Econstruct Design And Buld Pvt Ltd.

PRESENTS

ANUBHAVA MANTAPA

Project Introduction

Location:

The project is spread across 25-30 acres on the bank of Tipranta Lake in Basavakalyan, Bidar district located at North-Eastern part of Karnataka.

Landmark:

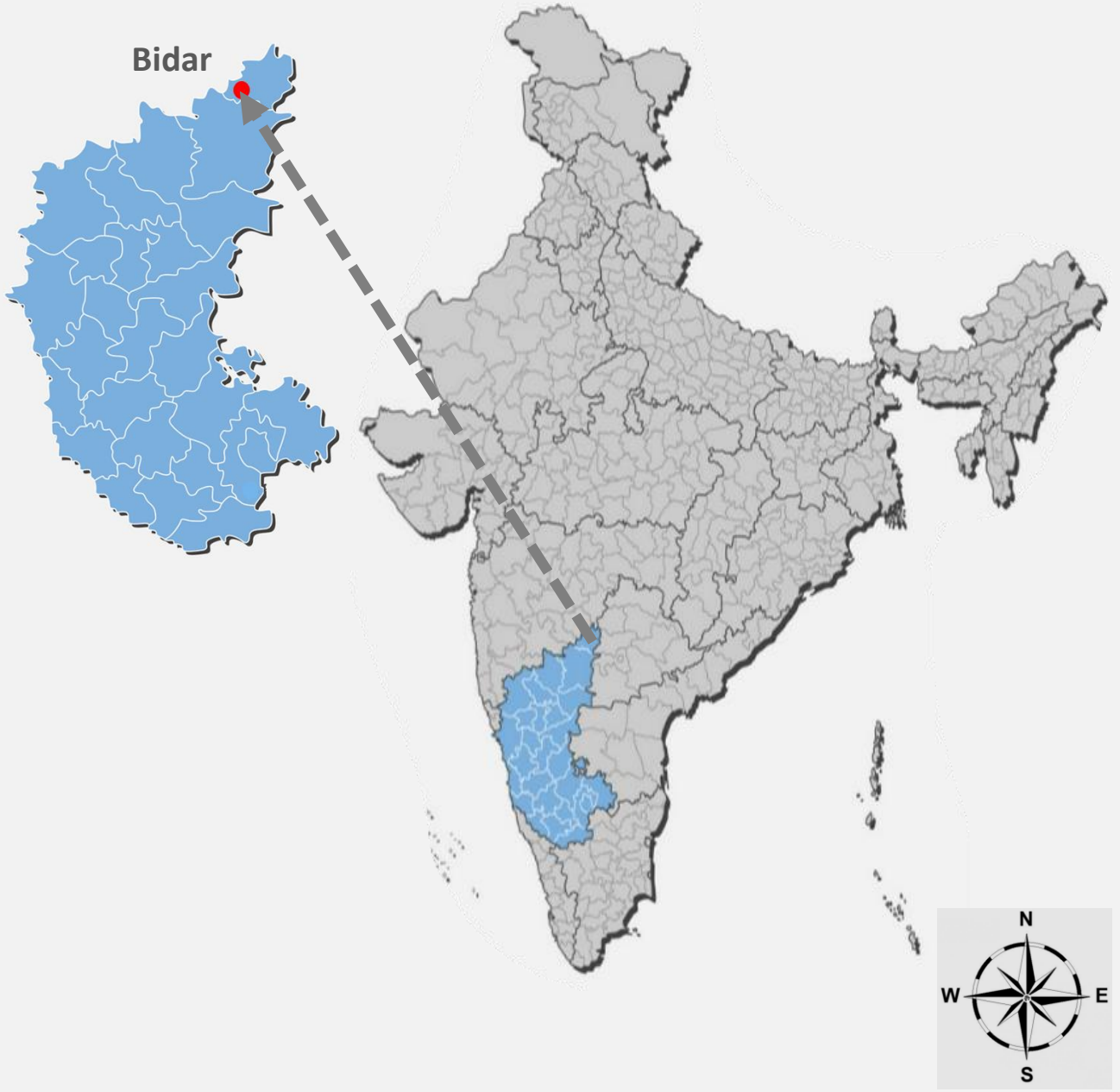
Patil Hospital

Proximity:

Bidar Railway St.
1hr. 57min - 77.4kms.

Bidar airport
1hr. 41min - 75kms.

KSRTC Bus Stand ,Bidar
1hr. 57min - 77.4kms.



Project Information

Project Type

Monumental Building

No of floors

G+4 Building with Central Dome & Petals

Typical Floor Height

4.5 meters

Total Height of the Building

50.78 meters (Including Dome – Inner Ring)
22.5 meters (Middle Ring)

Width of the Building

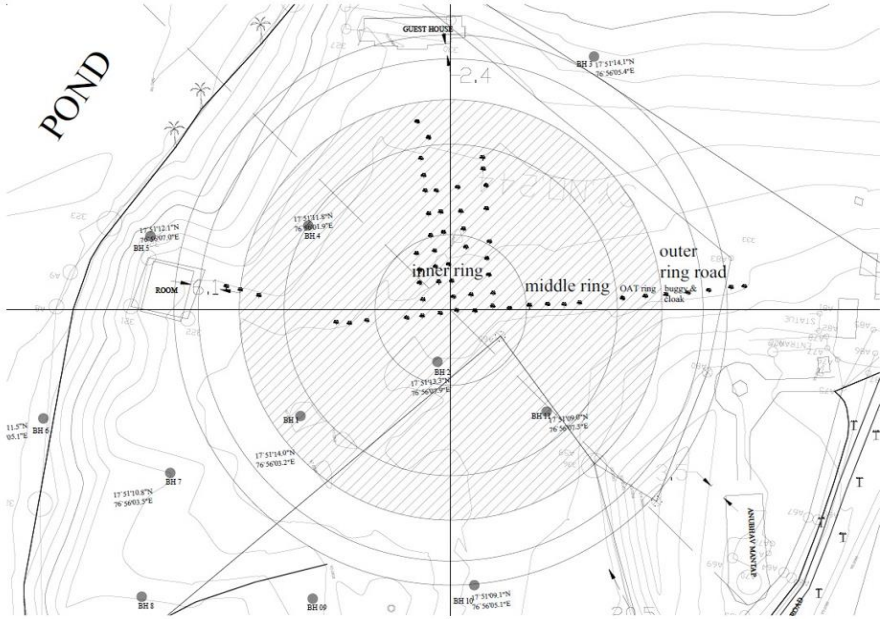
68.5 meters (Inner Ring)
152.56 meters (Middle Ring)

Grade of Concrete

M50

Rebars

Fe 550D

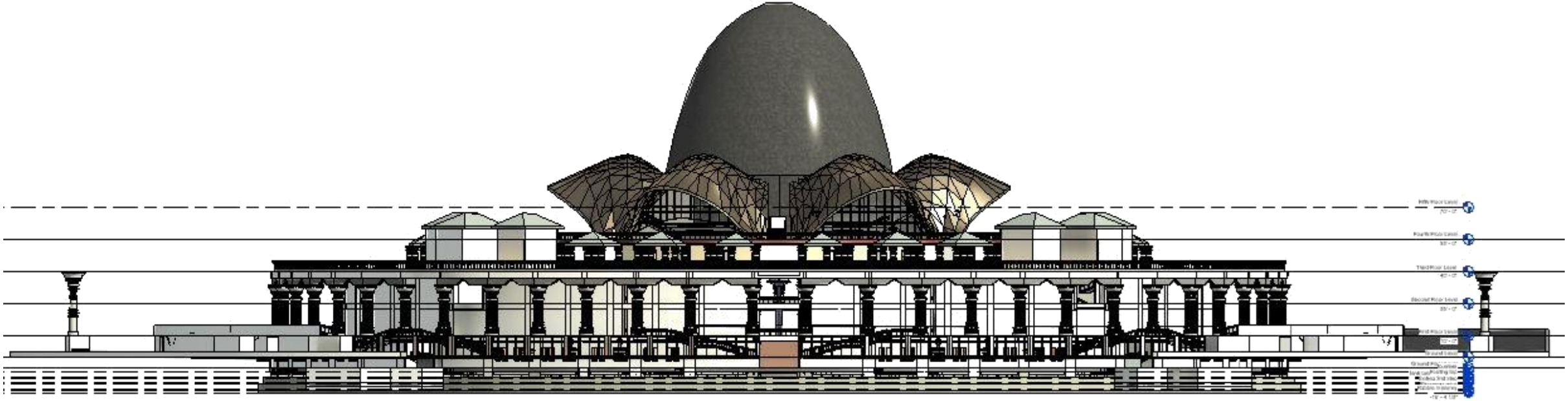


Note: Refer "Site contour" dwg file for spot levels, site contours, bore holelocation of soil tested.

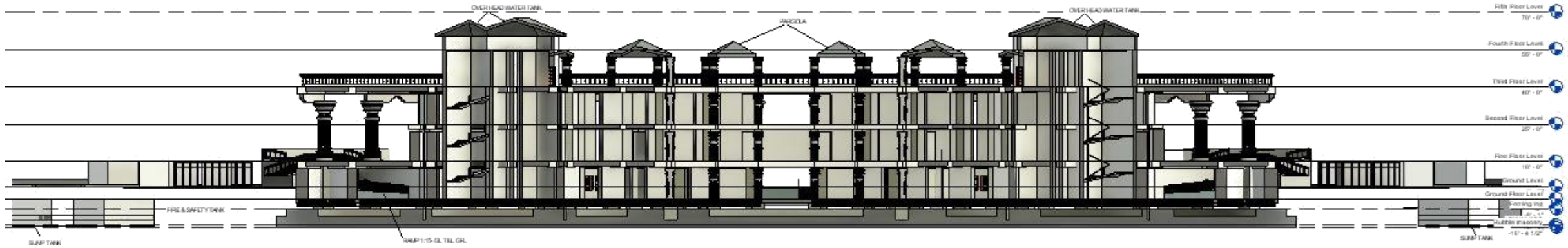
Site Layout with Building Footprint Marked

Indicating building location and lake in vicinity

Elevation & Sections - Anubhava Mantapa

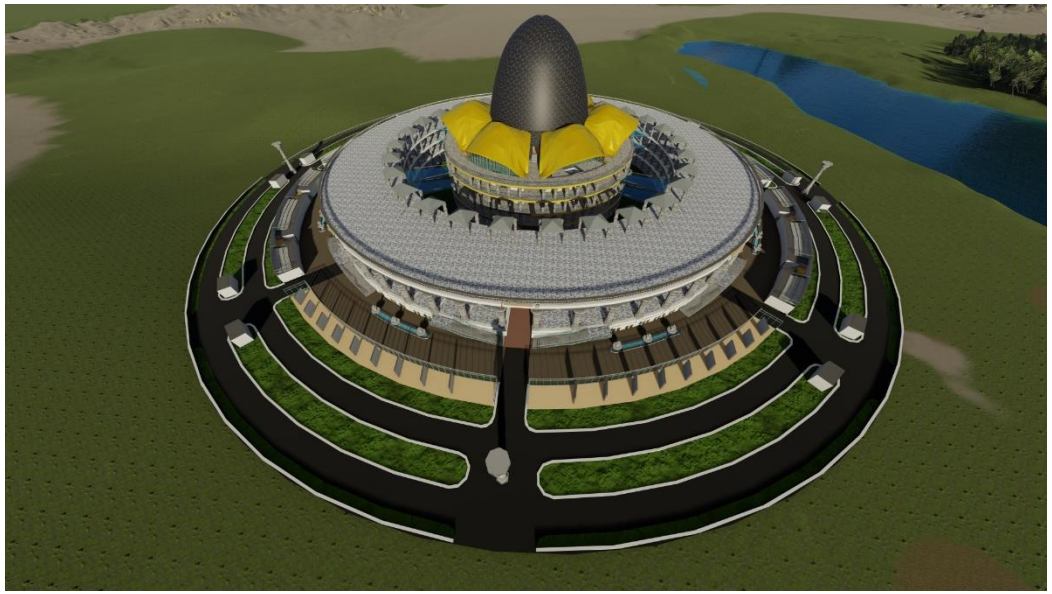


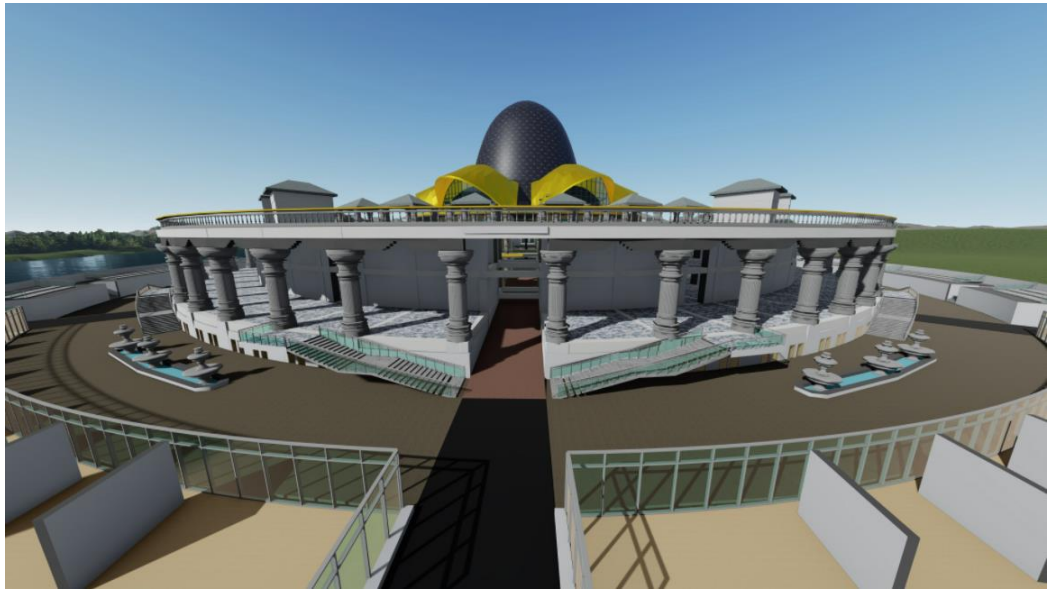
EAST ELEVATION



SECTION TAKEN ALONG SUMP TANK & OVERHEAD TANK

3D- Views Of Anubhava Mantapa





Project Features

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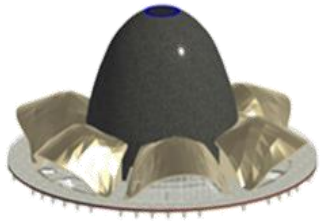
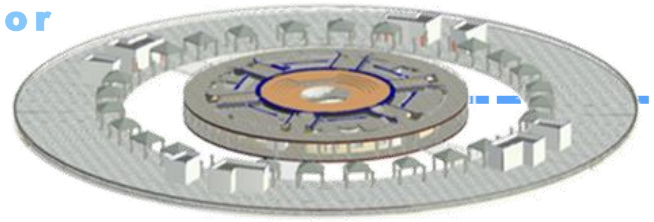
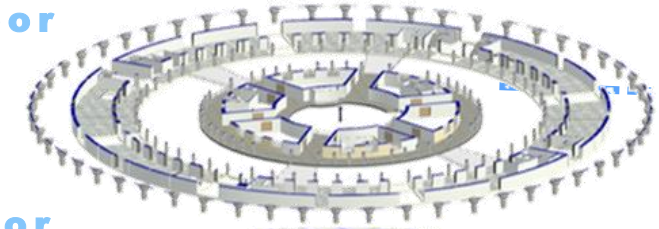
4TH Floor



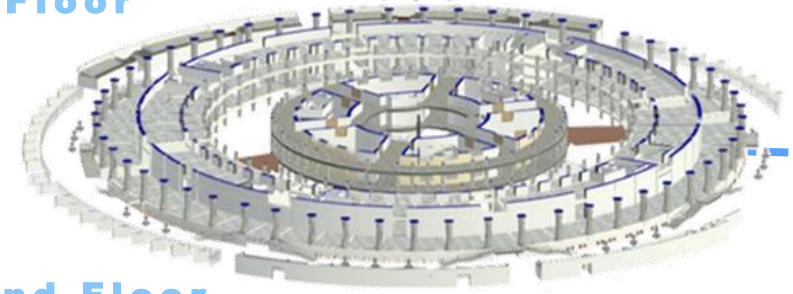
3RD Floor

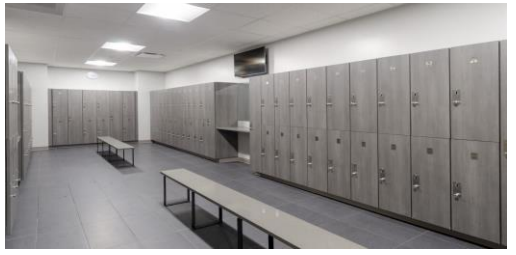


2ND Floor

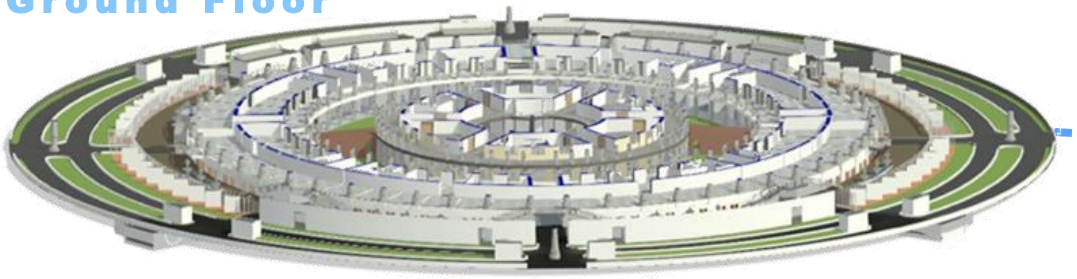


1ST Floor





Ground Floor



2D- Floor Plans

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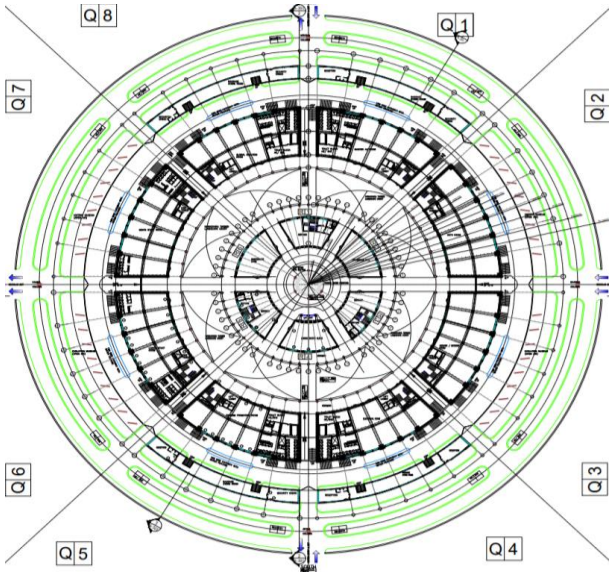
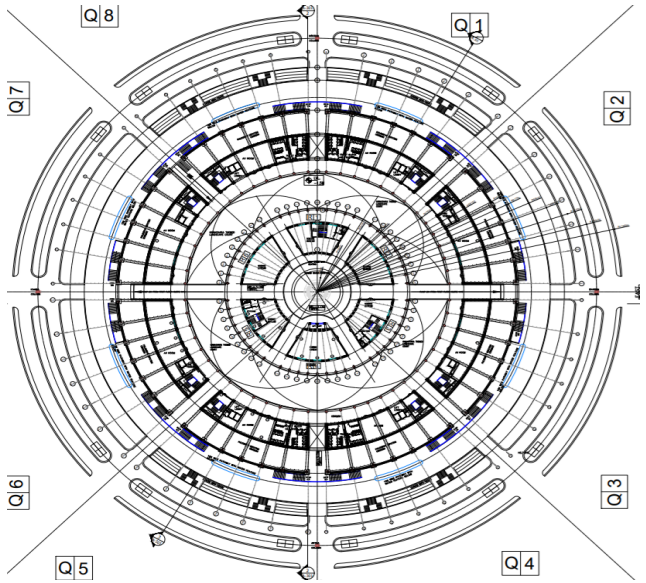
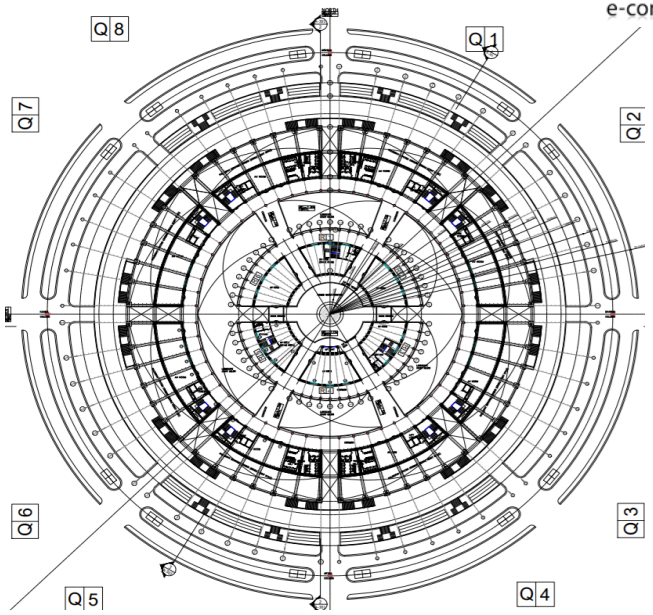


Ground Floor Plan



First Floor Plan



Second Floor Plan

OUTER

QM1& QM5 : Reception Room, Baggage store room & Security Check
QM2 & QM3 : History museum (open air)
QM4 & QM8 : Reception room, Baggage store room & Reception room
QM6 & QM7 : Evolution Museum (open Air)

QM1, QM4, QM5, QM8 : Elevated O.A.T

MIDDLE

QM1: Master AV room, Gents & Ladies Washroom
QM2 : CCTV Camera **QM3 :** Server Internet Room
QM4 : Reception room, Baggage store room & Reception room
QM6 & QM7 : Ladies & Gents Staff room
QM8 : Global Solution room, Gents & ladies Washrooms

QM1, QM4, QM5, QM8 : AV room, Gents & Ladies Washroom
QM2 ,QM3 ,QM6 & QM7 : AV room

QM1, QM4, QM5, QM8 : AV room, Gents & Ladies Washroom
QM2 ,QM3 ,QM6 & QM7 : AV room

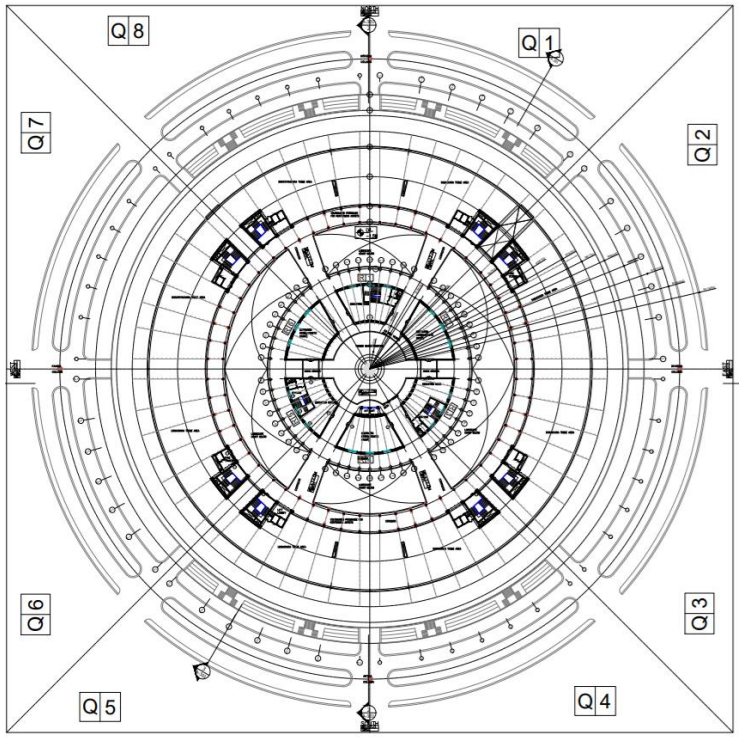
INNER

QR1, QR3 & QR5: Services
QR2 : Conference Hall
QR4 : Administrative Block
QR6 : Maintenance Room

