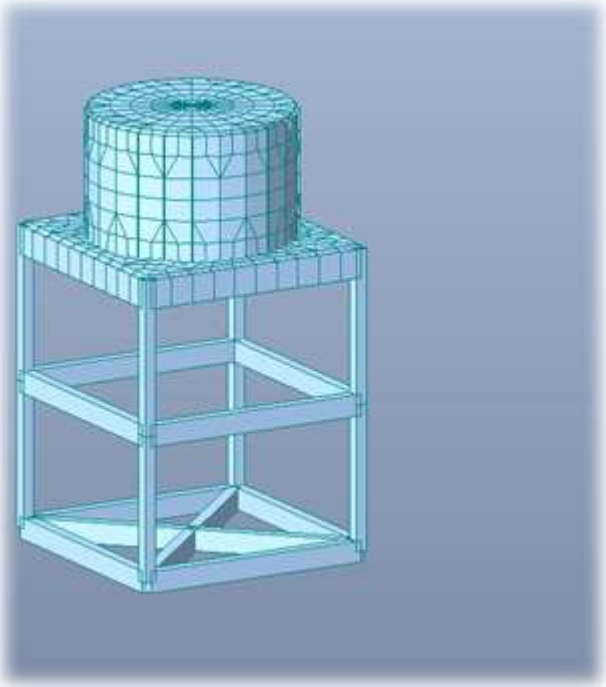


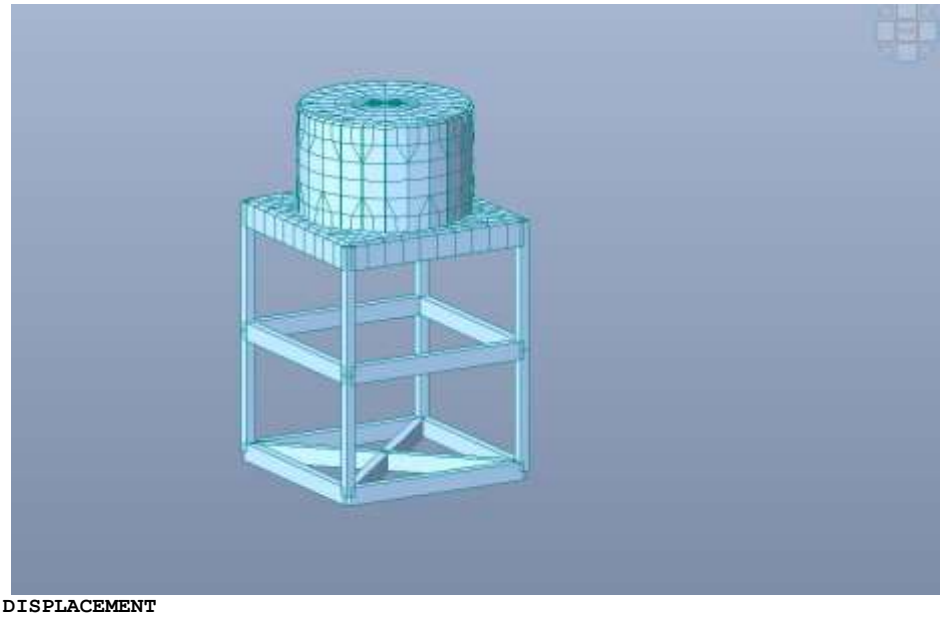
25 M^3 ELEVATED STORAGE WATER TANK DESIGN REPORT

