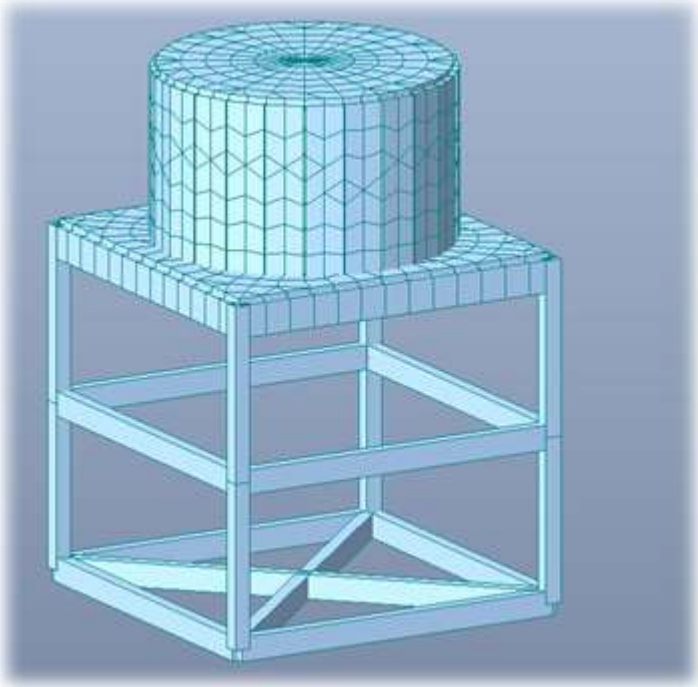


50 M^3 ELEVATED STORAGE WATER TANK DESIGN REPORT

2nd September 2023

Prepared by:
Sheilla Constance Apio

Project Name : Elevated Concrete Storage Water Tank (50 cubic meter tank)
Created :02/09/2023
User Name : Sheilla