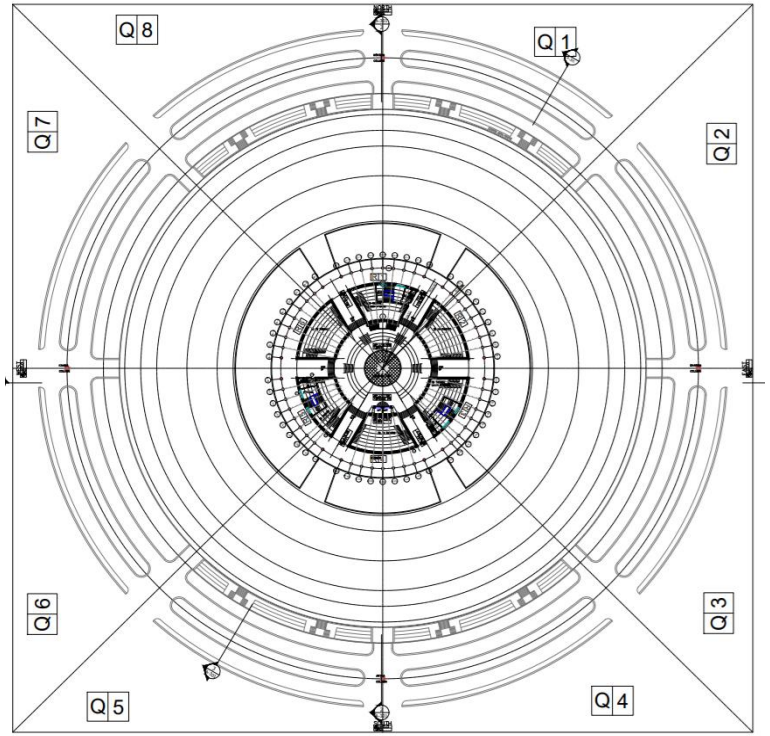
QR1, QR2 & QR3 : Science Museum
QR4, QR5 & QR6 : Science Museum

QR1, QR2 & QR3 : Audio –Visual Room
QR4, QR5 & QR6 : Audio –Visual Room

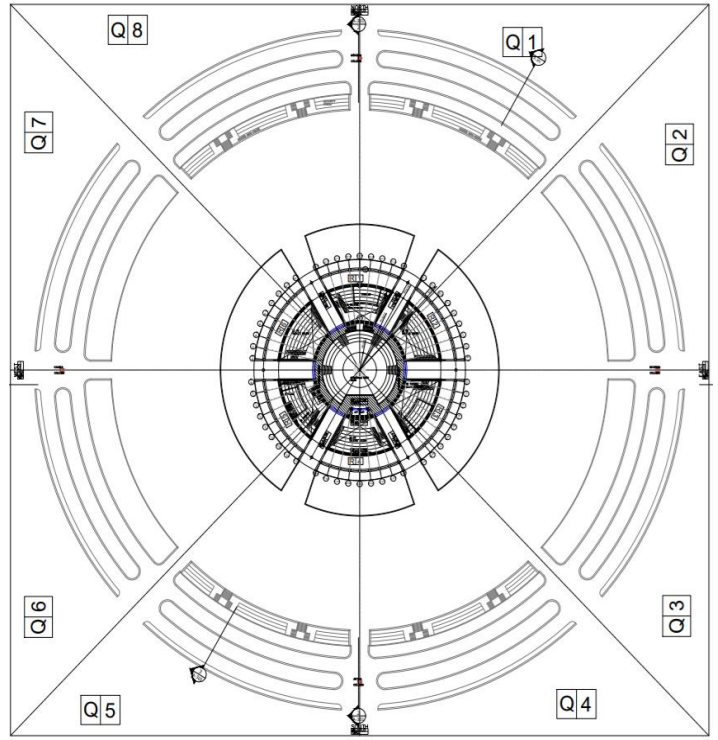
2D- Floor Plans



Third Floor Plan



Fourth Floor Lower Level Plan



Fourth Floor Upper Level Plan

MIDDLE

QM1 & QM2: Sadachara Theme Area

QM3 & QM4 : Shivachara Theme Area

QM5 & QM6 : Lingachara Theme Area

QM7 & QM8 : Bhrathychara Theme Area

INNER

QR1, QR3 & QR5: Education Room

QR2, QR4 & QR6: Meditation Room

QR1 ,QR3 & QR5 : 7D theater (screen at ceiling)

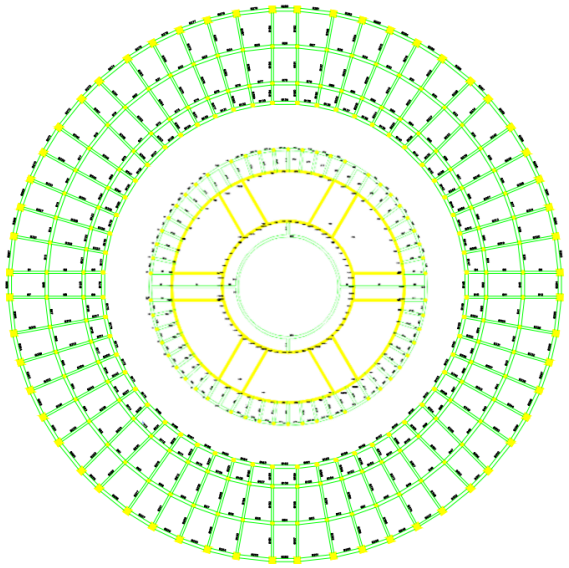
QR1 ,QR3 & QR5 : 7D AV theater

QR1 ,QR3 & QR5 : 7D theater (screen at ceiling)

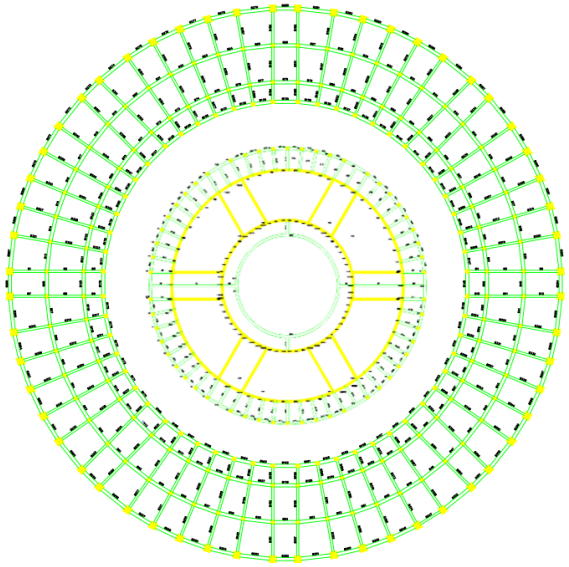
QR1 ,QR3 & QR5 : 7D AV theater

Structural Details

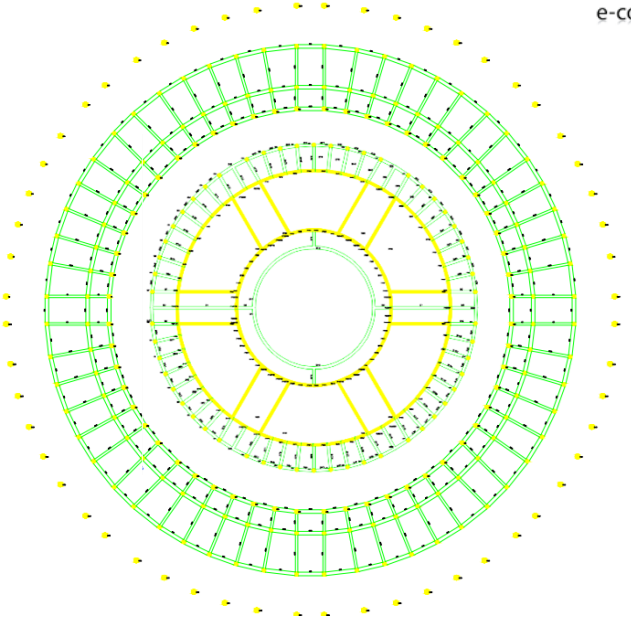
2D Structural Framing Plans



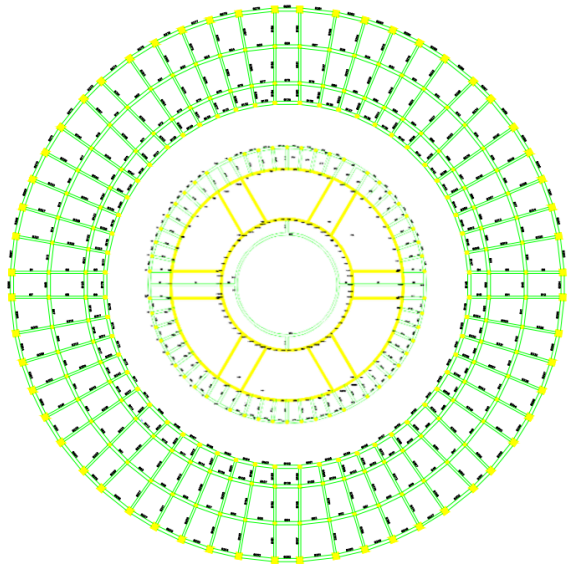
Ground Floor Plan



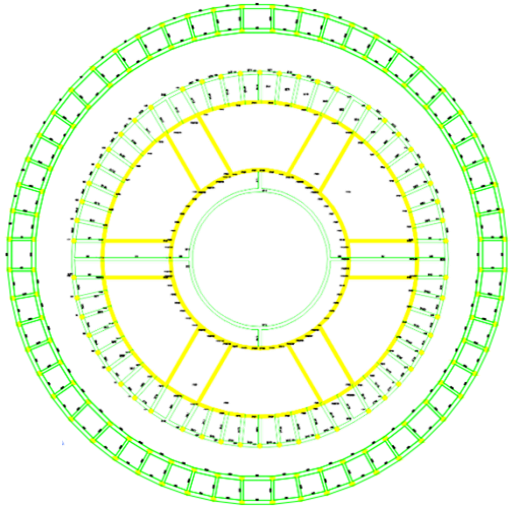
First Floor Plan



Second Floor Plan



Third Floor Plan



Fourth Floor Plan

Inner Ring Modelling in ETABS

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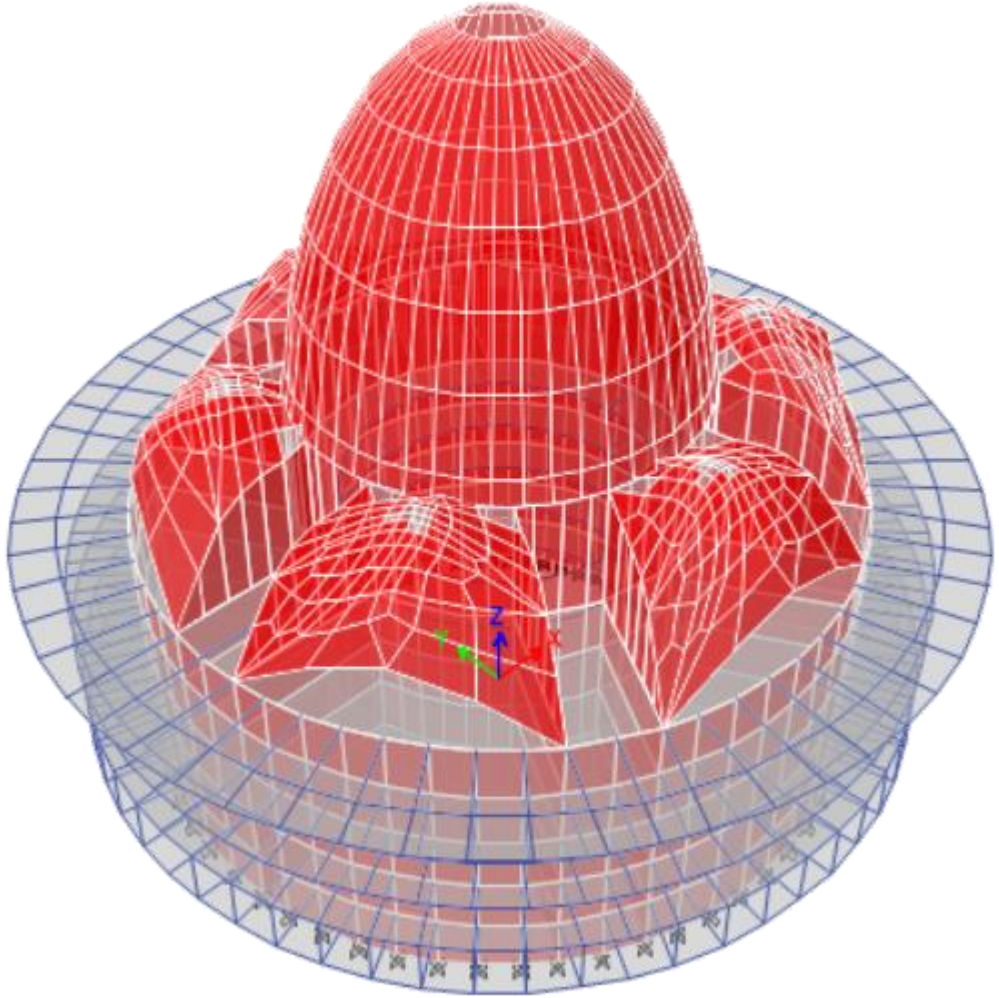
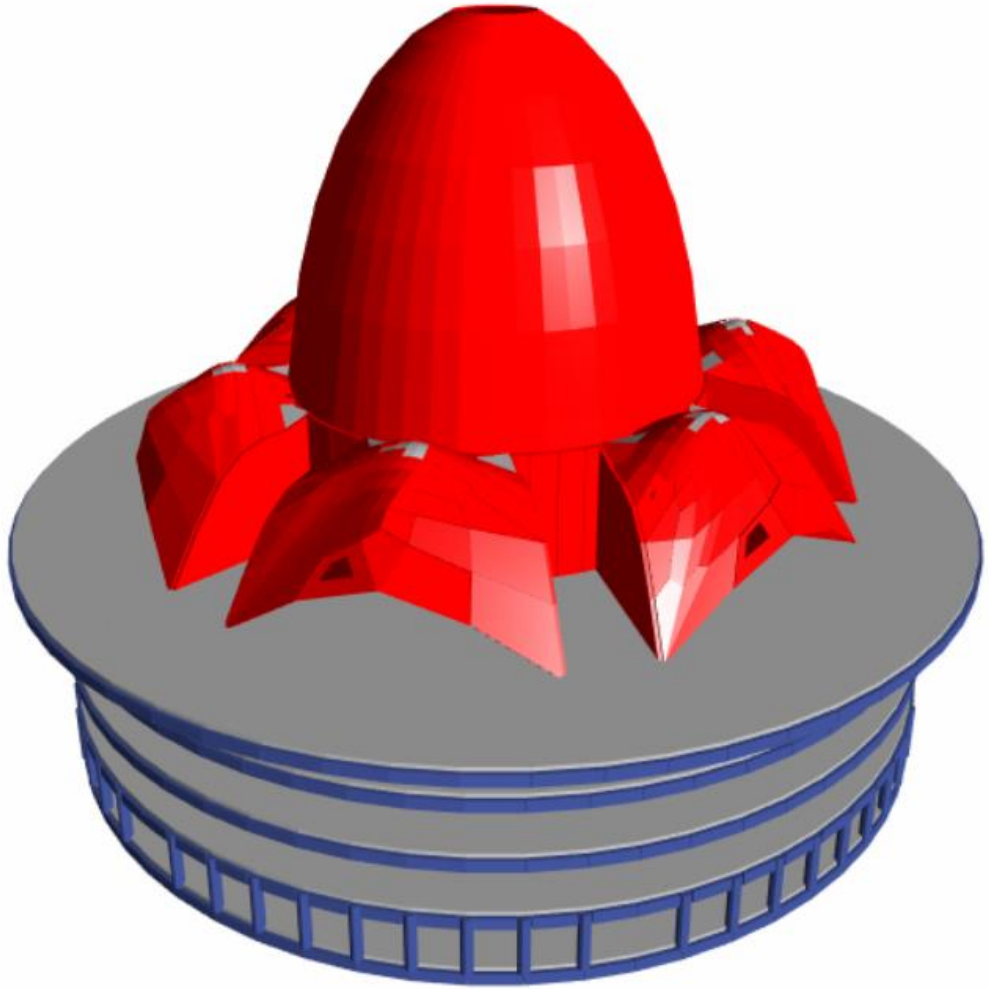
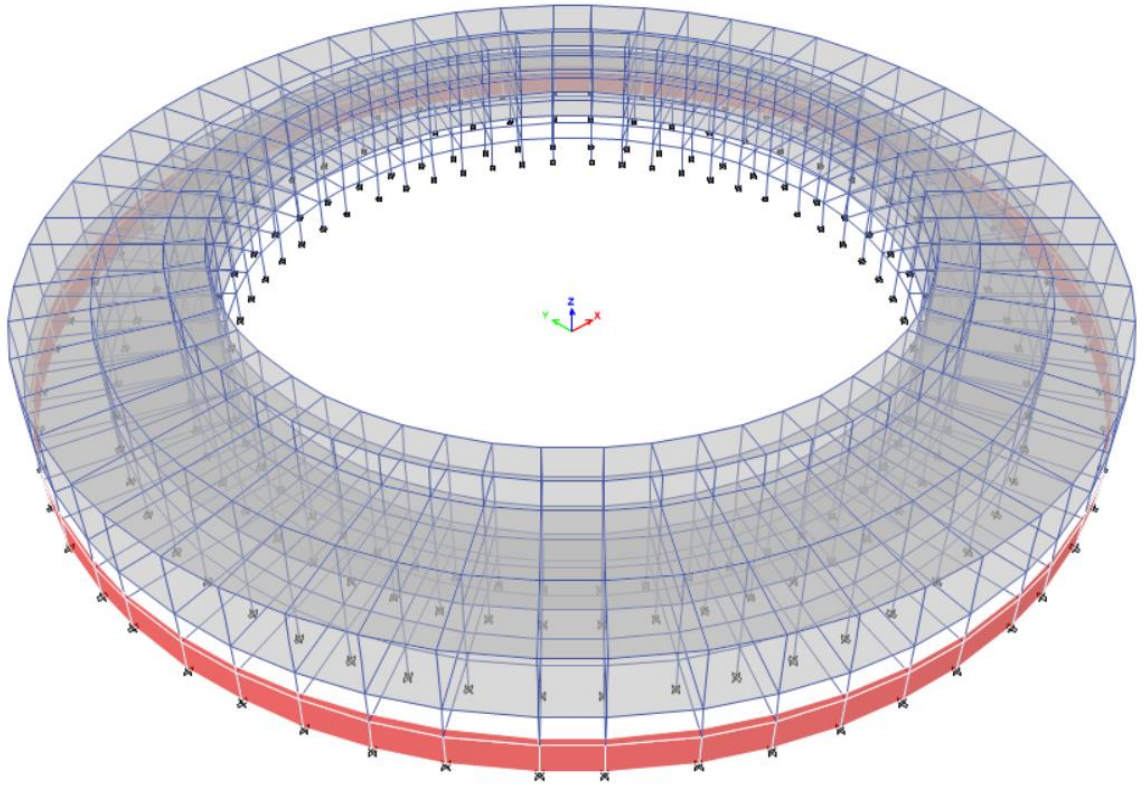


Mathematical Model
3D View

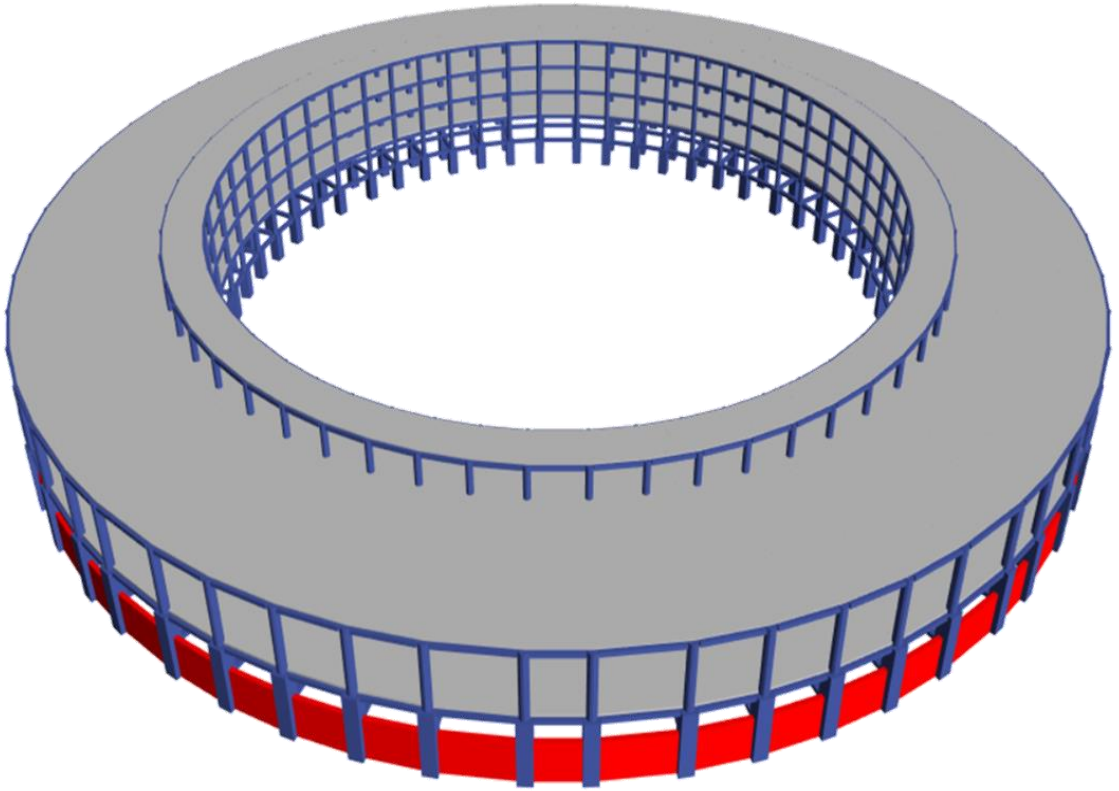


Mathematical Model
Rendered View

Middle Ring Modelling in ETABS



Mathematical Model
3D View



Mathematical Model
Rendered View

3D Structure Model

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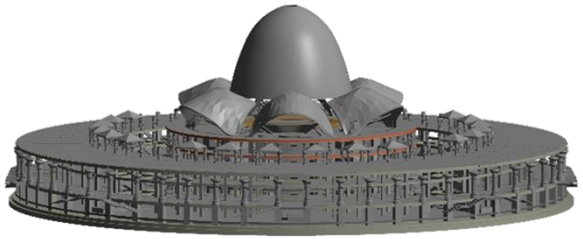
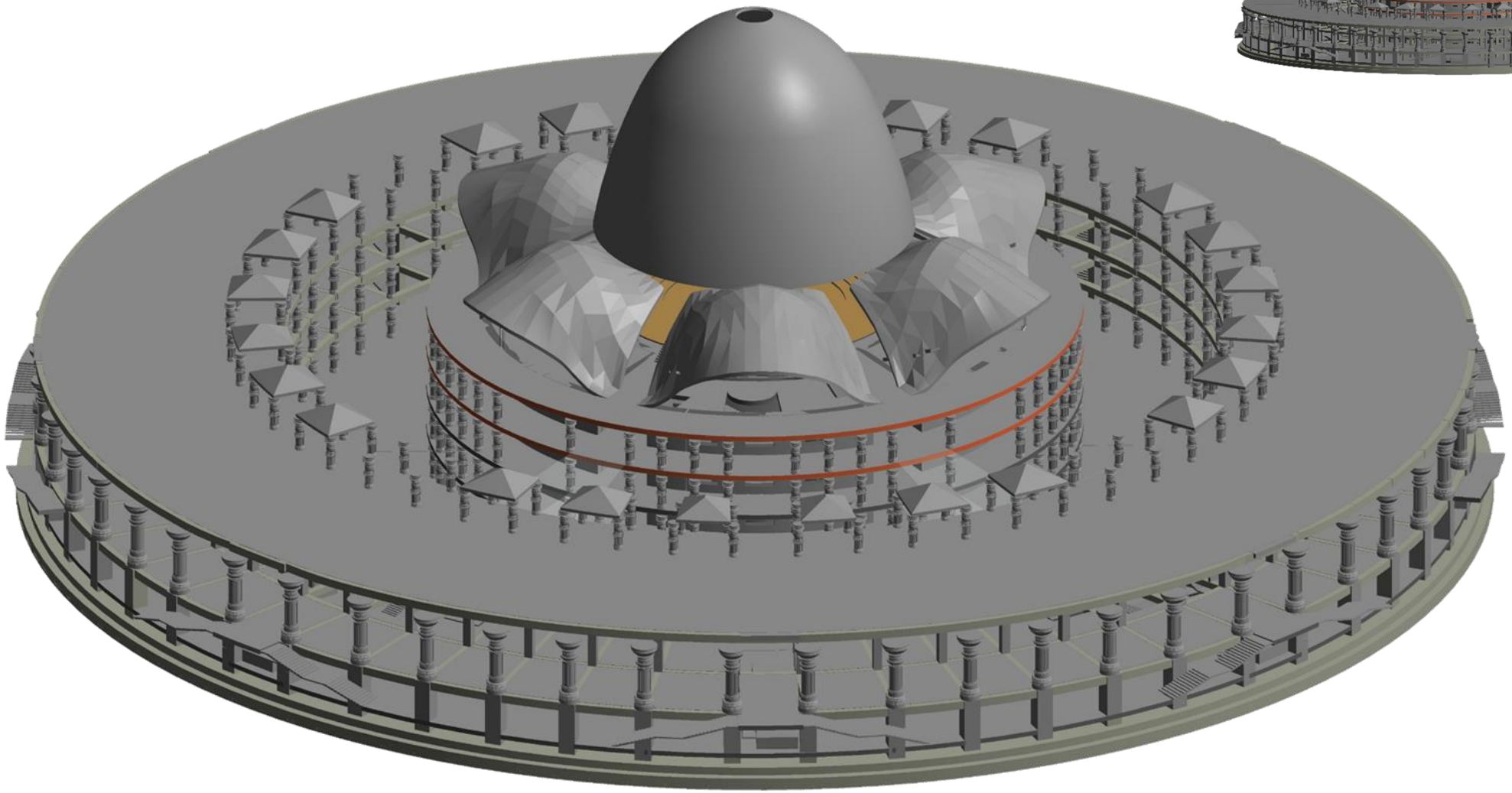




