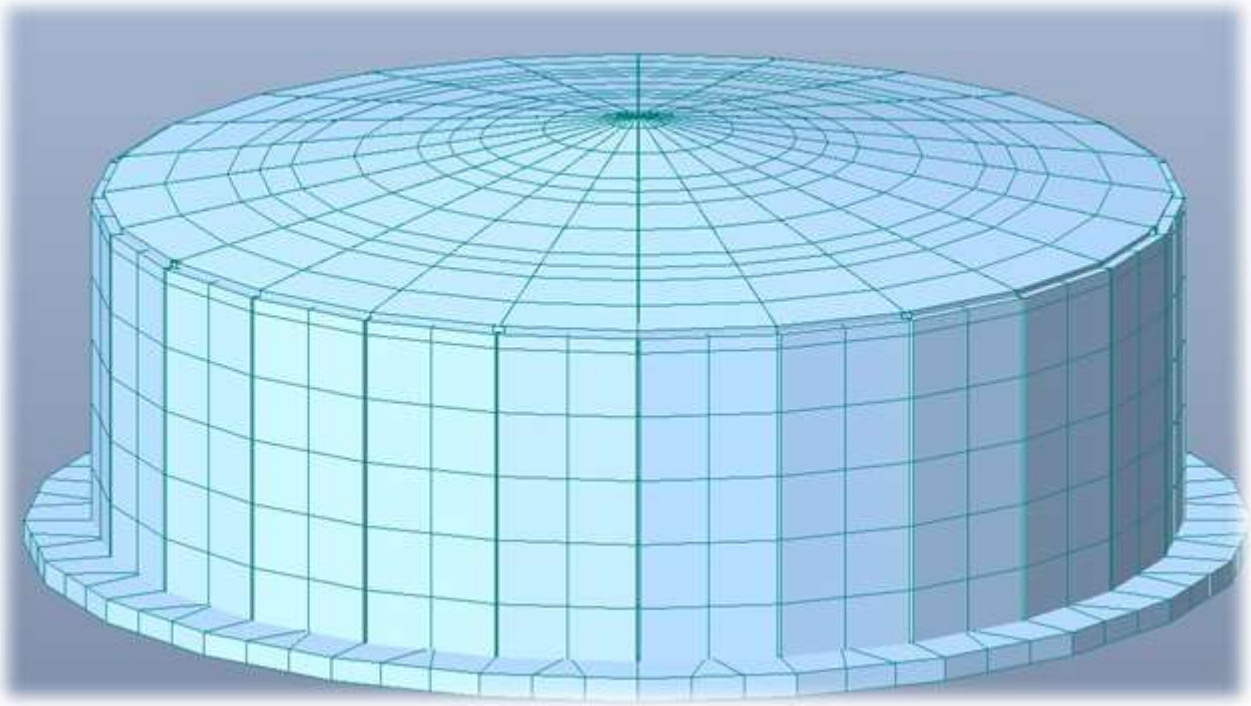


6.7 M DIAMETER FERROCEMENT WATER TANK DESIGN REPORT

31st July 2023

Prepared by:
Sheilla Constance Apio

ANALYSIS MODEL

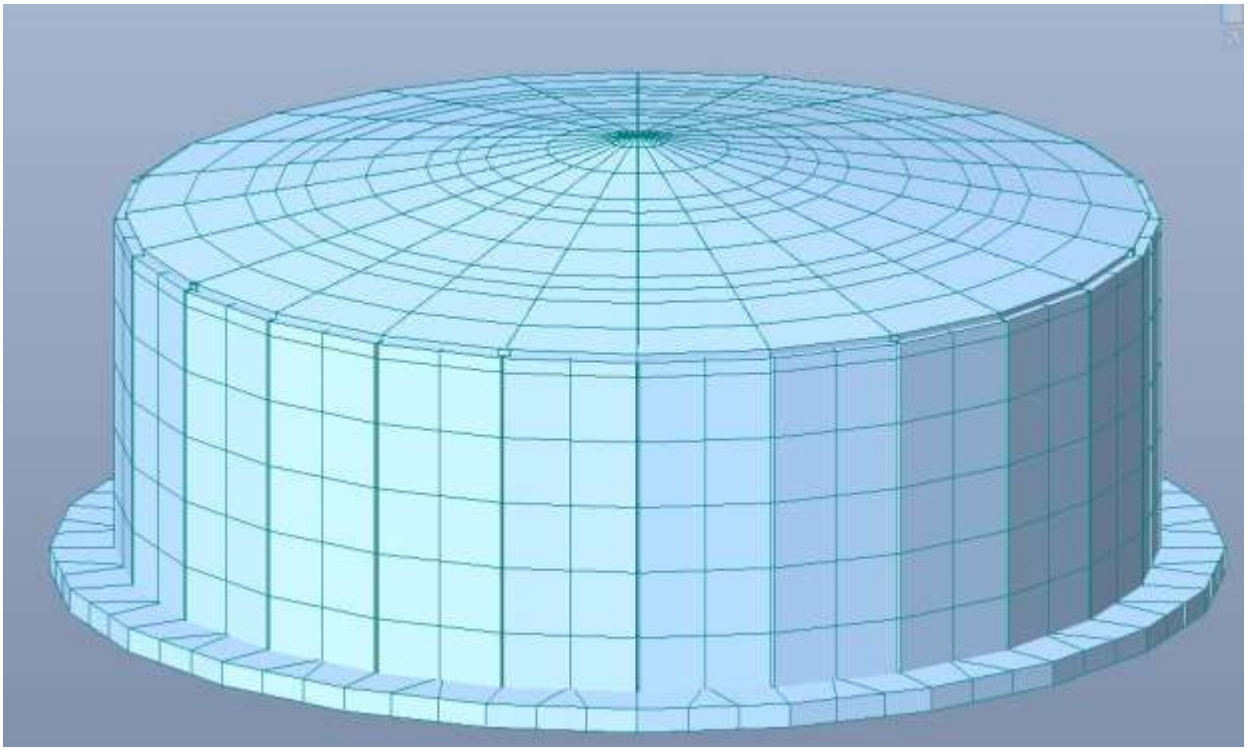


Figure 1 Analysis model

MODEL SUPPORTS

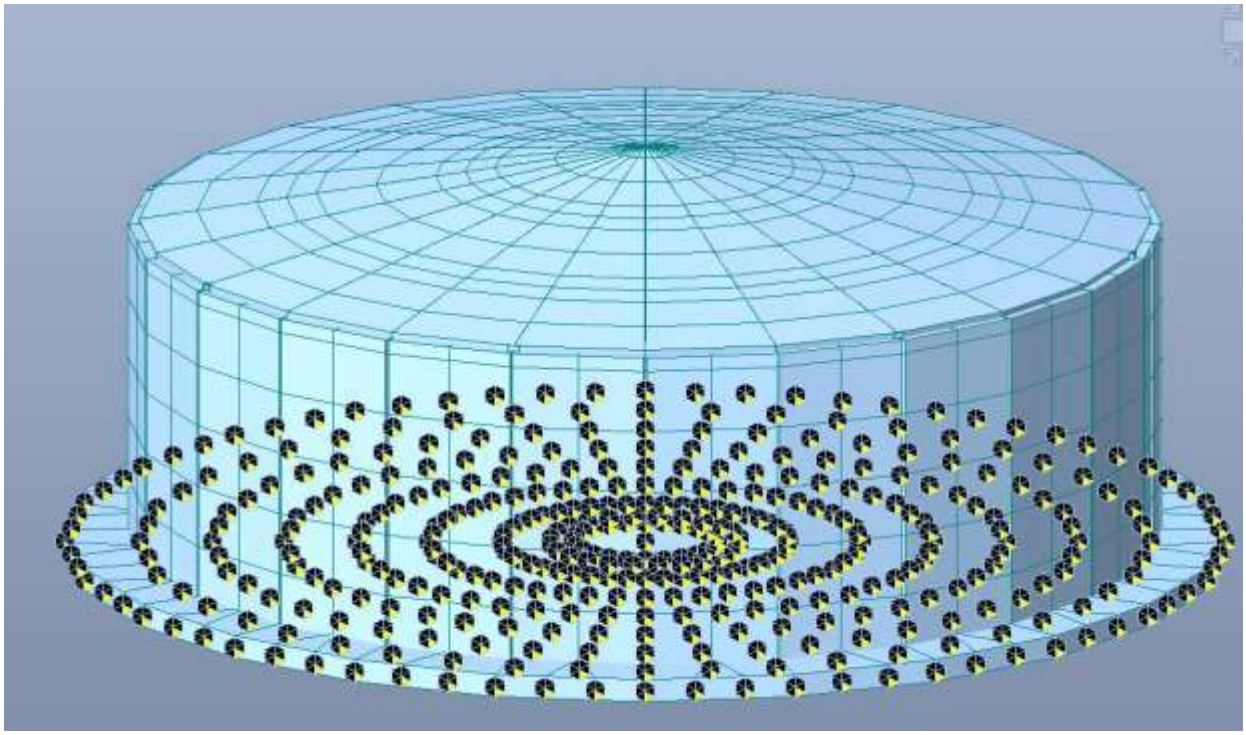


Figure 2 support conditions (using surface springs based on 150 kN/m2 soil capacity)