ANALYSIS MODEL

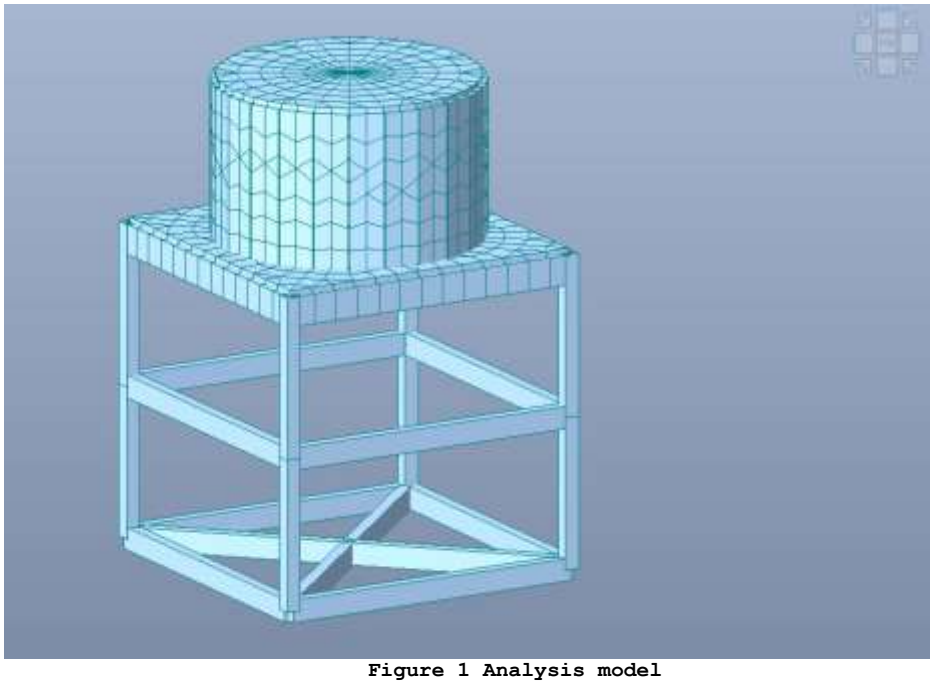


Figure 1 Analysis model

MODAL DISPLACEMENT

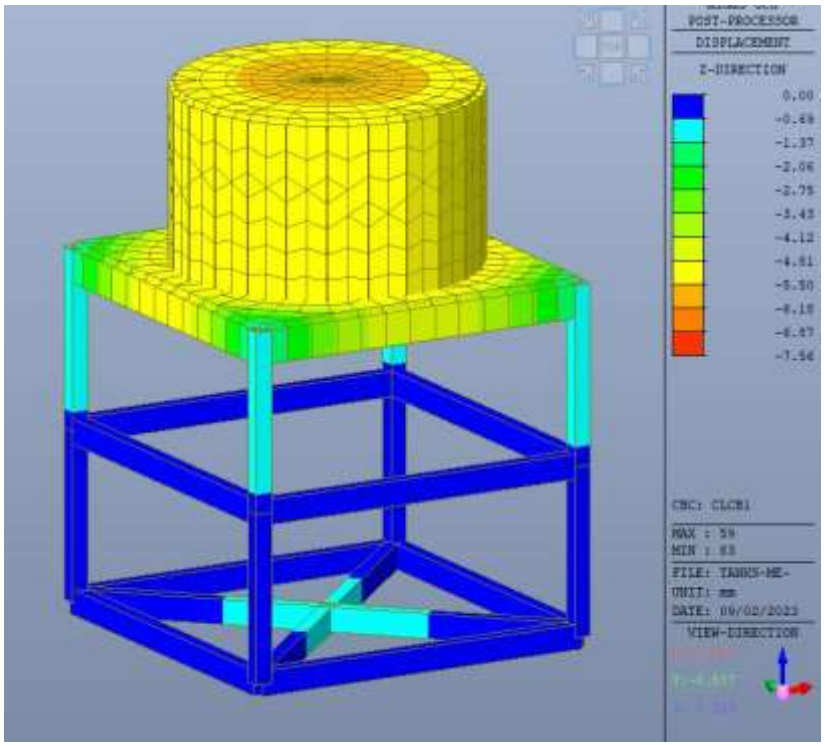


Figure 2 Modal displacement

LOAD CASES AND COMBINATIONS

No.	Name	Combination
1	cLCB1	1.35D + 1.5(1.0LL)
2	cLCB2	1.35D + 1.5(1.0LL) + 1.5(0.6)WL
3	cLCB3	1.35D + 1.5(0.7LL) + 1.5WL
4	cLCB4	1.35D + 1.5(1.0LL) - 1.5(0.6)WL
5	cLCB5	1.35D + 1.5(0.7LL) - 1.5WL
6	cLCB6	1.0D + 1.0(0.3L) + 1.0E
7	cLCB7	1.0D + 1.0(0.3L) - 1.0E
8	cLCB8	SERV :1.0D + (1.0LL)
9	cLCB9	SERV :1.0D + (1.0LL) + (0.6)WL
10	cLCB10	SERV :1.0D + (1.0LL) - (0.6)WL
11	cLCB12	SERV :1.0D + (0.7LL) - 1.0WL
12	cLCB13	SERV :1.0D + (0.5LL)
13	cLCB14	SERV :1.0D + (0.3LL) + (0.2)WL
14	cLCB15	SERV :1.0D + (0.3LL) - (0.2)WL
15	cLCB16	SERV :1.0D + (0.3LL)

D – DEAD LOAD

LL -LIVELOAD

WL – WIND LOAD (based on wind speed of 35 m/s)

E – EARTHQUAKE (based on a PGA of 0.064g)

SERV - Serviceability

LOADS

No.	Section	DEAD LOAD (kN/m2)	LIVE LOAD (kN/m2)
1.	Roof load	-1.2	-1.5

Pressure on the within the tank is based on water density of 10kN/m^3

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
-------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
===========================================================================================


=============================================================================
    [[[*]]]   SLAB CHECKING MAXIMUM RESULT DATA  : DOMAIN Water tank-Bottom slab, Dir 1.
=============================================================================
 ---------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |    M_Ed( LCB)    M_Rd   Rat CHK
 ---------------------------------------------------------------------
  0.2000   1158 BOT 0.0009 0.0010 | 55.4997(   1) 64.1510 0.865  OK
           1071 TOP 0.0004 0.0010 | 25.3633(   1) 64.1510 0.395  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 1158
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.030 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.4010 kN.
    M_Rd     = Cc*(d-a/2)  =      64.1510  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P16 @200
    As_req =       0.0009 m^2/m.  (       0.0009 m^2/m.)
    M_Ed   =      55.4997  kN-m./m.
    M_Rd   =      64.1510  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.865  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.215

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 1071
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
============================================================================================

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.030 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.4010 kN.
    M_Rd     = Cc*(d-a/2)  =      64.1510  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P16 @200
    As_req =       0.0004 m^2/m.  (       0.0004 m^2/m.)
    M_Ed   =      25.3633  kN-m./m.
    M_Rd   =      64.1510  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.395  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.215
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
============================================================================================