FOUNDATION DETAILS :

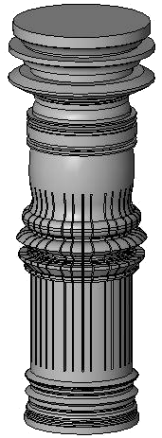
DROP : 900mm / 1100mm

RAFT FOUNDATION : 900mm / 1100mm

PCC (M30) : 150mm

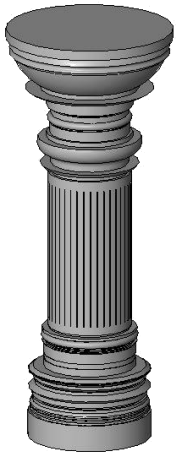
RUBBLE MASONRY : 300mm
(40mm + 20mm + 10mm+4mm
+ M30 Self compacted Micro-concreting)

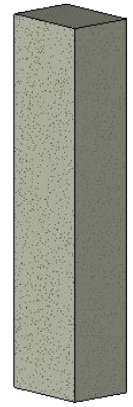
COLUMN DETAILS :



CIRCULAR COLUMN -900 MM STONE BASALT

CIRCULAR COLUMN -1200 MM STONE BASALT

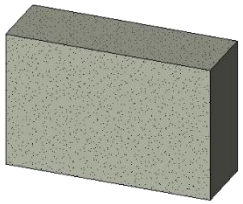




RCC SQUARE COLUMN 900 MM X 900MM

S. No	Description	Sizes	Material	Grade
1.	Circular Stone Column	900mm dia	Concrete	M50
2.	Circular Stone Column	1200mm dia	Concrete	M50
3.	RCC Column (Sqaure)	900mm	Concrete	M50
4.	Pedestal (Square)	1500mm	Concrete	M50

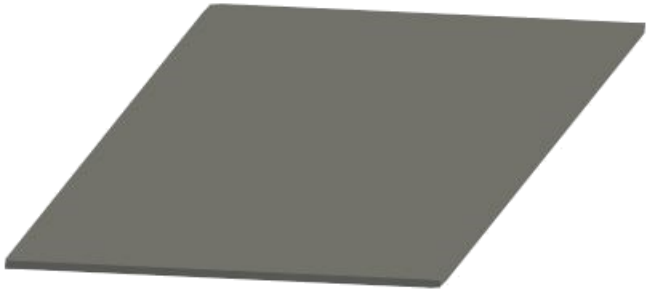
BEAM DETAILS :



S. No	Description	Sizes	Material	Grade
1.	Beam	900x700	Concrete	M50
2.	Beam	600x700	Concrete	M50

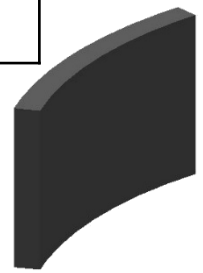
SLAB DETAILS :

S. No	Description	Thickness	Material	Grade
1.	Slab	200	Concrete	M50
2.	Slab	250	Concrete	M50
3.	Slab	300	Concrete	M50



RETAINING WALL :

S. No	Description	Thickness	Material	Grade
1.	Retaining Wall	300	Concrete	M50



AREA LOADS:

S. No.	DESCRIPTION	DEAD LOAD (As Per IS875 Part 1 & Calculations)	LIVE LOAD (As Per IS875 Part 2, Table 1)	UNITS
1	All Slabs	5	5	kN/m^2
2	Water Tank Load	15	0.75	kN/m^2
3	Cladding Load	10	-	kN/m^2

FRAME LOADS:

S. No.	DESCRIPTION	LOAD (As Per IS875 Part 1 & Calculations)	UNITS
1	**Parapet** (0.3m sill +1.2m pillar + 0.1m railing)	4	kN/m
2	**Brick Wall** (0.23m thick x 20 kN/m3 density x 3.6m clear height)	17	kN/m

Cracked Moment of Inertia - SMF

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Table 6 Cracked RC Section Properties

(Clause 7.2)

Sl No.	Structural Element	Un-factored Loads		Factored Loads	
		Area	Moment of Inertia	Area	Moment of Inertia
(1)	(2)	(3)	(4)	(5)	(6)
i)	Slabs	1.0 A_g	0.35 I_g	1.00 A_g	0.25 I_g
ii)	Beams	1.0 A_g	0.7 I_g	1.00 A_g	0.35 I_g
iii)	Columns	1.0 A_g	0.9 I_g	1.00 A_g	0.70 I_g
iv)	Walls	1.0 A_g	0.9 I_g	1.00 A_g	0.70 I_g

Table 6 of IS 16700 - 2017

Seismic Analysis

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Mass source from IS 1893:2016, Table 10, Clause 7.3.1

Loading Type	Mass Multiplier
Dead	1
Live>3	0.5

STATIC BASE SHEAR

$V_B = A_h W$ (As Per IS1893 Part-1: 2016; Cl. No. 6.4.2)

$$A_h = \frac{\left(\frac{Z}{2}\right)\left(\frac{Sa}{g}\right)}{\left(\frac{R}{I}\right)}$$

Where, A_h = Design horizontal acceleration coefficient || W = Seismic weight of the building

Z = Seismic zone factor (As per IS 1893:2016, Part-1, Table-3)

I = Importance Factor (As per IS 1893:2016, Part-1, Table-8)

R = Response reduction factor (As per IS 1893:2016, Part-1, Table-9)

$\left(\frac{Sa}{g}\right)$ = Design acceleration coefficient

Fundamental Natural Time Period (Ta) = $\frac{0.09h}{\sqrt{d}}$ (As per IS 1893, Part-1, Clause 7.6.2)

Seismic Analysis

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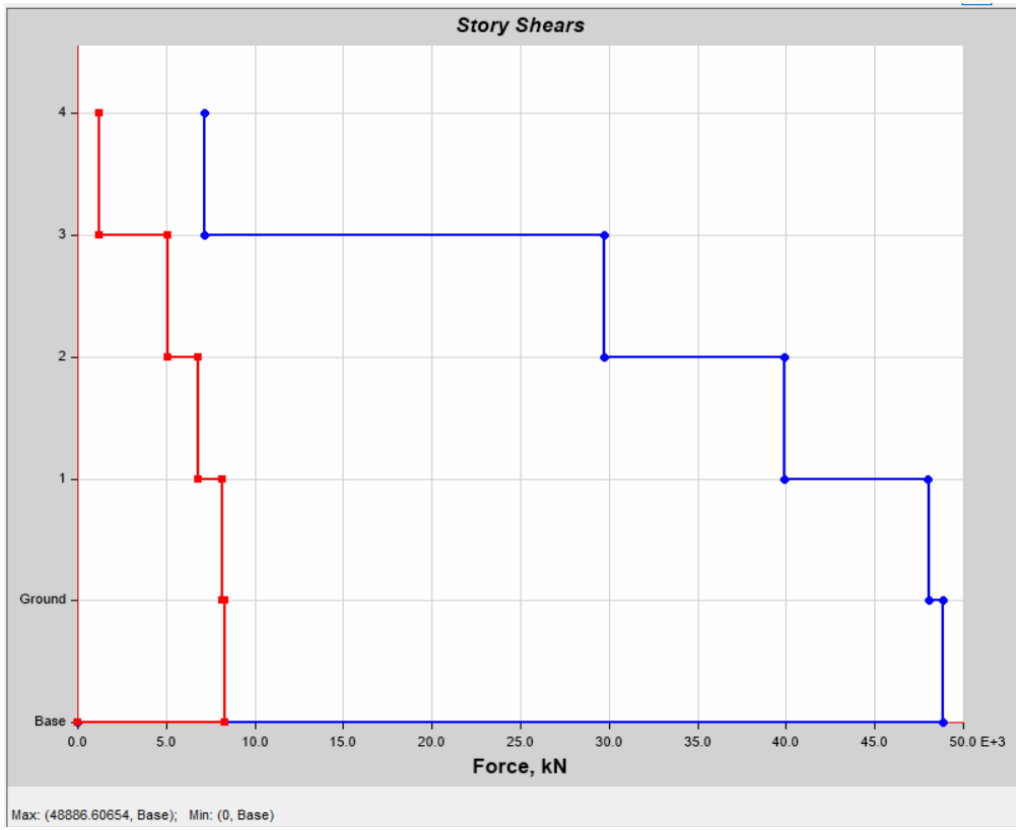
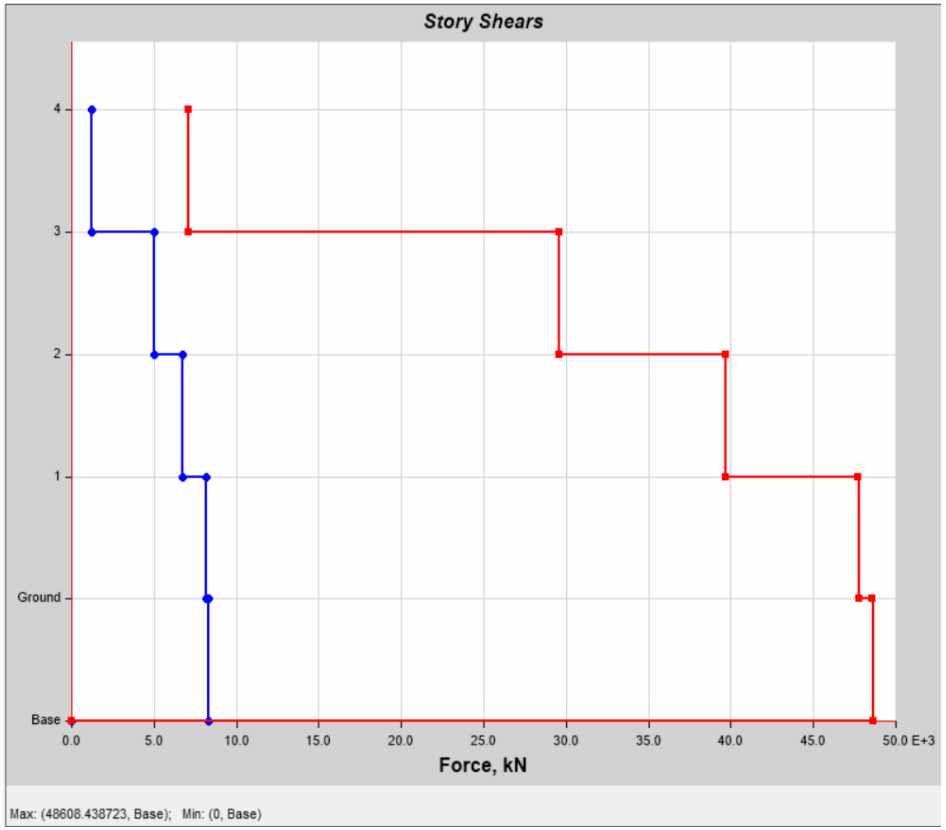
Inner Ring

Static Base Shear = 48886 kN





Seismic Dynamic Base Shear After Scaling in X and Y Direction – 48886 kN

Seismic Analysis

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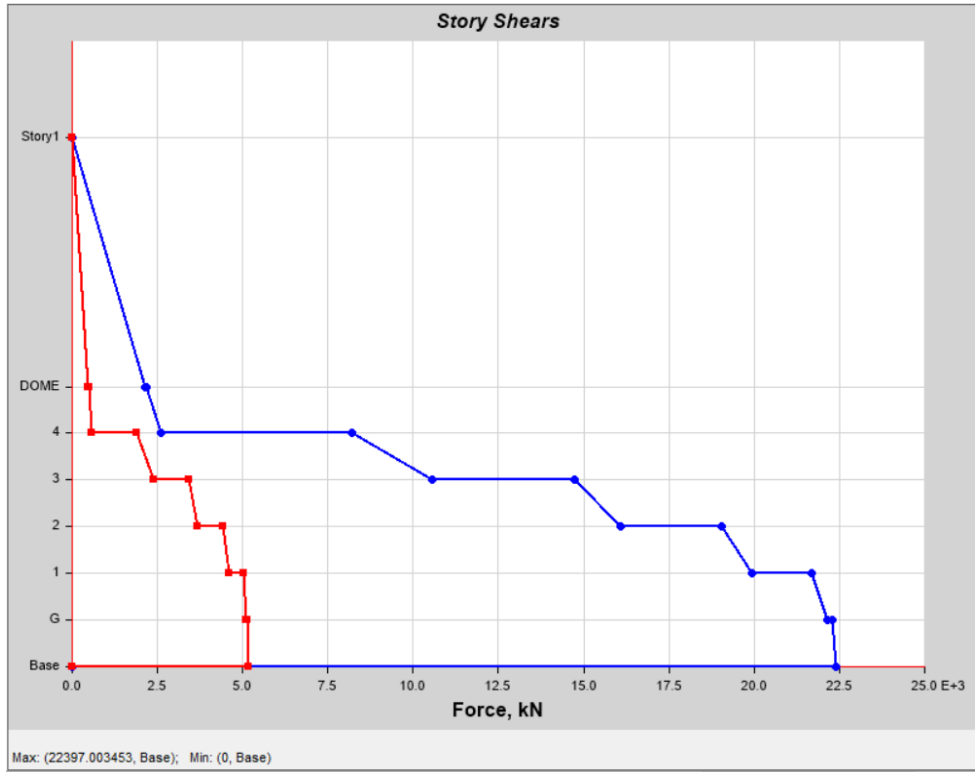
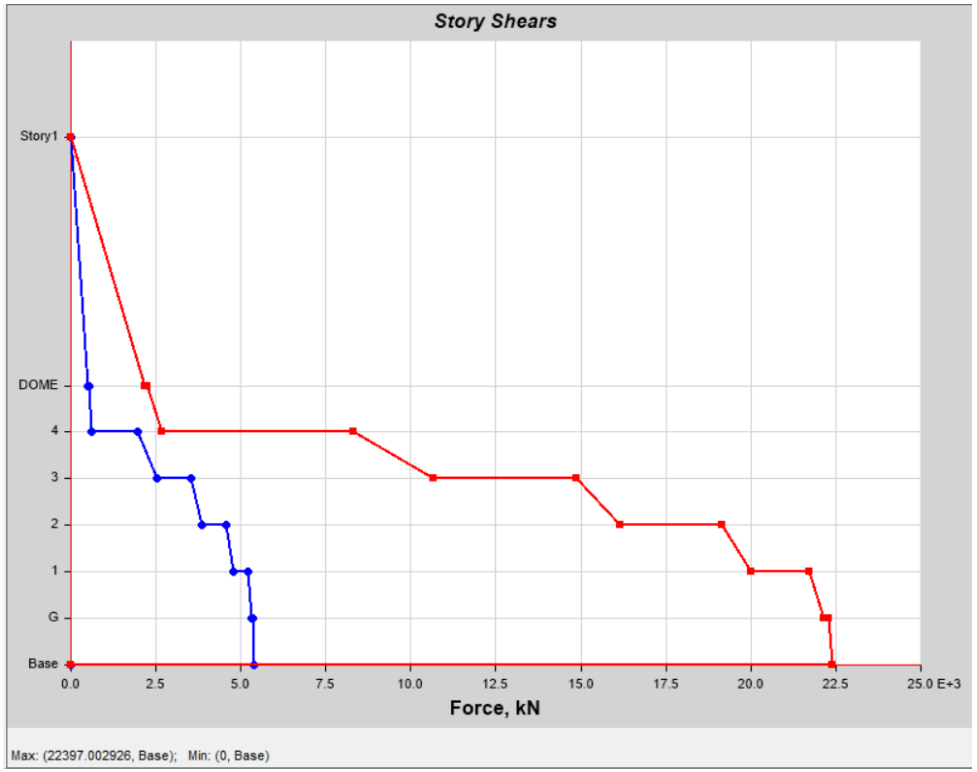
Middle Ring

Static Base Shear = 22397 kN





Seismic Dynamic Base Shear After Scaling in X and Y Direction – 22397 kN

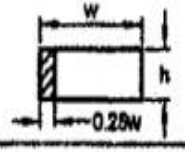
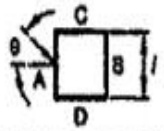
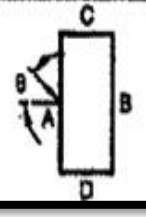
Wind Analysis

Wind Exposure Parameters

Height of building considered to wind analysis (h) = 22.5 m

Greater horizontal dimension of building (l) = 152.56 m

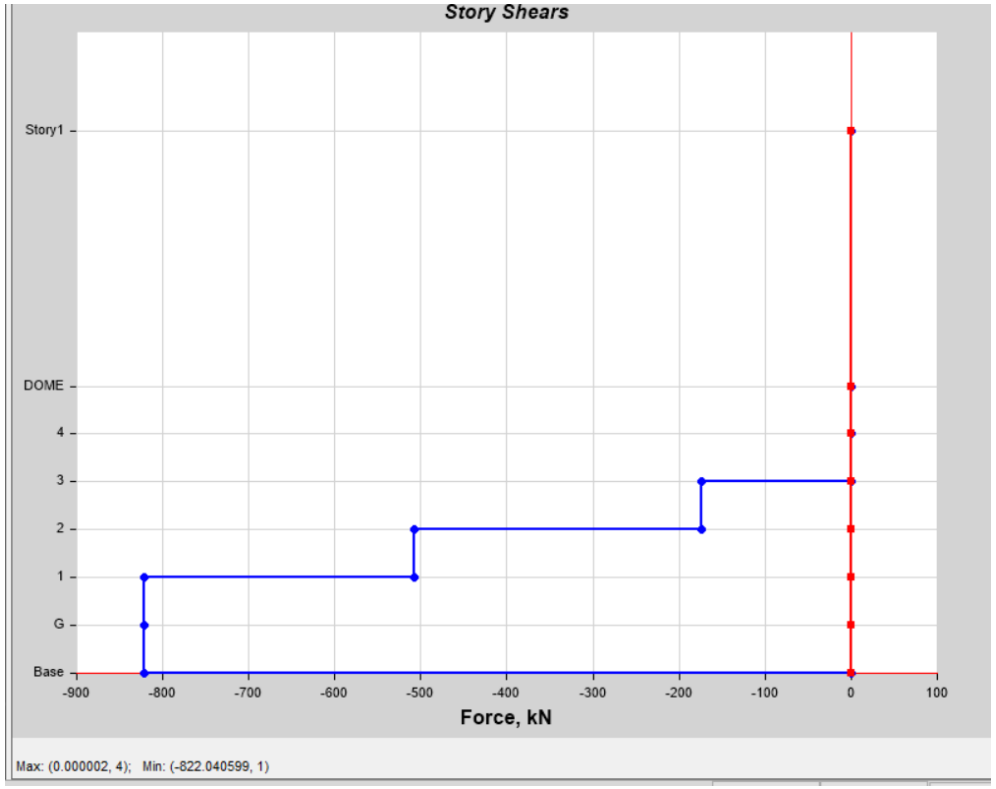
Lesser horizontal dimension of building (w) = 152.56 m

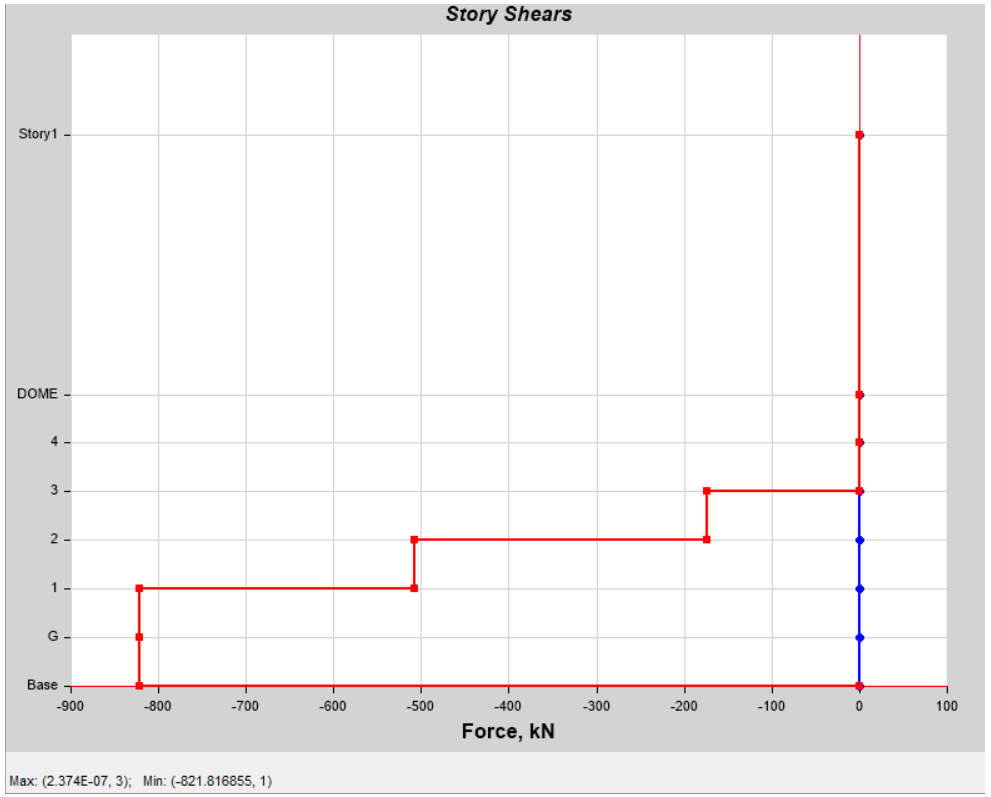
BUILDING HEIGHT RATIO	BUILDING PLAN RATIO	ELEVATION	PLAN	WIND ANGLE θ	C_{pe} FOR SURFACE				LOCAL C_{pe}
					A	B	C	D	
$\frac{h}{w} \le \frac{1}{2}$	$1 < \frac{l}{w} \le \frac{3}{2}$			Degrees 0 90	+0.7 -0.5	-0.2 -0.5	-0.5 +0.7	-0.5 -0.2	-0.8
	$\frac{3}{2} < \frac{l}{w} < 4$			0 90	+0.7 -0.5	-0.25 -0.5	-0.6 +0.7	-0.6 -0.1	-1.0

(As per IS 875: 2015, Table No 5, Part 3, Clause 7.3.3.1)