WATER LOADING

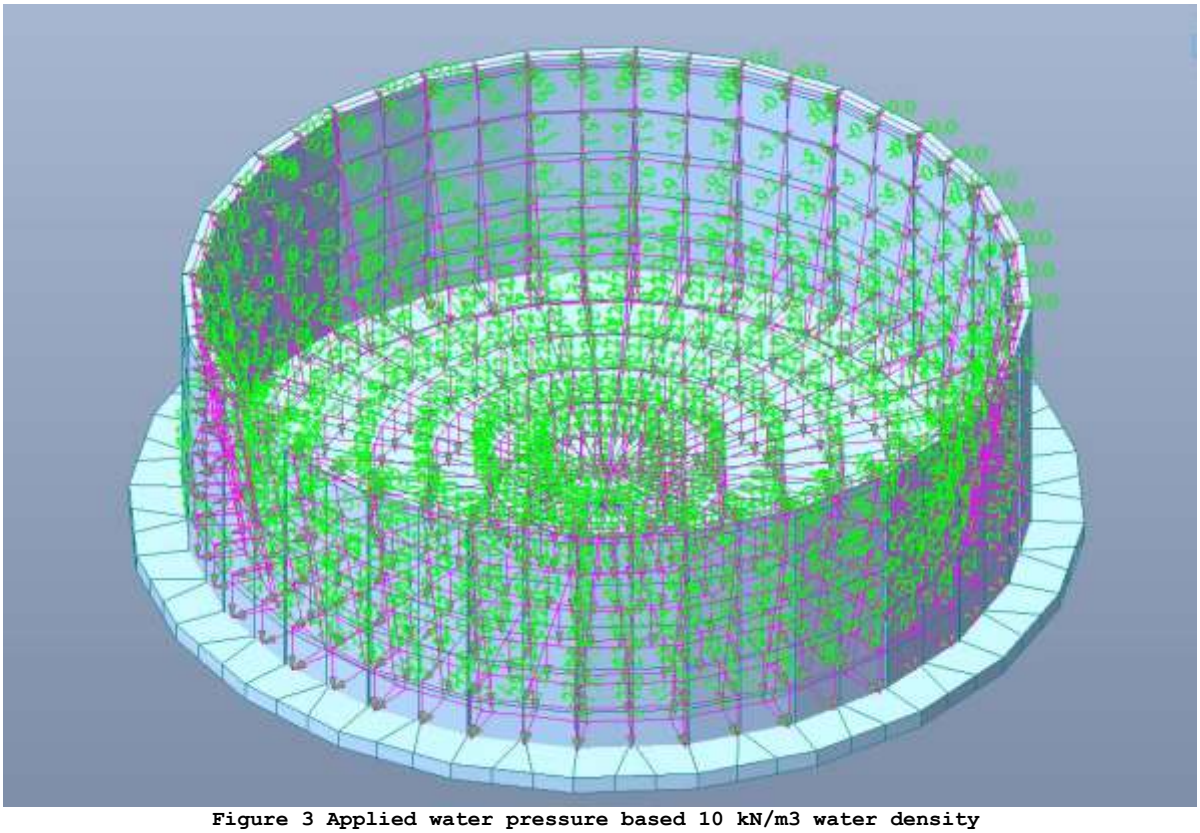


Figure 3 Applied water pressure based 10 kN/m3 water density

ROOF LOAD

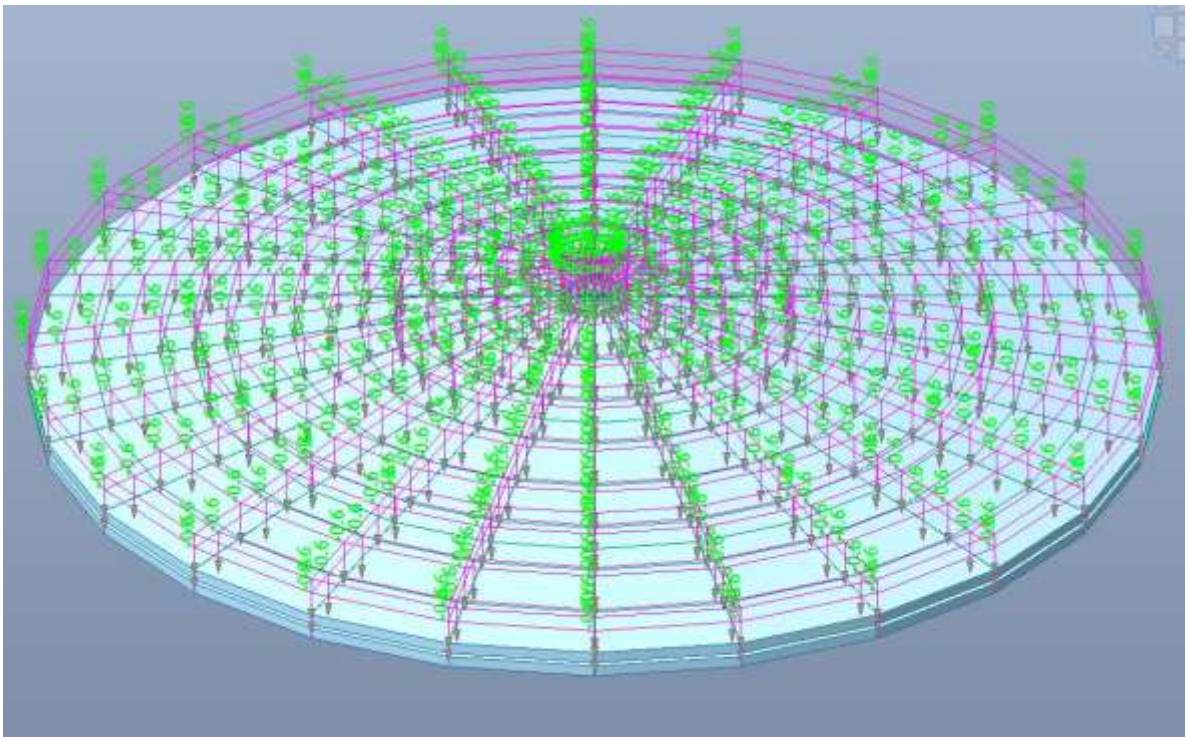


Figure 4 roof loading

STEEL SUPPORT FRAME

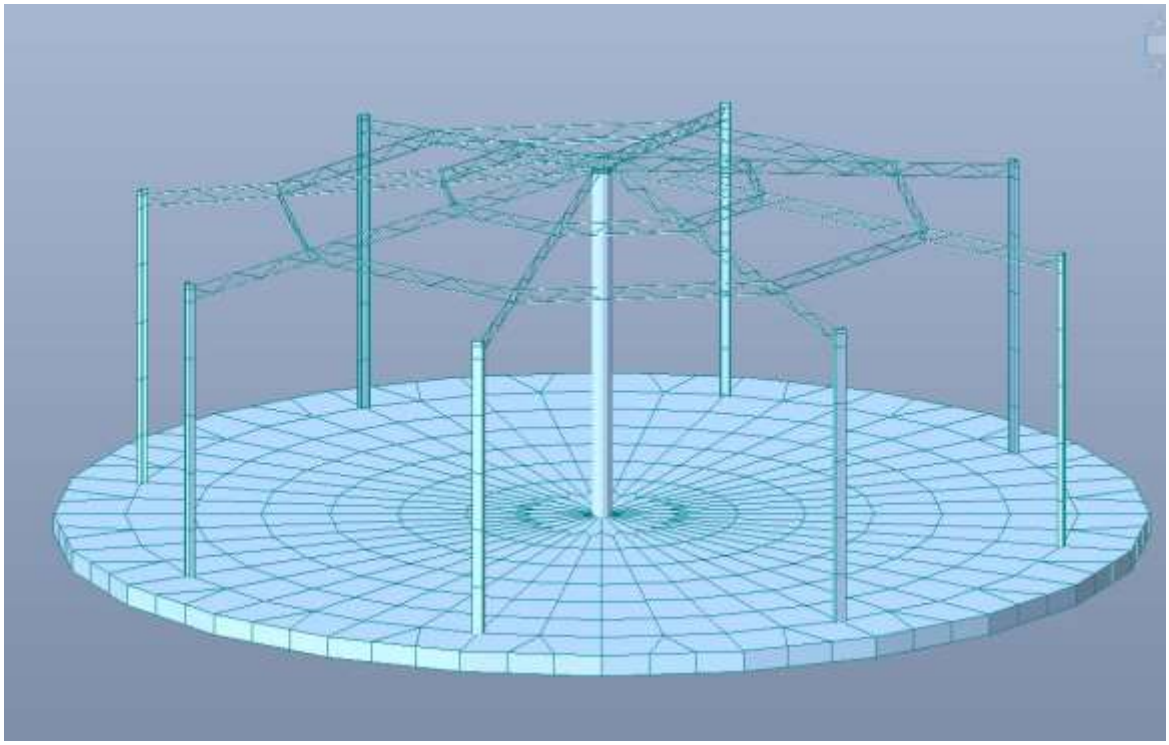


Figure 5 steel frame

MODAL DISPLACEMENT

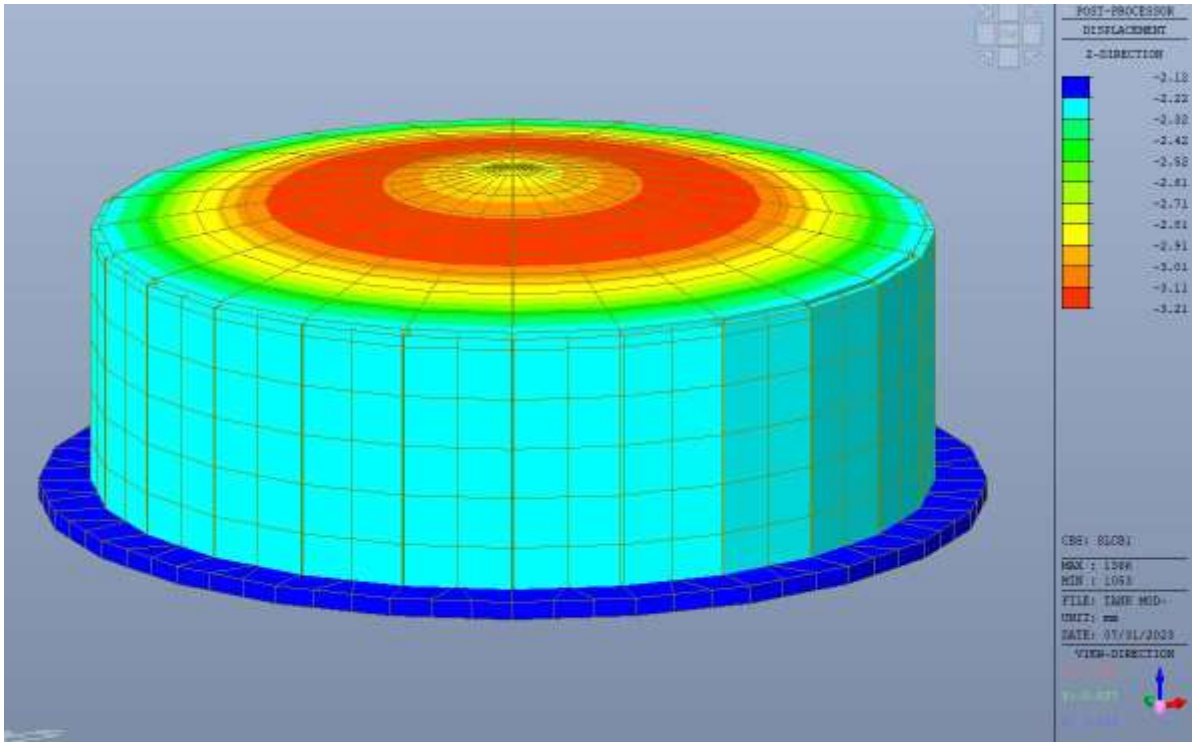


Figure 6 vertical displacement of model

Project Name : 6.7 m diameter Ferrocement Water Tank
Created :31/07/2023
User Name : Sheila

TANK DIMENSIONS

No.	Section	Dimension (m)
1.	Tank height	2.3
2.	Tank height (to roof)	2.8
3.	Diameter	6.7

LOAD CASES AND COMBINATIONS

No.	Name	Combination
1	cLCB1	1.35D + 1.5L
2	cLCB2	SERV :1.0D+ 1.0L
3	cLCB3	SERV :1.0D + 0.5L
4	cLCB4	SERV :1.0D + 0.3L

D – DEAD LOAD

L –LIVELOAD

SERV - Serviceability

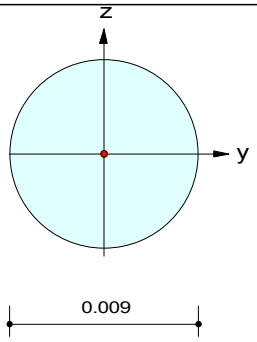
LOADS

No.	Section	DEAD LOAD (kN/m2)	LIVE LOAD (kN/m2)
1.	Roof load	-0.25	-0.60

	Company		**Project Title**	6.7 m dia Water Tank design