============================================================================
    [[[*]]]   SLAB CHECKING MAXIMUM RESULT DATA  : DOMAIN Water tank-Bottom slab, Dir 2.
============================================================================
 ------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |    M_Ed( LCB)    M_Rd   Rat CHK
 ------------------------------------------------------------------
  0.2000   1215 BOT 0.0009 0.0010 | 55.7113(   1) 64.1510 0.868  OK
           1009 TOP 0.0004 0.0010 | 25.2422(   1) 64.1510 0.393  OK
 ------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 1215
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.030 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.4010 kN.
    M_Rd     = Cc*(d-a/2)  =      64.1510  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P16 @200
    As_req =       0.0009 m^2/m.  (       0.0009 m^2/m.)
    M_Ed   =      55.7113  kN-m./m.
    M_Rd   =      64.1510  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.868  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.215

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 1009
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
============================================================================================

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.030 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.4010 kN.
    M_Rd     = Cc*(d-a/2)  =      64.1510  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P16 @200
    As_req =       0.0004 m^2/m.  (       0.0004 m^2/m.)
    M_Ed   =      25.2422  kN-m./m.
    M_Rd   =      64.1510  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.393  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.215
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
--------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
============================================================================================


============================================================================
    [[[*]]]   SLAB CHECKING MAXIMUM RESULT DATA  : DOMAIN Water tank-Top slab, Dir 1.
============================================================================
 ---------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |    M_Ed( LCB)    M_Rd   Rat CHK
 ---------------------------------------------------------------------
  0.2000   4081 BOT 0.0002 0.0004 | 6.94260(   1) 26.5133 0.262  OK
           4213 TOP 0.0002 0.0004 | 8.29102(   1) 26.5133 0.313  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 4081
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.012 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1568 kN.
    M_Rd     = Cc*(d-a/2)  =      26.5133  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    M_Ed   =       6.9426  kN-m./m.
    M_Rd   =      26.5133  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.262  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.084

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 4213
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
---------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
=============================================================================================

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.012 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1568 kN.
    M_Rd     = Cc*(d-a/2)  =      26.5133  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    M_Ed   =       8.2910  kN-m./m.
    M_Rd   =      26.5133  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.313  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.084
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
==========================================================================================


================================================================================
    [[[*]]]   SLAB CHECKING MAXIMUM RESULT DATA  : DOMAIN Water tank-Top slab, Dir 2.
================================================================================
 ---------------------------------------------------------------------
     Thk   Elem POS  AsReq  AsUse |    M_Ed( LCB)    M_Rd   Rat CHK
 ---------------------------------------------------------------------
  0.2000   4081 BOT 0.0002 0.0004 | 6.95893(   1) 26.5133 0.262  OK
           4165 TOP 0.0002 0.0004 | 8.37972(   1) 26.5133 0.316  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 4081
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.012 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1568 kN.
    M_Rd     = Cc*(d-a/2)  =      26.5133  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    M_Ed   =       6.9589  kN-m./m.
    M_Rd   =      26.5133  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.262  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.084

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 4165
    Thickness :    0.2000 m.
    Materials :  fck =  20000.0000 KPa.
                 fcd =  13333.3333 KPa.
                 fyk = 460000.0000 KPa.
    Covering  :  dB  =   0.0250 m.
                 dT  =   0.0250 m.
    LCB No.   :    1
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

```
---------------------------------------------------------------------------------------------
 midas Gen - RC-Slab Flexural Checking   [ Eurocode2:04 & Eurocode8:04 ]    Gen 2019
=============================================================================================

 -. Information of Design.
    b        =   0.0010 m.  (by Code Unit Length).
    d        =   0.1750 m.
    lambda   =   0.800
    a        = lambda * x  =   0.012 m.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1568 kN.
    M_Rd     = Cc*(d-a/2)  =      26.5133  kN-m./m.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    M_Ed   =       8.3797  kN-m./m.
    M_Rd   =      26.5133  kN-m./m.
    RatM   = M_Ed / M_Rd =   0.316  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.084
```

RC Beam Strength Checking Result

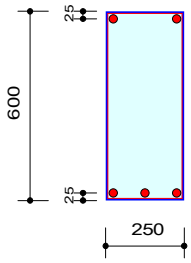
	Company		**Project Title**	50 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

1. Design Information

Design Code : Eurocode2:04
Unit System : kN, mm
Material Data : fck = 0.02, fyk = 0.46, fyw = 0.25 kN/mm^2
Section Property: 600x250 loading beams (No : 5)
Beam Span : 8980.26 mm

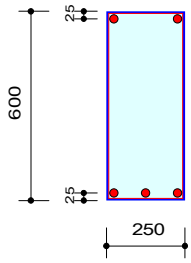
2. Section Diagram

[END-I]



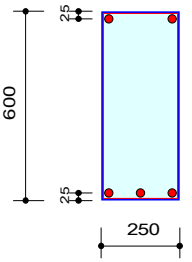
TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

[MID]



TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

[END-J]



TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

3. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	4	4	4
Moment (M_Ed)	29673.70	7453.14	29812.54
Factored Strength (M_Rd)	88980.14	88980.14	88980.14
Check Ratio (M_Ed/M_Rd)	0.3335	0.0838	0.3350
Neutral Axis (x/d)	0.0533	0.0533	0.0533
(+) Load Combination No.	4	4	4
Moment (M_Ed)	52231.77	115972.15	68352.51
Factored Strength (M_Rd)	132436.44	132436.44	132436.44
Check Ratio (M_Ed/M_Rd)	0.3944	0.8757	0.5161
Neutral Axis (x/d)	0.0781	0.0781	0.0781
Using Rebar Top (As_top)	402.1200	402.1200	402.1200
Using Rebar Bot (As_bot)	603.1800	603.1800	603.1800

4. Shear Capacity

	END-I	MID	END-J
Load Combination No.	4	4	4
Factored Shear Force (V_Ed)	165.92	33.97	163.29
Shear Strength by Conc.(V_Rdc)	55.73	55.73	55.73
Shear Strength by Rebar.(V_Rds)	176.72	176.72	176.72
Shear Strength by Rebar.(V_Rdmax)	476.10	476.10	476.10
Using Shear Reinf. (Asw)	1570.8000	1570.8000	1570.8000
Using Stirrups Spacing	2-P10 @100	2-P10 @100	2-P10 @100
Shear Ratio by Conc	2.9772	0.6095	2.9301
Shear Ratio by (V_Rds ; V_Rdmax)	0.9389	0.1922	0.9240
Check Ratio	0.9389	0.6095	0.9240

RC Beam Strength Checking Result

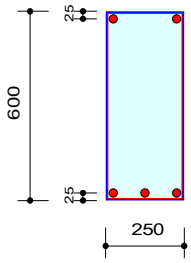
	Company		**Project Title**	50 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

1. Design Information

Design Code : Eurocode2:04
Unit System : kN, mm
Material Data : fck = 0.02, fyk = 0.46, fyw = 0.25 kN/mm^2
Section Property: 600x250 tie beams (No : 4)
Beam Span : 6350 mm

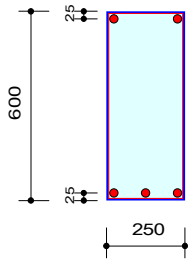
2. Section Diagram

[END-I]



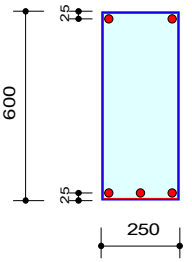
TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

[MID]



TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

[END-J]



TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

3. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	4	4	4
Moment (M_Ed)	19826.00	4957.06	19828.22
Factored Strength (M_Rd)	88980.14	88980.14	88980.14
Check Ratio (M_Ed/M_Rd)	0.2228	0.0557	0.2228
Neutral Axis (x/d)	0.0533	0.0533	0.0533
(+) Load Combination No.	4	4	4
Moment (M_Ed)	72094.46	105833.10	72266.40
Factored Strength (M_Rd)	132436.44	132436.44	132436.44
Check Ratio (M_Ed/M_Rd)	0.5444	0.7991	0.5457
Neutral Axis (x/d)	0.0781	0.0781	0.0781
Using Rebar Top (As_top)	402.1200	402.1200	402.1200
Using Rebar Bot (As_bot)	603.1800	603.1800	603.1800

4. Shear Capacity

	END-I	MID	END-J
Load Combination No.	4	7	4
Factored Shear Force (V_Ed)	152.23	35.70	152.43
Shear Strength by Conc.(V_Rdc)	55.73	55.73	55.73
Shear Strength by Rebar.(V_Rds)	176.72	176.72	176.72
Shear Strength by Rebar.(V_Rdmax)	476.10	476.10	476.10
Using Shear Reinf. (Asw)	1570.8000	1570.8000	1570.8000
Using Stirrups Spacing	2-P10 @100	2-P10 @100	2-P10 @100
Shear Ratio by Conc	2.7316	0.6405	2.7352
Shear Ratio by (V_Rds ; V_Rdmax)	0.8614	0.2020	0.8626
Check Ratio	0.8614	0.6405	0.8626