BUILDING HEIGHT RATIO	BUILDING PLAN RATIO	WIND ANGLE (θ)	Cp FOR SURFACE	
			WINDWARD	LEEWARD
h/w = 0.15	l/w = 1	0	0.7	0.2
		90	0.7	0.2

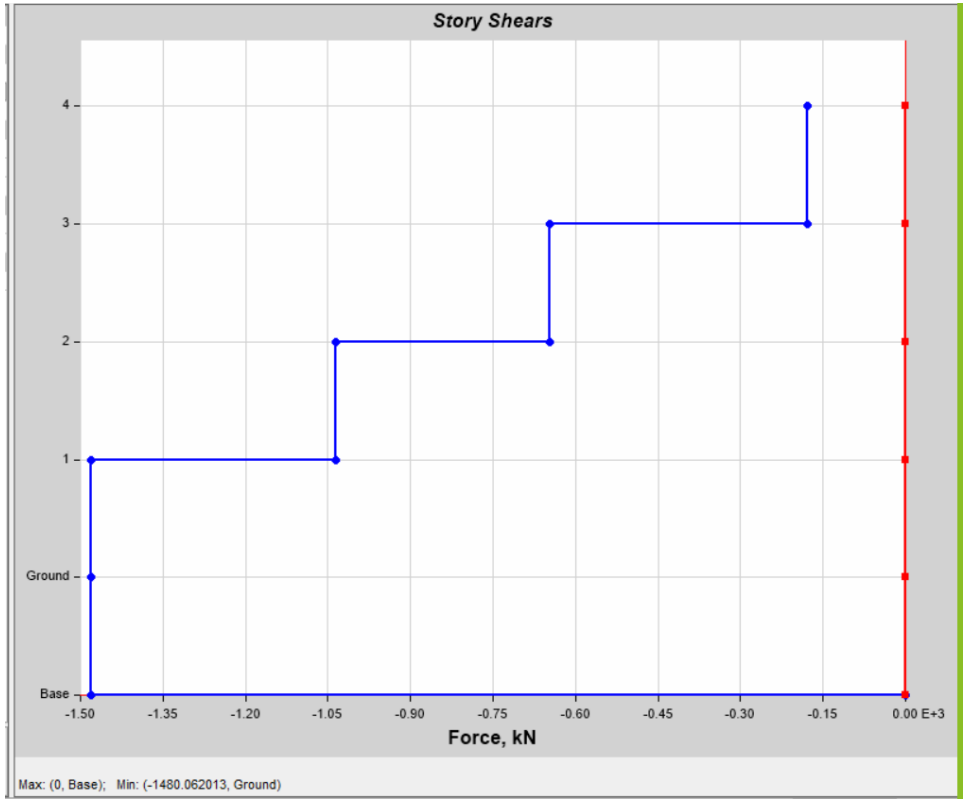
Wind Analysis – Inner Ring

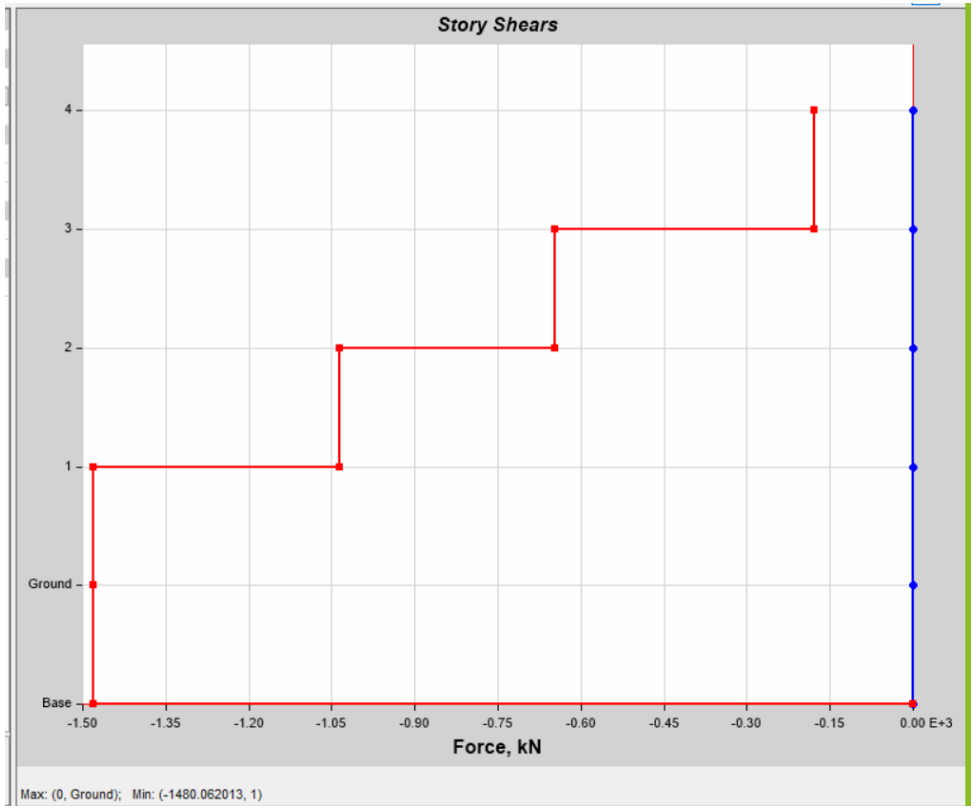




Wind Base Shear After Scaling in X and Y Direction are 822 kN & 821.82 kN respectively

Wind Analysis – Middle Ring

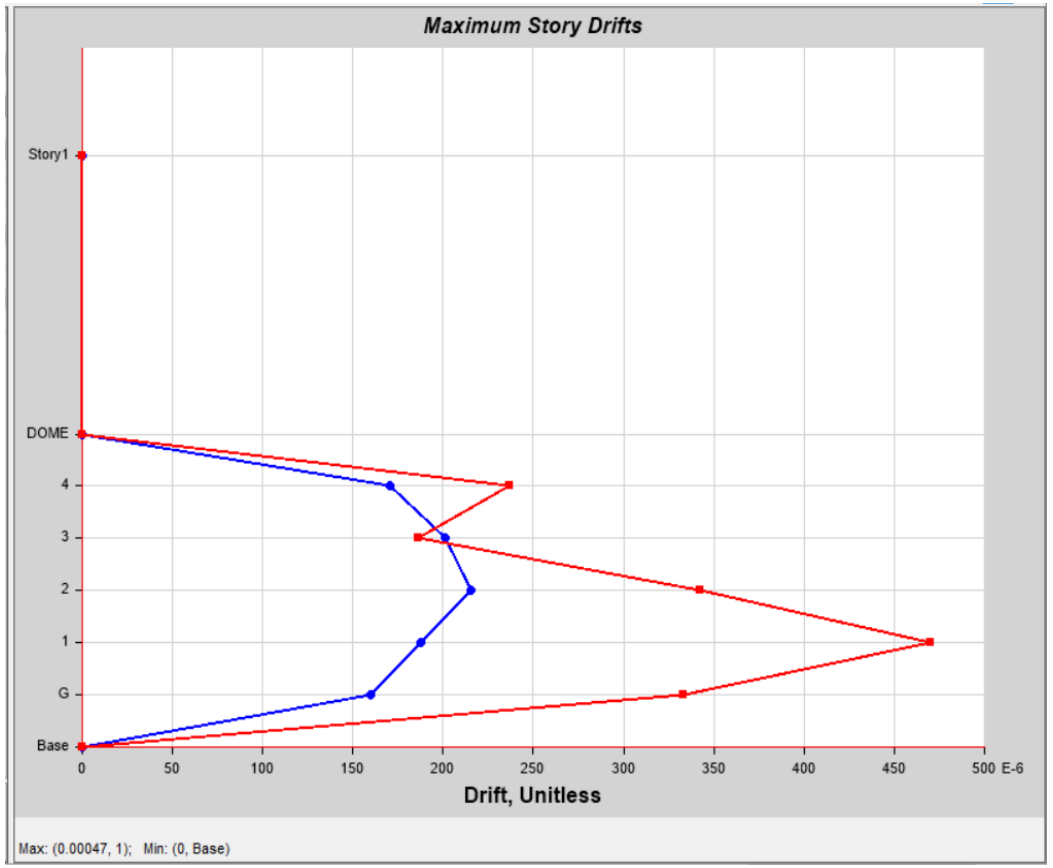




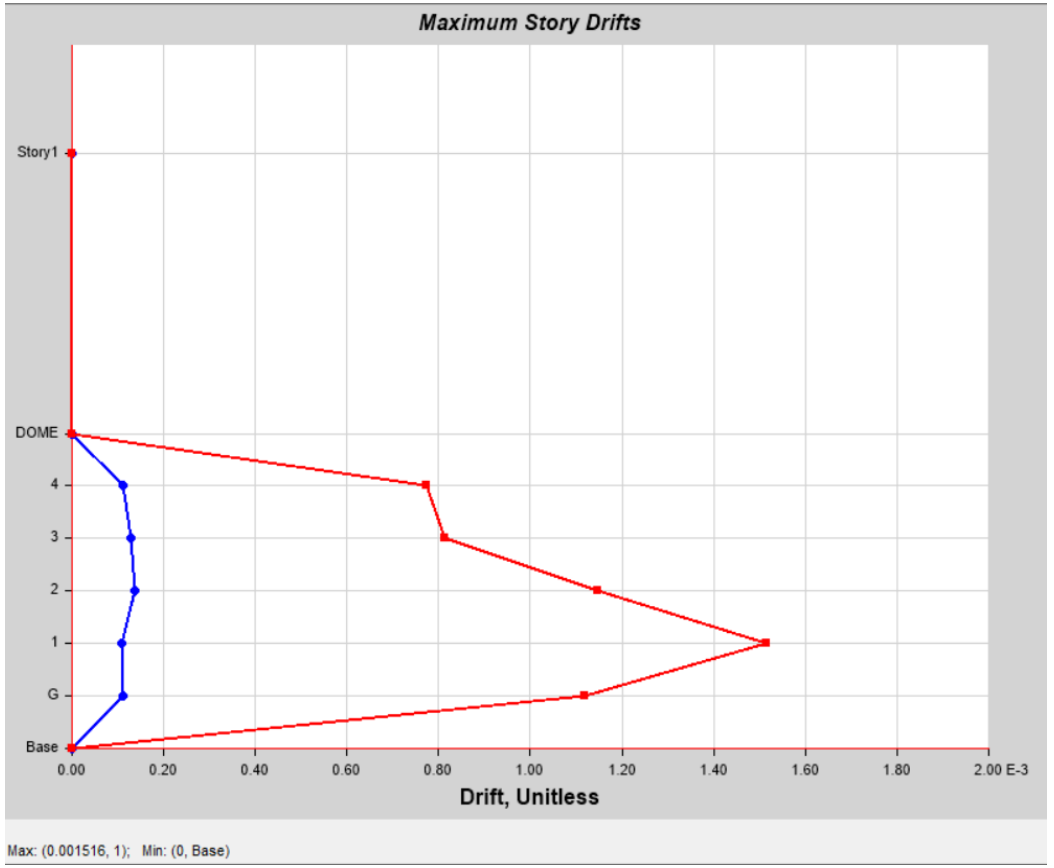
Wind Base Shear After Scaling in X and Y Direction are 1400 kN & 1400 kN respectively

Stability Checks

Inter-storey Drift Check - Inner Ring

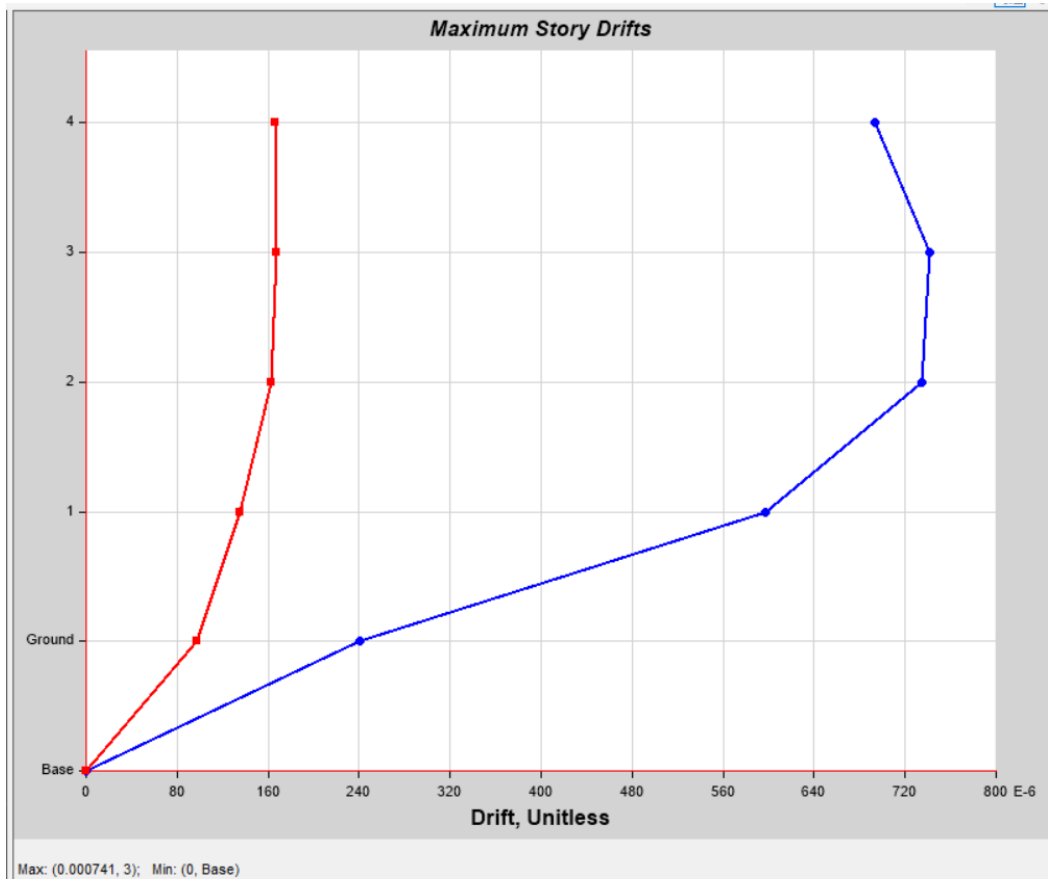


Maximum inter-storey drift due to Specx is 0.00047 which is less than 0.004 hence ok

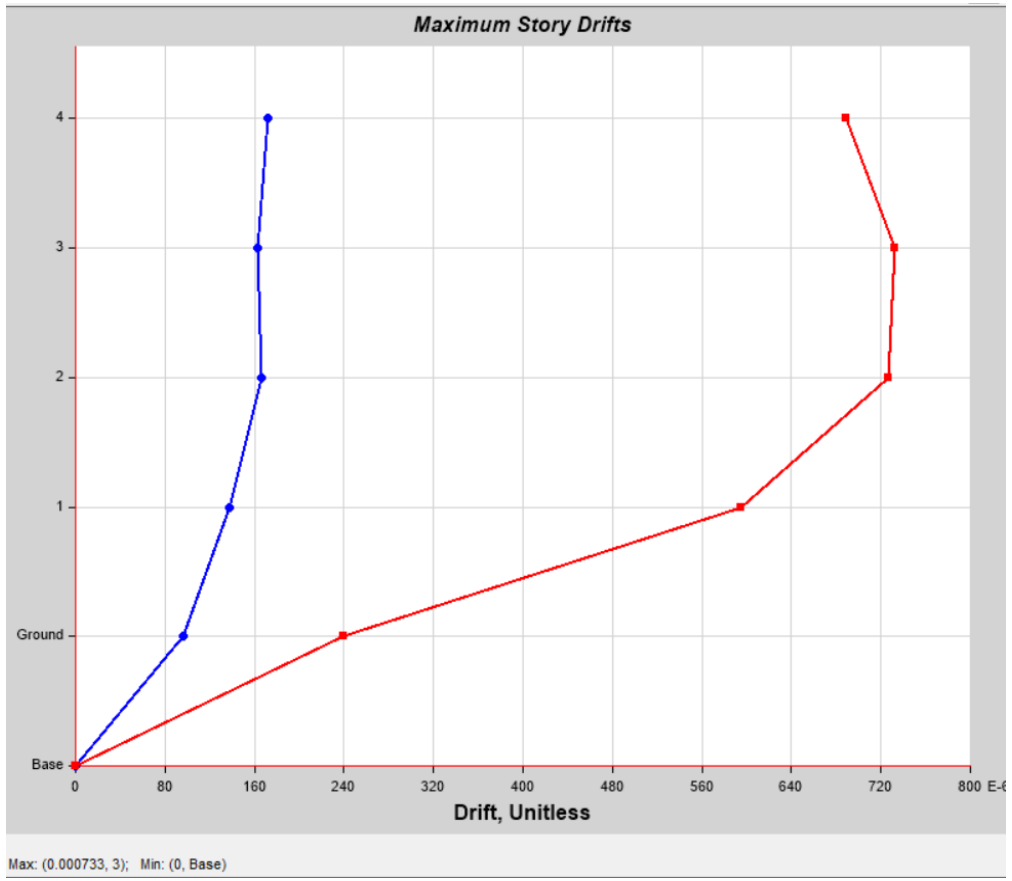


Maximum inter-storey drift due to Specx is 0.001516 which is less than 0.004 hence ok

Inter-storey Drift Check – Middle Ring

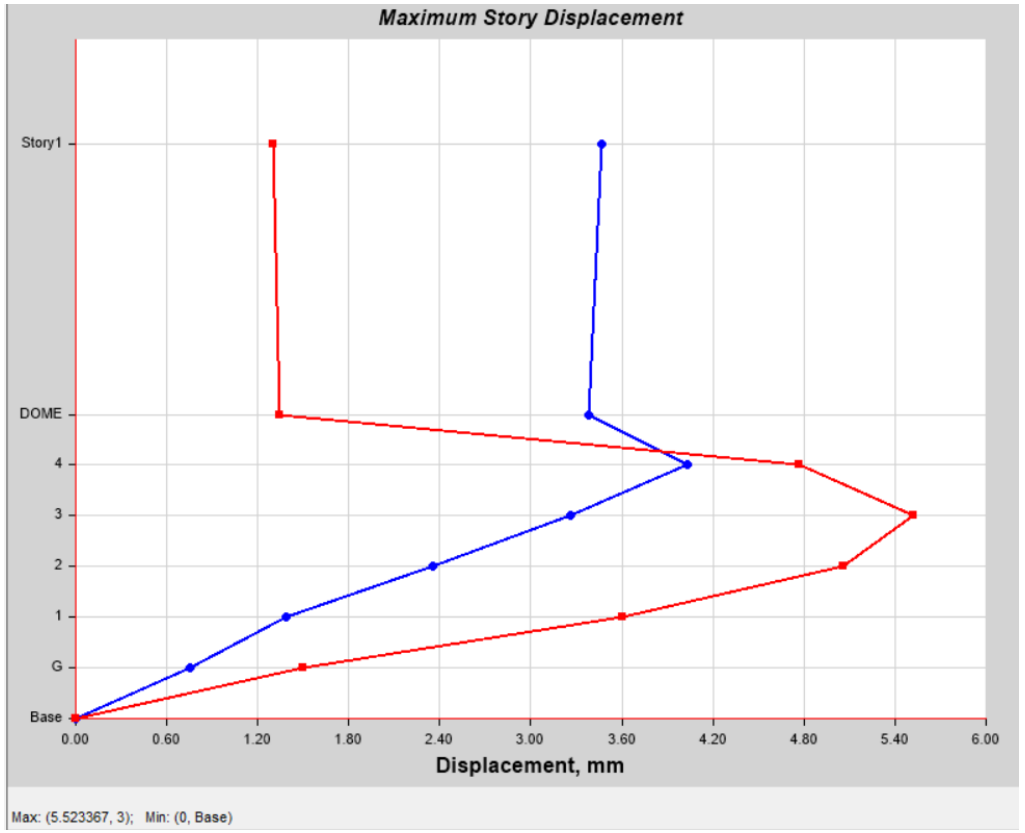


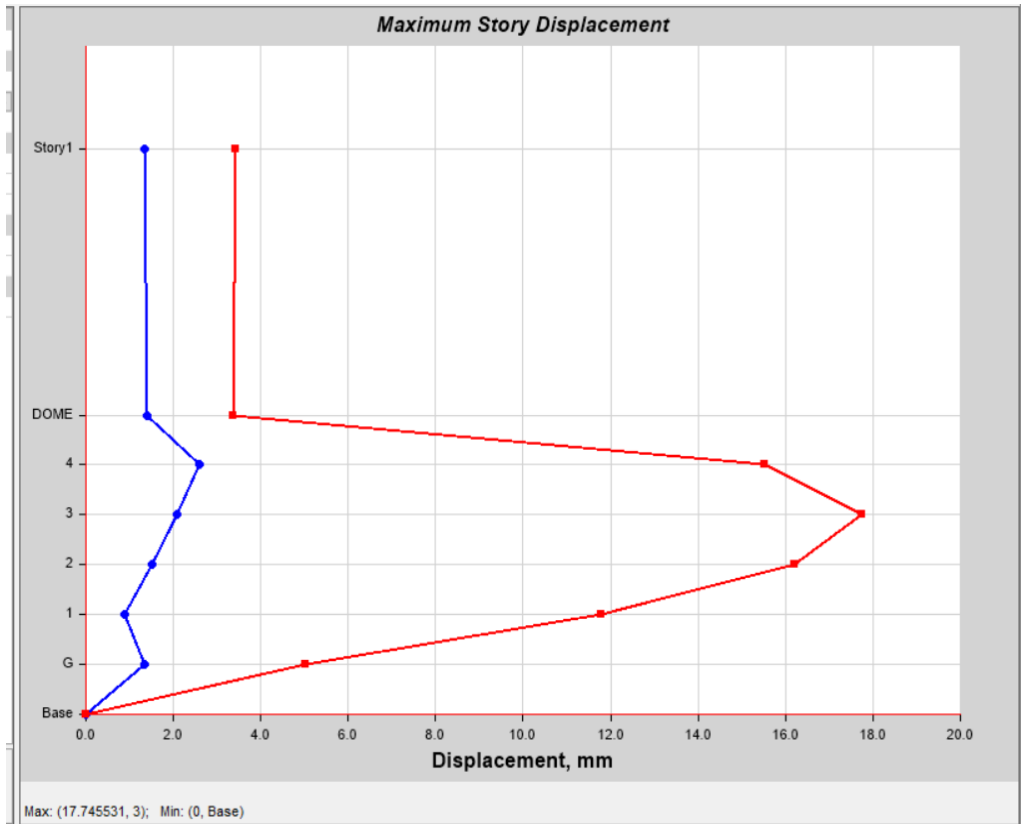
Maximum inter-storey drift due to Specx is 0.000741 which is less than 0.004 hence ok



Maximum inter-storey drift due to Specx is 0.000733 which is less than 0.004 hence ok

