Design of Box Bridge of 2X6.23m clear span with 2.0m height aligned in Stright

A1 Basic design parameters for structural design of RCC box culvert .

A1.1 **Basis**

Basic design criteria have been prepared with a view to satisfy all the relevant technical requirements specified in the contract.

A1.2 **Structure Description**

The box culvert consists of one span RCC box of clear span 2X6.23 m & Clear height of 2.2m aligned

A1.3 **Material :**

a) Grades of concrete are as follows:

i) Foundation :M35
ii) Substructure :M35
iii) Superstructure :M35

b) Grade of Reinforcement :Fe-500D

A1.4 **LOADS :**

a) Unit Weight of Materials :

i) Unit weight of RCC substructure & foundatio = 25.0 KN/m^3
ii) Unit weight of Structural steel = 78.5 KN/m^3
iii) Unit weight of Wearing course = 22.0 KN/m^3
iv) Unit weight of Earth = 20.0 KN/m^3

b) Dead Load (SW) :

Selfweight of RCC deck, wall & base slab have been considered for analysis & design of structure.

c)Super Imposed Dead Load (SIDL) :

Weight of BC+DBM, parapets have been calculated and applied as UDL on deck slab.

d) Live Load (LL) :

Normal overall culvert width is 10.5m,

Excluding two outer parapet width of 2x0.5=1.0m ,the clear structure width is 11.0m.

As per IRC : 6 :2017, Live loads on three lane carriageway superstructure are as follows:

i) Single lane of 70R wheeled and Single lane c or
ii) Single lane of 70R Tracked and Single lane cl or
ii) Three lane class-A, whichever governs

e) Impact (IL)

Impact factor of live load has been calculated as per IRC: 6-2017

f) Braking Force (BR F)

Braking has been calculated as per IRC: 6-2017
Braking force = 0.20 x First vehicle + 0.05 x Succeeding Vehicle

g) Earth Pressure (EP) :

Value of f for backfill = 30 deg Value of d of backfill = 20 deg
Active earth pressure Co-efficient has been calculated as per Coulomb's formula. It is used in trough design.Earth pressure at rest as per clause no. 214.1.3 IRC :6-2017 is considered in box design.Neglect the vertical component active earth pressure and Passive earth pressure resistance.

h) Wind Load (WL)

Wind Loads has been calculated as per clause 212 of IRC: 6-2017. For buried structure, wind Loads need not be considered.

i) Seismic Load (EQ)

Earthquake Loads has been calculated as per IS:1893 and IRC: 6-2017.
Project is located in earthquake zone III. Horizontal seismic forces has been computed as per clause no. 219.2 of IRC : 6-2017 for zone III.

z = zone factor = For Zone III = 0.16 I = Importance factor = 1.20

R = Response Reduction f = 2.50 S_a/g = = 2.50

As for small span culvert no seismic forces are considered in design.

j) Water current force (Fwc)

In general, water current force is calculated as per clause no. 210 of IRC:6-2017 based on design hydrology for the particular structure. For box structure, obstructed area of substructure and foundation are negligible and the transverse rigidity is much more compare to longitudinal rigidity.So, water current force for box structure need not be considered.

k) Force due to Support Settlement (SS)

For box structure, forces due to differential settlement of supports need not be considered.

l) Temperature Load (TL)

Force due to temperature rise & fall has been considered in Box analysis & Design.

m) Load & Load Combination (LC)

The following loads shall be considered for design

LOAD 1: Selfweight (SW)
LOAD 2: Surfacing or SIDL (SIDL)
LOAD 3: Earth pressure in dry condition in both side (EP(BS))
LOAD 4: Maximum live load (LL)
LOAD 5: Live load surcharge both side (SUR(BS))
LOAD 6: Live load surcharge Left side (SUR(LS))
LOAD 7: Live load surcharge Right side (SUR(RS))
LOAD 8: Braking left side (BR F (LS)
LOAD 9: Braking Right side (BR F (RS))
LOAD 10: Tempareture load uniform rise (TUR)
LOAD 11: Tempareture load uniform fall (TUF)
LOAD 12: Tempareture load Gradient rise (TGR)
LOAD 13: Tempareture load Gradient fall (TGF)

For Various load combinations are analysed in staad input file as per IRC 6:2017
Load Combinations for base pressure check: Unfactored loads are considered.
Load combination 101 TO 118.
Load Combinations for ULS Strength check: As per Table-3.2 Column 2.
Load combination 119 TO 129.
Load Combinations for SLS Crack check: As per Table-3.3 Column 4.
Load combination 130 TO 147.
Load Combinations for SLS Stress check: As per Table-3.3 Column 2.
Load combination 148 TO 204.

A1.6 **Analysis**

Dead load, SIDL, Live load , live load surcharge - force analyses for box structure have been done by staad pro and in excel spreadsheet.

A1.7 **Construction Methodology**

Cast-in Situ construction shall be adopted for Box construction.
Cast-in-situ construction shall also be adopted RCC wing wall

A1.8 **Referrance codes & books**

1) IRC: 5-2015
2) IRC: 6-2017
3) IRC: 78-2014
4) IRC: 112-2011

DESIGN OF BOX CULVERT FOR 2X6.23m SPAN

1.1 Input Data

Density of concrete			=	25	KN/m^3
Density of dry soil			=	15	KN/m^3
Density of wearing coat			=	22	KN/m^3
Coefficient of active earth pressure			=	0.5	
Skew angle				0	degree
Size of Box	Size of Box		=	2X6.23X2.0	m
	Clear span		=	6.23	m
	Clear span in skew		=	6.23	m
	Opening	Height	=	2.00	m
	thk. of	Wall	=	0.550	m
		intermediate wall	=	0.300	m
		Top slab	=	0.500	m
		Bottom slab	=	0.550	m
		Haunch	=	0.150	m
		Skew	=	0	deg
		FRL Right	=	7.1	m
		Left	=	7.1	m
		Soffit level	=	2.550	m
		Invert Right	=	0.000	m
		Left	=	0.000	m
		Camber Slope	=	2.5%	
Total Width of Box for Design			=	1	m
Total Width			=	12	m
Thickness of wearing coat			=	0.15	m
Effective Span			=	6.23	m
Thickness of Profile corrective course			=	4.00	m
Thickness of earth fill			=	0.00	m
Thickness of earth fill over bottom slab			=	0	m
Width of Parapet wall			=	0.5	m
Soil Bearing Capacity			=	120	KN/m^2
Permissible Settlement			=	75	mm
Subgrade Reaction			=	16000	KN/m^2
Total length of Box in traffic direction			=	13.86	m

1.2 Design Parameter

1	Grade of Concrete	=	M35	
2	Grade of steel	=	Fe500	
3	Clear Cover for earth face structural component	=	75	mm
4	Clear Cover for inside face structural component	=	50	mm

1.3 Calculation Height of Cushion

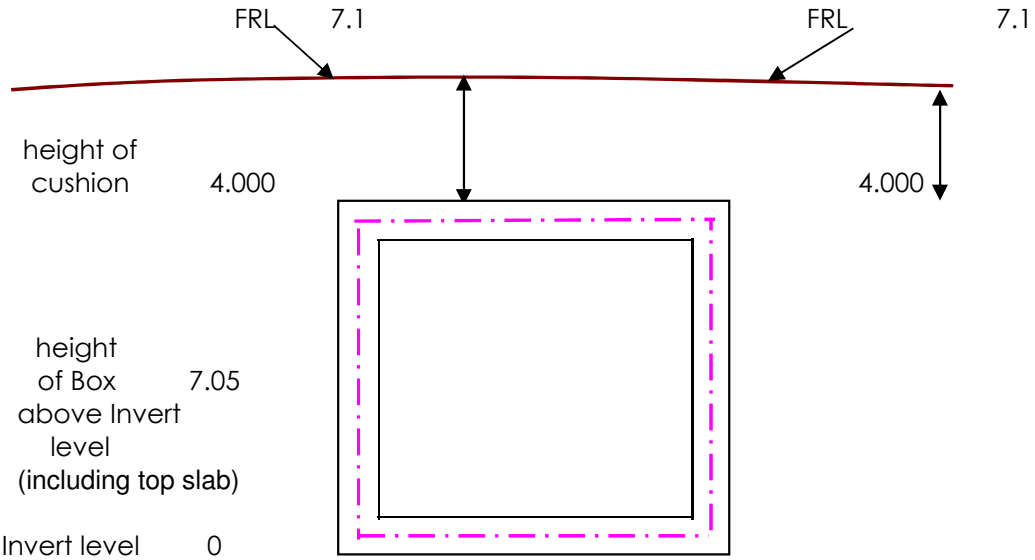
Input

	Right	Left
FRL	7.1	7.1
Invert	0.000	0.000
Clear Height	2.000	
Top Slab Thickne	0.500	
Total height of Box	7.05	

height of cushion 4.000

height of Box above Invert level (including top slab) 7.05

Invert level 0



2.0 Load Calculations for the Box Structure

2.1 Dead Load

Self weight of the structure has been calculated directly in STAAD file by the comment "SELFWEIGHT -1".

2.2 Super Imposed Dead Load

(a) Top Slab

Thickness of (wearing coat+earth fill)		=	0.15 m
Thickness of Profile corrective course		=	4.00 m
Load (UDL) on top slab =		=	62.3 KN/m

(b) Bottom Slab

Thickness of earth fill		=	0 m
Load (UDL) on bottom slab =	0.000 * 15	=	0 KN/m

2.3 Earth Pressure

Thickness of top slab	=	0.500 m
Height of top haunch	=	0.150 m
Clear height between top & bottom slab	=	2.000 m
Height of bottom haunch	=	0.150 m
Thickness of bottom slab	=	0.550 m

1. Dry Soil Pressure:

Height from top (m)		Intensity of Earth pressure (KN/m^2)		
		Dry soil		
4.40	4.40	0.5*15*4.400	=	33.00
0.25	4.7	0.5*15*4.650	=	34.88
0.15	4.80	0.5*15*4.800	=	36.00
1.700	6.50	0.5*15*6.500	=	48.75
0.150	6.65	0.5*15*6.650	=	49.88
0.275	6.93	0.5*15*6.925	=	51.94

2.4 Live Load Surcharge

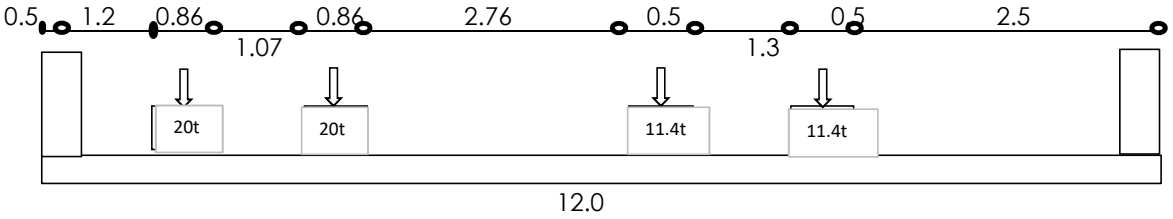
Equivalent height		=	1.2 m
Uniform Intensity of loading =	1.2 * 15 * 0.5	=	9.00 KN/m^2

2.5 Braking Load

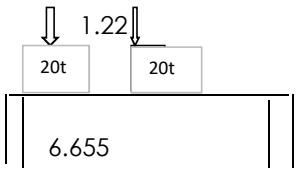
Carriageway Braking Load	=	45.7 KN
EffectiveWidth of the box for braking consideration	=	12 m
Braking Load/m =	=	3.81 KN/m

2.6) Calculation of Live load intensity for different load cases

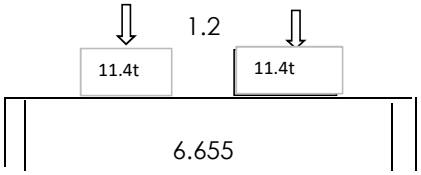
A) Class 70R vehicle 1Lane + Class A 1 Lane:



Position of Live Load along Tranverse Direction



Longitudnal position 40t Load



Longitudnal position ClassA Load

i) Single Lane 70R Wheeled Loading 40T Bogie loading

Dispersion of 70R along tranverse direction as per cl. No. B3.2 of IRC: 112-2011

$b_{ef} = aa(1-a/l_o)+b_1$

Where, b The effective width of slab

l_o=	The effective span	6.655	m
a =	The distance of the C.G. of loading from nearest sup	3.3275	m
b_1=	The breadth of concentration area of the wheel ove	8.86	m
a =	A constant depending upon the ratio b/l_o = 1.80	2.6	

b_{ef}	13.19	>	1.93 m, two wheels of 70R wheeled are overlapped each others.
	6.59	>	2.13 m, edge is fully effected due to live load.
	6.59	>	1.81 m, wheels of 70R wheeled & Class-A are overlapped each others.