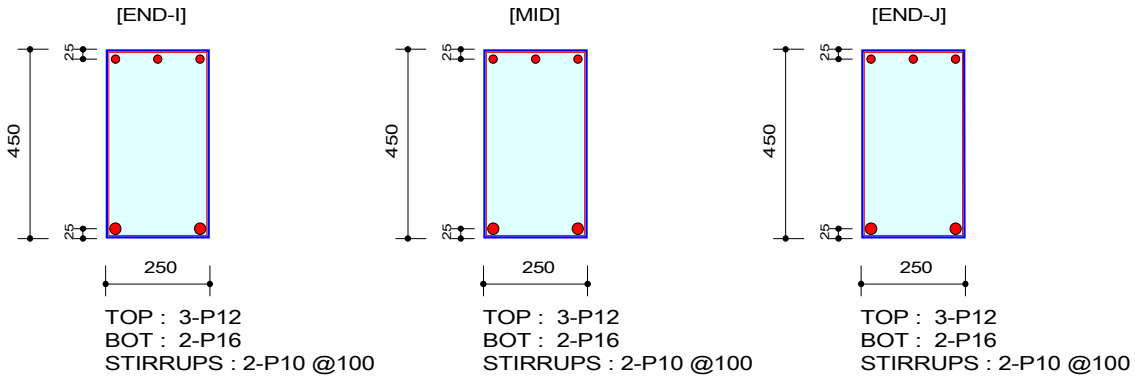
RC Beam Strength Checking Result

	Company		**Project Title**	50 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

1. Design Information

Design Code : Eurocode2:04
Unit System : kN, mm
Material Data : fck = 0.02, fyk = 0.46, fyw = 0.25 kN/mm^2
Section Property: 450x250 tie beams (No : 6)
Beam Span : 6350 mm

2. Section Diagram



3. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	4	4	4
Moment (M_Ed)	14056.13	3515.42	14061.69
Factored Strength (M_Rd)	55164.63	55164.63	55164.63
Check Ratio (M_Ed/M_Rd)	0.2548	0.0637	0.2549
Neutral Axis (x/d)	0.0725	0.0725	0.0725
(+) Load Combination No.	4	5	4
Moment (M_Ed)	7028.06	5894.74	7030.84
Factored Strength (M_Rd)	65137.57	65137.57	65137.57
Check Ratio (M_Ed/M_Rd)	0.1079	0.0905	0.1079
Neutral Axis (x/d)	0.0835	0.0835	0.0835
Using Rebar Top (As_top)	339.3000	339.3000	339.3000
Using Rebar Bot (As_bot)	402.1200	402.1200	402.1200

4. Shear Capacity

	END-I	MID	END-J
Load Combination No.	7	7	7
Factored Shear Force (V_Ed)	27.88	18.95	27.88
Shear Strength by Conc.(V_Rdc)	42.21	42.21	42.21
Shear Strength by Rebar.(V_Rds)	130.62	130.62	130.62
Shear Strength by Rebar.(V_Rdmax)	351.90	351.90	351.90
Using Shear Reinf. (Asw)	1570.8000	1570.8000	1570.8000
Using Stirrups Spacing	2-P10 @100	2-P10 @100	2-P10 @100
Shear Ratio by Conc	0.6604	0.4489	0.6604
Shear Ratio by (V_Rds ; V_Rdmax)	0.2134	0.1450	0.2134
Check Ratio	0.6604	0.4489	0.6604

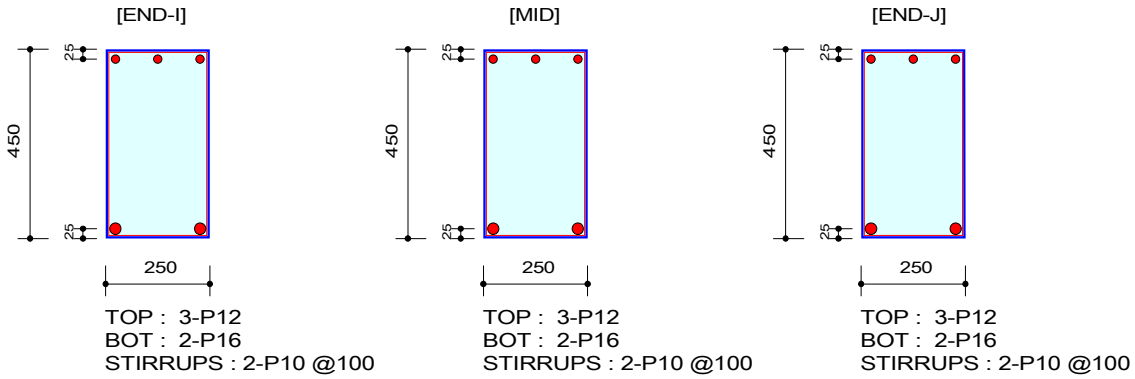
RC Beam Strength Checking Result

	Company		**Project Title**	50 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

1. Design Information

Design Code : Eurocode2:04
Unit System : kN, mm
Material Data : fck = 0.02, fyk = 0.46, fyw = 0.25 kN/mm^2
Section Property: 450x250 ground beams (No : 7)
Beam Span : 8980.26 mm