Deflection due to EQ – Inner Ring

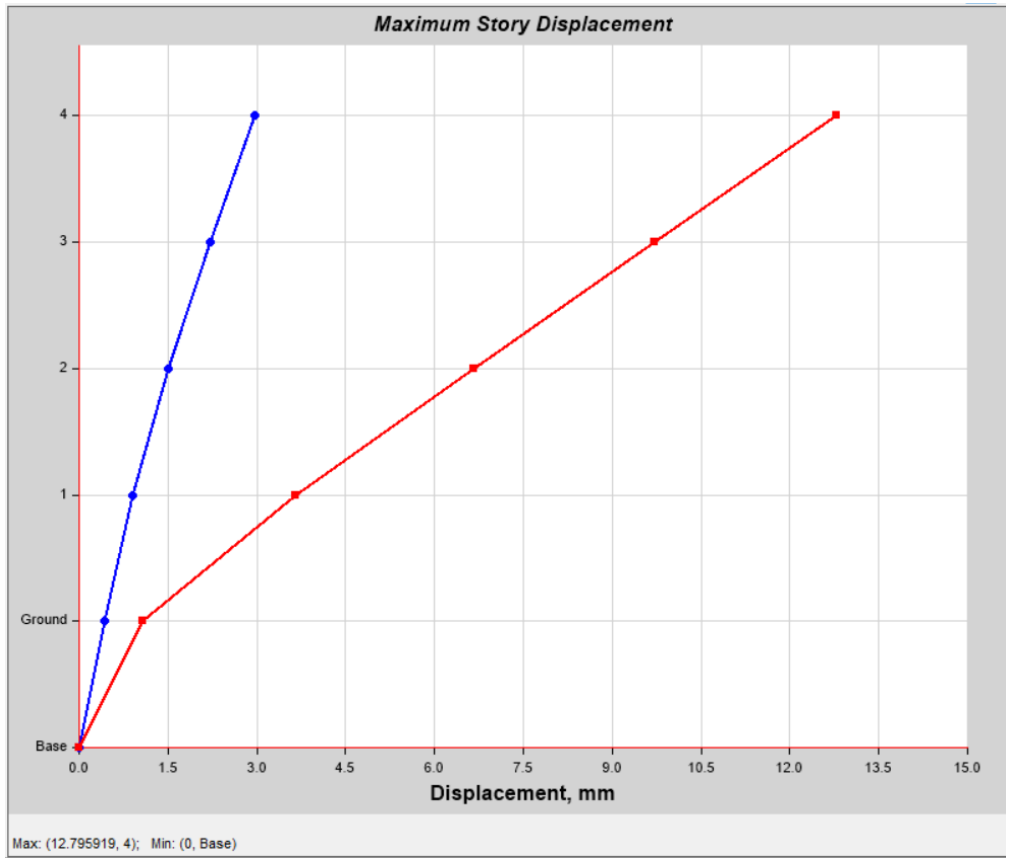




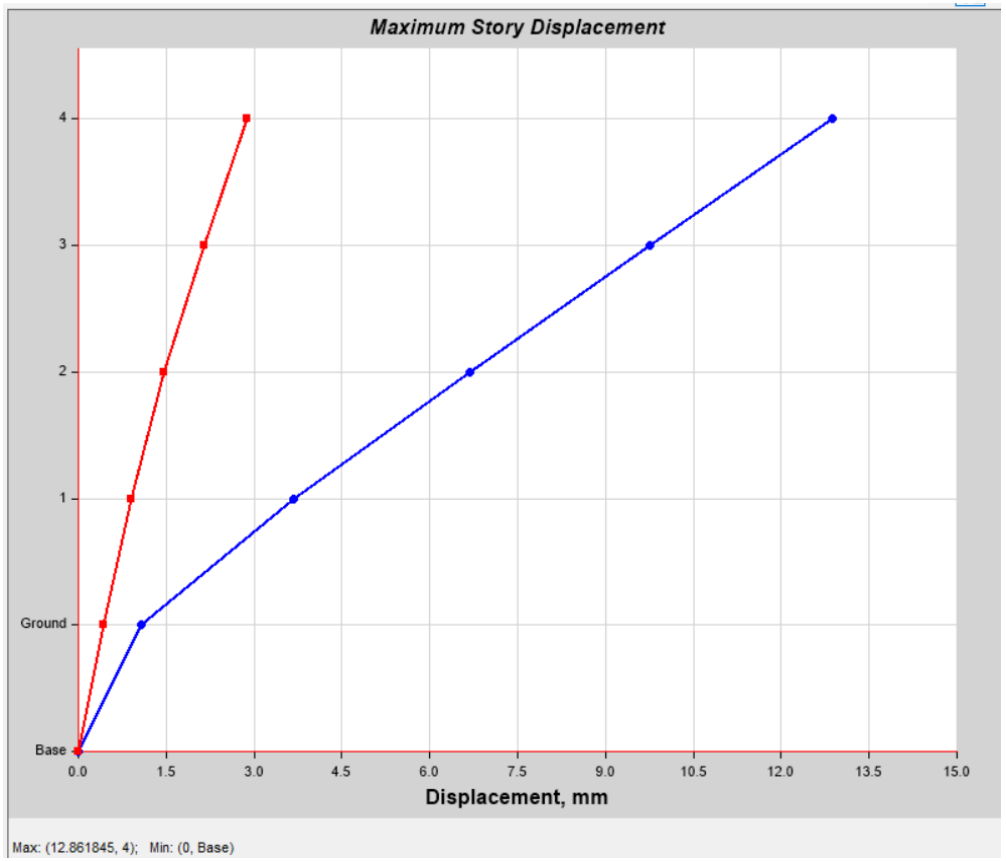
Maximum storey displacement due to Specx is 5.523mm which is less than 90mm (H/250) hence ok

Maximum storey displacement due to Specx is 17.74 mm which is less than 90mm (H/250) hence ok

Deflection due to EQ – Middle Ring



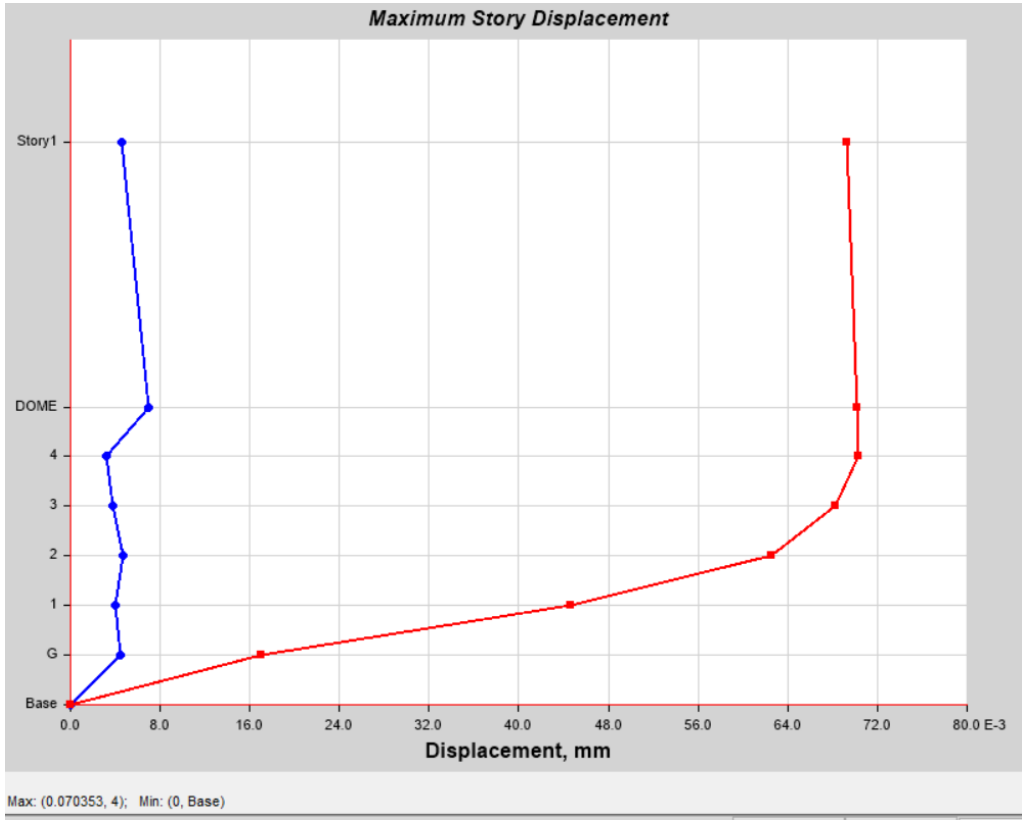
Maximum storey displacement due to Specx is 12.795mm which is less than 90mm (H/250) hence ok



Maximum storey displacement due to Specx is 12.795mm which is less than 90mm (H/250) hence ok

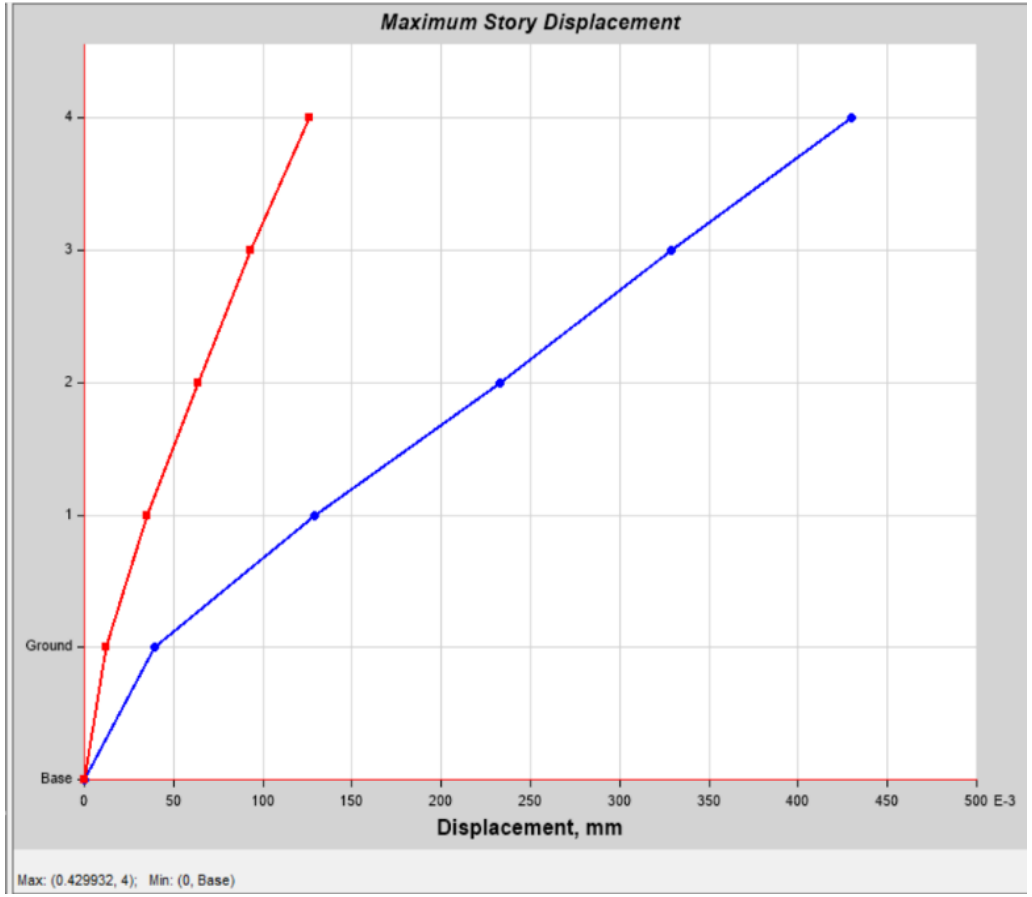
Deflection due to Wind – Inner Ring

Maximum storey displacement due to Wind X is 0.092mm which is less than 45mm (H/500) hence ok



Maximum storey displacement due to Wind X is 0.07mm which is less than 45mm (H/500) hence ok

Deflection due to Wind – Middle Ring



Maximum storey displacement due to Wind X is 0.429mm which is less than 45mm (H/500) hence ok

Maximum storey displacement due to Wind X is 0.429mm which is less than 45mm (H/500) hence ok

Design Load Combinations

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Definitions

D.L – Dead Load

L.L – Live Load

Wx – Wind load in X Direction

Wy – Wind load in Y Direction

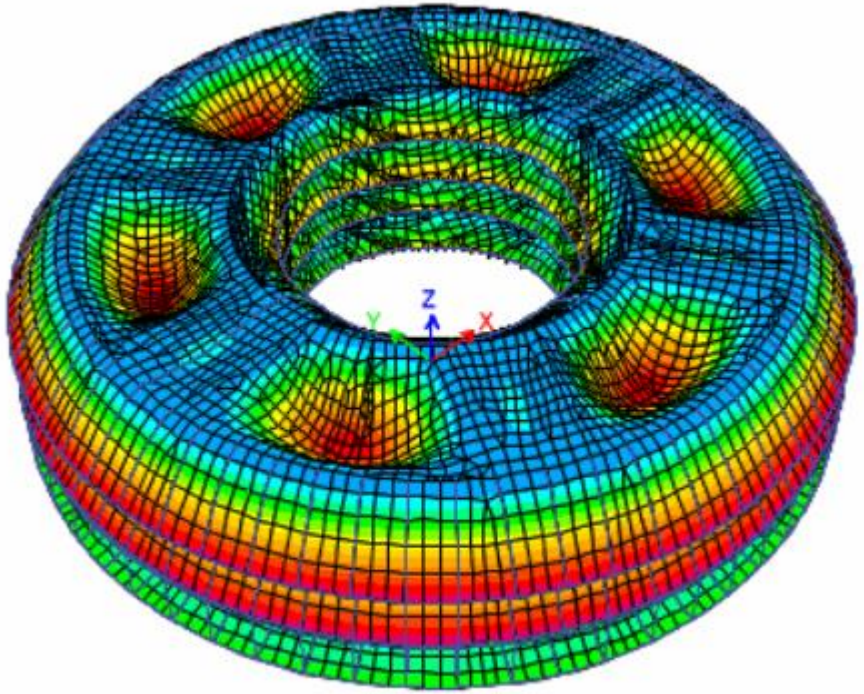
SPECX – Seismic Load in X Direction (Dynamic)

SPECY – Seismic Load in Y Direction (Dynamic)

Load Combinations

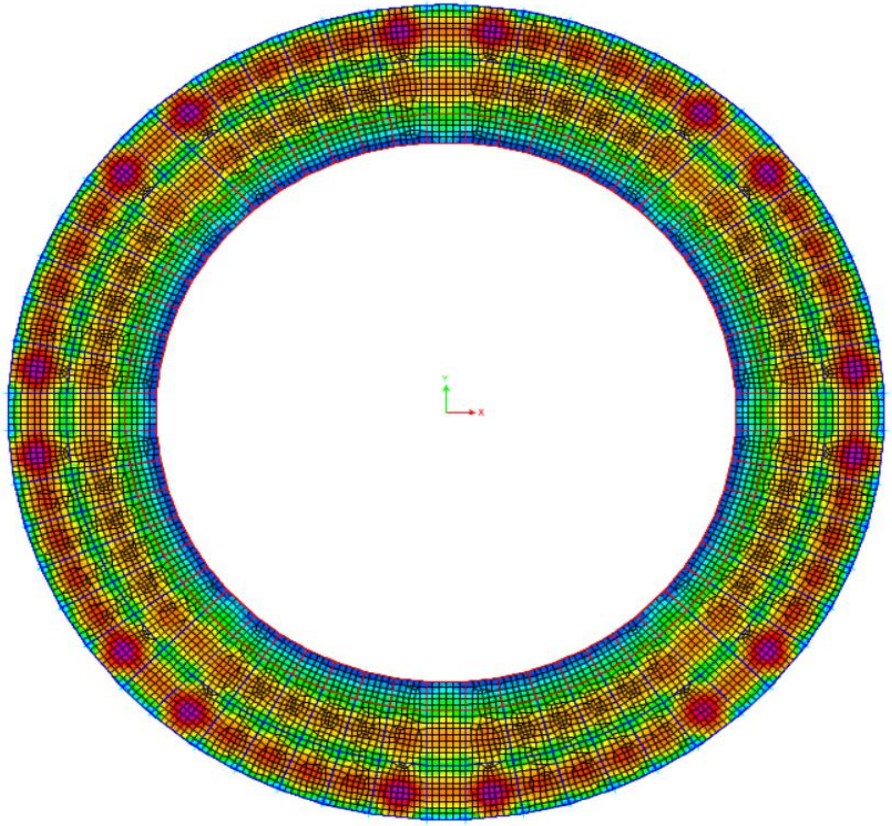
1. 1.5DL + 1.5LL
2. 1.5DL ± 1.5Wx
3. 1.5DL ± 1.5Wy
4. 1.5DL + 1.5SPECX
5. 1.5DL + 1.5SPECY
6. 1.2DL + 1.2LL ± 1.2Wx
7. 1.2DL + 1.2LL ± 1.2Wy
8. 1.2DL + 1.2LL + 1.2SPECX
9. 1.2DL + 1.2LL + 1.2SPECY
10. 0.9DL ± 1.5Wx
11. 0.9DL ± 1.5Wy
12. 0.9DL + 1.5SPECX
13. 0.9DL + 1.5SPECY
14. DL + 1.5SRSS (Orthogonal)
15. 1.2DL + 1.2LL + 1.2SRSS (Orthogonal)
16. 0.9DL + 1.5SRSS (Orthogonal)

Creep Deflection (400 years)



Inner Ring

Deflection – 35mm



Middle Ring

Deflection – 29.3mm

Hence we need to go for pre-chambering of 25mm

FOUNDATION DESIGN

Foundation – Service Load Combinations

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SR NO.	COMBINATION	LIMIT STATES OF SERVICEABILITY					
		DL	LL	WX	WY	SPECX	SPECY
1.	DL+LL	1.5	1.5	-	-	-	-
2.	DL	1.5					
3.	DL+SPECX	1.5	-	-	-	1.5	-
4.	DL+SPECY	1.5	-	-	-	-	1.5
5.	DL ±WX	1.5	-	±1.5	-	-	-
6.	DL±WY	1.5	-	-	±1.5	-	-
7.	DL+LL+SPECX	1.2	1.2	-	-	1.2	-
8.	DL+LL+SPECY	1.2	1.2	-	-	-	1.2
9.	DL+LL ±WX	1.2	1.2	±1.2	-	-	-
10.	DL+LL±WY	1.2	1.2	-	±1.2	-	-
11.	DL+SPECX	0.9	-	-	-	1.5	-
12.	DL+SPECY	0.9	-	-	-	-	1.5
13.	DL ±WX	0.9	-	±1.5	-	-	-
14.	DL±WY	0.9	-	-	±1.5	-	-

Foundation – Strength Load Combinations

SR NO.	COMBINATION	LIMIT STATES OF SERVICEABILITY					
		DL	LL	WX	WY	SPECX	SPECY
1.	DL+LL	1.5	1.5	-	-	-	-
2.	DL	1.5					
3.	DL+SPECX	1.5	-	-	-	1.5	-
4.	DL+SPECY	1.5	-	-	-	-	1.5
5.	DL ±WX	1.5	-	±1.5	-	-	-
6.	DL±WY	1.5	-	-	±1.5	-	-
7.	DL+LL+SPECX	1.2	1.2	-	-	1.2	-
8.	DL+LL+SPECY	1.2	1.2	-	-	-	1.2
9.	DL+LL ±WX	1.2	1.2	±1.2	-	-	-
10.	DL+LL±WY	1.2	1.2	-	±1.2	-	-
11.	DL+SPECX	0.9	-	-	-	1.5	-
12.	DL+SPECY	0.9	-	-	-	-	1.5
13.	DL ±WX	0.9	-	±1.5	-	-	-
14.	DL±WY	0.9	-	-	±1.5	-	-

Foundation Details

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1. Material Properties of Concrete

Grade of Concrete	E ($N/mm^{2)}$	Unit Wt. ($kN/m^{3)}$	Fc ($N/mm^{2)}$
M45	31622	25	45

2. Material Properties of Rebar

Grade of Steel	E (N/mm^2)	Unit Wt. (kN/m^3)	Fy ($N/mm^{2)}$	Fu (N/mm^2)
Fe550D	200000	76.97	550	545

3. Forces And Grouping f Footing

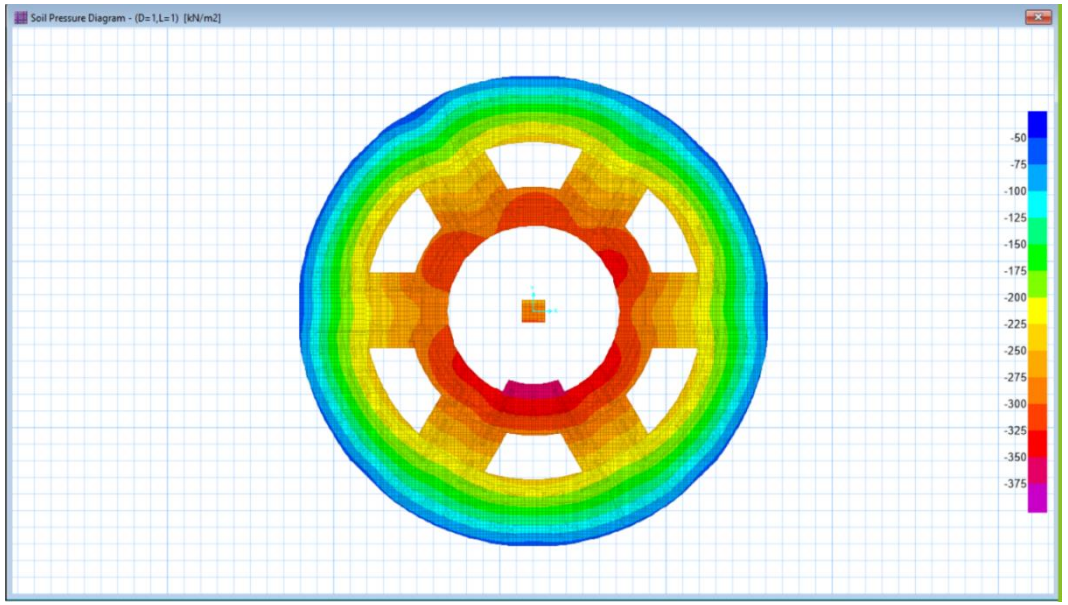
Initial sizes of the footing as per the manual calculations for better control

Foundation Members	MATERIALS		DEPTH OF FOOTING (mm)
	GRADE OF CONCRETE	GRADE OF STEEL	
Raft	M45	Fe550D	900
Drop	M45	Fe550D	900

SBC of the soil as per soil report is 750 kN/m^2

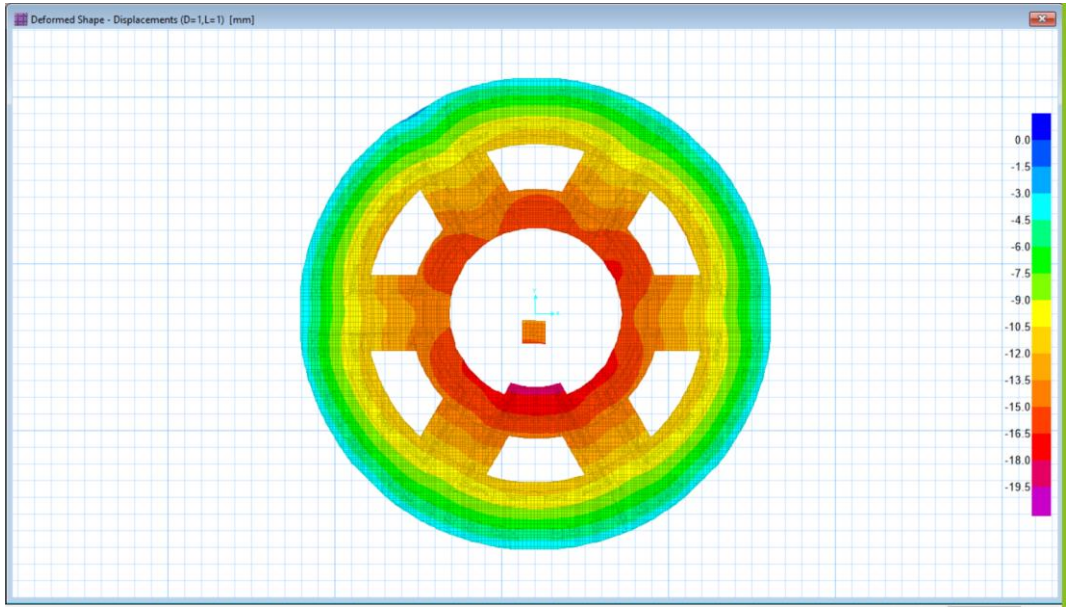
Foundation - Inner Ring

Check for Ground Bearing Pressure



Maximum value for the GBP is coming 373 KN/m^2 for (Dead load + Live load) which is less than 750 kN/m^2 and it is safe

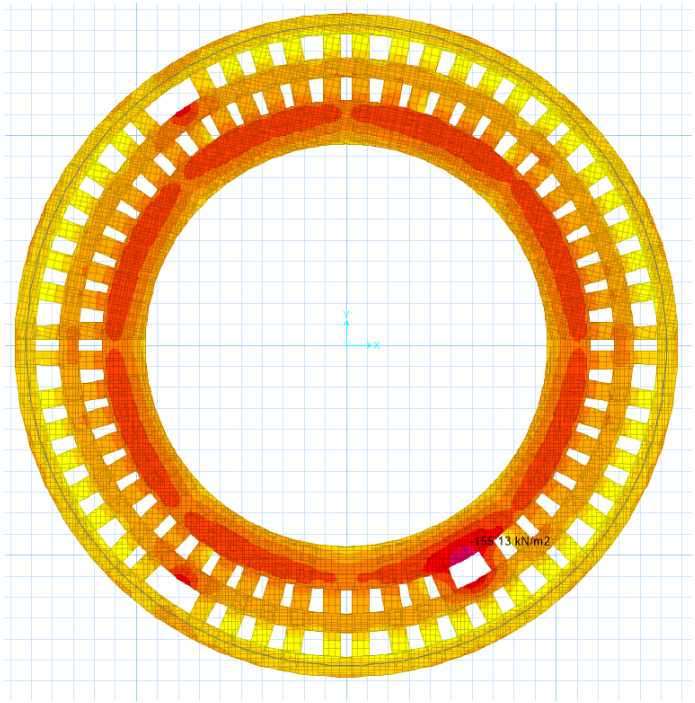
Check for Settlement



Maximum settlement observed is 18.68 mm for Dead load + Live load which is safe as per the limit of 50 mm for the isolated footing

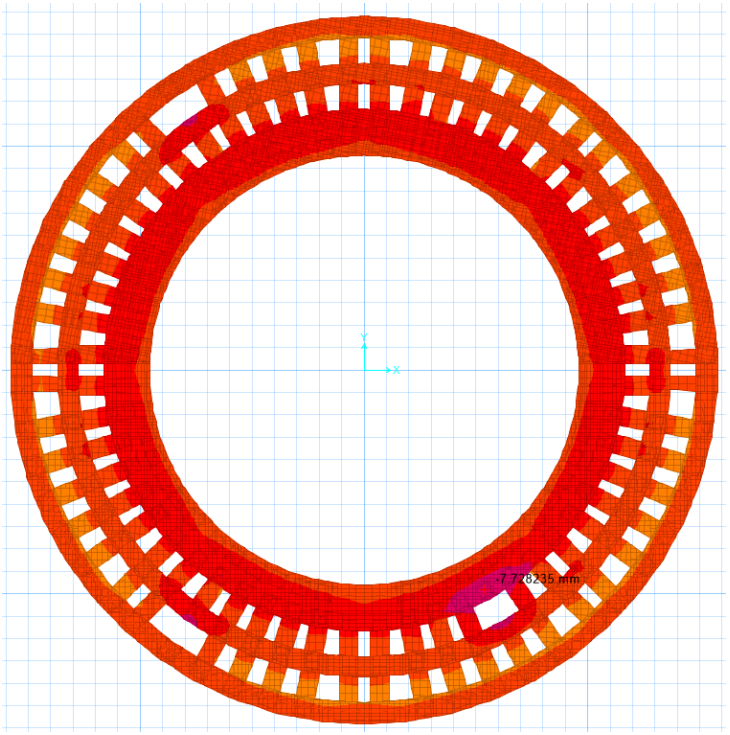
Foundation - Middle Ring

Check for Ground Bearing Pressure



Maximum value for the GBP is coming 157 KN/m^2 for (Dead load + Live load) which is less than 750 kN/m^2 and it is safe.