2nd September 2023

Prepared by:
Sheilla Constance Apio

ANALYSIS MODEL

Figure 1 Analysis model



MODAL DISPLACEMENT

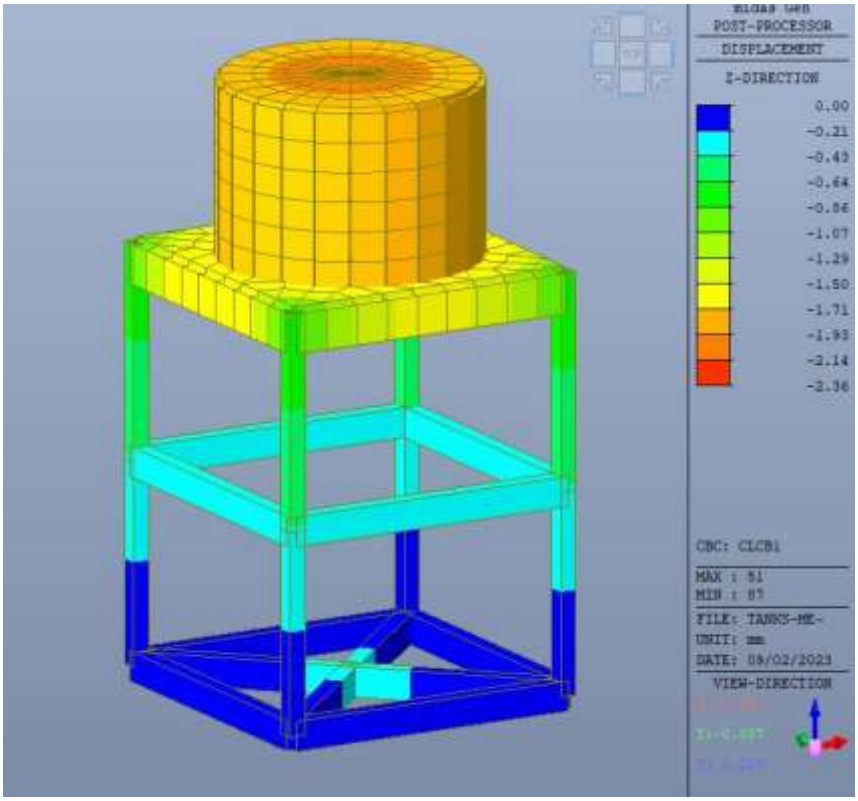


Figure 2 Modal displacement

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 : 25 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
 ---------------------------------------------------------------------
  150.00    874 BOT 0.5331 0.5655 | 23.9908(   1) 26.1139 0.919  OK
            657 TOP 0.3019 0.5655 | 13.5835(   1) 26.1139 0.520  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 874
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1

 -. Information of Design.
    b        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  16.797 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.2240 kN.
    M_Rd     = Cc*(d-a/2)  =      26.1139  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P12 @200
    As_req =       0.5331 mm^2/mm.  (     533.1282 mm^2/m.)
    M_Ed   =      23.9908  kN-mm./mm.
    M_Rd   =      26.1139  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.919  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.170

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 657
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1
```

PROJECT TITLE : 25 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        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  16.797 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.2240 kN.
    M_Rd     = Cc*(d-a/2)  =      26.1139  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P12 @200
    As_req =       0.3019 mm^2/mm.  (     301.8561 mm^2/m.)
    M_Ed   =      13.5835  kN-mm./mm.
    M_Rd   =      26.1139  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.520  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.170
```

PROJECT TITLE : 25 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
 ---------------------------------------------------------------------
  150.00    709 BOT 0.5330 0.5655 | 23.9837(   1) 26.1139 0.918  OK
            823 TOP 0.2981 0.5655 | 13.4160(   1) 26.1139 0.514  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 709
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1

 -. Information of Design.
    b        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  16.797 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.2240 kN.
    M_Rd     = Cc*(d-a/2)  =      26.1139  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P12 @200
    As_req =       0.5330 mm^2/mm.  (     532.9713 mm^2/m.)
    M_Ed   =      23.9837  kN-mm./mm.
    M_Rd   =      26.1139  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.918  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.170

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 823
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1
```

PROJECT TITLE : 25 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        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  16.797 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.2240 kN.
    M_Rd     = Cc*(d-a/2)  =      26.1139  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P12 @200
    As_req =       0.2981 mm^2/mm.  (     298.1326 mm^2/m.)
    M_Ed   =      13.4160  kN-mm./mm.
    M_Rd   =      26.1139  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.514  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.170
```

PROJECT TITLE : 25 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
 ---------------------------------------------------------------------
  150.00   3850 BOT 0.1625 0.3927 | 3.75138(   1) 18.6157 0.202  OK
           3810 TOP 0.1625 0.3927 | 5.40186(   1) 18.6157 0.290  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 3850
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1

 -. Information of Design.
    b        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  11.719 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1562 kN.
    M_Rd     = Cc*(d-a/2)  =      18.6157  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.1625 mm^2/mm.  (     162.5000 mm^2/m.)
    M_Ed   =       3.7514  kN-mm./mm.
    M_Rd   =      18.6157  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.202  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.118