So, effective contact area of wheels overlaps each other, but not excedes the slab edge
and also not overlaps with Class-A load Modified effective width for 70R wheel only = **15.12** m

Dispersion of 70R along Longitudinal direction as per cl. No.B3.3 of IRC: 112-2011

Tyre contact width =100/((0.86-0.05)x5.273x100) 0.234 m

Effective width along span = Width of track+twice of thickness of deck slab & W/C **9.234** m

> 1.22

Total load of 70R wheeled = 200 kN Impact = 1.25

ii) Single Lane Class-A (Neglecting other minor loads)

Considered only 2 Nos. 11.4t axle loads neglecting other minor loads

Where, b_{ef} = The effective width of slab

l_o= The effective span 6.655 m

a = The distance of the C.G. of loading from nearest sup 3.3275 m

b_1= The breadth of concentration area of the wheel ove 8.5 m

a = A constant depending upon the ratio b/l 1.80 2.6

b_{ef} 12.83 > 1.8 m, two Wheels of Class-A are overlapped each others.

6.41 > 1.63 m, Wheels of 70R tracked & Class-A are overlapped each others.

Modified effective width for Class -A only= **14.626** m

Dispersion of class-A along Longitudinal direction as per cl. No. B3.3 of IRC: 112-2011

Effective width along span = Width of track+twice of thickness of deck slab & W/C **9.25** m

> 1.2

For 70R Wheeled Load

Total are =9.23*15.12 139.58 m2

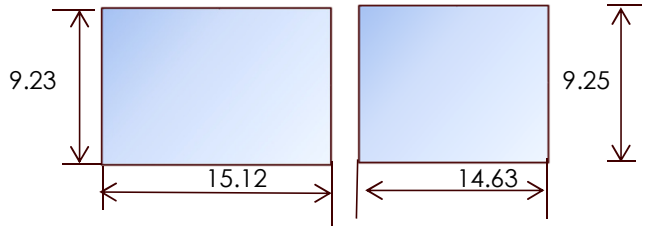
Total load incl. impact

=200*(1+1.25) 250 kN

Intensity of loading on deck slab

=250.00/139.58 1.8 kN/m^2

0.2 t/m2



For ClassA 1-Lane Load

Total are =9.25*14.63 135.29 m2

Total load incl. impact

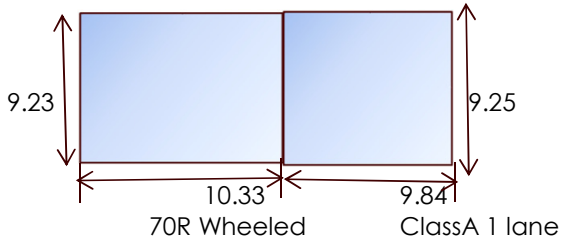
=114*(1+0.50) 171 kN

Intensity of loading on deck slab

=171.00/135.29	1.3	kN/m^2
	0.1	t/m2

For 70R Wheeled+classA 1-lane combined Load

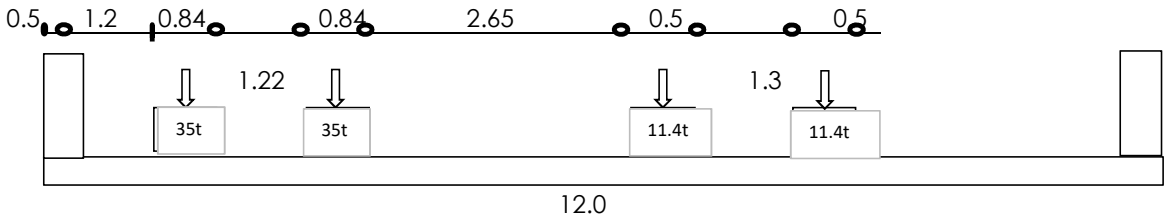
Effective width of 70R Wheel	**10.333**
Effective width of ClassA loa	**9.843**



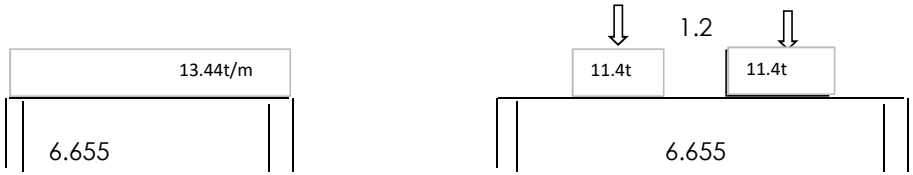
Intensity of loading on deck slab for combined effect of 70R wheeled+ClassA 1 lane load

0.26 t/m2

B) Class 70R Tracked + Class A 1 Lane:



Position of Live Load along Tranverse Direction



Longitudnal position 70R tracked Load **Longitudnal position ClassA Load**

i) Single Lane 70R Tracked Loading

Dispersion of 70R along tranverse direction as per cl. No. B3.2 of IRC: 112-2011

b_{ef} = $aa(1-a/l_o)+b_1$

Where, b The effective width of slab

l_o=	The effective span	6.655	m
a =	The distance of the C.G. of loading from nearest sup	3.3275	m
b_1=	The breadth of concentration area of the wheel ove	8.84	m
a =	A constant depending upon the ratio b/l	1.80	2.6

b_{ef}	13.17	>	2.06	m, two wheels of 70R Tracked are overlapped each others.
	6.58	>	2.12	m, edge is fully effected due to live load.
	6.58	>	1.745	m, wheels of 70R Tracked & Class-A are overlapped each others.

So, effective contact area of wheels overlaps each other, but not excedes the slab edge
and also not overlaps with Class-A load Modified effective width for 70R tracked only = **15.226** m

Dispersion of 70R along Longitudinal direction as per cl. No.B3.3 of IRC: 112-2011

Effective width along span = Width of track+twice of thickness of deck slab & W/C **13.57** m

Total Load = 70 t So, load per metre run = 5.16 t/m

Impact = 1.25

ii) Single Lane Class-A (Neglecting other minor loads)

Considered only 2 Nos. 11.4t axle loads neglecting other minor loads

Where, b_{ef} = The effective width of slab

l_o=	The effective span	6.655	m
a =	The distance of the C.G. of loading from nearest sup	3.3275	m
b_1=	The breadth of concentration area of the wheel ove	8.5	m
a =	A constant depending upon the ratio b/l	1.80	2.6

b_{ef}	12.82575	>	1.8	m, two Wheels of Class-A are overlapped each others.
	6.412875	>	1.575	m, Wheels of 70R tracked & Class-A are overlapped each others.

Modified effective width for Class -A on **14.626** m

Dispersion of class-A along Longitudinal direction as per cl. No. B3.3 of IRC: 112-2011

Effective width along span = Width of track+twice of thickness of deck slab & W/C **9.25** m

> 1.2

For 70R Tracked Load

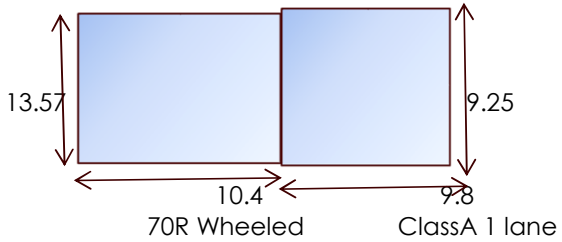
Total are =13.57*15.23	206.61	m2
Total load incl. impact		
=700*(1+1.25	875	kN
Intensity of loading on deck slab		
=875.00/206.61	4.2	kN/m^2
	0.4	t/m2

For ClassA 1-Lane Load

Total are =9.25*14.63	135.29	m2
Total load incl. impact		
=114*(1+0.50	171	kN
Intensity of loading on deck slab		
=171.00/135.29	1.3	kN/m^2
	0.1	t/m2

For 70R Tracked+classA 1-lane combined Load

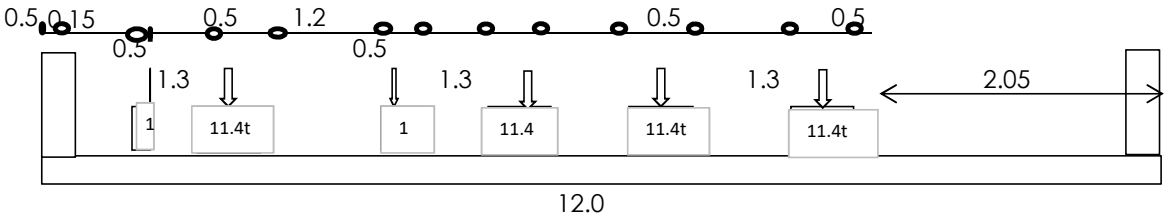
Effective width of 70R tracke	**10.388**
Effective width of ClassA loa	**9.788**



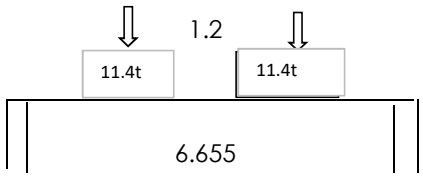
Intensity of loading on deck slab for combined effect of 70R wheeled+ClassA 1 lane load

0.62 t/m2

C) 3-Lane Class A 1 Lane:



Position of Live Load along Tranverse Direction



Longitudnal position ClassA Load

i) Single Lane Class A Loading

Dispersion of Class A along tranverse direction as per cl. No. B3.2 of IRC: 112-2011

b_{ef} = $aa(1-a/l_o)+b_1$

Where, b The effective width of slab

l_o=	The effective span	6.655	m
a =	The distance of the C.G. of loading from nearest sup	3.3275	m
b_1=	The breadth of concentration area of the wheel ove	8.5	m
a =	A constant depending upon the ratio b/l	1.80	2.6

b_{ef}	12.83	>	1.8	m, two wheels of ClassA are overlapped each others.
	6.41	>	0.9	m, edge is fully effected due to live load.
	6.41	>	0.85	m, wheels of Class-A are overlapped each others.