Check for Settlement



Maximum settlement observed is 7.77 mm for Dead load + Live load which is safe as per the limit of 50 mm for the isolated footing.

Foundation - Inner Ring

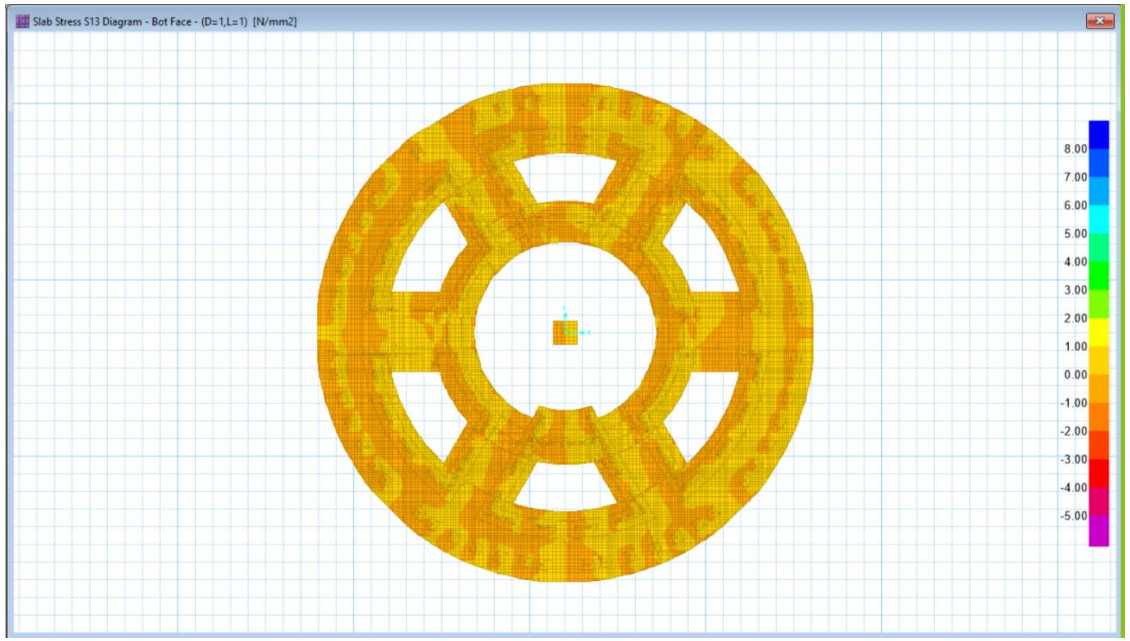
Stress Checks

Check for One-way Stress of Concrete as the S13 and S23 (for the service envelope) at the bottom face of the footing

Check as per the S13 criteria. (Maximum)

Allowable Punching Shear Stress = $0.16x\sqrt{fck}$ = 1.073 for M45

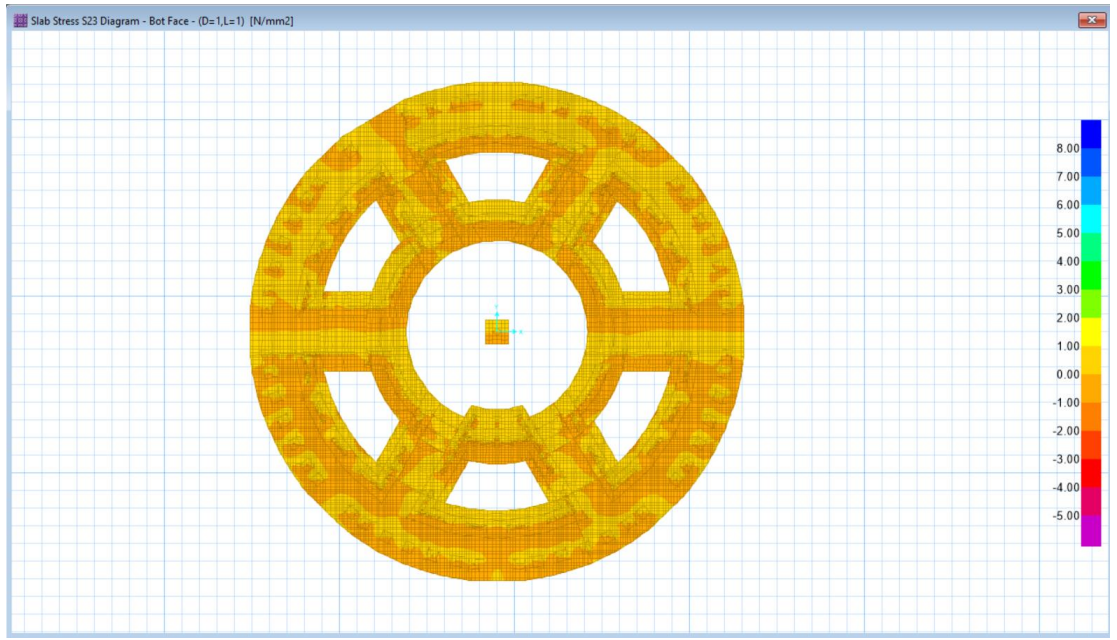
Max. Punching Shear Stress (S13) at d/2 = 0.76



Check as per the S23 criteria (Maximum)

Allowable Punching Shear Stress = $0.16x\sqrt{fck}$ = 1.073 for M45

Max. Punching Shear Stress (S23) at d/2 = 0.3



Foundation - Middle Ring

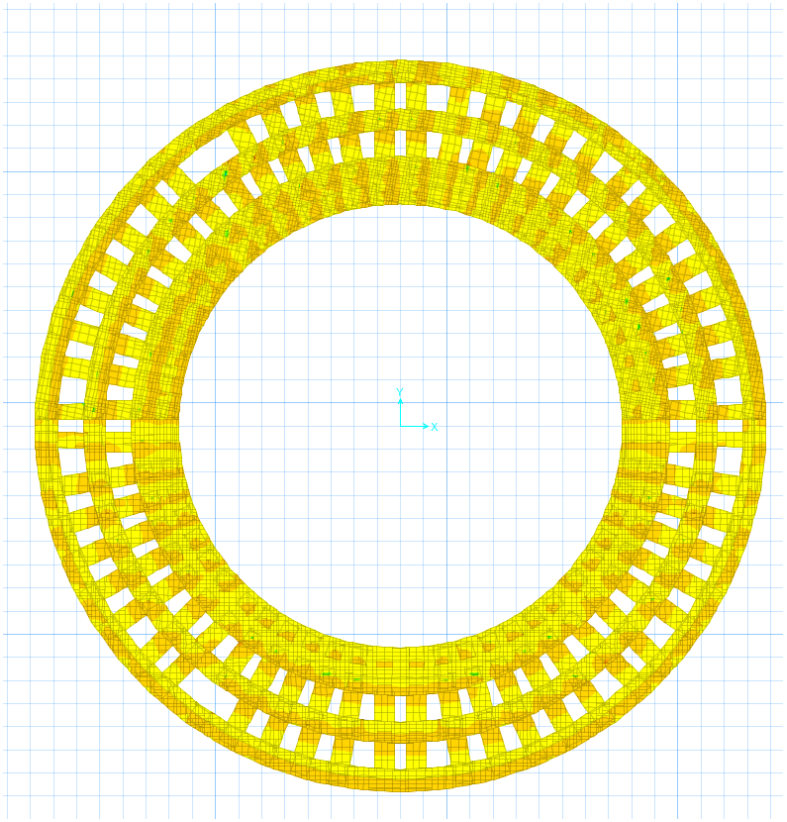
Stress Checks

Check for One-way Stress of Concrete as the S13 and S23 (for the service envelope) at the bottom face of the footing

Check as per the S13 criteria. (Maximum)

Allowable Punching Shear Stress = $0.16x\sqrt{fck}$ = 1.073 for M45

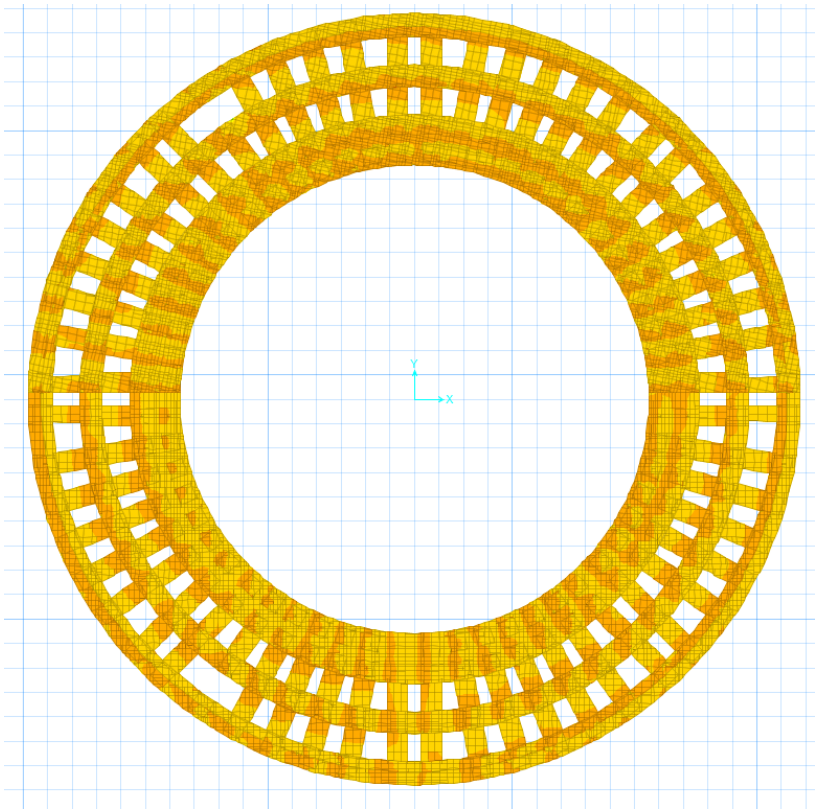
Max. Punching Shear Stress (S13) at d/2 = 0.76



Check as per the S23 criteria (Maximum)

Allowable Punching Shear Stress = $0.16x\sqrt{fck}$ = 1.073 for M45

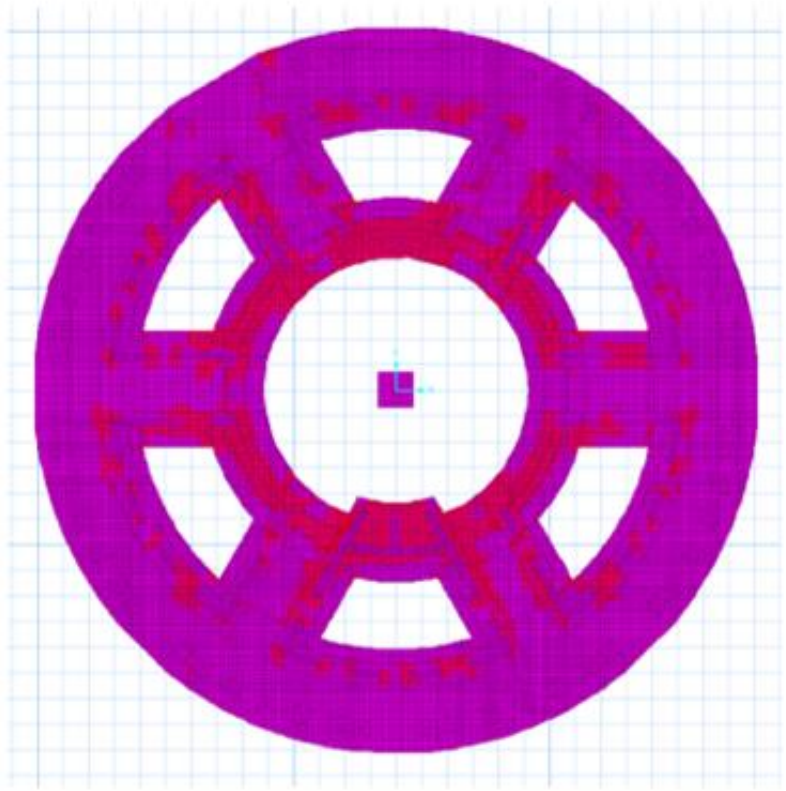
Max. Punching Shear Stress (S23) at d/2 = 0.3

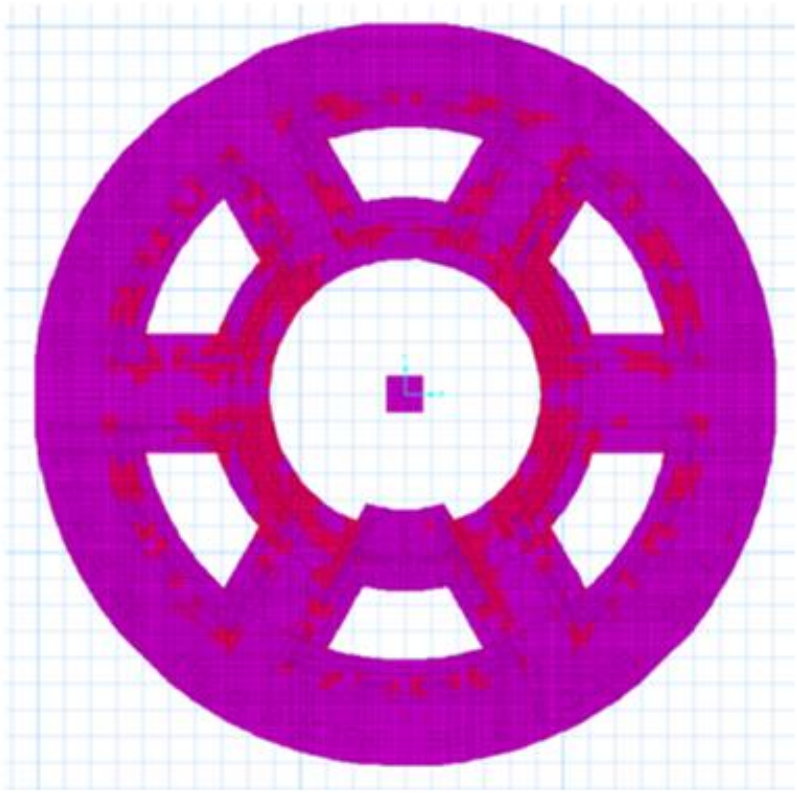


Foundation - Inner Ring

Reinforcement Details - Bottom

Changing Dead Load and Live Load case to non- linear (Cracked) for Bottom Steel



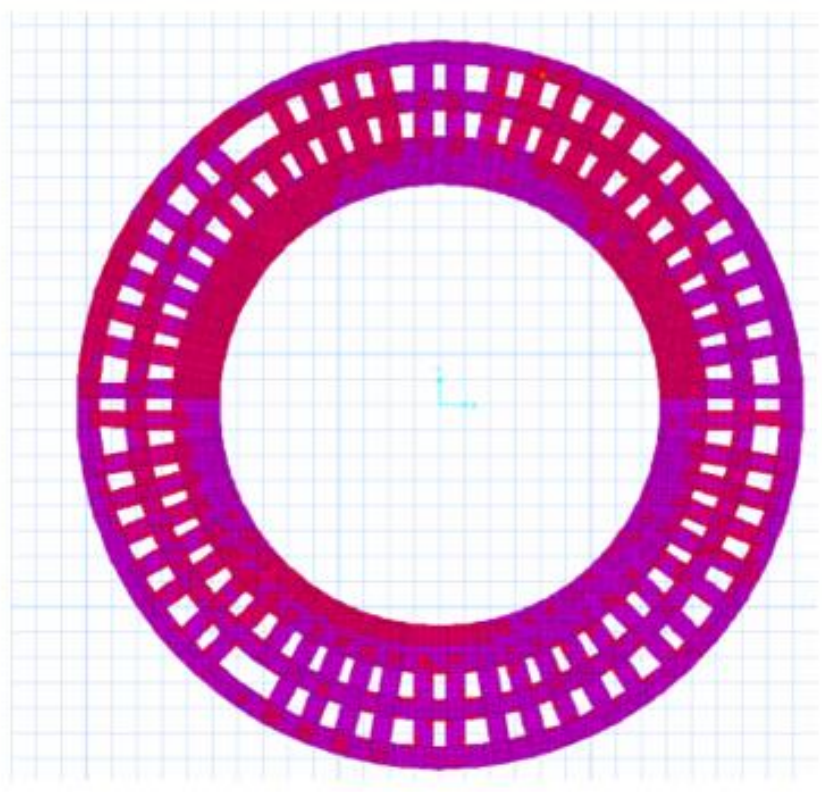


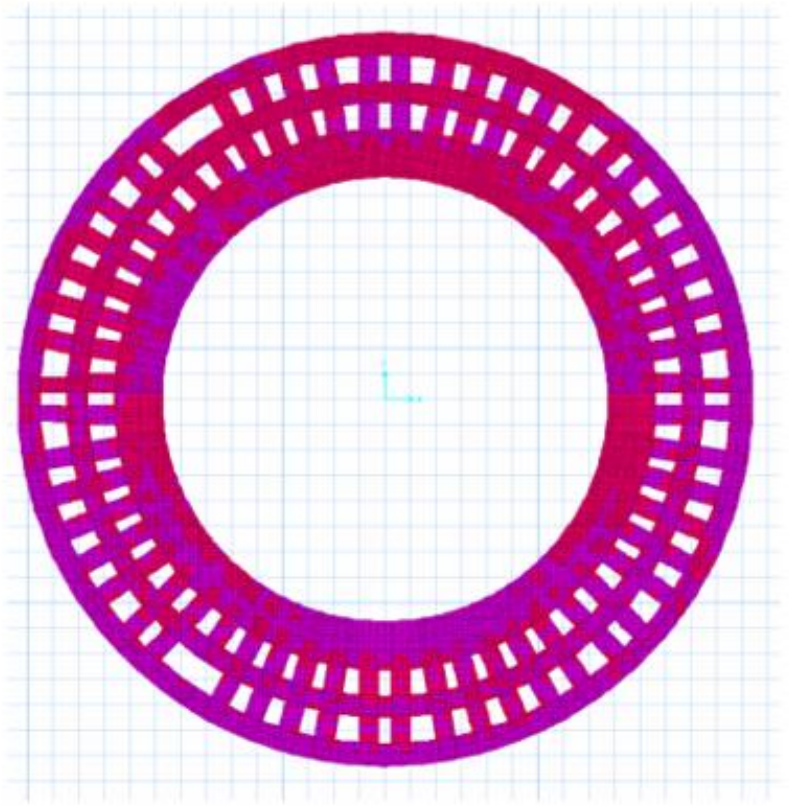
Bottom Direction 1 & 2 – T25 @ 150 c/c + Extra T25 @ 125 c/c (at some places)

Foundation - Middle Ring

Reinforcement Details - Bottom

Changing Dead Load and Live Load case to non- linear (Cracked) for Bottom Steel



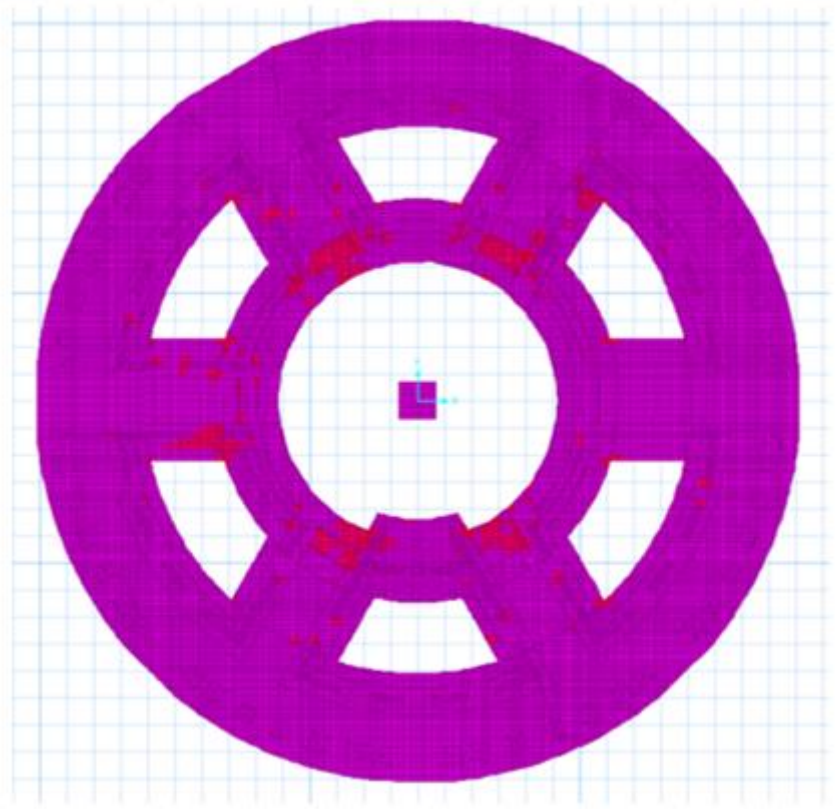


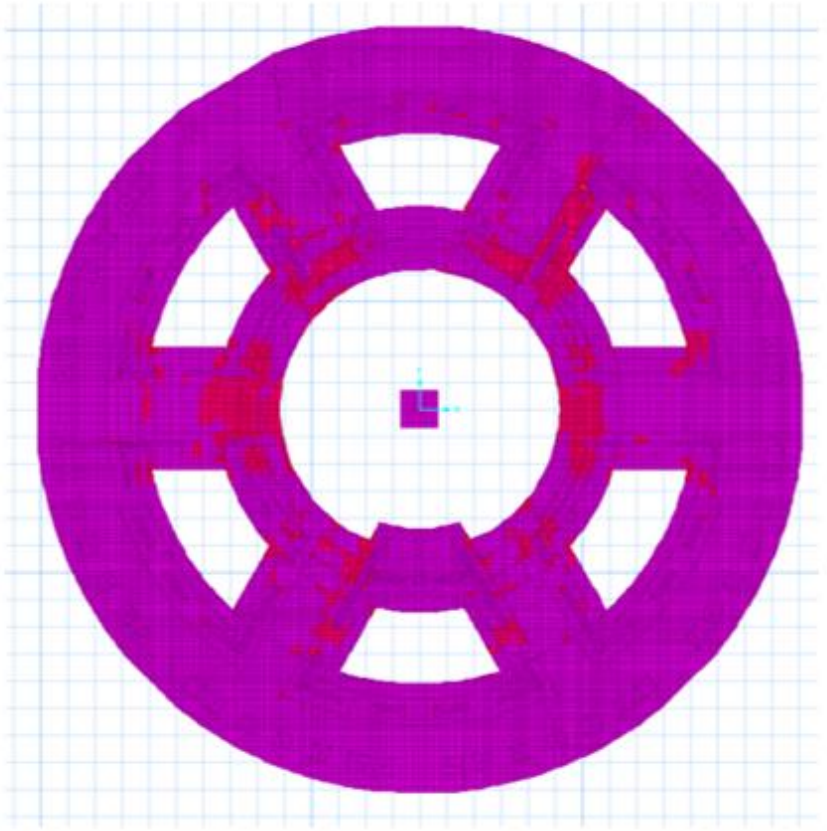
Bottom Direction 1 & 2 – T25 @ 150 c/c + Extra 3000 mm2/m

Foundation - Inner Ring

Reinforcement Details - Top

Changing Dead Load and Live Load case to Non-linear Uplift for top steel.