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 3810
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1
```

PROJECT TITLE : 25 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        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  11.719 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1562 kN.
    M_Rd     = Cc*(d-a/2)  =      18.6157  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.1625 mm^2/mm.  (     162.5000 mm^2/m.)
    M_Ed   =       5.4019  kN-mm./mm.
    M_Rd   =      18.6157  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.290  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.118
```

PROJECT TITLE : 25 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
 ---------------------------------------------------------------------
  150.00   3983 BOT 0.1625 0.3927 | 3.75158(   1) 18.6157 0.202  OK
           3851 TOP 0.1625 0.3927 | 5.39403(   1) 18.6157 0.290  OK
 ---------------------------------------------------------------------


 << BOTTOM >>

 -. Information of Parameters.
    Elem No.  : 3983
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1

 -. Information of Design.
    b        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  11.719 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1562 kN.
    M_Rd     = Cc*(d-a/2)  =      18.6157  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.1625 mm^2/mm.  (     162.5000 mm^2/m.)
    M_Ed   =       3.7516  kN-mm./mm.
    M_Rd   =      18.6157  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.202  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.118

 << TOP >>

 -. Information of Parameters.
    Elem No.  : 3851
    Thickness :  150.0000 mm.
    Materials :  fck =      0.0200 kN/mm^2.
                 fcd =      0.0133 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Covering  :  dB  =  25.0000 mm.
                 dT  =  25.0000 mm.
    LCB No.   :    1
```

PROJECT TITLE : 25 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        =   1.0000 mm.  (by Code Unit Length).
    d        = 125.0000 mm.
    lambda   =   0.800
    a        = lambda * x  =  11.719 mm.
    eta      =   1.000
    Cc       = eta*fcd*b*a =      0.1562 kN.
    M_Rd     = Cc*(d-a/2)  =      18.6157  kN-mm./mm.

 -. Information of Moments and Result.
    Rein. Bar :  P10 @200
    As_req =       0.1625 mm^2/mm.  (     162.5000 mm^2/m.)
    M_Ed   =       5.3940  kN-mm./mm.
    M_Rd   =      18.6157  kN-mm./mm.
    RatM   = M_Ed / M_Rd =   0.290  <  1.0  --->  O.K !

 -. Check ratio of neutral axis depth to effective depth.
    x/d         =    0.118
```

RC Beam Strength Checking Result

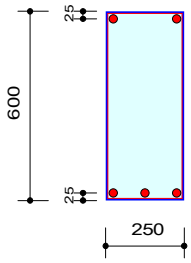
	Company		**Project Title**	25 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

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 : 6929.65 mm

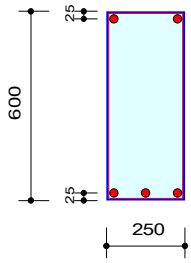
2. Section Diagram

[END-I]



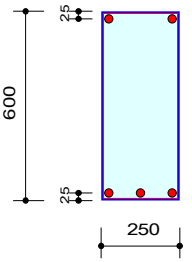
TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

[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)	19692.74	4923.18	19692.71
Factored Strength (M_Rd)	88980.14	88980.14	88980.14
Check Ratio (M_Ed/M_Rd)	0.2213	0.0553	0.2213
Neutral Axis (x/d)	0.0533	0.0533	0.0533
(+) Load Combination No.	4	4	4
Moment (M_Ed)	46557.41	56964.57	46575.43
Factored Strength (M_Rd)	132436.44	132436.44	132436.44
Check Ratio (M_Ed/M_Rd)	0.3515	0.4301	0.3517
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)	102.97	39.03	102.97
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	1.8477	0.7003	1.8476
Shear Ratio by (V_Rds ; V_Rdmax)	0.5827	0.2208	0.5827
Check Ratio	0.5827	0.7003	0.5827

RC Beam Strength Checking Result

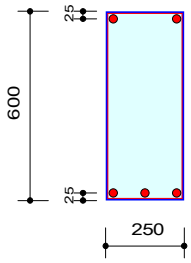
	Company		**Project Title**	25 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

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 : 4900 mm

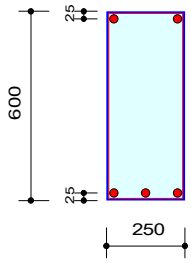
2. Section Diagram

[END-I]



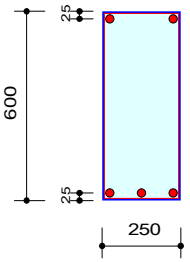
TOP : 2-P16
BOT : 3-P16
STIRRUPS : 2-P10 @100