So, effective contact area of wheels overlaps each other, excedes the slab edge and also overlaps with Class-A loading. Modified effective width **12.000** m

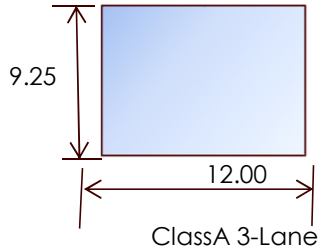
Dispersion of class-A along Longitudinal direction as per cl. No. B3.3 of IRC: 112-2011

Effective width along span = Width of track+twice of thickness of deck slab & W/C **9.25** m

> 1.2

For ClassA 3-Lane Load

Total are =9.25*12.00	111.00	m2
Total load incl. impact		
=342*(1+0.50	513	kN
Intensity of loading on deck slab		
=513.00/111.00	4.6	kN/m^2
	0.46	t/m2



LOAD SUMMARY

Vehicle	Load (t/m^2)
70R Wheel (40T)	0.18
Wheel (40T)+Cla	0.26
70R Tracked	0.42
0R Tracked+Class	0.62
Class A 1-Lane	0.13
Class A 3-Lane	0.46

Design LL intensity for analysis = = **0.62** t/m^2

2.7 CALCULATIONS FOR UNIFORM TEMPERATURE RISE

UNIFORM TEMPERATURE CASE

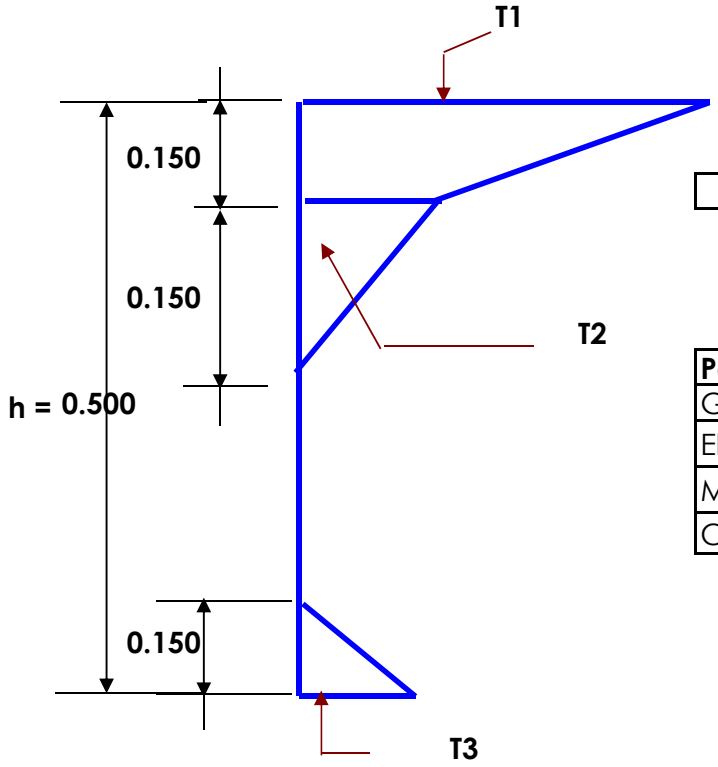
The top slab is designed for the effects of uniform temperature rise across the deck depth.

Variation of uniform tepperature	50
Temp Rise	35
Temp Fall	-15

2.7.1 CALCULATIONS FOR TEMPERATURE GRADIENT

TEMPERATURE RISE CASE

The top slab is designed for the effects of the distribution of the temperature across the deck depth as given in the sketch below.

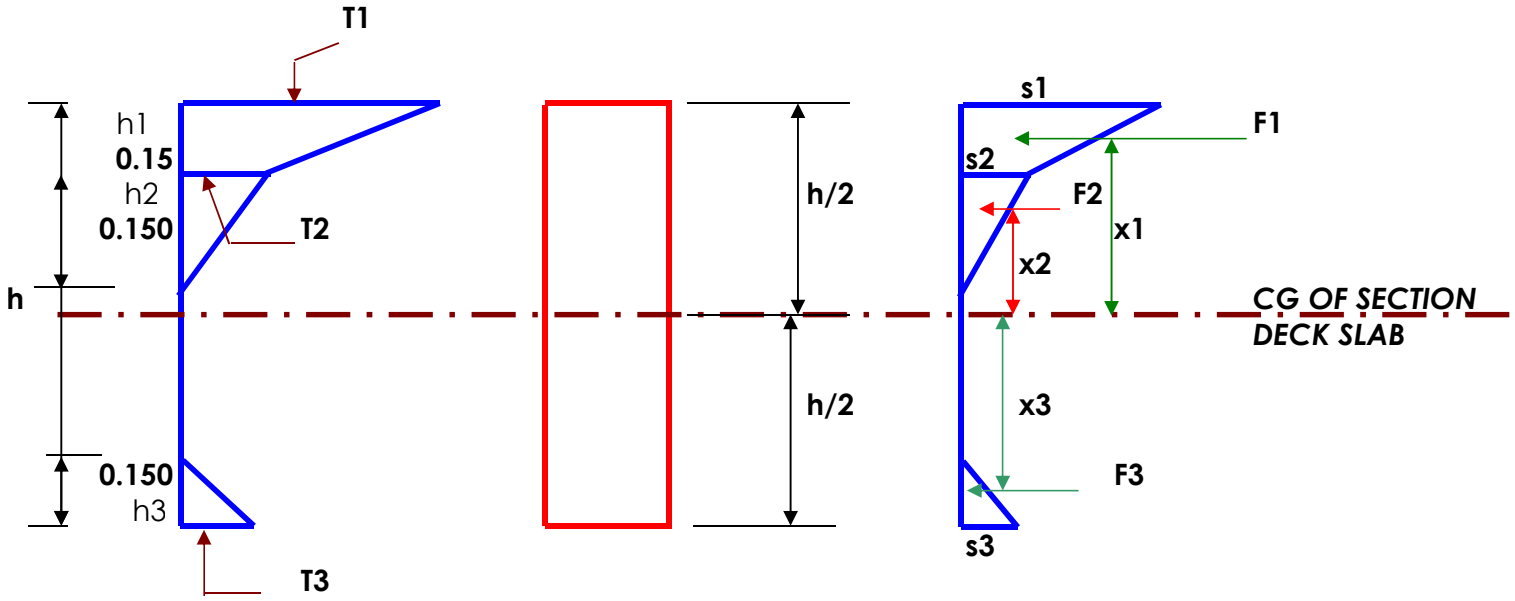


h =	Depth of Superstructure =	0.500	m

Parameters:			
Grade of Concrete	M =	35	
Elasticity for Concrete	E_i =	3.231E+06	T / m^2
Modified Elasticity for Concrete	$E_c = E_i$	3.231E+06	T / m^3
Coefficient of Thermal Expansi	a =	0.0000117	/ °C

OUTPUT		
Stress	s =	E a t
Force	F =	F1 + F2 + F3
Moment	M =	F1x1 + F2x2 -F3x3

Generalised Temperature & corresponding Force Diagram



TEMPERATURE RISE CASE

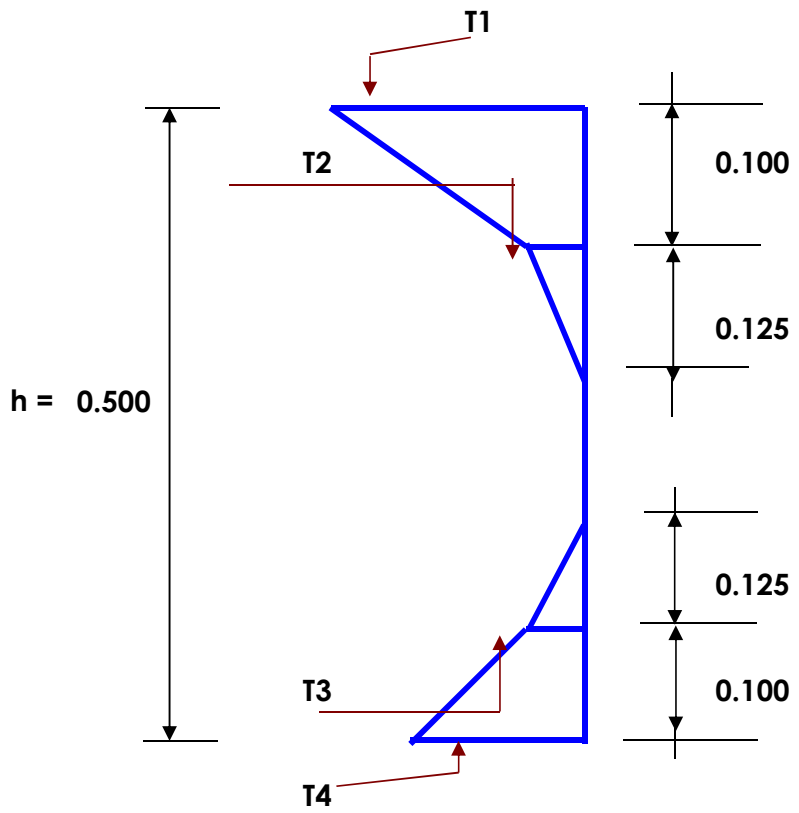
Member Description	h	h1	h2	h3	T1	T2	T3
	(m)	(m)	(m)	(m)	°C	°C	°C
Top slab	0.5	0.150	0.150	0.150	17.80	4.00	2.10

Member	s 1	s 2	s 3	F1	F2	F3	F
Descripti	T / m2	T / m2	T / m2	T	T	T	T
Top slab	672.9	151.2	79.38	61.80	11.34	5.95	**79.10**

Member Description	CG of Section from TOP	CG of Section from BOTTOM	CG of TOP BLOCK from TOP	CG of MID BLOCK from TOP	CG of BOTTOM BLOCK from BOTTOM	x1	x2	x3	M
	m	m	m	m	m	m	m	m	T - m
Top slab	0.2500	0.2500	0.0592	0.2000	0.0500	0.1908	0.0500	0.2000	**11.17**

2.7.2 TEMPERATURE FALL CASE

The top slab is designed for the effects of the distribution of the temperature across the deck depth as given in the sketch below.

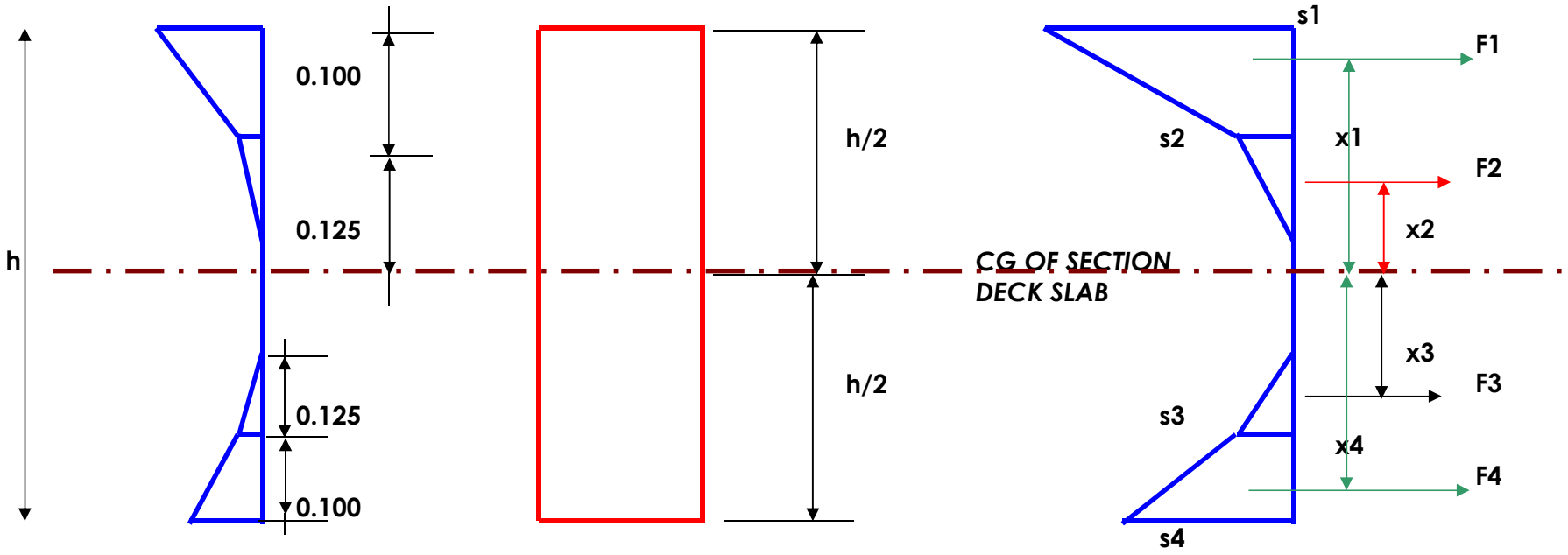


h =	Depth of Superstructure =	0.500	m

Parameters:			
Grade of Concrete	M =	35	
Elasticity for Concrete	E_i =	3.231E+06	T / m^2
Modified Elasticity for Concrete	$E_c = E_i$	3.231E+06	T / m^3
Coefficient of Thermal Expansio	a =	1.2E-05	/ °C