	Author	Sheila	**File Name**	D:\...\tank models_meshed.mgb

1. Design Information

Design Code : Eurocode3:05
Unit System : kN, m
Member No : 181
Material : S460 (No:1)
(Fy = 460000, Es = 210000000)
Section Name : 9 mm round bars (No:1)
(Rolled : 9 mm round bars).
Member Length : 0.09165



2. Member Forces

Axial Force	Fxx = -15.303 (LCB: 1, POS:J)
Bending Moments	My = 0.00000, Mz = -0.0000
End Moments	Myi = -0.0000, Myj = 0.00000 (for Lb)
	Myi = -0.0000, Myj = 0.00000 (for Ly)
	Mzi = 0.00000, Mzj = -0.0000 (for Lz)
Shear Forces	Fyy = 0.00003 (LCB: 1, POS:1/2)
	Fzz = -0.0001 (LCB: 1, POS:1/2)

Outer Dia. 0.00900			
Area	0.00006	Asz	0.00006
Qyb	0.00001	Qzb	0.00001
Iyy	0.00000	Izz	0.00000
Ybar	0.00450	Zbar	0.00450
Wely	0.00000	Welz	0.00000
ry	0.00225	rz	0.00225

3. Design Parameters

Unbraced Lengths Ly = 0.09165, Lz = 0.09165, Lb = 0.09165
Effective Length Factors Ky = 1.00, Kz = 1.00