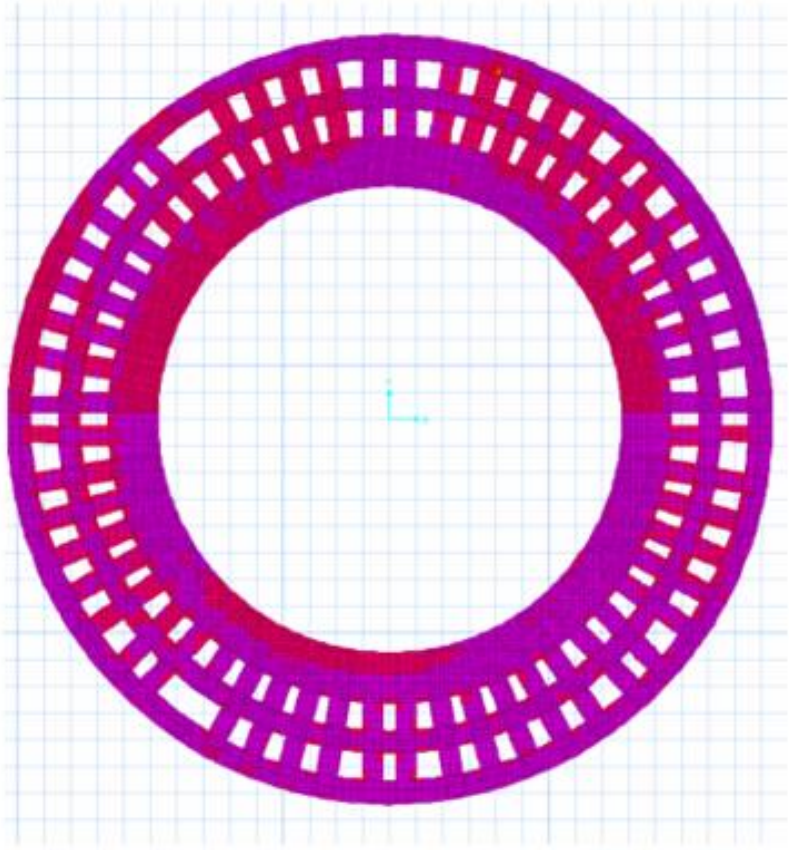


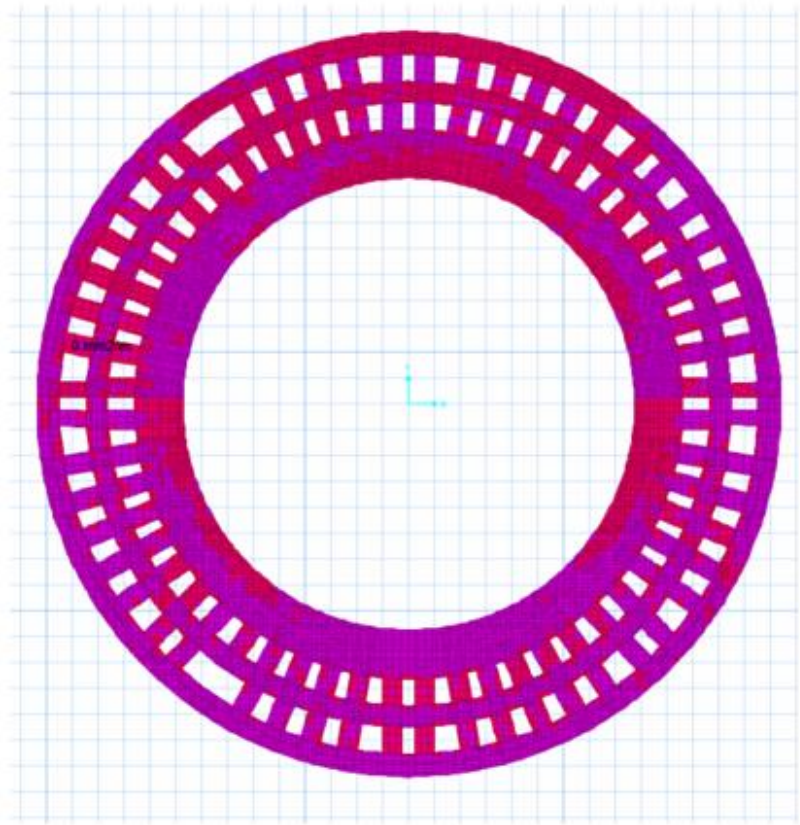
Top Direction 1 & 2 – T20 @ 150 c/c + Extra T20 @ 125 c/c (at some places)

Foundation – Middle Ring

Reinforcement Details - Top

Changing Dead Load and Live Load case to Non-linear Uplift for top steel.





Top Direction 1 & 2 – T20 @ 150 c/c + Extra 2000 mm2/m

Foundation – Punching Shear Checks

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As per clause 35.3.2. of IS456:2000

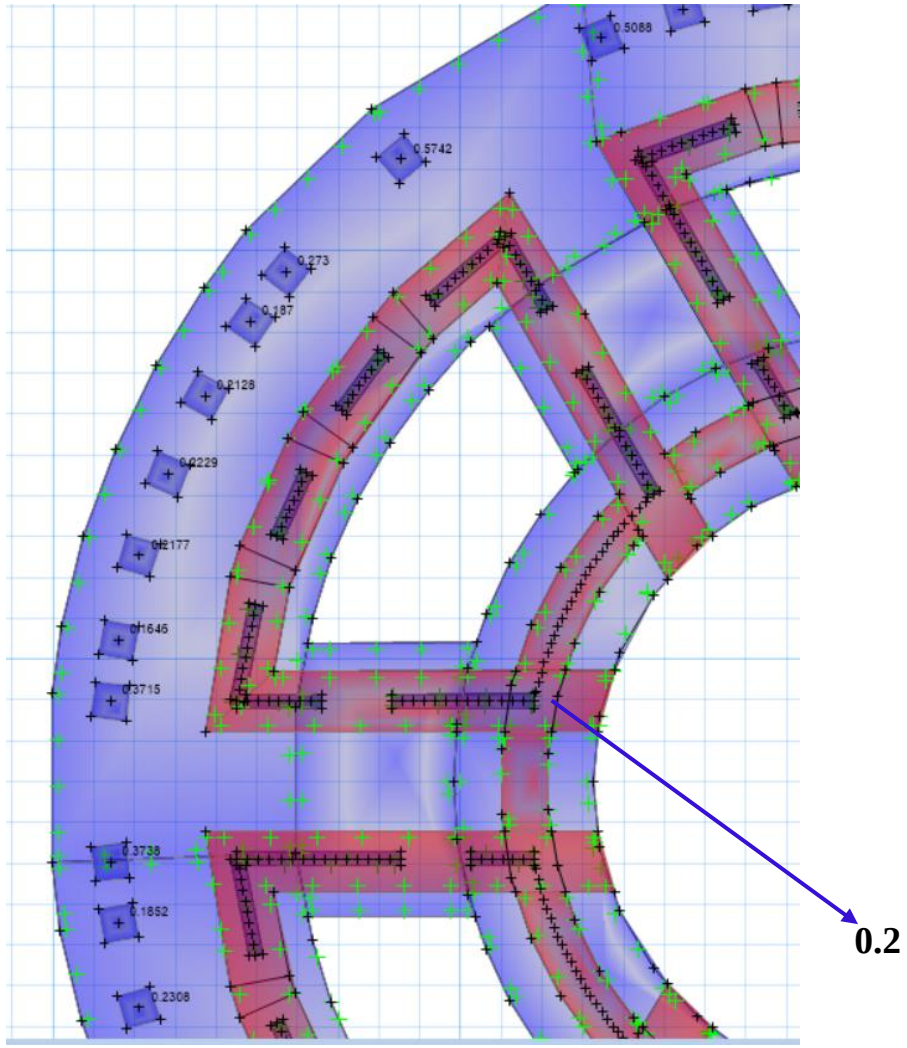
a. The surface width of the cracks should not, in general, exceed 0.3 mm in members where cracking is not harmful and does not have any serious adverse effects upon the preservation of reinforcing steel nor upon the durability of the structures.

b. In members where cracking in the tensile zone is harmful either because they are exposed to the effects of the weather or continuously exposed to moisture or in contact soil or ground water, an upper limit of 0.2 mm is suggested for the maximum width of cracks.

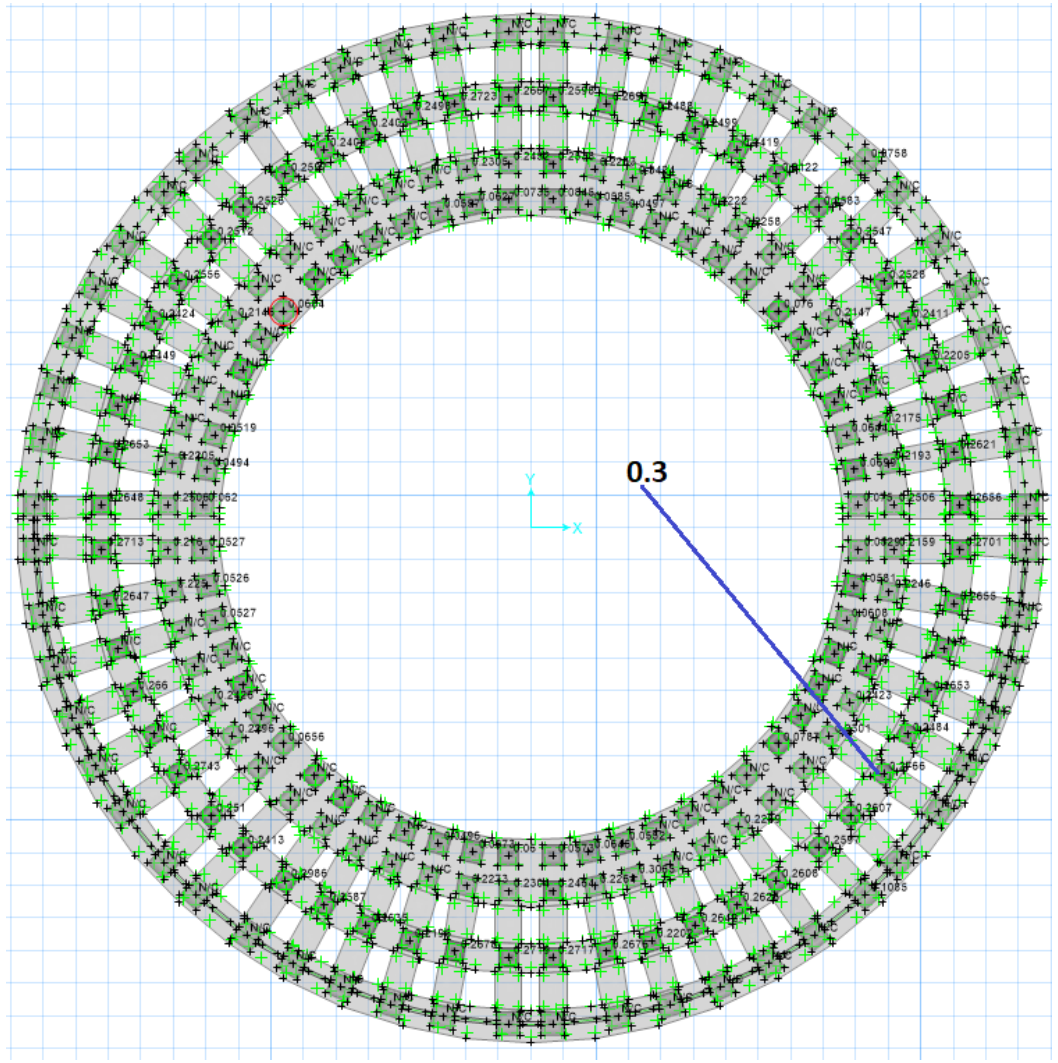
c. Here we have considered 0.3mm as per (a)

Foundation – Punching Shear Checks

Inner Ring

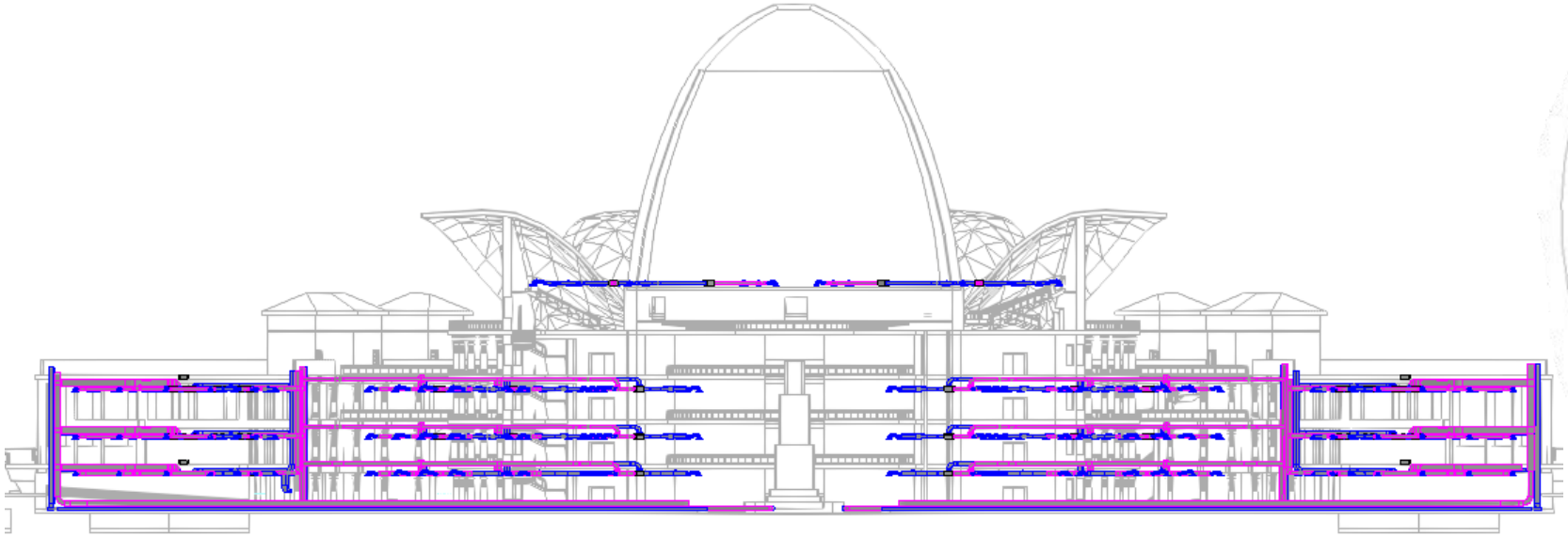


Middle Ring

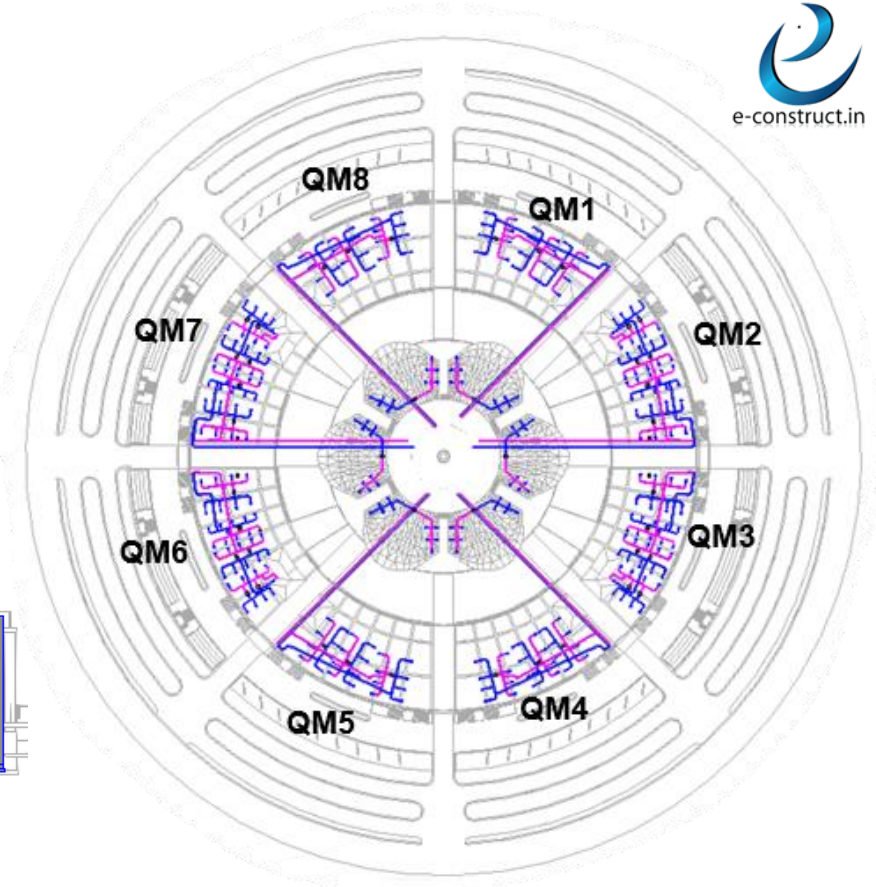


MEP DETAILS

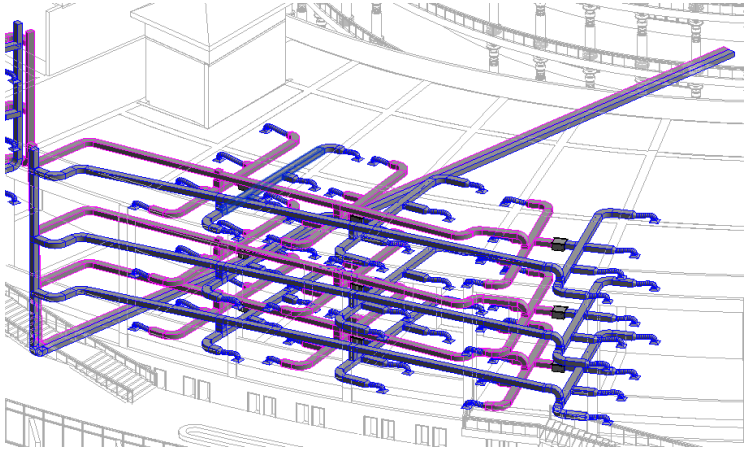
Mechanical (HVAC Services)