OUTPUT		
Stress	s =	E a t
Force	F =	F1 + F2 + F3 + F4
Moment	M =	F1x1 + F2x2 - F3x3 - F4x4

Generalised Temperature & corresponding Force Diagram



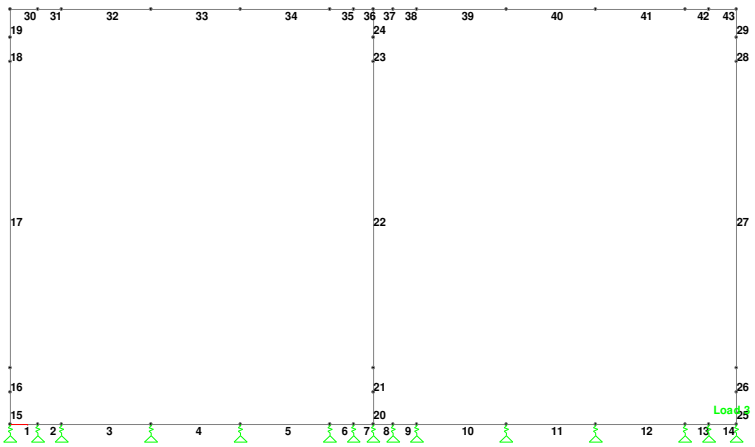
TEMPERATURE FALL CASE

Member Description	h	h1	h2	h3	h4	T1	T2	T3	T4
	(m)	(m)	(m)	(m)	(m)	°C	°C	°C	°C
Top slab	0.500	0.100	0.125	0.125	0.100	10.60	0.70	0.80	6.60

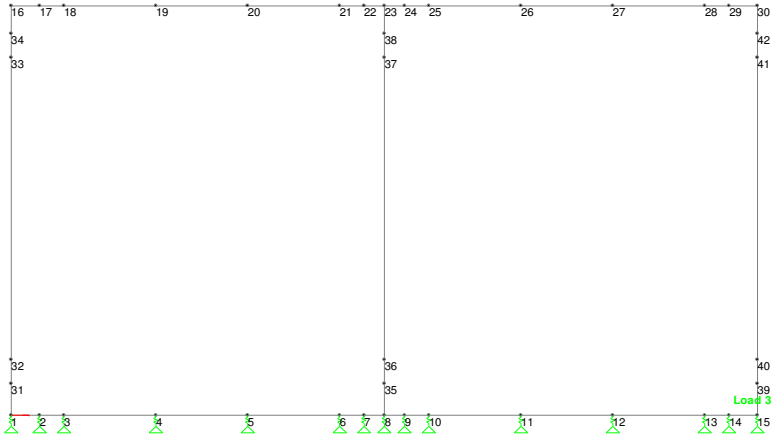
Member Description	s 1	s 2	s 3	s 4	F1	F2	F3	F4	F
	T / m2	T / m2	T / m2	T / m3	T	T	T	T	T
Top slab	400.7	26.5	30.2	249.5	21.36	1.65	1.89	13.99	**38.89**

Member Description	CG of Section from TOP	CG of Section from BOTTOM	CG of TOP BLOCK from TOP	CG of MID BLOCK from TOP	CG of MID BLOCK from BOTTOM	CG of BOTTOM BLOCK from BOTTOM	x1	x2	x3	x4	M
	m	m	m	m	m	m	m	m	m	m	T - m
Top slab	0.250	0.250	0.035	0.142	0.142	0.063	0.215	0.108	0.108	0.187	**1.943**

3.0 Design of Box Section (ULS):



BEAM NO



JOINT NO

Check for Flexture

Section to be checked	32 33 34 39 40 41		30 31 35 36 37 38 42 43		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	BOTTOM	TOP	BOTTOM	OUTSIDE	INSIDE	OUTSIDE	INSIDE	OUTSIDE	INSIDE	TOP	BOTTOM	TOP	BOTTOM	INTER WALL TOP	INTER WALL MID	INTER WALL BOTT
Design Moment(KNm)	172	253	554	0	311	0	284	0	303	0	0	512	269	370	10	9	10
Width of section (m)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Depth of section (m)	0.500	0.500	0.500	0.500	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.300	0.300	0.300
Grade of Concrete	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35
Grade of Steel	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500
"E" value for concrete **(As per Eq. A2-5 (page-236) of IRC:112-2011)**	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308
"E" value for Steel **(As per Cl 6.3.5 of IRC:112-2011)**	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000

Section to be checked	32 33 34 39 40 41		30 31 35 36 37 38 42 43		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	**BOTTOM**	**TOP**	**BOTTOM**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**TOP**	**BOTTOM**	**TOP**	**BOTTOM**	**INTER WALL TOP**	**INTER WALL MID**	**INTER WALL BOTT**
Design compressive streangth of Concrete(Mpa) **(As per Eq 6.22 (Page 49) of IRC:112-2011)**	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56	15.56
Design Peak Strength of Steel(Mpa) **(As per fig-6.2 (Page-30) of IRC:112-2011)**	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78	434.78
Concrete failure strain **(As per Table -6.5 of IRC:112-2011)**	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035
~~Concrete limiting strain~~ **(As per Table -6.5 of**	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Yield strain of steel	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217	0.00217
Limiting strain of steel	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417
R=M/bd^2	0.891	1.293	2.859	0.000	1.440	0.000	1.329	0.000	1.415	0.000	0.000	2.391	1.119	1.728	0.177	0.149	0.173
Pt=	0.00211	0.00311	0.00734	0.00000	0.00348	0.00000	0.00320	0.00000	0.00342	0.00000	0.00000	0.00601	0.00268	0.00423	0.00041	0.00034	0.00040
Ast required (mm2)	**929**	**1376**	**3231**	**0**	**1620**	**0**	**1481**	**0**	**1582**	**0**	**0**	**2782**	**1311**	**1955**	**99**	**83**	**97**
Provide Reinforcement(mm2)	20 dia	16 dia	20 dia	16 dia	20 dia	16 dia	25 dia	16 dia	25 dia	16 dia	20 dia	25 dia	20 dia	25 dia	16 dia	16 dia	16 dia
	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm
	&	&	&	&	&	&	&	&	&	&	&	&	&	&	&	&	&
	0 dia	16 dia	25 dia	0 dia	25 dia	0 dia	0 dia	0 dia	25 dia	0 dia	0 dia	25 dia	20 dia	0 dia	20 dia	0 dia	20 dia
	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm	200 mm
Total Reinforcement(mm2) provided	**1571**	**2011**	**4025**	**1005**	**4025**	**1005**	**2454**	**1005**	**4909**	**1005**	**1571**	**4909**	**3142**	**2454**	**2576**	**1005**	**2576**
Clear Cover (mm)	50	50	50	50	75	50	75	50	75	50	50	75	50	75	50	50	50
Effective depth d (mm)	440	442	440	442	465	492	462.5	492	462.5	492	490	462.5	490	462.5	242	242	242
Actual Neutral Axis Depth Nu (mm)	53.9	69.0	138.1	34.5	138.1	34.5	84.2	34.5	168.4	34.5	53.9	168.4	107.8	84.2	88.4	34.5	88.4
So strain	0.02507	0.01892	0.00765	0.04134	0.00828	0.04642	0.01572	0.04642	0.00611	0.04642	0.02832	0.00611	0.01241	0.01572	0.00608	0.02105	0.00608
So strsss	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8	434.8
Balanced Neu axis depth Nbal (mm)	200.7	201.6	200.7	201.6	212.1	224.4	210.9	224.4	210.9	224.4	223.5	210.9	223.5	210.9	110.4	110.4	110.4

Section to be checked	32 33 34 39 40 41		30 31 35 36 37 38 42 43		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	**BOTTOM**	**TOP**	**BOTTOM**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**TOP**	**BOTTOM**	**TOP**	**BOTTOM**	**INTER WALL TOP**	**INTER WALL MID**	**INTER WALL BOTT**
Total Ultimate compressive force (KN)	683.0	874.2	1750.1	437.1	1750.1	437.1	1067.1	437.1	2134.2	437.1	683.0	2134.2	1365.9	1067.1	1120.0	437.1	1120.0
Total Ultimate Tensile force (KN)	683.0	874.2	1750.1	437.1	1750.1	437.1	1067.1	437.1	2134.2	437.1	683.0	2134.2	1365.9	1067.1	1120.0	437.1	1120.0
So, Difference in force (KN)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
CG of compressive force (mm)	22.4	28.7	57.5	14.4	57.5	14.4	35.0	14.4	70.1	14.4	22.4	70.1	44.8	35.0	36.8	14.4	36.8
UNDER / OVER REINFORCED CHECK	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**	**U.R.SEC, OK**
So Moment of resistance (in terms of compressive streangth of concrete) (KNm)	285.2	361.3	669.5	186.9	713.2	208.8	456.2	208.8	837.5	208.8	319.3	837.5	608.0	456.2	229.9	99.5	229.9
So Moment of resistance (in terms of	285.2	361.3	669.5	186.9	713.2	208.8	456.2	208.8	837.5	208.8	319.3	837.5	608.0	456.2	229.9	99.5	229.9
	OK	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**

Check for Shear (As per CL 10.3.2 of IRC:112-2011)

Section to be checked	Top slab	Side Wall	Bottom slab	INTER WALL
Shear force at **d** distance from support (KN)	396.4	74.9	419.5	9.2
Enhancement factor (**As per Cl 10.3.2 (5) of**	1	1	1	1
Design shear force (KN)	**396.4**	**74.9**	**419.5**	**9.2**
Width of section (m)	1.00	1.00	1.00	1.00
Effective Depth of section (m)	440	465	462.5	242
K = 1+SQRT(200/d) (**As per Eq 10.2 of IRC:112-2011)**	1.674	1.656	1.658	1.909
Governing k	1.67	1.66	1.66	1.91
Asl (mm2)	4025	4909	4909	2576
ρ1 = Asl / (bw x d) **(As per Eq 10.5 of IRC:112-2011)**	0.00915	0.01056	0.01061	0.01065
Ned = axial compression	0	0	0	0
σcp =	0.00	0.00	0.00	0.00
So Vrdc (KN) (**As per Eq 10.1 of IRC:112-2011)**	257.78	282.47	281.75	169.96
vmin (**As per Eq 10.1 of IRC:112-2011)**	0.397	0.391	0.391	0.484
Vrdcmin =	174.8	181.7	181.0	117.1
So governing shear resistance Vrdcgovern=	**258**	**282**	**282**	**170**
	<	**>**	**<**	**>**
	396.4	74.9	419.5	9.2

Distribution Reinforcement :

Maximum required main reinforcement a **3231** mm2
So,distribution reinforcement re 0.2 tieme **646** mm2
Let provi 12 dia | 175 mm = **759** mm2
OK