[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.	5	5	5
Moment (M_Ed)	1786.61	446.65	1775.45
Factored Strength (M_Rd)	88980.14	88980.14	88980.14
Check Ratio (M_Ed/M_Rd)	0.0201	0.0050	0.0200
Neutral Axis (x/d)	0.0533	0.0533	0.0533
(+) Load Combination No.	4	4	4
Moment (M_Ed)	42245.55	56202.78	42243.67
Factored Strength (M_Rd)	132436.44	132436.44	132436.44
Check Ratio (M_Ed/M_Rd)	0.3190	0.4244	0.3190
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.	7	4	7
Factored Shear Force (V_Ed)	82.99	49.80	82.99
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	1.4893	0.8936	1.4892
Shear Ratio by (V_Rds ; V_Rdmax)	0.4697	0.2818	0.4696
Check Ratio	0.4697	0.8936	0.4696

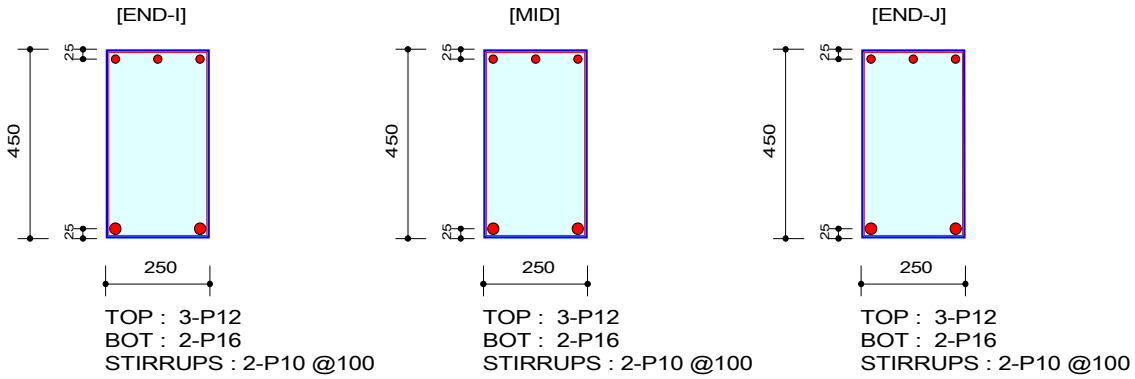
RC Beam Strength Checking Result

	Company		Project Title	25 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 : 4900 mm

2. Section Diagram



3. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	4	4	4
Moment (M_Ed)	5633.62	1408.56	5634.23
Factored Strength (M_Rd)	55164.63	55164.63	55164.63
Check Ratio (M_Ed/M_Rd)	0.1021	0.0255	0.1021
Neutral Axis (x/d)	0.0725	0.0725	0.0725
(+) Load Combination No.	5	5	5
Moment (M_Ed)	3188.39	6036.29	3187.65
Factored Strength (M_Rd)	65137.57	65137.57	65137.57
Check Ratio (M_Ed/M_Rd)	0.0489	0.0927	0.0489
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)	31.44	24.55	31.44
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	0.7450	0.5817	0.7450
Shear Ratio by (V_Rds ; V_Rdmax)	0.2407	0.1880	0.2407
Check Ratio	0.7450	0.5817	0.7450

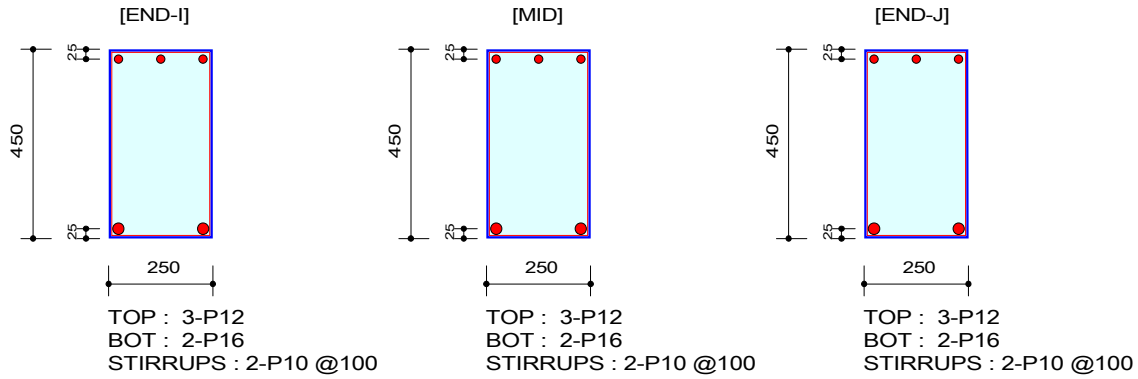
RC Beam Strength Checking Result

	Company		**Project Title**	25 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 : 6929.65 mm