Equivalent Uniform Moment Factors Cmy = 1.00, Cmz = 1.00, CmLT = 1.00

4. Checking Results

Slenderness Ratio
KL/r = 186.0 < 200.0 (Memb:1158, LCB: 1)..... O.K
Axial Resistance
N_Ed/MIN[Nc_Rd, Nb_Rd] = 15.3033/22.8648 = 0.669 < 1.000 ..... O.K
Bending Resistance
M_Edy/M_Rdy = 0.00000/0.05589 = 0.000 < 1.000 ..... O.K
M_Edz/M_Rdz = 0.00000/0.05589 = 0.000 < 1.000 ..... O.K
Combined Resistance
RNRd = MAX[M_Edy/Mny_Rd, M_Edz/Mnz_Rd]
Rmax1 = (M_Edy/Mny_Rd)^Alpha + (M_Edz/Mnz_Rd)^Beta
Rcom = N_Ed/(A*fy/Gamma_M0), Rbend = M_Edy/My_Rd + M_Edz/Mz_Rd
Rc_LT1 = N_Ed/(Xiy*A*fy/Gamma_M1)
Rb_LT1 = (kyy*M_Edy)/(Xi_LT*Wply*fy/Gamma_M1) + (kyz*Msdz)/(Wplz*fy/Gamma_M1)
Rc_LT2 = N_Ed/(Xiz*A*fy/Gamma_M1)
Rb_LT2 = (Kzy*M_Edy)/(Xi_LT*Wply*fy/Gamma_M1) + (Kzz*Msdz)/(Wplz*fy/Gamma_M1)
Rmax = MAX[RNRd, Rmax1, (Rcom+Rbend), MAX(Rc_LT1+Rb_LT1, Rc_LT2+Rb_LT2)] = 0.669 < 1.000 .. O.K
Shear Resistance
V_Edy/Vy_Rd = 0.000 < 1.000 ..... O.K
V_Edz/Vz_Rd = 0.000 < 1.000 ..... O.K