2. Section Diagram



3. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	5	7	5
Moment (M_Ed)	25516.58	0.00	25516.58
Factored Strength (M_Rd)	55164.63	55164.63	55164.63
Check Ratio (M_Ed/M_Rd)	0.4626	0.0000	0.4626
Neutral Axis (x/d)	0.0725	0.0725	0.0725
(+) Load Combination No.	5	5	5
Moment (M_Ed)	3189.57	12758.29	3189.57
Factored Strength (M_Rd)	65137.57	65137.57	65137.57
Check Ratio (M_Ed/M_Rd)	0.0490	0.1959	0.0490
Neutral Axis (x/d)	0.0835	0.0835	0.0835
Using Rebar Top (As_top)	339.3000	339.3000	339.3000
Using Rebar Bot (As_bot)	402.1200	402.1200	402.1200

4. Shear Capacity

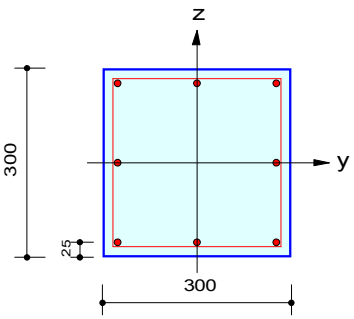
	END-I	MID	END-J
Load Combination No.	5	5	5
Factored Shear Force (V_Ed)	17.05	8.52	17.05
Shear Strength by Conc.(V_Rdc)	42.21	42.21	42.21
Shear Strength by Rebar.(V_Rds)	130.62	130.62	130.62
Shear Strength by Rebar.(V_Rdmax)	351.90	351.90	351.90
Using Shear Reinf. (Asw)	1570.8000	1570.8000	1570.8000
Using Stirrups Spacing	2-P10 @100	2-P10 @100	2-P10 @100
Shear Ratio by Conc	0.4039	0.2020	0.4039
Shear Ratio by (V_Rds ; V_Rdmax)	0.1305	0.0653	0.1305
Check Ratio	0.4039	0.2020	0.4039

RC Column Checking Result

	Company		**Project Title**	50 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

1. Design Condition

Design Code : Eurocode2:04 UNIT SYSTEM kN, mm
Member Number : 92 (PM), 87 (Shear)
Material Data : fck = 0.02, fyk = 0.46, fyw = 0.25 kN/mm^2
Column Height : 3250 mm
Section Property : 300x300 columns (No : 2)
Rebar Pattern : 8 - 3 - P16 Ast = 1608.48 mm^2 (Rhost = 0.018)



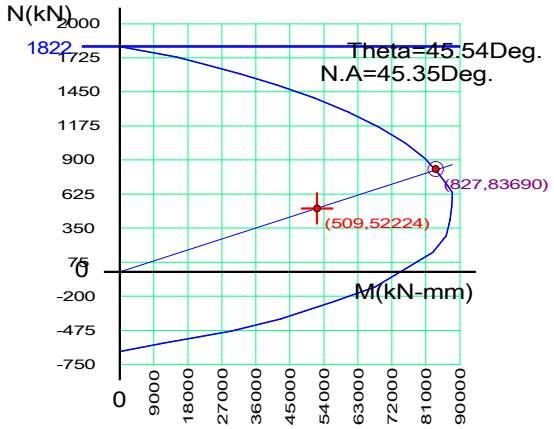
2. Applied Loads

Load Combination : 4 AT (J) Point
N_Ed = 509.254 kN M_Edy = 36702.5 kN-mm M_Edz = 37152.3 kN-mm
M_Ed = SQRT(M_Edy^2+ M_Edz^2) = 52224.2 kN-mm

3. Axial Forces and Moments Capacity Check

Concentric Max. Axial Load	N_Rdmax	= 1821.95 kN	
Axial Load Ratio	N_Ed/N_Rd	= 509.254 / 826.891	= 0.616 < 1.000 ..... O.K
Moment Ratio	M_Ed/M_Rd	= 52224.2 / 83690.4	= 0.624 < 1.000 ..... O.K
	M_Edy/M_Rdy	= 36702.5 / 58622.7	= 0.626 < 1.000 ..... O.K
	M_Edz/M_Rdz	= 37152.3 / 59728.2	= 0.622 < 1.000 ..... O.K
Normalized Axial Load Ratio	Nu_d / 0.65	= 0.231 / 0.650	= 0.356 < 1.000 ..... O.K

4. M-N Interaction Diagram



N_Rd(kN)	M_Rd(kN-mm)
1821.95	0.00
1675.68	22630.51
1507.43	41728.55
1286.89	60736.21
1040.53	75695.50
795.87	84526.76
643.32	88093.55
521.77	87961.99
289.00	86416.56
29.60	75986.48
-240.55	56725.48
-476.33	29645.50
-643.39	0.00

