

ANSWER KEY for STORAGE TANK DESIGN PROBLEM (Groups 1-5)

$$(2\pi r^2 + 2\pi rh)h\rho_s g + \pi r^2 L \rho_L g > \pi r^2 S \rho_w g$$

GROUP 1			
Given:		Conversions:	
d (ft)	25	r (ft)	12.5
h (ft)	10	h (ft)	10
t (in)	0.25	t (ft)	0.02
g (m/s ²)	9.8	g (ft/s ²)	32.14
L (ft)	5	L (ft)	5
S (ft)	1	S (ft)	1
ρ_s (lb/in ³)	0.284	ρ_s (lb/ft ³)	490.75
ρ_L (kg/m ³)	1.178	ρ_L (lb/ft ³)	0.07
ρ_w (kg/m ³)	1000	ρ_w (lb/ft ³)	62.44

GROU	
Given:	
d (ft)	40
h (ft)	15
t (in)	0.5
g (m/s ²)	9.8
L (ft)	15
S (ft)	2
ρ_s (lb/in ³)	0.284
ρ_L (kg/m ³)	1.81
ρ_w (kg/m ³)	1000

Weight of AST (lb)
18067.30

Weight of water (lb)
30650.62

Weight of AST (lb)
89935.00

Weight of liquid (lb)
180.53

Weight of liquid (lb)
2130.34

18247.83

30650.62

92065.34

Above-Ground Storage Tank Design Project Activity
Source: TeachEngineering.org

P 2	
Conversions:	
r (ft)	20
h (ft)	15
t (ft)	0.04
g (ft/s ²)	32.14
L (ft)	15
S (ft)	2
ρs (lb/ft ³)	490.75
ρL (lb/ft ³)	0.11
ρw (lb/ft ³)	62.44

GROUP 3			
Given:		Conversions:	
d (ft)	65	r (ft)	32.5
h (ft)	20	h (ft)	20
t (in)	0.25	t (ft)	0.02
g (m/s ²)	9.8	g (ft/s ²)	32.14
L (ft)	10	L (ft)	10
S (ft)	7	S (ft)	7
ρs (lb/in ³)	0.284	ρs (lb/ft ³)	490.75
ρL (kg/m ³)	640	ρL (lb/ft ³)	39.96
ρw (kg/m ³)	1000	ρw (lb/ft ³)	62.44

Weight of water (lb)
156931.16

Weight of AST (lb)
109608.28

Weight of water (lb)
1450387.20

Weight of liquid (lb)
1326068.30

156931.16

1435676.58

1450387.20

GROUP 4			
Given:		Conversions:	
d (ft)	80	r (ft)	40
h (ft)	25	h (ft)	25
t (in)	0.25	t (ft)	0.02
g (m/s ²)	9.8	g (ft/s ²)	32.14
L (ft)	10	L (ft)	10
S (ft)	8	S (ft)	8
ρ _s (lb/in ³)	0.284	ρ _s (lb/ft ³)	490.75
ρ _L (kg/m ³)	876.5	ρ _L (lb/ft ³)	54.73
ρ _w (kg/m ³)	1000	ρ _w (lb/ft ³)	62.44

Given:	
d (ft)	95
h (ft)	30
t (in)	0.5
g (m/s ²)	9.8
L (ft)	5
S (ft)	8
ρ _s (lb/in ³)	0.284
ρ _L (kg/m ³)	866.9
ρ _w (kg/m ³)	1000

Weight of AST (lb)
167022.15

Weight of water (lb)
2510898.56

Weight of AST (lb)
472961.75

Weight of liquid (lb)
2751003.23

Weight of liquid (lb)
1918427.65

2918025.38

2510898.56

2391389.39

GROUP 5		
	Conversions:	
	r (ft)	47.5
	h (ft)	30
	t (ft)	0.04
	g (ft/s ²)	32.14
	L (ft)	5
	S (ft)	8
	ρ_s (lb/ft ³)	490.75
	ρ_L (lb/ft ³)	54.13
	ρ_w (lb/ft ³)	62.44

Weight of water (lb)
3540759.29

3540759.29