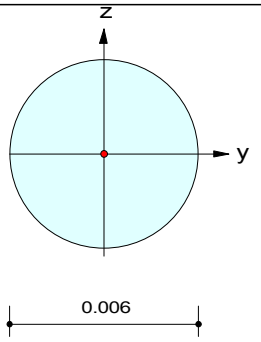
5. Deflection Checking Results

L/ 250.0 = 0.0016 > 0.0000 (Memb:491, LCB: 2, POS: 0.2m, Dir-Z)..... O.K

	Company		**Project Title**	6.7 m dia Water Tank design
	Author	Sheila	**File Name**	D:\...\tank models_meshed.mgb

1. Design Information

Design Code : Eurocode3:05
Unit System : kN, m
Member No : 859
Material : S460 (No:1)
(Fy = 460000, Es = 210000000)
Section Name : 6 mm round bars (No:2)
(Rolled : 6 mm round bars).
Member Length : 0.21966



2. Member Forces

Axial Force	Fxx = -2.0831 (LCB: 1, POS:I)
Bending Moments	My = -0.0001, Mz = 0.00000
End Moments	Myi = -0.0001, Myj = 0.00005 (for Lb)
	Myi = -0.0001, Myj = 0.00005 (for Ly)
	Mzi = 0.00000, Mzj = 0.00000 (for Lz)
Shear Forces	Fyy = 0.00000 (LCB: 3, POS:1/2)
	Fzz = -0.0008 (LCB: 1, POS:I)

Outer Dia. 0.00600			
Area	0.00003	Asz	0.00003
Qyb	0.00000	Qzb	0.00000
Iyy	0.00000	Izz	0.00000
Ybar	0.00300	Zbar	0.00300
Wely	0.00000	Welz	0.00000
ry	0.00150	rz	0.00150

3. Design Parameters

Unbraced Lengths Ly = 0.21966, Lz = 0.21966, Lb = 0.21966
Effective Length Factors Ky = 1.00, Kz = 1.00
Equivalent Uniform Moment Factors Cmy = 1.00, Cmz = 1.00, CmLT = 1.00

4. Checking Results

Slenderness Ratio
KL/r = 173.4 < 200.0 (Memb:514, LCB: 1)..... O.K
Axial Resistance
N_Ed/MIN[Nc_Rd, Nb_Rd] = 2.08313/2.19427 = 0.949 < 1.000 ..... O.K
Bending Resistance
M_Edy/M_Rdy = 0.00006/0.01656 = 0.004 < 1.000 ..... O.K
M_Edz/M_Rdz = 0.00000/0.01656 = 0.000 < 1.000 ..... O.K
Combined Resistance
RNRd = MAX[M_Edy/Mny_Rd, M_Edz/Mnz_Rd]
Rcom = N_Ed/(A*fy/Gamma_M0), Rbend = M_Edy/My_Rd + M_Edz/Mz_Rd
Rc_LT1 = N_Ed/(Xiy*A*fy/Gamma_M1)
Rb_LT1 = (kyy*M_Edy)/(Xi_LT*Wply*fy/Gamma_M1) + (kyz*Msdz)/(Wplz*fy/Gamma_M1)
Rc_LT2 = N_Ed/(Xiz*A*fy/Gamma_M1)
Rb_LT2 = (Kzy*M_Edy)/(Xi_LT*Wply*fy/Gamma_M1) + (Kzz*Msdz)/(Wplz*fy/Gamma_M1)
Rmax = MAX[RNRd, (Rcom+Rbend), MAX(Rc_LT1+Rb_LT1, Rc_LT2+Rb_LT2)] = 0.957 < 1.000 .. O.K
Shear Resistance
V_Edy/Vy_Rd = 0.000 < 1.000 ..... O.K
V_Edz/Vz_Rd = 0.000 < 1.000 ..... O.K

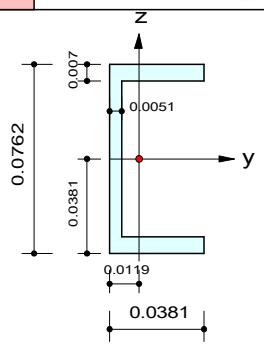
5. Deflection Checking Results

L/ 250.0 = 0.0006 > 0.0000 (Memb:874, LCB: 4, POS: 0.1m, Dir-Z)..... O.K

Company		Project Title	6.7 m dia Water Tank design
Author	Sheila	File Name	D:\...\tank models_meshed.mgb

1. Design Information

Design Code : Eurocode3:05
Unit System : kN, m
Member No : 71
Material : S275 (No:5)
(Fy = 275000, Es = 210000000)
Section Name : C channel (No:3)
(Rolled : C 76x38x6.70).
Member Length : 0.09165



2. Member Forces

Axial Force	Fxx = -0.8021 (LCB: 1, POS:J)
Bending Moments	My = 0.04452, Mz = 0.05886
End Moments	Myi = 0.01767, Myj = 0.04452 (for Lb)
	Myi = 0.01767, Myj = 0.04452 (for Ly)
	Mzi = -0.0216, Mzj = 0.05886 (for Lz)
Shear Forces	Fyy = -0.8783 (LCB: 1, POS:1/2)
	Fzz = -0.2930 (LCB: 1, POS:1/2)

Depth	0.07620	Web Thick	0.00510
Top F Width	0.03810	Top F Thick	0.00700
Bot.F Width	0.03810	Bot.F Thick	0.00700
Area	0.00086	Asz	0.00039
Qyb	0.00229	Qzb	0.00034
Iyy	0.00000	Izz	0.00000
Ybar	0.01190	Zbar	0.03810
Wely	0.00002	Welz	0.00000
ry	0.02950	rz	0.01120

