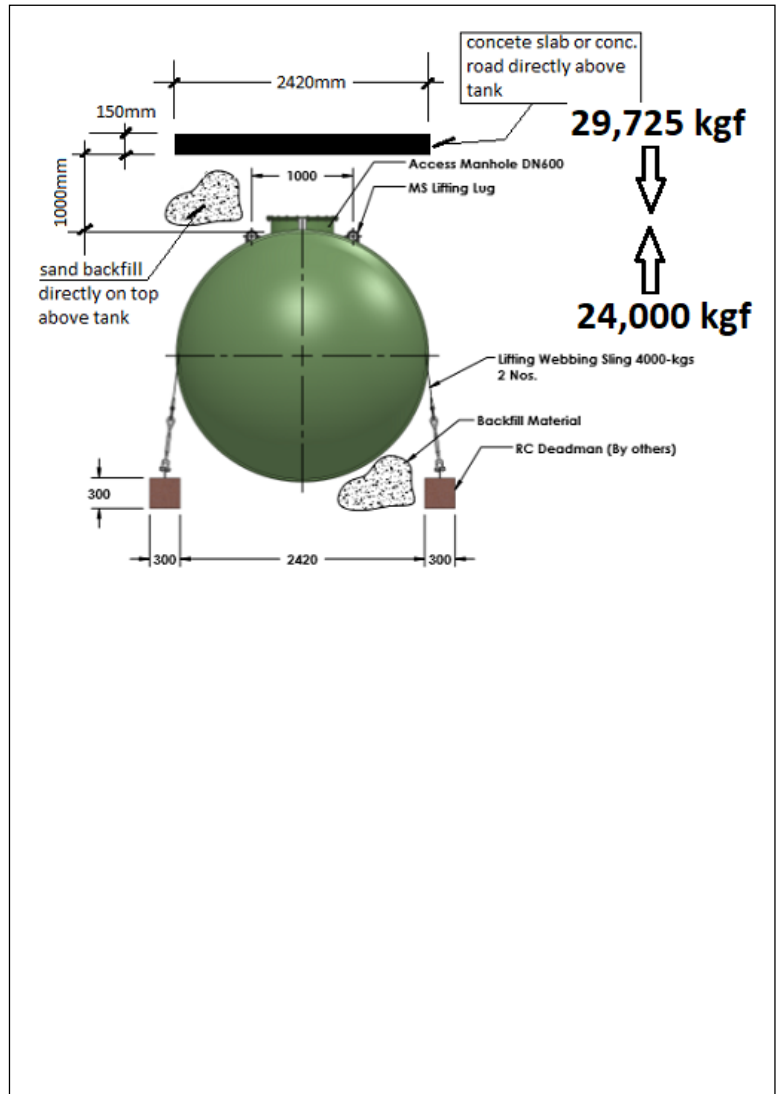
Length of concrete slab = 6105mm

Volume of concrete slab = 2.4 x 0.150 x 6.105  
= 2.93 cu.m

W\_concrete\_slab = 2.19 x 2400  
= 5,256 kgs

Volume of sand backfill above the tank  
= 2.4 x 1.000 x 6.105  
= 14.65 cu.m

W\_sand\_backfill = 14.65 x 1602 = 24,469 kgs



## G.I. Turnbuckles



Size: M16

Allowable Load: 1,840 kgs



Size: 12mm dia.



Wire-rope Clip

Size: M16