2. Section Diagram



3. Bending Moment Capacity

	END-I	MID	END-J
(-) Load Combination No.	5	7	5
Moment (M_Ed)	15193.83	0.00	15193.83
Factored Strength (M_Rd)	55164.63	55164.63	55164.63
Check Ratio (M_Ed/M_Rd)	0.2754	0.0000	0.2754
Neutral Axis (x/d)	0.0725	0.0725	0.0725
(+) Load Combination No.	5	5	5
Moment (M_Ed)	1899.23	7596.91	1899.23
Factored Strength (M_Rd)	65137.57	65137.57	65137.57
Check Ratio (M_Ed/M_Rd)	0.0292	0.1166	0.0292
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

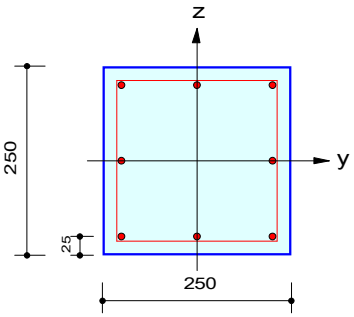
	END-I	MID	END-J
Load Combination No.	5	5	5
Factored Shear Force (V_Ed)	13.16	6.58	13.16
Shear Strength by Conc.(V_Rdc)	42.21	42.21	42.21
Shear Strength by Rebar.(V_Rds)	130.62	130.62	130.62
Shear Strength by Rebar.(V_Rdmax)	351.90	351.90	351.90
Using Shear Reinf. (Asw)	1570.8000	1570.8000	1570.8000
Using Stirrups Spacing	2-P10 @100	2-P10 @100	2-P10 @100
Shear Ratio by Conc	0.3117	0.1558	0.3117
Shear Ratio by (V_Rds ; V_Rdmax)	0.1007	0.0504	0.1007
Check Ratio	0.3117	0.1558	0.3117

RC Column Checking Result

	Company		**Project Title**	25 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 : 80 (PM), 81 (Shear)
Material Data : fck = 0.02, fyk = 0.46, fyw = 0.25 kN/mm^2
Column Height : 3250 mm
Section Property : 250x250 columns (No : 1)
Rebar Pattern : 8 - 3 - P12 Ast = 904.8 mm^2 (Rhost = 0.014)



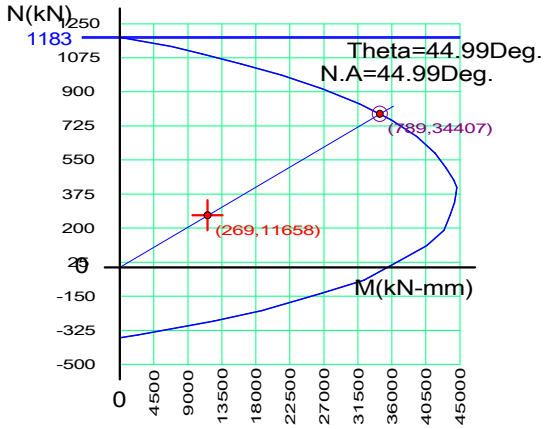
2. Applied Loads

Load Combination : 4 AT (J) Point
N_Ed = 268.685 kN M_Edy = 8245.04 kN-mm M_Edz = 8241.68 kN-mm
M_Ed = SQRT(M_Edy^2+ M_Edz^2) = 11657.9 kN-mm

3. Axial Forces and Moments Capacity Check

Concentric Max. Axial Load	N_Rdmax	= 1183.19 kN	
Axial Load Ratio	N_Ed/N_Rd	= 268.685 / 789.107	= 0.340 < 1.000 ..... O.K
Moment Ratio	M_Ed/M_Rd	= 11657.9 / 34406.8	= 0.339 < 1.000 ..... O.K
	M_Edy/M_Rdy	= 8245.04 / 24334.4	= 0.339 < 1.000 ..... O.K
	M_Edz/M_Rdz	= 8241.68 / 24324.1	= 0.339 < 1.000 ..... O.K
Normalized Axial Load Ratio	Nu_d / 0.65	= 0.186 / 0.650	= 0.286 < 1.000 ..... O.K