3. Design Parameters

Unbraced Lengths Ly = 0.09165, Lz = 0.09165, Lb = 0.09165
Effective Length Factors Ky = 1.00, Kz = 1.00
Equivalent Uniform Moment Factors Cmy = 0.85, Cmz = 0.85, CmLT = 1.00

4. Checking Results

Slenderness Ratio
KL/r = 185.1 < 200.0 (Memb:1, LCB: 1)..... O.K
Axial Resistance
N_Ed/MIN[Nc_Rd, Nb_Rd] = 0.802/235.400 = 0.003 < 1.000 ..... O.K
Bending Resistance
M_Edy/M_Rdy = 0.04452/6.46250 = 0.007 < 1.000 ..... O.K
M_Edz/M_Rdz = 0.05886/2.13950 = 0.028 < 1.000 ..... O.K
Combined Resistance
RNRd = MAX[M_Edy/Mny_Rd, M_Edz/Mnz_Rd]
Rmax1 = (M_Edy/Mny_Rd)^Alpha + (M_Edz/Mnz_Rd)^Beta
Rcom = N_Ed/(A*fy/Gamma_M0), Rbend = M_Edy/My_Rd + M_Edz/Mz_Rd
Rc_LT1 = N_Ed/(Xiy*A*fy/Gamma_M1)
Rb_LT1 = (kyy*M_Edy)/(Xi_LT*Wply*fy/Gamma_M1) + (kyz*Msdz)/(Wplz*fy/Gamma_M1)
Rc_LT2 = N_Ed/(Xiz*A*fy/Gamma_M1)
Rb_LT2 = (Kzy*M_Edy)/(Xi_LT*Wply*fy/Gamma_M1) + (Kzz*Msdz)/(Wplz*fy/Gamma_M1)
Rmax = MAX[RNRd, Rmax1, (Rcom+Rbend), MAX(Rc_LT1+Rb_LT1, Rc_LT2+Rb_LT2)] = 0.038 < 1.000 .. O.K
Shear Resistance
V_Edy/Vy_Rd = 0.010 < 1.000 ..... O.K
V_Edz/Vz_Rd = 0.005 < 1.000 ..... O.K

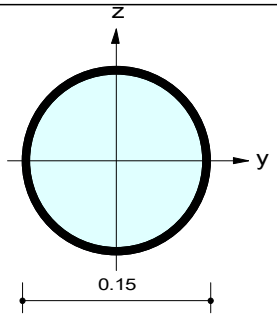
5. Deflection Checking Results

L/ 300.0 = 0.0001 > 0.0000 (Memb:18, LCB: 2, Dir-X)..... O.K

	Company		**Project Title**	6.7 m dia Water Tank design
	Author	Sheila	**File Name**	D:\...\tank models_meshed.mgb

1. Design Condition

Design Code : SSRC79
Unit System : kn, m
Element Number : 895
Material : S275 (No:4)
Section : GI Pipe (No:4)
Member Length : 2.57271
Concrete filled option for Pipe/Tube = Filled



Concrete Section
Type = Filled Section (Fc = 12000)
Dc = 0.13800
Area (Ac) = 0.01496

Steel Section
Sect Name = GI Pipe (Fy = 275000)
Outer Dia. = 0.15000 Wall Thk = 0.00600
Area (As) = 0.00271

Main Rebar
None

2. Member Force

Axial Forces	Fxx = -42.581 (LCB: 1, POS:J)
Bending Moments	My = -0.0097, Mz = 0.00481
End Moments	Myi = 0.00282, Myj = -0.0097 (for Lb)
	Myi = 0.00282, Myj = -0.0097 (for Ly)
	Mzi = -0.0014, Mzj = 0.00481 (for Lz)
Shear Forces	Fyy = -0.0024 (LCB: 1, POS:1/2)
	Fzz = 0.00488 (LCB: 1, POS:1/2)

3. Design Parameter

Moment Coefficients	Cmy = 0.85, Cmz = 0.85
Effective Length Factors	Ky = 1.00, Kz = 1.00
Unbraced Length	Ly = 2.57271, Lz = 2.57271, Lu = 2.57271

4. Modified Properties of Composite Section

Yield Stress	Fmy = Fy+1.0*Fyr*(Ar/As)+0.85*Fc*(Ac/As) = 331206
Modulus of Elasticity	Em = Es+0.4*Ec*(Ac/As) = 246138446
Radius of Gyration	Rmy = ry = 0.05096, Rmz = rz = 0.05096

5. Stress Checking Results

Axial Stresses
Slenderness Ratio : KL/r = 50.5 < 200.0 ..... O.K
fa/Fa = 15687/ 166725 = 0.094 < 1.000 ..... O.K

Bending Stresses
Major Axis
fby/Fby = 103/ 206250 = 0.001 < 1.000 ..... O.K
Minor Axis
fbz/Fbz = 51/ 206250 = 0.000 < 1.000 ..... O.K

Combined Stresses (Compression+Bending)
Rcom = (fa/Fa)^2 + SQRT([[Cmy/(1-fa/F'ey)]*fby/Fby]^2 + [[Cmz/(1-fa/F'ez)]*fbz/Fbz]^2)
Rcom = 0.009 < 1.000 ..... O.K

Shear Stresses
fvy/Fvy = 4/ 110000 = 0.000 < 1.000 ..... O.K
fvz/Fvz = 4/ 110000 = 0.000 < 1.000 ..... O.K

PROJECT TITLE : 6.7 m dia Water Tank design

	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Design     [ Eurocode2:04 ]                    Gen 2019
============================================================================================