Maximum required main reinforcement a **1620** mm2

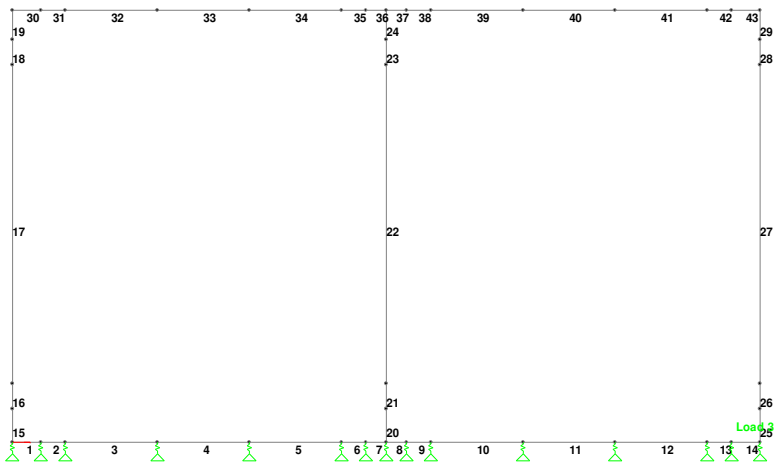
So,distribution reinforcement re 0.2 tieme **324** mm2
Let provi 12 dia | 175 mm = **759** mm2
OK

Maximum required main reinforcement a **2782** mm2
So,distribution reinforcement re 0.2 tieme **556** mm2
Let provi 12 dia | 175 mm = **759** mm2
OK

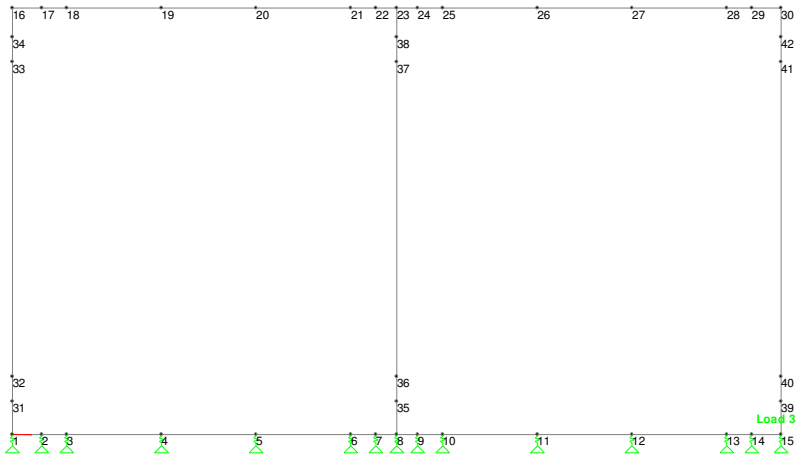
Section to be checked	32 33 34 39 40 41		30 31 35 36 37 38 42 43		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	BOTTOM	TOP	BOTTOM	OUTSIDE	INSIDE	OUTSIDE	INSIDE	OUTSIDE	INSIDE	TOP	BOTTOM	TOP	BOTTOM	INTER WALL TOP	INTER WALL MID	INTER WALL BOTT
			Shear Reinforce reqd	OK	Shear Reinforc e reqd	OK											

LET , θ (Degree)=	11.03	11.03	11.03
αcw =	1	1	1
bw (mm)=	1000	1000	1000
z =	0.9	0.9	0.9
v1=	0.6	0.6	0.6
fcd=	15.56	15.56	15.56
SO Vrdmax =	1577.06	1577.06	1577.06
Shear Reinforcement	2 Legged	2 Legged	2 Legged
	10 mm dia	10 mm dia	10 mm dia
	200 mm	200 mm	200 mm
Asw (mm2) =	157.080	157.080	157.080
z=	0.9	0.9	0.9
fywd=	434.8	434.8	434.8
Vrds =	1577.06	1577.06	1577.06
Difference in force	0.00	0.00	0.00
So shear capacity =	1577.1	1577.1	1577.1
Design shear force =	396.404	74.867	419.485
	OK	**OK**	**OK**

4.1 Design of Box Section (SLS):



BEAM NO



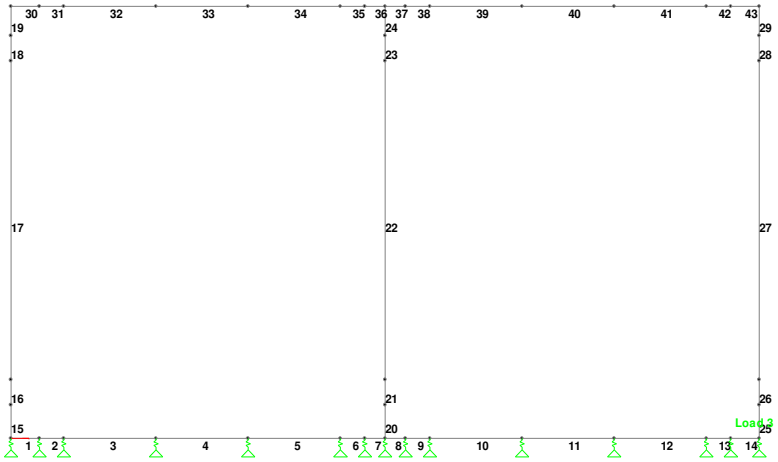
JOINT NO

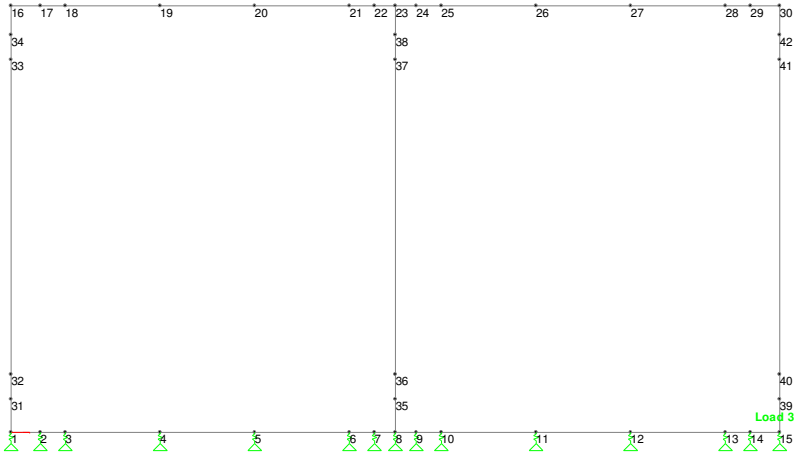
Crack Width check:

Section to be checked	32 33 34 39 40 41		0 31 35 36 37 38 42 4		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	**BOTTOM**	**TOP**	**BOTTOM**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**TOP**	**BOTTOM**	**TOP**	**BOTTOM**	**INTER WALL TOP**	**INTER WALL MID**	**INTER WALL BOTT**
Design Moment(KNm)	**121**	**164**	**356**	**0**	**198**	**0**	**0**	**0**	**196**	**0**	**0**	**328**	**173**	**118**	**0.115**	**0.417**	**0.455**
Width of section (m)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Depth of section (m)	0.500	0.500	0.500	0.500	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.300	0.300	0.300
Grade of Concrete	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35
Grade of Steel	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500
(As per Eq. A2-5 (page-236) of IRC:112-2011)	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308
"E" value for Steel **(As per Cl 6.3.5 of IRC:112-2011)**	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000
Clear Cover (mm)	50	50	50	50	75	50	75	50	75	50	50	75	50	75	50	50	50
Effective depth d (mm)	440	442	440	442	465	492	462.5	492	462.5	492	490	462.5	490	462.5	242	242	242
Modular ratio in tension :	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
per Table -6.5 of IRC:112-2011)	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035
per Table -6.5 of IRC:112-2011)	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8

Section to be checked	32 33 34 39 40 41		0 31 35 36 37 38 42 4		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	BOTTOM	TOP	BOTTOM	OUTSIDE	INSIDE	OUTSIDE	INSIDE	OUTSIDE	INSIDE	TOP	BOTTOM	TOP	BOTTOM	INTER WALL TOP	INTER WALL MID	INTER WALL BOTT
Max stress in Steel:	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Area of rein provided :	1571	2011	4025	1005	4025	1005	2454	1005	4909	1005	1571	4909	3142	2454	2576	1005	2576
Actual Neutral Axis Depth Nu:	93	104	139	40	144	81	68	81	155	69	43	155	134	150	101	104	66
Balanced neutral axis depth:	126	126	126	126	138	138	138	138	138	138	138	138	138	138	75	75	75
Actual tensile stress :	188	201	225	0	118	0	0	0	97	0	0	163	123	117	0	2	1
Maximum comp stress:	6.34	7.75	12.99	0.00	6.60	0.00	0.00	0.00	6.14	0.00	0.00	10.28	5.80	7.00	0.02	0.19	0.04
CG of compressive force:	31.11	34.75	46.40	13.41	47.94	27.09	22.80	27.09	51.77	23.05	14.23	51.77	44.60	50.00	33.61	34.83	22.13
Total Compressive Force :	296.08	403.73	904.25	0.00	474.32	0.00	0.00	0.00	477.08	0.00	0.00	798.29	387.72	525.20	0.96	9.93	1.26
Total Tensile Force :	296.08	403.73	904.25	0.00	474.32	0.00	0.00	0.00	477.08	0.00	0.00	798.29	387.72	286.45	0.55	2.01	2.07
Difference in force	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-238.75	-0.41	-7.92	0.81
Moment of resistance :	121.07	164.42	355.92	0.00	197.82	0.00	0.00	0.00	195.95	0.00	0.00	327.88	172.69	118.16	0.11	0.42	0.46
Applied Moment :	121.07	164.42	355.92	0.00	197.82	0.00	0.00	0.00	195.95	0.00	0.00	327.88	172.69	118.16	0.12	0.42	0.46
Difference in moment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
c = Clear cover to the longitudnal reinforcement	50	50	50	50	75	50	75	50	75	50	50	75	50	75	75	50	75
K1 =	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
K2 =	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ϕ =	20	16	20	16	20	16	25	16	25	16	20	25	20	25	16	16	16
As =	1571	2011	4025	1005	4025	1005	2454	1005	4909	1005	1571	4909	3142	2454	2576	1005	2576
hceff =	150	145	150	145	212.5	145	218.75	145	218.75	145	150	218.75	150	218.75	145	145	145
Aceff =	150000	145000	150000	145000	212500	145000	218750	145000	218750	145000	150000	218750	150000	218750	145000	145000	145000
ρpeff =	0.01047	0.01387	0.02683	0.00693	0.01894	0.00693	0.01122	0.00693	0.02244	0.00693	0.01047	0.02244	0.02094	0.01122	0.01777	0.00693	0.01777
Srmax = Maximum crack spacing =3.4xC+(0.425xK1xK2XΦ/ρpeff) (**As per Eq 12.8 of IRC:112-2011)**	494.68	366.16	296.70	562.32	434.50	562.32	633.79	562.32	444.39	562.32	494.68	444.39	332.34	633.79	408.10	562.32	408.10
σsc =	188	201	225	0	118	0	0	0	97	0	0	163	123	117	0	2	1
Kt =	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
fcteff =	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76	105.76
αe =	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190	6.190
(εsm-εcm) =	-0.0259	-0.0197	-0.0104	-0.0398	-0.0150	-0.0398	-0.0252	-0.0398	-0.0129	-0.0398	-0.0269	-0.0126	-0.0136	-0.0246	-0.0165	-0.0398	-0.0165
(εsm-εcm)min =	0.00057	0.00060	0.00067	0.00000	0.00035	0.00000	0.00000	0.00000	0.00029	0.00000	0.00000	0.00049	0.00037	0.00035	0.00000	0.00001	0.00000
(εsm-εcm)governing =	0.00057	0.00060	0.00067	0.00000	0.00035	0.00000	0.00000	0.00000	0.00029	0.00000	0.00000	0.00049	0.00037	0.00035	0.00000	0.00001	0.00000
Crack Width Wk = S rmax * (εsm-εcm)governing **As per Eq 12.5 of IRC:112-2011**	0.2797	0.2206	0.2000	0.0000	0.1536	0.0000	0.0000	0.0000	0.1296	0.0000	0.0000	0.2168	0.1230	0.2219	0.0003	0.0034	0.0010
Limiting value of Crack width (**As per Tab-12.1 of IRC:112-2011)**	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
STATUS	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	TOP SLAB				SIDE WALL						BOTTOM SLAB				INNER WALL		