5. Shear Force Capacity Check (End)

Applied Shear Force	V_Ed	= 47.2822 kN (Load Combination : 7)
Shear Ratio by Conc	V_Ed/V_Rdc	= 47.2822 / 82.3687 = 0.574
Shear Ratio by (V_Rds ; V_Rdmax)	V_Ed/V_Rds	= 47.2822 / 36.0633 = 1.311
Shear Ratio	V_Ed/V_Rd	= 0.574 < 1.000 ..... O.K
		(Asw-H_use = 670.26667 mm^2/m, 2-P8 @150)
Joint Shear Ratio	Vjhd/Vjs	= 0.00000 / 0.00000 = 0.000 < 1.000 ..... O.K
		(Ash = 268.10667 mm^2, 2-3 P8)

6. Shear Force Capacity Check (Middle)

Applied Shear Force	V_Ed	= 47.2822 kN (Load Combination : 7)
Shear Ratio by Conc	V_Ed/V_Rdc	= 47.2822 / 82.3687 = 0.574
Shear Ratio by (V_Rds ; V_Rdmax)	V_Ed/V_Rds	= 47.2822 / 36.0633 = 1.311
Shear Ratio	V_Ed/V_Rd	= 0.574 < 1.000 ..... O.K
		(Asw-H_use = 670.26667 mm^2/m, 2-P8 @150)

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

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 midas Gen - RC-Mesh Flexural Wall Design    [ Eurocode2:04 & Eurocode8:04 ]Gen 2019
============================================================================================


============================================================================================
    [[[*]]]   MESHED WALL DESIGN MAXIMUM RESULT DATA : DOMAIN Water tank-Walls. (Vertical)
============================================================================================


 -. Information of Parameters.
    Elem No.  : 2757
    LCB No.   :    4
    Materials :  fck =  20000.0000 KPa.
                 fyk = 460000.0000 KPa.
    Thickness :  t   =   0.2000 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 =  13333.3333 KPa.
    fyd      = fyk / gamma_s           = 400000.0000 KPa.
    Nu       = 0.6*(1-fck/250) =      0.5520 (fck in MPa)

 -. Design Forces.
    Sig_Edx  =   1612.1986 KPa.
    Sig_Edy  =   -610.7701 KPa.
    Tau_Edxy =    359.0605 KPa.

    Sig_Ed_max =   1612.1986 KPa. (x-dir)
    Sig_Ed_min =   -610.7701 KPa. (y-dir)
    Tau_Edxy   =    359.0605 KPa.

    (Sig_Ed_min in Tension or Sig_Ed_max*Sig_Ed_min <= Tau_Edxy^2 --> Rebar Required!)
    ftd_max  =      0.0000 KPa. (x-dir)
    ftd_min  = Tau_Edxy^2/Sig_Ed_max - Sig_Ed_min        =    690.7382 KPa. (y-dir)

    f'tdx    =      0.0000 KPa.
    f'tdy    =    690.7382 KPa.
    Sig_cd   = Sig_Ed_max*[1 + (Tau_Edxy/Sig_Ed_max)^2 ] =   1692.1666 KPa.

    rhoy_req = max(f'tdy/fyd, 0.002)               =  0.0020
    rhox_req = max(f'tdx/fyd, 0.001, 0.25*rhoy_req) =  0.0010