================================================================================
    [[[*]]]   SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 6.7 m Tank-Roof slab, Dir 2.
================================================================================
 ---------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |    M_Ed( LCB)    M_Rd   Rat CHK
 ---------------------------------------------------------------------
  0.0750   2211 BOT7.1500e-005 0.0001 | 0.67346(   1) 2.90199 0.232  OK
           2151 TOP7.7981e-005 0.0001 | 1.54403(   1) 2.90199 0.532  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 2211
    Thickness :    0.0750 m.
    Materials :  fck =  12000.0000 KPa.
                 fcd =   8000.0000 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0200 m.
                 dT  =   0.0200 m.
    LCB No.   :    1
```

PROJECT TITLE : 6.7 m dia Water Tank design

	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Design     [ Eurocode2:04 ]                    Gen 2019
============================================================================================

 -. Information of Design.
    b         =   0.0010 m.  (by Code Unit Length).
    d         =   0.0550 m.
    lambda    =   0.800
    a         = lambda * x  =   0.007 m.
    eta       =   1.000
    Cc        = eta*fcd*b*a =      0.0564 kN.
    M_Rd      = Cc*(d-a/2)  =       2.9020  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P6 @200
    As_req =  7.1500e-005 m^2/m.  (  7.1500e-005 m^2/m.)
    M_Ed   =       0.6735  kN-m./m.
    M_Rd   =       2.9020  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.232  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.081
```

PROJECT TITLE : 6.7 m dia Water Tank design

	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
================================================================================
    [[[*]]]   SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 6.7 m Tank-Roof slab, Dir 1.
================================================================================
 ------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |    M_Ed( LCB)    M_Rd   Rat CHK
 ------------------------------------------------------------------
  0.0750   2049 BOT7.1500e-005 0.0001 | 0.67349(   1) 2.90199 0.232  OK
           2160 TOP7.6913e-005 0.0001 | 1.52288(   1) 2.90199 0.525  OK
 ------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 2049
    Thickness :    0.0750 m.
    Materials :  fck =  12000.0000 KPa.
                 fcd =   8000.0000 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0200 m.
                 dT  =   0.0200 m.
    LCB No.   :    1
```

PROJECT TITLE : 6.7 m dia Water Tank design

	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Design     [ Eurocode2:04 ]                    Gen 2019
============================================================================================

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.0550 m.
    lambda   =   0.800
    a        = lambda * x  =   0.007 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.0564 kN.
    M_Rd     = Cc*(d-a/2)  =       2.9020  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P6 @200
    As_req =  7.1500e-005 m^2/m.  (  7.1500e-005 m^2/m.)
    M_Ed   =       0.6735  kN-m./m.
    M_Rd   =       2.9020  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.232  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.081
```

PROJECT TITLE : 6.7 m dia Water Tank design

MIDAS	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Design     [ ACI318-14 ]                        Gen 2019
============================================================================================

================================================================================
    [[[*]]]   SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 6.7 m Tank-Base slab, Dir 2.
================================================================================
 ------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |      Mu( LCB)     pMn   Rat CHK
 ------------------------------------------------------------------
  0.1500   3262 BOT 0.0002 0.0003 | 8.78213(   1) 14.1686 0.620  OK
           3667 TOP 0.0002 0.0003 | 1.84870(   1) 14.1686 0.130  OK
 ------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 3262
    Thickness :    0.1500 m.
    Materials :  fc  =  12000.0000 KPa.
                 Fy  = 400000.0000 KPa.
    Covering  :  dB  =   0.0200 m.
                 dT  =   0.0200 m.
    LCB No.   :    1

 -. Information of Design.
    phi    =   0.900
    b      =   0.0254 m.  (by Code Unit Length).
    d      =   0.1300 m.

 -. Information of Moments and Result.
    Rein. Bar :  P9 @200
    As_req =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    As_use =       0.0003 m^2/m.  (       0.0003 m^2/m.)
    Mn     = As_use*Fy*[d-As_use*Fy/(1.7*fc*b)] =      15.7429  kN-m./m.
    phiMn  = phi * Mn   =      14.1686  kN-m./m.
    Mu                  =       8.7821  kN-m./m.
    RatM   = Mu / phiMn =   0.620  <  1.0  --->  O.K !
```

PROJECT TITLE : 6.7 m dia Water Tank design

	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Design     [ ACI318-14 ]                        Gen 2019
==========================================================================================


================================================================================
    [[[*]]]   SLAB DESIGN MAXIMUM RESULT DATA : DOMAIN 6.7 m Tank-Base slab, Dir 1.
================================================================================
 ------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |      Mu( LCB)     pMn   Rat CHK
 ------------------------------------------------------------------
  0.1500   3377 BOT 0.0002 0.0003 | 8.78210(   1) 14.1686 0.620  OK
           3517 TOP 0.0002 0.0003 | 1.84870(   1) 14.1686 0.130  OK
 ------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 3377
    Thickness :    0.1500 m.
    Materials :  fc  =  12000.0000 KPa.
                 Fy  = 400000.0000 KPa.
    Covering  :  dB  =   0.0200 m.
                 dT  =   0.0200 m.
    LCB No.   :    1

 -. Information of Design.
    phi    =   0.900
    b      =   0.0254 m.  (by Code Unit Length).
    d      =   0.1300 m.

 -. Information of Moments and Result.
    Rein. Bar :  P9 @200
    As_req =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    As_use =       0.0003 m^2/m.  (       0.0003 m^2/m.)
    Mn     = As_use*Fy*[d-As_use*Fy/(1.7*fc*b)] =      15.7429  kN-m./m.
    phiMn  = phi * Mn   =      14.1686  kN-m./m.
    Mu                  =       8.7821  kN-m./m.
    RatM   = Mu / phiMn =   0.620  <  1.0  --->  O.K !
```