4.2 Design of Box Section (SLS):





Stress Check

Section to be checked	32 33 34 39 40 41		30 31 35 36 37 38 42 43		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	**BOTTOM**	**TOP**	**BOTTOM**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**OUTSIDE**	**INSIDE**	**TOP**	**BOTTOM**	**TOP**	**BOTTOM**	**INTER WALL TOP**	**INTER WALL MID**	**INTER WALL BOTT**
Design Moment(KNm)	**144**	**178**	**384**	**0**	**218**	**0**	**0**	**0**	**213**	**0**	**0**	**355**	**188**	**257**	**6.922**	**5.841**	**6.764**
Width of section (m)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Depth of section (m)	0.500	0.500	0.500	0.500	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.300	0.300	0.300
Grade of Concrete	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35	M35
Grade of Steel	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500	Fe500
(As per Eq. A2-5 (page-236) of IRC:112-2011)	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308	32308
"E" value for Steel **(As per Cl 6.3.5 of IRC:112-2011)**	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000
Clear Cover (mm)	50	50	50	50	75	50	75	50	75	50	50	75	50	75	50	50	50
Effective depth d (mm)	440	442	440	442	465	492	462.5	492	462.5	492	490	462.5	490	462.5	242	242	242

Section to be checked	32 33 34 39 40 41		30 31 35 36 37 38 42 43		18 19 28 29		17 27		15 16 25 26		1 2 6 7 8 9 13 14		3 4 5 10 11 12		23 24	22	20 21
	TOP	BOTTOM	TOP	BOTTOM	OUTSIDE	INSIDE	OUTSIDE	INSIDE	OUTSIDE	INSIDE	TOP	BOTTOM	TOP	BOTTOM	INTER WALL TOP	INTER WALL MID	INTER WALL BOTT
Modular ratio in tension :	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Concrete failure strain **(As per Table -6.5 of IRC:112-2011)**	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035
Max stress in concrete: **(As per Table -6.5 of IRC:112-2011)**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**	**16.8**
Max stress in Steel:	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**
Area of reinforcement provided	1571	2011	4025	1005	4025	1005	2454	1005	4909	1005	1571	4909	3142	2454	2576	1005	2576
Actual Neutral Axis Depth Nu:	93	104	139	77	144	81	68	81	155	62	99	155	134	117	81	55	81
Balanced neutral axis depth:	126	126	126	126	138	138	138	138	138	138	138	138	138	138	75	75	75
Actual tensile stress :	**224**	**217**	**243**	**0**	**130**	**0**	**0**	**0**	**106**	**0**	**0**	**176**	**134**	**247**	**13**	**26**	**12**
Maximum compressive stress:	**7.55**	**8.38**	**14.03**	**0.00**	**7.26**	**0.00**	**0.00**	**0.00**	**6.68**	**0.00**	**0.00**	**11.14**	**6.29**	**10.40**	**0.79**	**0.95**	**0.77**
CG of compressive force:	31.11	34.75	46.40	25.55	47.94	27.09	22.80	27.09	51.77	20.70	33.04	51.77	44.60	38.85	27.12	18.29	27.12
Total Compressive Force :	352.25	436.75	976.16	0.00	522.33	0.00	0.00	0.00	518.66	0.00	0.00	864.90	421.12	605.91	32.21	26.11	31.48
Total Tensile Force :	352.25	436.75	976.17	0.00	522.33	0.00	0.00	0.00	518.66	0.00	0.00	864.90	421.12	605.91	32.21	26.11	31.48
Difference in force	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Moment of resistance :	144.03	177.87	384.22	0.00	217.84	0.00	0.00	0.00	213.03	0.00	0.00	355.24	187.57	256.69	6.92	5.84	6.76
Applied Moment :	144.03	177.87	384.22	0.00	217.84	0.00	0.00	0.00	213.03	0.00	0.00	355.24	187.57	256.69	6.92	5.84	6.76
Difference in moment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHECK FOR COMPRESSIVE STRESS	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**
CHECK FOR TENSILE STRESS	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**
	TOP SLAB				**SIDE WALL**						**BOTTOM SLAB**				**INNER WALL**		

5.0 Check for Safe Bearing Capacity of Soil

5.1 Calculation for live load

For the full width of box	L=	13.86	m	A=	166.32	m2
	W=	12.0	m	Z=	332.64	m3

For 70R wheel load	P=	400	Kn			
Transverse eccentri	e=	2.905	m			
	M=	1162	Knm	σ_{LL1max} =	5.90	KN/m^2
				σ_{LL1min} =	-1.09	KN/m^2
For 70R wheel load with class A 1 LANE	P=	400	Kn			
Transverse eccentri	e=	2.905	m			
	M=	1162	Knm	σ_{LL2max} =	5.90	KN/m^2
				σ_{LL2min} =	-1.09	KN/m^2
For Class A 1 lane	P=	228	Kn			
Transverse eccentri	e=	-2.9	m			
	M=	-661.2	Knm	σ_{LL2max} =	-0.62	KN/m^2
				σ_{LL2min} =	3.36	KN/m^2

combined with class A 1 LANE	σ_{LL2max} =	5.28	KN/m^2
	σ_{LL2min} =	2.27	KN/m^2

For Class A 3 lane w	P=	684	Kn			
Transverse eccentri	e=	0.7	m			
	M=	478.8	Knm	σ_{LL3max} =	5.55	KN/m^2
				σ_{LL3min} =	2.67	KN/m^2
				$\sigma_{LL\ max}$ =	5.90	KN/m^2
				$\sigma_{LL\ min}$ =	-1.09	KN/m^2

5.2 Calculation Base pressure

FOR LOAD CASE 102

Support No:	Vertical Reaction(kN)
1	16.094
2	24.386
3	120.59
4	187.293
5	186.904
6	113.478
7	16.05
8	16.071
9	32.093
10	113.44
11	186.659
12	187.077
13	120.481
14	24.364
15	16.079
TOTAL LC	**1361.06** kN

Width of E	(Per to the direction of T	=	1	m
Length of	(Parallel to the direction	=	13.9	m
Area A		=	13.860	m2

So, base pressure	**98.20**	kN/m2
	9.82	t/m2

STAAD INPUT FILE FOR BASE PRESSURE CHECK

```
STAAD PLANE RCC BOX   2 X 6.23 X 2
START JOB INFORMATION
ENGINEER DATE            29-03-2023
ENGINEER NAME MRINAL
CHECKER NAME S SAMADDAR

END JOB INFORMATION
UNIT METER KN
INPUT WIDTH 79
JOINT COORDINATES
1 0 0 0 ;
2 0.275 0 0 ;
3 0.425 0 0 ;
4 2.402 0 0 ;
5 4.378 0 0 ;
6 6.355 0 0 ;
7 6.505 0 0 ;
8 6.655 0 0 ;
9 6.805 0 0 ;
10 6.955 0 0 ;
11 8.932 0 0 ;
12 10.908 0 0 ;
13 12.885 0 0 ;
14 13.035 0 0 ;
15 13.31 0 0 ;
16 0 2.525 0 ;
17 0.275 2.525 0 ;
18 0.425 2.525 0 ;
19 2.402 2.525 0 ;
20 4.378 2.525 0 ;
21 6.355 2.525 0 ;
22 6.505 2.525 0 ;
23 6.655 2.525 0 ;
24 6.805 2.525 0 ;
25 6.955 2.525 0 ;
26 8.932 2.525 0 ;
27 10.908 2.525 0 ;
28 12.885 2.525 0 ;
29 13.035 2.525 0 ;
30 13.31 2.525 0 ;
31 0 0.275 0 ;
32 0 0.425 0 ;
33 0 2.125 0 ;
34 0 2.275 0 ;
35 6.655 0.275 0 ;
36 6.655 0.425 0 ;
37 6.655 2.125 0 ;
38 6.655 2.275 0 ;
39 13.31 0.275 0 ;
40 13.31 0.425 0 ;
41 13.31 2.125 0 ;
42 13.31 2.275 0 ;
MEMBER INCIDENCES
1 1 2;
2 2 3;
3 3 4;
4 4 5;
```

5 5 6;
6 6 7;
7 7 8;
8 8 9;
9 9 10;
10 10 11;
11 11 12;
12 12 13;
13 13 14;
14 14 15;
15 1 31;
16 31 32;
17 32 33;
18 33 34;
19 34 16;
20 8 35;
21 35 36;
22 36 37;
23 37 38;
24 38 23;
25 15 39;
26 39 40;
27 40 41;
28 41 42;
29 42 30;
30 16 17;
31 17 18;
32 18 19;
33 19 20;
34 20 21;
35 21 22;
36 22 23;
37 23 24;
38 24 25;
39 25 26;
40 26 27;
41 27 28;
42 28 29;
43 29 30;
MEMBER PROPERTY INDIAN
1 14 PRIS YD 0.7 ZD 1
2 13 PRIS YD 0.625 ZD 1
3 TO 5 PRIS YD 0.55 ZD 1
10 TO 12 PRIS YD 0.55 ZD 1
6 9 PRIS YD 0.625 ZD 1
7 8 PRIS YD 0.7 ZD 1
15 25 PRIS YD 0.7 ZD 1
16 26 PRIS YD 0.625 ZD 1
17 27 PRIS YD 0.55 ZD 1
18 28 PRIS YD 0.625 ZD 1
19 29 PRIS YD 0.7 ZD 1
20 24 PRIS YD 0.45 ZD 1
21 23 PRIS YD 0.375 ZD 1
22 PRIS YD 0.3 ZD 1
30 43 PRIS YD 0.65 ZD 1
31 42 PRIS YD 0.575 ZD 1
32 TO 34 PRIS YD 0.5 ZD 1
39 TO 41 PRIS YD 0.5 ZD 1
35 38 PRIS YD 0.575 ZD 1

36 37 PRIS YD 0.65 ZD 1
CONSTANTS
E 3.05e+007 ALL
POISSON 0.15 ALL
DENSITY 25 ALL
ALPHA 1.2e-005
SUPPORTS
1 FIXED BUT FZ MX MY MZ KFY 2200
15 FIXED BUT FX FZ MX MY MZ KFY 2200
2 14 FIXED BUT FX FZ MX MY MZ KFY 3400
3 13 FIXED BUT FX FZ MX MY MZ KFY 17013.334
4 5 11 12 FIXED BUT FX FZ MX MY MZ KFY 31626.667
6 10 FIXED BUT FX FZ MX MY MZ KFY 17013.334
7 9 FIXED BUT FX FZ MX MY MZ KFY 2400.001
8 9 FIXED BUT FX FZ MX MY MZ KFY 2400.001
LOAD 1 SELFWEIGHT
SELFWEIGHT Y -1
LOAD 2 SIDL
MEMBER LOAD
30 TO 43 UNI GY -62.25
1 TO 14 UNI GY 0.00
LOAD 3 ACTIVE EARTH PRESSURE (IN DRY CONDITION)
MEMBER LOAD
15 TRAP GX 51.94 49.88
16 TRAP GX 49.88 48.75
17 TRAP GX 48.75 36.00
18 TRAP GX 36.00 34.88
19 TRAP GX 34.88 33.00
29 TRAP GX -34.88 -33.00
28 TRAP GX -36.00 -34.88
27 TRAP GX -48.75 -36.00
26 TRAP GX -49.88 -48.75
25 TRAP GX -51.94 -49.88