4. M-N Interaction Diagram



N_Rd(kN)	M_Rd(kN-mm)
1183.19	0.00
1096.75	10965.09
985.78	21479.71
838.76	31724.89
674.23	39381.86
508.92	43268.04
410.20	44681.28
333.93	44321.68
189.66	42915.43
30.28	36957.43
-131.99	26786.89
-275.25	12447.55
-361.92	0.00

5. Shear Force Capacity Check (End)

Applied Shear Force	V_Ed	= 29.0451 kN (Load Combination : 7)
Shear Ratio by Conc	V_Ed/V_Rdc	= 29.0451 / 53.3699 = 0.544
Shear Ratio by (V_Rds ; V_Rdmax)	V_Ed/V_Rds	= 29.0451 / 29.5063 = 0.984
Shear Ratio	V_Ed/V_Rd	= 0.544 < 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	= 29.0451 kN (Load Combination : 7)
Shear Ratio by Conc	V_Ed/V_Rdc	= 29.0451 / 53.6915 = 0.541
Shear Ratio by (V_Rds ; V_Rdmax)	V_Ed/V_Rds	= 29.0451 / 29.5063 = 0.984
Shear Ratio	V_Ed/V_Rd	= 0.541 < 1.000 ..... O.K
		(Asw-H_use = 670.26667 mm^2/m, 2-P8 @150)

PROJECT TITLE : 25 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 Checking  [ Eurocode2:04 & Eurocode8:04 ]Gen 2019
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============================================================================================
    [[[*]]]   MESHED WALL CHECKING MAXIMUM RESULT DATA : DOMAIN Water tank-Walls. (Vertical)
============================================================================================


 -. Information of Parameters.
    Elem No.  : 2316
    LCB No.   :    4
    Materials :  fck =      0.0200 kN/mm^2.
                 fyk =      0.4600 kN/mm^2.
    Thickness :  t   = 150.0000 mm.
    Covering  :  Dw  =  25.0000 mm.

 -. 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 =      0.0133 kN/mm^2.
    fyd      = fyk / gamma_s           =      0.4000 kN/mm^2.
    Nu       = 0.6*(1-fck/250) =      0.5520 (fck in MPa)

 -. Design Forces.
    Sig_Edx  =      0.0005 kN/mm^2.
    Sig_Edy  =     -0.0003 kN/mm^2.
    Tau_Edxy =      0.0002 kN/mm^2.

    Sig_Ed_max =      0.0005 kN/mm^2. (x-dir)
    Sig_Ed_min =     -0.0003 kN/mm^2. (y-dir)
    Tau_Edxy   =      0.0002 kN/mm^2.

    (Sig_Ed_min in Tension or Sig_Ed_max*Sig_Ed_min <= Tau_Edxy^2 --> Rebar Required!)
    ftd_max  =      0.0000 kN/mm^2. (x-dir)
    ftd_min  = Tau_Edxy^2/Sig_Ed_max - Sig_Ed_min        =      0.0004 kN/mm^2. (y-dir)

    f'tdx    =      0.0000 kN/mm^2.
    f'tdy    =      0.0004 kN/mm^2.
    Sig_cd   = Sig_Ed_max*[1 + (Tau_Edxy/Sig_Ed_max)^2 ] =      0.0006 kN/mm^2.