    b        = 1.0 m.  (by Unit Length).
    Asx_Req  =       0.0002 m^2/m.  (       0.0002 m^2/m.)
    Asy_Req  =       0.0004 m^2/m.  (       0.0004 m^2/m.)
    Asx_use  =       0.0004 m^2/m.  (       0.0004 m^2/m.)
    Asy_use  =       0.0006 m^2/m.  (       0.0006 m^2/m.)
    ftnx     = Asx_use/(b*t)*fyd =    785.4000 KPa.
    ftny     = Asy_use/(b*t)*fyd =   1131.0000 KPa.
```

PROJECT TITLE : 50 cum tank

	Company		Client	
	Author	Sheilla C A	File Name	tanks-meshed-loaded-analysis.rcs

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--------------------------------------------------------------------------------------------
 midas Gen - RC-Mesh Flexural Wall Design    [ Eurocode2:04 & Eurocode8:04 ]Gen 2019
============================================================================================


 -. Information of Result.
    Rein. Bar_x :  P10 @200 (Hor.)
    Rein. Bar_y :  P12 @200 (Ver.)
    Rat_x   = f'tdx/ftnx       =   0.000
    Rat_y   = f'tdy/ftny       =   0.611
    Rat_cd  = Sig_cd/(Nu*fcd)  =   0.230
    Rat     = Rat_y =   0.611  <  1.0  --->  O.K !
```
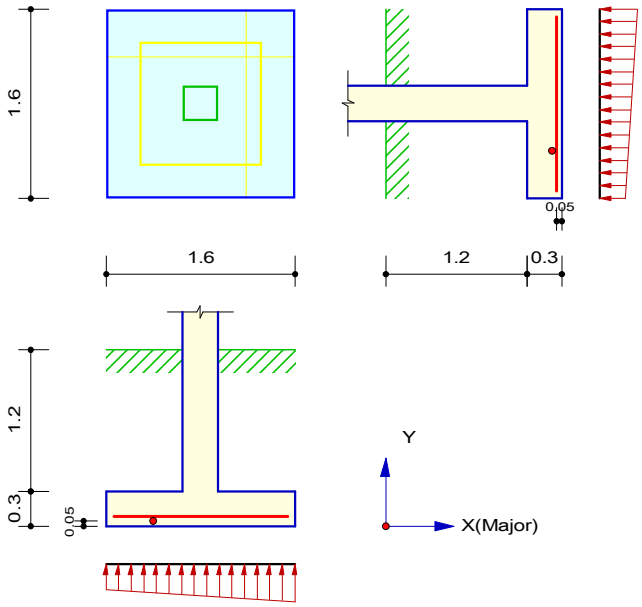

Company		**Project Title**	50 cum tank
Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

1. Geometry and Materials

Material : fcu = 20594, fy = 392266 kN/m^2
Dim. : 1.6 * 1.6 * 0.3 m (Dc = 0.05 m)
Allow. Soil Qe = 350 kN/m^2
Soil Depth H = 1.2 m (Density = 18 kN/m^3)



2. Design Condition

Design Code : BS8110-97
Selected Node No : 61
Design Node No : 61 (Column Size: 0.3*0.3 m)
Design Load Combination
Service : 2 [fLCB2 : 1.0D + (1.0LL)]
Factored : 1 [fLCB1 : 1.35D + 1.5(1.0LL)]
Applied Loads
Ns = 421.709, Nu = 593.657 kN
Msx = 23.3710, Mux = 31.7250 kN-m
Msy = 23.3421, Muy = 31.6820 kN-m

3. Soil Bearing Pressure Check

Actual Pressure
Qs(max) = 261.957 kN/m^2 < Qe = 350.000 kN/m^2 ..... O.K
Qs(min) = 125.103 kN/m^2 > 0.00 kN/m^2 ..... O.K
Design Pressure
Qu(max) = 324.779 kN/m^2
Qu(min) = 139.016 kN/m^2

4. Bending Moment Check (Gammamc= 1.50, Gammams= 1.05)

X-X Axis (Y Direction)

	Required Space	Max. Space
Mux = 56.1467 kN-m/m		
As = 0.00064 m^2/m	P12 @ 170	P12 @ 220
As(req) = As*Lx*2/3(Cx+3d) = 0.00065 m^2/m	P13 @ 200	P13 @ 260

Y-Y Axis (X Direction)

	Required Space	Max. Space
Muy = 56.1370 kN-m/m		
As = 0.00067 m^2/m	P12 @ 160	P12 @ 220
As(req) = As*Ly*2/3(Cy+3d) = 0.00071 m^2/m	P13 @ 180	P13 @ 260

5. Shear Check (Gammam= 1.25)

Vertical Shear
Vy_d = 426.802 kN/m^2 < 2*Vcy = 900.358 kN/m^2 ..... O.K
Vy_2d = 164.408 kN/m^2 < Vcy = 450.179 kN/m^2 ..... O.K
Vx_d = 461.087 kN/m^2 < 2*Vcx = 943.693 kN/m^2 ..... O.K
Vx_2d = 199.778 kN/m^2 < Vcx = 471.846 kN/m^2 ..... O.K

Punching Shear
V = 584.712 kN/m^2 < Vc = 691.293 kN/m^2 ..... O.K
Vcf = 1956.24 kN/m^2 < Vmax = 3631.08 kN/m^2 ..... O.K

REQUIRED REINFORCEMENTAND CONCRETE STRENGTH

SECTION	**Dimensions**	**REINFORCEMENT**	**CONCRETE STRENGTH**
Tank roof slab	200mm thick	T10 @ 200 (All bars)	C20/25
Tank floor slab	200 mm thick	T16 @ 200 (All bars)	C20/25
Tank walls	200 mm thick	T12 @ 200 (Vertical) T10 @ 200 (Horizontal)	C20/25
Footing	1.6x1.6x0.3m	T12 @ 150 (All bars)	C20/25