LOAD 4 LIVE LOAD
MEMBER LOAD
30 TO 43 UNI GY -5.90
LOAD 5 LIVE LOAD SURCHARGE (BS)
MEMBER LOAD
15 TO 19 UNI GX 9.00
25 TO 29 UNI GX -9.00
LOAD 6 LIVE LOAD SURCHARGE (LEFT SIDE)
MEMBER LOAD
15 TO 19 UNI GX 9.00
LOAD 7 LIVE LOAD SURCHARGE (RIGHT SIDE)
MEMBER LOAD
25 TO 29 UNI GX -9.00
LOAD 8 BRAKING FORCES (LEFT SIDE)
JOINT LOAD
16 FX 3.81
LOAD 9 BRAKING FORCES (RIGHT SIDE)
JOINT LOAD
30 FX -3.81
LOAD 10 TEMPERATURE LOAD (UNIFORM RISE)
TEMPERATURE LOAD
1 to 43 TEMP 35
LOAD 11 TEMPERATURE LOAD (UNIFORM FALL)
TEMPERATURE LOAD
1 to 43 TEMP -15
LOAD 12 TEMPERATURE LOAD (GRADIENT RISE)
JOINT LOAD
16 FX -790.98
16 MZ 111.70
23 FX -790.98
23 MZ 111.70
23 FX 790.98
23 MZ -111.70
30 FX 790.98
30 MZ -111.70
LOAD 13 TEMPERATURE GRADIENT (GRADIENT FALL)
JOINT LOAD
16 FX 388.87
16 MZ -19.43
23 FX 388.87
23 MZ -19.43
23 FX -388.87
23 MZ 19.43
30 FX -388.87
30 MZ 19.43

***** LOAD COMBINATION FOR BASE PRESSURE CHECK***

LOAD COMBINATION 101 SW+SIDL+EP(BS)
1 1.0 2 1.0 3 1.0
LOAD COMBINATION 102 SW+SIDL+EP(BS)+LL
1 1.0 2 1.0 3 1.0 4 1.0
LOAD COMBINATION 103 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.0 2 1.0 3 1.0 4 1.0 5 1.0
LOAD COMBINATION 104 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)
1 1.0 2 1.0 3 1.0 4 1.0 6 1.0 8 1.0
LOAD COMBINATION 105 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.0 2 1.0 3 1.0 4 1.0 7 1.0 9 1.0
LOAD COMBINATION 106 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)
1 1.0 2 1.0 3 1.0 7 1.0 9 1.0
LOAD COMBINATION 107 SW+SIDL+EP(BS)+TUR+TGR

1 1.0 2 1.0 3 1.0 10 1.0 12 1.0
LOAD COMBINATION 108 SW+SIDL+EP(BS)+LL+TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 10 1.0 12 1.0
LOAD COMBINATION 109 SW+SIDL+EP(BS)+LL+SUR(BS) +TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 10 1.0 12 1.0
LOAD COMBINATION 110 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 6 1.0 8 1.0 10 1.0 12 1.0
LOAD COMBINATION 111 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 7 1.0 9 1.0 10 1.0 12 1.0
LOAD COMBINATION 112 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.0 3 1.0 7 1.0 9 1.0 10 1.0 12 1.0
LOAD COMBINATION 113 SW+SIDL+EP(BS)+TUF+TGF
1 1.0 2 1.0 3 1.0 11 1.0 13 1.0
LOAD COMBINATION 114 SW+SIDL+EP(BS)+LL+TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 11 1.0 13 1.0
LOAD COMBINATION 115 SW+SIDL+EP(BS)+LL+SUR(BS)+ TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 5 1.0 11 1.0 13 1.0
LOAD COMBINATION 116 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 6 1.0 8 1.0 11 1.0 13 1.0
LOAD COMBINATION 117 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 7 1.0 9 1.0 11 1.0 13 1.0
LOAD COMBINATION 118 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.0 3 1.0 7 1.0 9 1.0 11 1.0 13 1.0
****
****
PERFORM ANALYSIS
FINISH

STAAD INPUT FILE FOR SLS & ULS LOAD COMB

```
STAAD PLANE RCC BOX   2 X 6.23 X 2
START JOB INFORMATION
ENGINEER DATE         29-03-2023
ENGINEER NAME MRINAL
CHECKER NAME S SAMADDAR

END JOB INFORMATION
UNIT METER KN
INPUT WIDTH 79
JOINT COORDINATES
1 0 0 0 ;
2 0.275 0 0 ;
3 0.425 0 0 ;
4 2.402 0 0 ;
5 4.378 0 0 ;
6 6.355 0 0 ;
7 6.505 0 0 ;
8 6.655 0 0 ;
9 6.805 0 0 ;
10 6.955 0 0 ;
11 8.932 0 0 ;
12 10.908 0 0 ;
13 12.885 0 0 ;
14 13.035 0 0 ;
15 13.31 0 0 ;
16 0 2.525 0 ;
17 0.275 2.525 0 ;
18 0.425 2.525 0 ;
19 2.402 2.525 0 ;
20 4.378 2.525 0 ;
21 6.355 2.525 0 ;
22 6.505 2.525 0 ;
23 6.655 2.525 0 ;
24 6.805 2.525 0 ;
25 6.955 2.525 0 ;
26 8.932 2.525 0 ;
27 10.908 2.525 0 ;
28 12.885 2.525 0 ;
29 13.035 2.525 0 ;
30 13.31 2.525 0 ;
31 0 0.275 0 ;
32 0 0.425 0 ;
33 0 2.125 0 ;
34 0 2.275 0 ;
35 6.655 0.275 0 ;
36 6.655 0.425 0 ;
37 6.655 2.125 0 ;
38 6.655 2.275 0 ;
39 13.31 0.275 0 ;
40 13.31 0.425 0 ;
41 13.31 2.125 0 ;
42 13.31 2.275 0 ;
MEMBER INCIDENCES
1 1 2;
2 2 3;
3 3 4;
4 4 5;
```

5 5 6;
6 6 7;
7 7 8;
8 8 9;
9 9 10;
10 10 11;
11 11 12;
12 12 13;
13 13 14;
14 14 15;
15 1 31;
16 31 32;
17 32 33;
18 33 34;
19 34 16;
20 8 35;
21 35 36;
22 36 37;
23 37 38;
24 38 23;
25 15 39;
26 39 40;
27 40 41;
28 41 42;
29 42 30;
30 16 17;
31 17 18;
32 18 19;
33 19 20;
34 20 21;
35 21 22;
36 22 23;
37 23 24;
38 24 25;
39 25 26;
40 26 27;
41 27 28;
42 28 29;
43 29 30;
MEMBER PROPERTY INDIAN
1 14 PRIS YD 0.7 ZD 1
2 13 PRIS YD 0.625 ZD 1
3 TO 5 PRIS YD 0.55 ZD 1
10 TO 12 PRIS YD 0.55 ZD 1
6 9 PRIS YD 0.625 ZD 1
7 8 PRIS YD 0.7 ZD 1
15 25 PRIS YD 0.7 ZD 1
16 26 PRIS YD 0.625 ZD 1
17 27 PRIS YD 0.55 ZD 1
18 28 PRIS YD 0.625 ZD 1
19 29 PRIS YD 0.7 ZD 1
20 24 PRIS YD 0.45 ZD 1
21 23 PRIS YD 0.375 ZD 1
22 PRIS YD 0.3 ZD 1
30 43 PRIS YD 0.65 ZD 1
31 42 PRIS YD 0.575 ZD 1
32 TO 34 PRIS YD 0.5 ZD 1
39 TO 41 PRIS YD 0.5 ZD 1
35 38 PRIS YD 0.575 ZD 1

36 37 PRIS YD 0.65 ZD 1
CONSTANTS
E 3.05e+007 ALL
POISSON 0.15 ALL
DENSITY 25 ALL
ALPHA 1.2e-005
SUPPORTS
1 FIXED BUT FZ MX MY MZ KFY 2200
15 FIXED BUT FX FZ MX MY MZ KFY 2200
2 14 FIXED BUT FX FZ MX MY MZ KFY 3400
3 13 FIXED BUT FX FZ MX MY MZ KFY 17013.334
4 5 11 12 FIXED BUT FX FZ MX MY MZ KFY 31626.667
6 10 FIXED BUT FX FZ MX MY MZ KFY 17013.334
7 9 FIXED BUT FX FZ MX MY MZ KFY 2400.001
8 9 FIXED BUT FX FZ MX MY MZ KFY 2400.001
LOAD 1 SELFWEIGHT
SELFWEIGHT Y -1
LOAD 2 SIDL
MEMBER LOAD
30 TO 43 UNI GY -62.25
1 TO 14 UNI GY 0.00
LOAD 3 ACTIVE EARTH PRESSURE (IN DRY CONDITION)
MEMBER LOAD
15 TRAP GX 51.94 49.88
16 TRAP GX 49.88 48.75
17 TRAP GX 48.75 36.00
18 TRAP GX 36.00 34.88
19 TRAP GX 34.88 33.00
29 TRAP GX -34.88 -33.00
28 TRAP GX -36.00 -34.88
27 TRAP GX -48.75 -36.00
26 TRAP GX -49.88 -48.75
25 TRAP GX -51.94 -49.88
LOAD 4 LIVE LOAD
MEMBER LOAD
30 TO 43 UNI GY -6.21
LOAD 5 LIVE LOAD SURCHARGE (BS)
MEMBER LOAD
15 TO 19 UNI GX 9.00
25 TO 29 UNI GX -9.00
LOAD 6 LIVE LOAD SURCHARGE (LEFT SIDE)
MEMBER LOAD
15 TO 19 UNI GX 9.00
LOAD 7 LIVE LOAD SURCHARGE (RIGHT SIDE)
MEMBER LOAD
25 TO 29 UNI GX -9.00
LOAD 8 BRAKING FORCES (LEFT SIDE)
JOINT LOAD
16 FX 3.81
LOAD 9 BRAKING FORCES (RIGHT SIDE)
JOINT LOAD
30 FX -3.81
LOAD 10 TEMPERATURE LOAD (UNIFORM RISE)
TEMPERATURE LOAD
1 to 43 TEMP 35
LOAD 11 TEMPERATURE LOAD (UNIFORM FALL)
TEMPERATURE LOAD
1 to 43 TEMP -15
LOAD 12 TEMPERATURE LOAD (GRADIENT RISE)

JOINT LOAD

16 FX	-790.98
16 MZ	111.70
23 FX	-790.98
23 MZ	111.70
23 FX	790.98
23 MZ	-111.70
30 FX	790.98
30 MZ	-111.70

LOAD 13 TEMPERATURE GRADIENT (GRADIENT FALL)

