

# Design Study of a Ring Stiffened Cylinder for use as a Manned Submersible

Shell Yield using the Simple Hoop Stress Formula - Marks, Lionel S.  
 "Mechanical Engineering Handbook, Fifth Edition, 1951, Page 421

This is the maximum theoretical depth.

SafetyFactor := 2.0

DesignGoal := 1320·ft·SafetyFactor      DesignGoal = 2640 ft

## Design Variables:

Outside Diameter

OD := 42.0·in

Shell Thickness

t := .375·in, .4375·in, .5·in, .563·in, .625·in

Yield Strength

$\sigma := 38000 \frac{\text{lbf}}{\text{in}^2}$

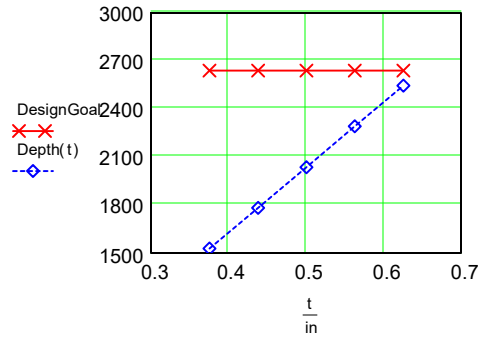
## Constants:

SeaWaterDensity :=  $64 \frac{\text{lbf}}{\text{ft}^3}$

ASTMA515 Grade 70  
 Yield Strength = 38,000 psi  
 Tensile Strength = 70,000 psi

## Equations:

$\text{Depth}(t) := \frac{2 \cdot t \cdot \sigma}{\text{OD} \cdot \text{SeaWaterDensity}}$



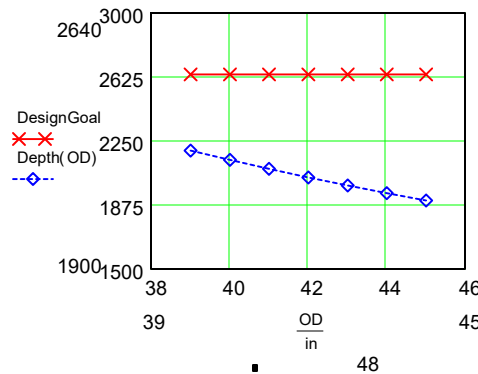
$\frac{t}{\text{in}} =$
0.375
0.438
0.5
0.563
0.625

$\frac{\text{Depth}(t)}{\text{ft}} =$
1527
1781
2036
2290
2545

OD := 39·in, 40·in, 41·in, 42·in, 43·in, 44·in, 45·in

t := .5·in

$\text{Depth}(\text{OD}) := \frac{2 \cdot t \cdot \sigma}{\text{OD} \cdot \text{SeaWaterDensity}}$



$\frac{\text{OD}}{\text{in}} =$
39
40
41
42
43
44
45

$\frac{\text{Depth}(\text{OD})}{\text{ft}} =$
2192
2138
2085
2036
1988
1943
1900