    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 mm.  (by Unit Length).
    Asx_Req  =       0.1500 mm^2/mm.  (     150.0000 mm^2/m.)
    Asy_Req  =       0.3000 mm^2/mm.  (     300.0000 mm^2/m.)
    Asx_use  =       0.3927 mm^2/mm.  (     392.7000 mm^2/m.)
    Asy_use  =       0.5655 mm^2/mm.  (     565.5000 mm^2/m.)
    ftnx     = Asx_use/(b*t)*fyd =      0.0010 kN/mm^2.
    ftny     = Asy_use/(b*t)*fyd =      0.0015 kN/mm^2.
```

PROJECT TITLE : 25 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 Checking  [ 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       =   0.273
    Rat_cd  = Sig_cd/(Nu*fcd)  =   0.084
    Rat     = Rat_y =   0.273  <  1.0  --->  O.K !
```
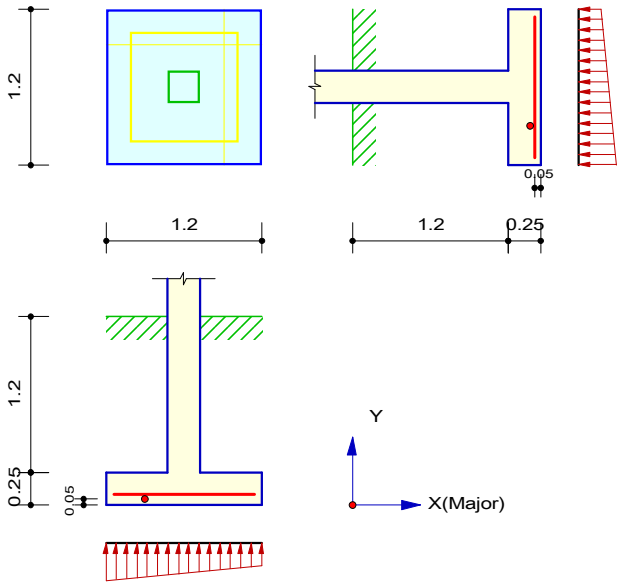

	Company		**Project Title**	25 cum tank
	Author	Sheilla C A	**File Name**	D:\...s-meshed-loaded-analysis.mgb

1. Geometry and Materials

Material : fcu = 20594, fy = 392266 kN/m^2
Dim. : 1.2 * 1.2 * 0.25 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 : 55
Design Node No : 55 (Column Size: 0.25*0.25 m)
Design Load Combination
Service : 2 [fLCB2 : 1.0D + (1.0LL)]
Factored : 1 [fLCB1 : 1.35D + 1.5(1.0LL)]
Applied Loads
Ns = 236.903, Nu = 332.340 kN
Msx = -13.178, Mux = -17.815 kN-m
Msy = -13.178, Muy = -17.815 kN-m

3. Soil Bearing Pressure Check

Actual Pressure
Qs(max) = 283.631 kN/m^2 < Qe = 350.000 kN/m^2 ..... O.K
Qs(min) = 100.601 kN/m^2 > 0.00 kN/m^2 ..... O.K
Design Pressure
Qu(max) = 354.505 kN/m^2
Qu(min) = 107.078 kN/m^2

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

X-X Axis (Y Direction)

	Required Space	Max. Space
Mux = 31.1729 kN-m/m		
As = 0.00044 m^2/m	P12 @ 250	P12 @ 270
As(min) = 0.0017*D = 0.00041 m^2/m	P13 @ 300	P13 @ 320

Y-Y Axis (X Direction)

	Required Space	Max. Space
Muy = 31.1729 kN-m/m		
As = 0.00047 m^2/m	P12 @ 240	P12 @ 270
As(min) = 0.0017*D = 0.00041 m^2/m	P13 @ 280	P13 @ 320

5. Shear Check (Gammam= 1.25)

Vertical Shear
Vy_d = 382.900 kN/m^2 < 2*Vcy = 907.617 kN/m^2 ..... O.K
Vy_2d = 108.293 kN/m^2 < Vcy = 453.809 kN/m^2 ..... O.K
Vx_d = 424.171 kN/m^2 < 2*Vcx = 960.616 kN/m^2 ..... O.K
Vx_2d = 151.420 kN/m^2 < Vcx = 480.308 kN/m^2 ..... O.K

Punching Shear
V = 536.590 kN/m^2 < Vc = 778.025 kN/m^2 ..... O.K
Vcf = 1638.74 kN/m^2 < Vmax = 3631.08 kN/m^2 ..... O.K

REQUIRED REINFORCEMENTAND CONCRETE STRENGTH

SECTION	**Dimensions**	**REINFORCEMENT**	**CONCRETE STRENGTH**
Tank roof slab	150mm thick	T10 @ 200 (All bars)	C20/25
Tank floor slab	150 mm thick	T12 @ 200 (All bars)	C20/25
Tank walls	150 mm thick	T12 @ 200 (Vertical) T10 @ 200 (Horizontal)	C20/25
Footing	1.2x1.2x0.25m	T12 @ 200 (All bars)	C20/25