JOINT LOAD

16 FX	388.87
16 MZ	-19.43
23 FX	388.87
23 MZ	-19.43
23 FX	-388.87
23 MZ	19.43
30 FX	-388.87
30 MZ	19.43

***** ULS COMBINATION FOR STRUCTURAL STRENGTH CHECK (Adding effect of Variable Load)***

LOAD COMBINATION 119 SW+SIDL+EP(BS)
1 1.35 2 1.75 3 1.5
LOAD COMBINATION 120 SW+SIDL+EP(BS)+LL
1 1.35 2 1.75 3 1.5 4 1.5
LOAD COMBINATION 121 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.35 2 1.75 3 1.5 4 1.5 5 1.2
LOAD COMBINATION 122 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)
1 1.35 2 1.75 3 1.5 4 1.5 6 1.2 8 1.5
LOAD COMBINATION 123 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.35 2 1.75 3 1.5 4 1.5 7 1.2 9 1.5
LOAD COMBINATION 124 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)
1 1.35 2 1.75 3 1.5 7 1.2 9 1.5

***** ULS COMBINATION FOR STRUCTURAL STRENGTH CHECK (Relieving effect of Variable Load)***

LOAD COMBINATION 125 SW+SIDL+EP(BS)+LL
1 1.0 2 1.0 3 1.0 4 1.5
LOAD COMBINATION 126 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.0 2 1.0 3 1.0 4 1.5 5 1.2
LOAD COMBINATION 127 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)
1 1.0 2 1.0 3 1.0 4 1.5 6 1.2 8 1.5
LOAD COMBINATION 128 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.0 2 1.0 3 1.0 4 1.5 7 1.2 9 1.5
LOAD COMBINATION 129 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)
1 1.0 2 1.0 3 1.0 7 1.2 9 1.5

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***** SLS COMBINATION FOR CRACK WIDTH CHECK***

LOAD COMBINATION 130 SW+SIDL+EP(BS)
1 1.0 2 1.2 3 1.0
LOAD COMBINATION 131 SW+SIDL+EP(BS)+LL
1 1.0 2 1.2 3 1.0 4 0
LOAD COMBINATION 132 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.0 2 1.2 3 1.0 4 0 5 0
LOAD COMBINATION 133 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)
1 1.0 2 1.2 3 1.0 4 0 6 0 8 0
LOAD COMBINATION 134 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.0 2 1.2 3 1.0 4 0 7 0 9 0
LOAD COMBINATION 135 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)
1 1.0 2 1.2 3 1.0 7 0 9 0
LOAD COMBINATION 136 SW+SIDL+EP(BS)+TUR+TGR
1 1.0 2 1.2 3 1.0 10 0.5 12 0.5
LOAD COMBINATION 137 SW+SIDL+EP(BS)+LL+TUR+TGR
1 1.0 2 1.2 3 1.0 4 0 10 0.5 12 0.5
LOAD COMBINATION 138 SW+SIDL+EP(BS)+LL+SUR(BS) +TUR+TGR
1 1.0 2 1.2 3 1.0 4 0 5 0 10 0.5 12 0.5
LOAD COMBINATION 139 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 0 6 0 8 0 10 0.5 12 0.5
LOAD COMBINATION 140 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 0 7 0 9 0 10 0.5 12 0.5
LOAD COMBINATION 141 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.2 3 1.0 7 0 9 0 10 0.5 12 0.5
LOAD COMBINATION 142 SW+SIDL+EP(BS)+TUF+TGF
1 1.0 2 1.2 3 1.0 11 0.5 13 0.5
LOAD COMBINATION 143 SW+SIDL+EP(BS)+LL+TUF+TGF
1 1.0 2 1.2 3 1.0 4 0 11 0.5 13 0.5
LOAD COMBINATION 144 SW+SIDL+EP(BS)+LL+SUR(BS)+ TUF+TGF
1 1.0 2 1.2 3 1.0 4 0 5 0 11 0.5 13 0.5
LOAD COMBINATION 145 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 0 6 0 8 0 11 0.5 13 0.5
LOAD COMBINATION 146 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 0 7 0 9 0 11 0.5 13 0.5
LOAD COMBINATION 147 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.2 3 1.0 7 0 9 0 11 0.5 13 0.5
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***** SLS COMBINATION FOR STRESS CHECK***

LOAD COMBINATION 148 SW+SIDL+EP(BS)
1 1.0 2 1.2 3 1.0
LOAD COMBINATION 149 SW+SIDL+EP(BS)+LL
1 1.0 2 1.2 3 1.0 4 1.0
LOAD COMBINATION 150 SW+SIDL+EP(BS)+LL
1 1.0 2 1.2 3 1.0 4 0.75
LOAD COMBINATION 151 SW+SIDL+EP(BS)+LL
1 1.0 2 1.0 3 1.0 4 1.0
LOAD COMBINATION 152 SW+SIDL+EP(BS)+LL
1 1.0 2 1.0 3 1.0 4 0.75
LOAD COMBINATION 153 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.0 2 1.2 3 1.0 4 1.0 5 0.8
LOAD COMBINATION 154 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.0 2 1.2 3 1.0 4 0.75 5 0.8
LOAD COMBINATION 155 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.0 2 1.0 3 1.0 4 1.0 5 0.8
LOAD COMBINATION 156 SW+SIDL+EP(BS)+LL+SUR(BS)
1 1.0 2 1.0 3 1.0 4 0.75 5 0.8
LOAD COMBINATION 157 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)

1 1.0 2 1.2 3 1.0 4 1.0 6 0.8 8 1.0
LOAD COMBINATION 158 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)
1 1.0 2 1.0 3 1.0 4 1.0 6 0.8 8 1.0
LOAD COMBINATION 159 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)
1 1.0 2 1.2 3 1.0 4 0.75 6 0.8 8 1.0
LOAD COMBINATION 160 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)
1 1.0 2 1.0 3 1.0 4 0.75 6 0.8 8 1.0
LOAD COMBINATION 161 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.0 2 1.2 3 1.0 4 1.0 7 0.8 9 1.0
LOAD COMBINATION 162 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.0 2 1.0 3 1.0 4 1.0 7 0.8 9 1.0
LOAD COMBINATION 163 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.0 2 1.2 3 1.0 4 0.75 7 0.8 9 1.0
LOAD COMBINATION 164 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)
1 1.0 2 1.0 3 1.0 4 0.75 7 0.8 9 1.0
LOAD COMBINATION 165 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)
1 1.0 2 1.2 3 1.0 7 0.8 9 1.0
LOAD COMBINATION 166 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)
1 1.0 2 1.0 3 1.0 7 0.8 9 1.0
LOAD COMBINATION 167 SW+SIDL+EP(BS)+TUR+TGR
1 1.0 2 1.2 3 1.0 10 1.0 12 1.0
LOAD COMBINATION 168 SW+SIDL+EP(BS)+TUF+TGF
1 1.0 2 1.2 3 1.0 11 1.0 13 1.0
LOAD COMBINATION 169 SW+SIDL+EP(BS)+LL+TUR+TGR
1 1.0 2 1.2 3 1.0 4 1.0 10 0.6 12 0.6
LOAD COMBINATION 170 SW+SIDL+EP(BS)+LL+TUR+TGR
1 1.0 2 1.2 3 1.0 4 0.75 10 1.0 12 1.0
LOAD COMBINATION 171 SW+SIDL+EP(BS)+LL+TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 10 0.6 12 0.6
LOAD COMBINATION 172 SW+SIDL+EP(BS)+LL+TUR+TGR
1 1.0 2 1.0 3 1.0 4 0.75 10 1.0 12 1.0
LOAD COMBINATION 173 SW+SIDL+EP(BS)+LL+TUF+TGF
1 1.0 2 1.2 3 1.0 4 1.0 11 0.6 13 0.6
LOAD COMBINATION 174 SW+SIDL+EP(BS)+LL+TUF+TGF
1 1.0 2 1.2 3 1.0 4 0.75 11 1.0 13 1.0
LOAD COMBINATION 175 SW+SIDL+EP(BS)+LL+TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 11 0.6 13 0.6
LOAD COMBINATION 176 SW+SIDL+EP(BS)+LL+TUF+TGF
1 1.0 2 1.0 3 1.0 4 0.75 11 1.0 13 1.0
LOAD COMBINATION 177 SW+SIDL+EP(BS)+LL+SUR(BS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 1.0 5 0.8 10 0.6 12 0.6
LOAD COMBINATION 178 SW+SIDL+EP(BS)+LL+SUR(BS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 0.75 5 0.8 10 1.0 12 1.0
LOAD COMBINATION 179 SW+SIDL+EP(BS)+LL+SUR(BS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 5 0.8 10 0.6 12 0.6
LOAD COMBINATION 180 SW+SIDL+EP(BS)+LL+SUR(BS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 0.75 5 0.8 10 1.0 12 1.0
LOAD COMBINATION 181 SW+SIDL+EP(BS)+LL+SUR(BS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 1.0 5 0.8 11 0.6 13 0.6
LOAD COMBINATION 182 SW+SIDL+EP(BS)+LL+SUR(BS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 0.75 5 0.8 11 1.0 13 1.0
LOAD COMBINATION 183 SW+SIDL+EP(BS)+LL+SUR(BS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 5 0.8 11 0.6 13 0.6
LOAD COMBINATION 184 SW+SIDL+EP(BS)+LL+SUR(BS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 0.75 5 0.8 11 1.0 13 1.0
LOAD COMBINATION 185 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 1.0 6 0.8 8 1.0 10 0.6 12 0.6
LOAD COMBINATION 186 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 6 0.8 8 1.0 10 1.0 12 1.0

LOAD COMBINATION 187 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 0.75 6 0.8 8 1.0 10 0.6 12 0.6
LOAD COMBINATION 188 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 0.75 6 0.8 8 1.0 10 1.0 12 1.0
LOAD COMBINATION 189 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 1.0 6 0.8 8 1.0 11 0.6 13 0.6
LOAD COMBINATION 190 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 6 0.8 8 1.0 11 1.0 13 1.0
LOAD COMBINATION 191 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 0.75 6 0.8 8 1.0 11 0.6 13 0.6
LOAD COMBINATION 192 SW+SIDL+EP(BS)+LL+SUR(LS)+BR F(LS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 0.75 6 0.8 8 1.0 11 1.0 13 1.0
LOAD COMBINATION 193 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 1.0 7 0.8 9 1.0 10 0.6 12 0.6
LOAD COMBINATION 194 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 1.0 7 0.8 9 1.0 10 1.0 12 1.0
LOAD COMBINATION 195 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.2 3 1.0 4 0.75 7 0.8 9 1.0 10 0.6 12 0.6
LOAD COMBINATION 196 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.0 3 1.0 4 0.75 7 0.8 9 1.0 10 1.0 12 1.0
LOAD COMBINATION 197 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 1.0 7 0.8 9 1.0 11 0.6 13 0.6
LOAD COMBINATION 198 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 1.0 7 0.8 9 1.0 11 1.0 13 1.0
LOAD COMBINATION 199 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.2 3 1.0 4 0.75 7 0.8 9 1.0 11 0.6 13 0.6
LOAD COMBINATION 200 SW+SIDL+EP(BS)+LL+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.0 3 1.0 4 0.75 7 0.8 9 1.0 11 1.0 13 1.0
LOAD COMBINATION 201 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.2 3 1.0 7 0.8 9 1.0 10 1.0 12 1.0
LOAD COMBINATION 202 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUR+TGR
1 1.0 2 1.0 3 1.0 7 0.8 9 1.0 10 1.0 12 1.0
LOAD COMBINATION 203 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.2 3 1.0 7 0.8 9 1.0 11 1.0 13 1.0
LOAD COMBINATION 204 SW+SIDL+EP(BS)+SUR(RS)+BR F(RS)+TUF+TGF
1 1.0 2 1.0 3 1.0 7 0.8 9 1.0 11 1.0 13 1.0
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PERFORM ANALYSIS
FINISH