SOIL PRESSURE

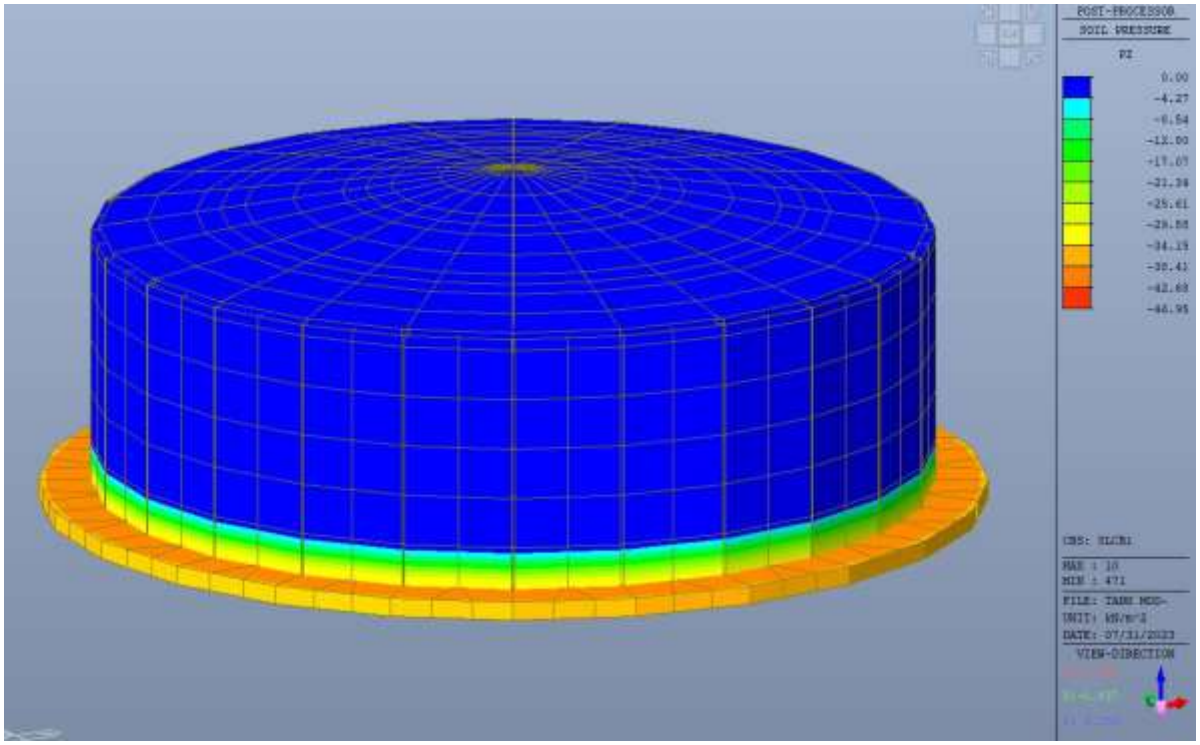


Figure 7 pressure on soil

Since the soil pressure is less than the allowable soil pressure (150kN/m2), the tank base is ok.

PROJECT TITLE : 6.7 m dia Water Tank design

	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
------------------------------------------------------------------------------------------
 midas Gen - RC-Mesh Flexural Wall Design    [ Eurocode2:04 ]               Gen 2019
==========================================================================================


==========================================================================================
    [[[*]]]   MESHED WALL DESIGN MAXIMUM RESULT DATA : DOMAIN 6.7 m Tank-Walls. (Vertical)
==========================================================================================


 -. Information of Parameters.
    Elem No.  : 5043
    LCB No.   :    1
    Materials :  fck =  12000.0000 KPa.
                 fyk = 460000.0000 KPa.
    Thickness :  t   =   0.1500 m.
    Covering  :  Dw  =   0.0250 m.

 -. Information of Design.
    Alpha_cc =   1.000  (Default or User Defined).
    gamma_c  =   1.500  (for Concrete)
    gamma_s  =   1.150  (for Reinforcement)
    fcd      = Alpha_cc *fck / gamma_c =   8000.0000 KPa.
    fyd      = fyk / gamma_s           = 400000.0000 KPa.
    Nu       = 0.6*(1-fck/250) =      0.5712 (fck in MPa)

 -. Design Forces.
    Sig_Edx  =   -443.8430 KPa.
    Sig_Edy  =     27.9439 KPa.
    Tau_Edxy =    -67.0311 KPa.

    Sig_Ed_max =     27.9439 KPa. (y-dir)
    Sig_Ed_min =   -443.8430 KPa. (x-dir)
    Tau_Edxy   =    -67.0311 KPa.

    (Sig_Ed_min in Tension or Sig_Ed_max*Sig_Ed_min <= Tau_Edxy^2 --> Rebar Required!)
    ftd_max  = |Tau_Edxy| - Sig_Ed_max =     39.0873 KPa. (y-dir)
    ftd_min  = |Tau_Edxy| - Sig_Ed_min =    510.8741 KPa. (x-dir)

    f'tdx    =    510.8741 KPa.
    f'tdy    =     39.0873 KPa.
    Sig_cd   = 2*|Tau_Edxy|         =    134.0622 KPa.

    rhoy_req = max(f'tdy/fyd, 0.002)               =  0.0020
    rhox_req = max(f'tdx/fyd, 0.001, 0.25*rhoy_req) =  0.0013

    b        = 1.0 m.  (by Unit Length).
    Asx_Req  =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    Asy_Req  =       0.0003 m^2/m.  (       0.0003 m^2/m.)
    Asx_use  =       0.0003 m^2/m.  (       0.0003 m^2/m.)
    Asy_use  =       0.0003 m^2/m.  (       0.0003 m^2/m.)
    ftnx     = Asx_use/(b*t)*fyd =    848.0000 KPa.
    ftny     = Asy_use/(b*t)*fyd =    848.0000 KPa.
```

PROJECT TITLE : 6.7 m dia Water Tank design

	Company		Client	
	Author	Sheila	File Name	tank models_meshed.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Mesh Flexural Wall Design    [ Eurocode2:04 ]               Gen 2019
============================================================================================


 -. Information of Result.
    Rein. Bar_x :  P9 @200 (Hor.)
    Rein. Bar_y :  P9 @200 (Ver.)
    Rat_x   = f'tdx/ftnx       =   0.602
    Rat_y   = f'tdy/ftny       =   0.046
    Rat_cd  = Sig_cd/(Nu*fcd)  =   0.029
    Rat     = Rat_y =   0.046  <  1.0  --->  O.K !
```

DESIGN RESULTS

TRUSS MEMBERS

No.	Section	Dimensions	Status
1.	Main members	9 mm diameter round bar	**OK**
2.	Internal members	9 mm diameter round bar	**OK**

STEEL MEMBERS

No.	Section	Dimensions	Status
1.	Composite GI pipe (filled with mortar and 4T9 main bar with T6 mm links at 200mm spacing)	150 mm diameter	**OK**
2.	C channel	76x38x6.7 mm section	**OK**

Concrete elements

No.	Section	Reinforcement	Status
1.	Roof slab (150 mm thick)	Top mesh reinforcement (A142) T6-200 mm -Middle (Radial & Longitudinal bars) Bottom mesh reinforcement (A142)	**OK**
2.	Wall (150 mm thick)	T9 at 200 mm vertical bars T9 at 200mm horizontal bars	**OK**
3.	Base slab (150 mm thick)	T9 at 200 mm (main and distribution bars)	**OK**