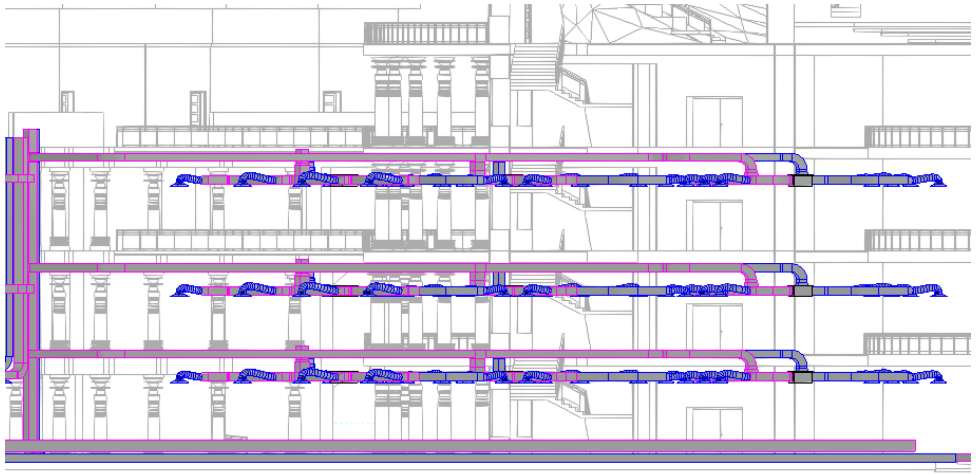
South- Elevation



HVAC PLAN



QM-2 3DView



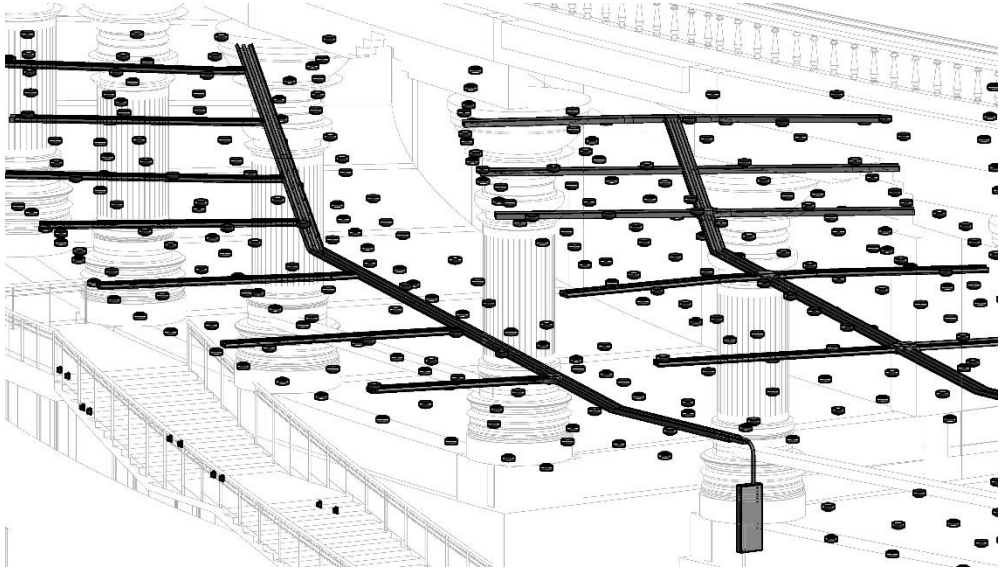
QM-2 3DSection

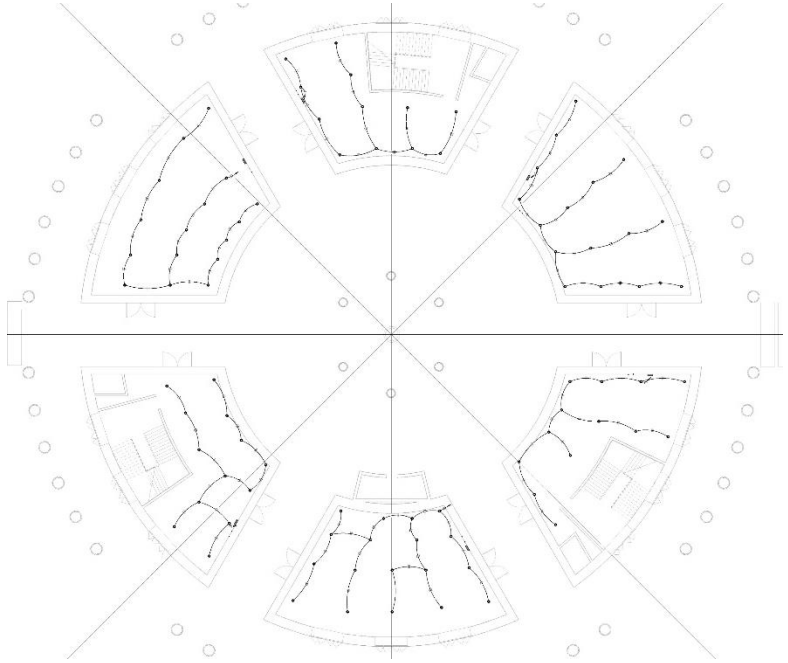
LEGENDS

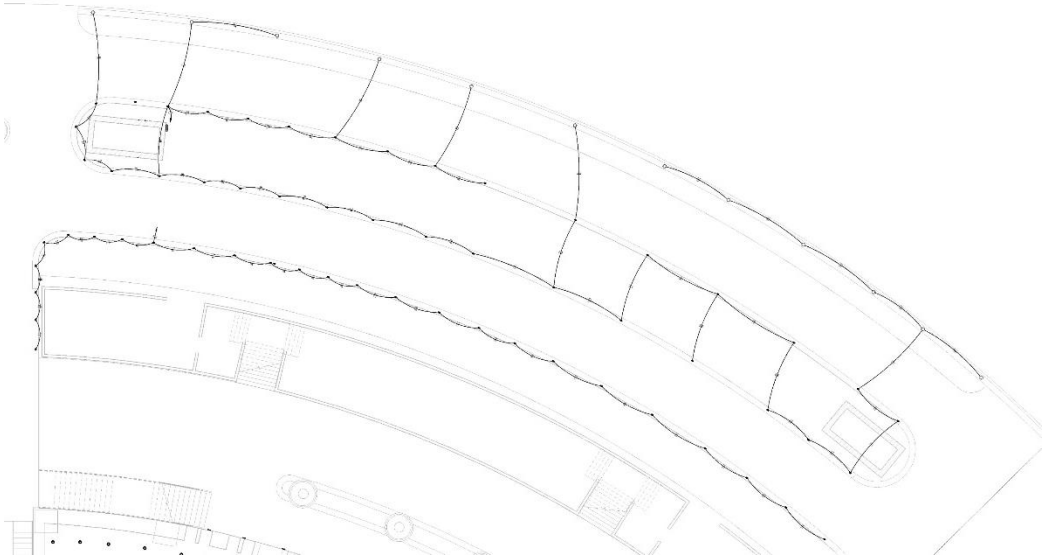
Supply Duct

Return Duct

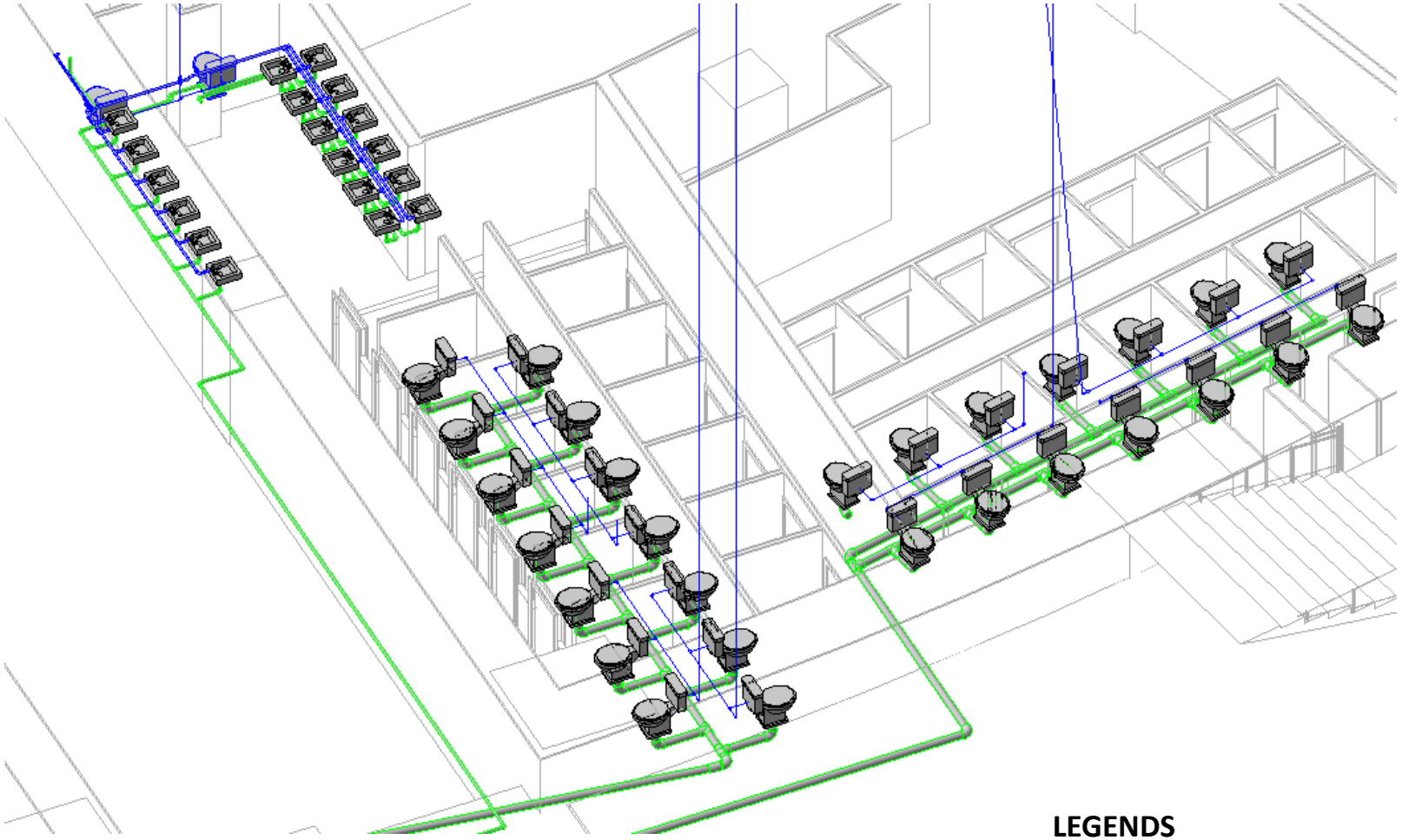
Electrical Services

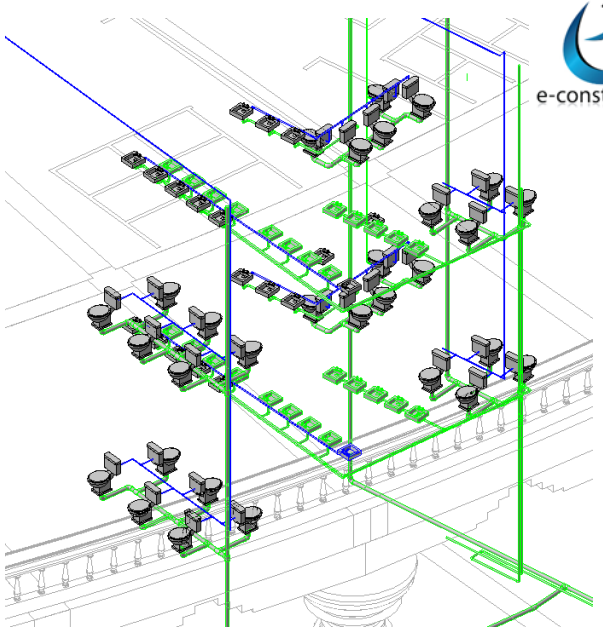




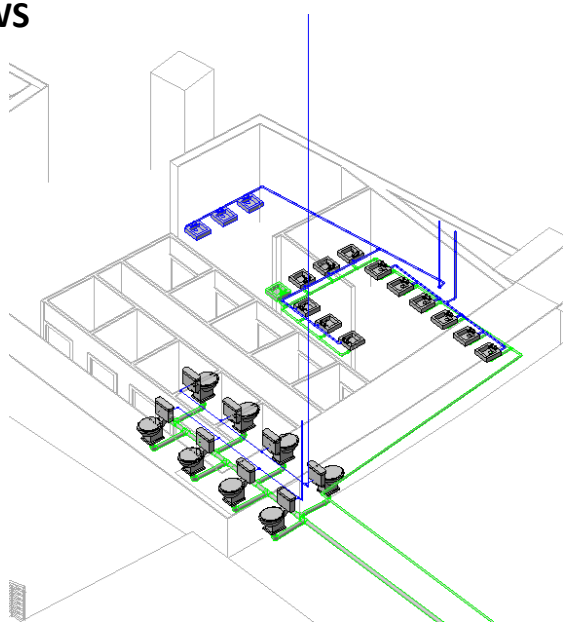


Plumbing Services





3D VIEWS

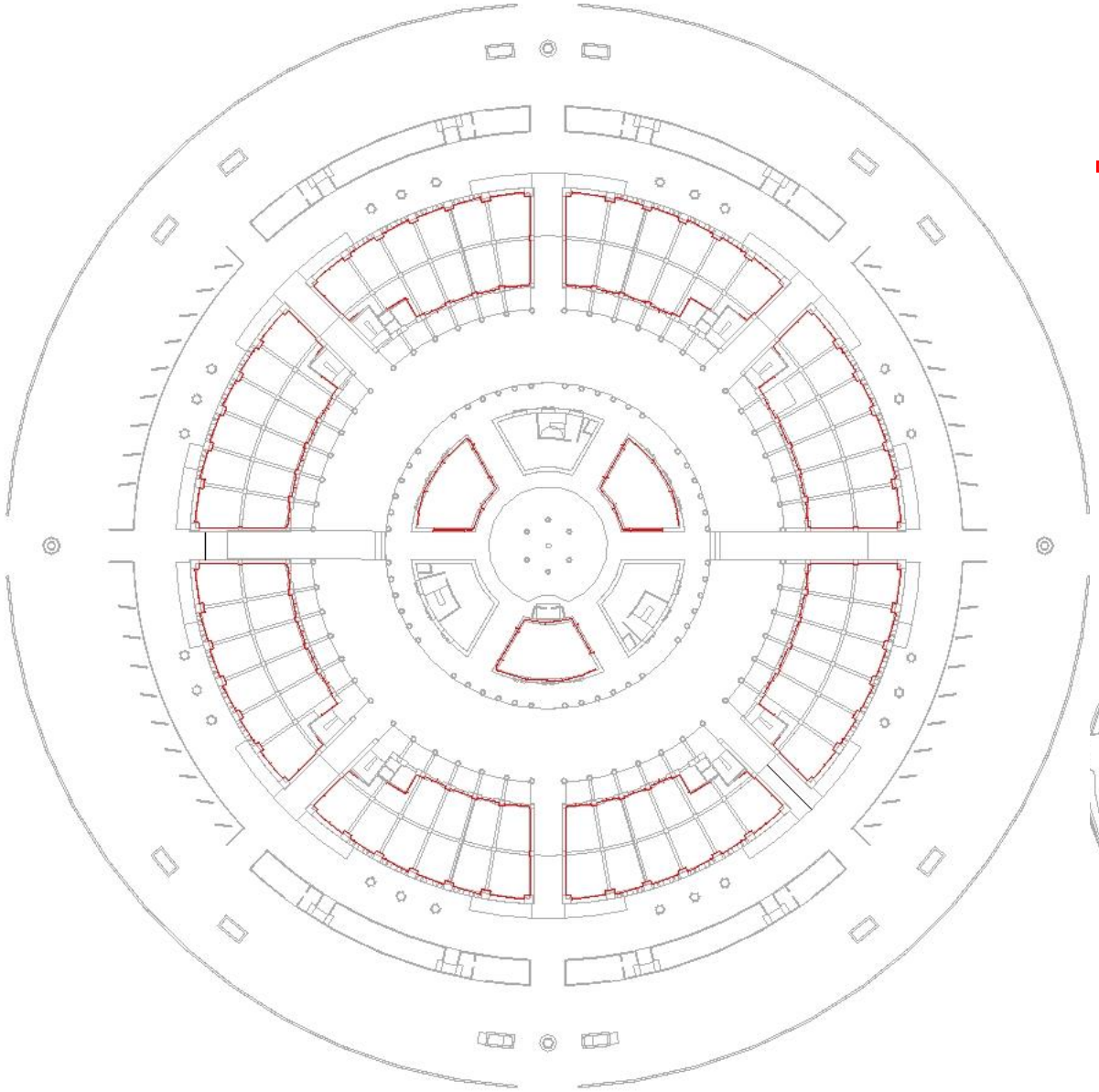


- 2 lakh liter capacity of Sump tank each
- Total 4 tanks has been considered

LEGENDS

- INLET COLD WATER PIPE
- WASTE WATER PIPE
- SOLID WASTE PIPE

Fire-Fighting Services



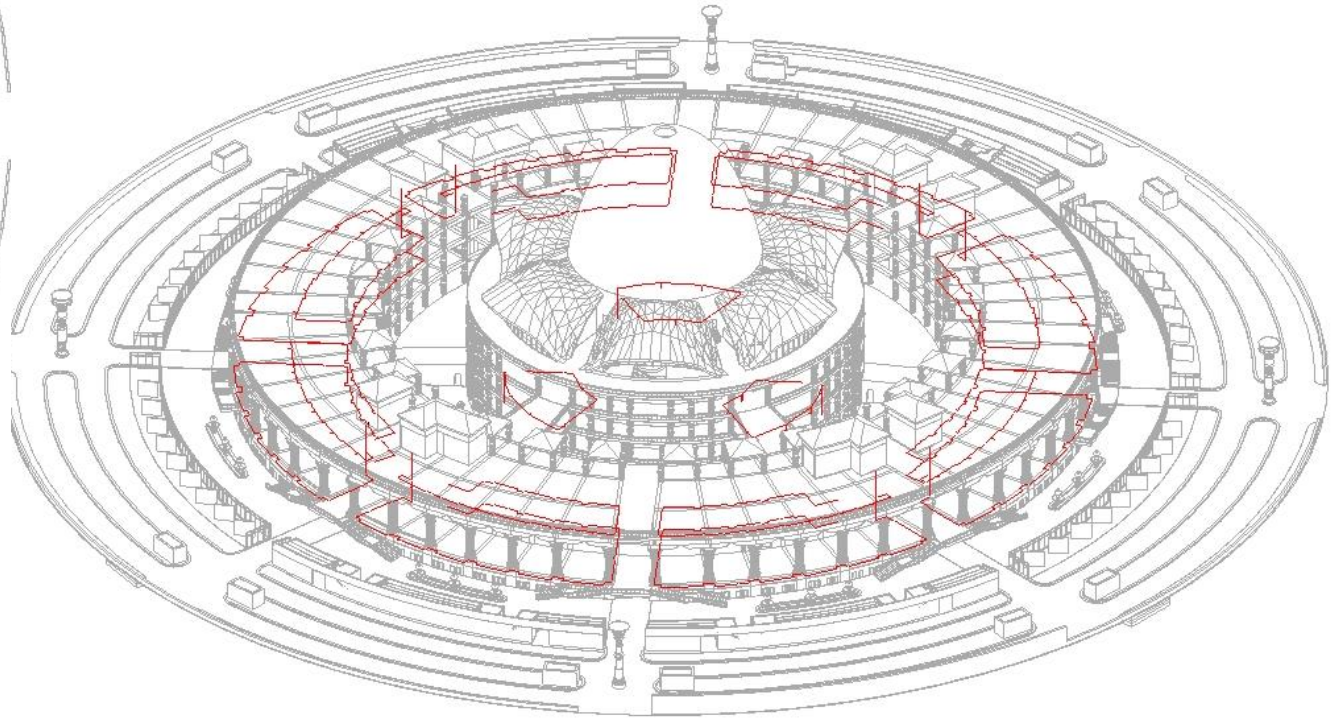
FIRE-FIGHTING PLAN

LEGENDS

Fire –**Sprinklers** Wall Type Systems

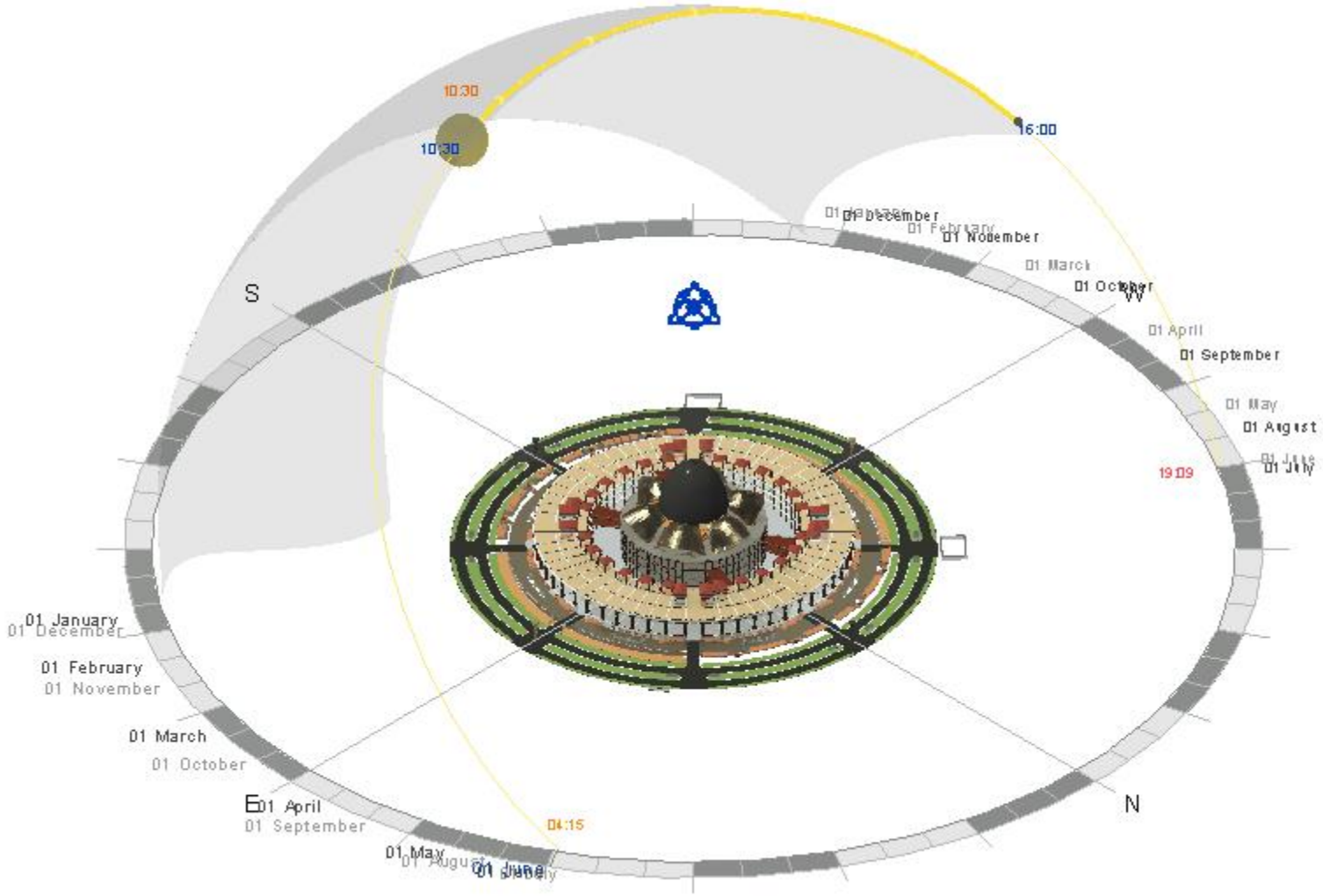
- 1 lakh liter capacity of Fire tank each
- Total 4 tanks has been considered

DSS Side Wall Type Sprinklers for Fighting System



3D –VIEW of FIRE-FIGHTING

Sun-Path For One Day



One day Sun path from East to West- Sun light as per the given timing at 10-30 AM

Solar PV Analysis For Project

e-construct.in

Solar Analysis

Study Type: Solar Energy - Annual PV

Surfaces: <user selection>

Results

PV Energy Production

2,556,147 kWh/Year

$383,422 energy savings

Building Energy Offset

11,966 m² PV panel area

13.2 years payback

Update

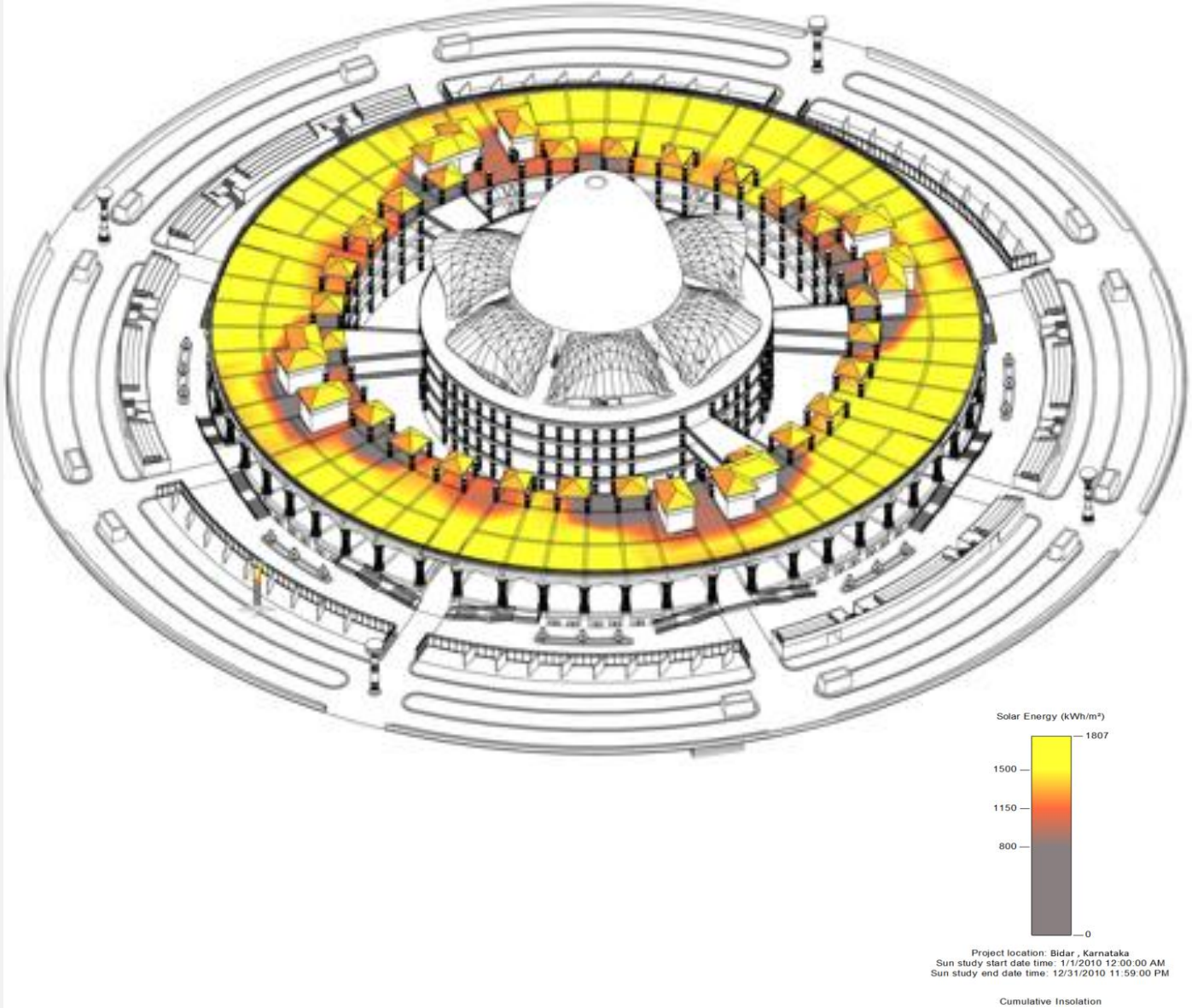
v21.0.0.0

Results Settings

Type: Cumulative Insolation | kWh/m²

Style: Solar Analysis Annual Insolation

Export: Insolation csv



Thank you