

Note: These results are not used in the final design.

Made by : DAC

See RCGrillageZeroJ950.pdf for design results.

Date : 23/7/09

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

Job No. : 001

Checked by :

10:47 : 11/11/14

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Job Name :2 Span Reinforced Concrete Deck ExampleStructure Type = Grillage
No of joints = 273
No of members = 512**Analysis Settings**

Analysis method = Linear Elastic

Sections

Data last edited at 10:44 on 11/11/14

Section 1 : Longtl A : GeneralAx = 507000.00 mm² Az = 0.00 mm²
Ix = 1.79e+10 mm² Iy = 1.76e+10 mm²
Cz = 0.0 mm²**Section 2 : Longtl B : General**Ax = 804000.00 mm² Az = 0.00 mm²
Ix = 2.20e+10 mm² Iy = 5.50e+10 mm²
Cz = 0.0 mm²**Section 3 : Longtl C : General**Ax = 867000.00 mm² Az = 0.00 mm²
Ix = 5.27e+10 mm² Iy = 6.52e+10 mm²
Cz = 0.0 mm²**Section 4 : Transv Cant : General**Ax = 830000.00 mm² Az = 0.00 mm²
Ix = 2.26e+10 mm² Iy = 1.32e+10 mm²
Cz = 0.0 mm²**Section 5 : Transv Deck : General**Ax = 1810000.00 mm² Az = 0.00 mm²
Ix = 1.86e+11 mm² Iy = 1.36e+11 mm²
Cz = 0.0 mm²**Supports**

Data last edited at 18:04 on 29/4/09

Joint No	DZ (kN/m)	RX (kN.m/deg)	RY (kN.m/deg)
43	Rigid	Free	Free
53	Rigid	Free	Free
63	Rigid	Free	Free
85	Rigid	Free	Free
95	Rigid	Free	Free
105	Rigid	Free	Free
127	Rigid	Free	Free
137	Rigid	Free	Free
147	Rigid	Free	Free
169	Rigid	Free	Free
179	Rigid	Free	Free
189	Rigid	Free	Free
211	Rigid	Free	Free
221	Rigid	Free	Free
231	Rigid	Free	Free

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Loadcase Titles

Loadcase No	Reference	Title
1	B1	Concrete Dead
2	B2	Surfacing
3	B3	F'way Dead
4	B4	Parapet
5	B5	HL:HA Span 1
6	B6	HL:HA Spans 1 and 2
7	B7	HL:HB Sag Span 1
8	B8	HL:HB Hog Span 1 & 2
9	B9	Settlement
10	B10	HL:Accidental Wheel Sag Span
11	B11	HL:Accidental Wheel Hog Span
12	B12	Footway Sag Span 1
13	B13	Footway Hog Spans 1 & 2
14	B14	HL:HA Shear Span 1
15	B15	HL:HB Shear Span 1
16	B16	HL:HA Shear at Pier
17	B17	HL:HB at Pier
18	C1	Dead Load SLS
19	C2	Dead Load ULS
20	C3	Permanent Loads SLS
21	C4	Permanent Loads ULS
22	C5	Dead + HA + Fwy Sag SLS
23	C6	Dead + HA + Fwy Sag ULS
24	C7	Dead + HB + Fwy Sag SLS
25	C8	Dead + HB + Fwy Sag ULS
26	C9	Dead + HA + Fwy + Setl Hog SLS
27	C10	Dead + HA + Fwy + Setl Hog ULS
28	C11	Dead + HB + Fwy + Setl Hog SLS
29	C12	Dead + HB + Fwy + Setl ULS
30	C13	Dead + HA + Fwy Shear Span 1 U
31	C14	Dead + HB + Fwy Shear Span 1 U
32	C15	Dead + Footway Span 1 SLS
33	C16	Dead + Footway Span 1 ULS
34	C17	Dead + Accidental Wheel SLS
35	C18	Dead + Accidental Wheel ULS

Combination Loadcase 1 : Dead Load SLS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
1	B1	1.000
2	B2	1.200
3	B3	1.000
4	B4	1.000

Combination Loadcase 2 : Dead Load ULS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
5	B1	1.150
6	B2	1.750
7	B3	1.200
8	B4	1.200

2 Span Reinforced Concrete Deck Example
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Combination Loadcase 3 : Permanent Loads SLS

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Entry no	Loadcase reference	Load Factor
9	C1	1.000
10	B9	1.000

Combination Loadcase 4 : Permanent Loads ULS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
11	C2	1.000
12	B9	1.200

Combination Loadcase 5 : Dead + HA + Fwy Sag SLS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
13	C1	1.000
14	B5	1.200
41	B12	1.000

Combination Loadcase 6 : Dead + HA + Fwy Sag ULS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
15	C2	1.000
16	B5	1.500
42	B12	1.500

Combination Loadcase 7 : Dead + HB + Fwy Sag SLS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
17	C1	1.000
18	B7	1.100
43	B12	1.000

Combination Loadcase 8 : Dead + HB + Fwy Sag ULS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
19	C2	1.000
20	B7	1.300
44	B12	1.500

Combination Loadcase 9 : Dead + HA + Fwy + Setl Hog SLS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
21	C1	1.000
22	B6	1.200
45	B13	1.000
51	B9	1.000

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Combination Loadcase 10 : Dead + HA + Fwy + Setl Hog ULS

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Entry no	Loadcase reference	Load Factor
23	C2	1.000
24	B6	1.500
46	B13	1.500
52	B9	1.200

Combination Loadcase 11 : Dead + HB + Fwy + Setl Hog SLS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
25	C1	1.000
26	B8	1.100
47	B13	1.000
53	B9	1.000

Combination Loadcase 12 : Dead + HB + Fwy + Setl ULS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
27	C2	1.000
28	B8	1.300
48	B13	1.500
54	B9	1.200

Combination Loadcase 13 : Dead + HA + Fwy Shear Span 1 U

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
29	C2	1.000
30	B14	1.500
49	B12	1.500

Combination Loadcase 14 : Dead + HB + Fwy Shear Span 1 U

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
31	C2	1.000
32	B15	1.300
50	B12	1.500

Combination Loadcase 15 : Dead + Footway Span 1 SLS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
33	C1	1.000
34	B12	1.000

Combination Loadcase 16 : Dead + Footway Span 1 ULS

Data last edited at 15:01 on 26/7/09

Entry no	Loadcase reference	Load Factor
35	C2	1.000
36	B12	1.500

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Combination Loadcase 17 : Dead + Accidental Wheel SLS

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Entry no	Loadcase reference	Load Factor
37	C1	1.000
38	B10	1.200

Combination Loadcase 18 : Dead + Accidental Wheel ULS

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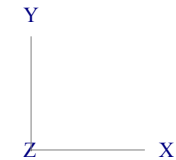
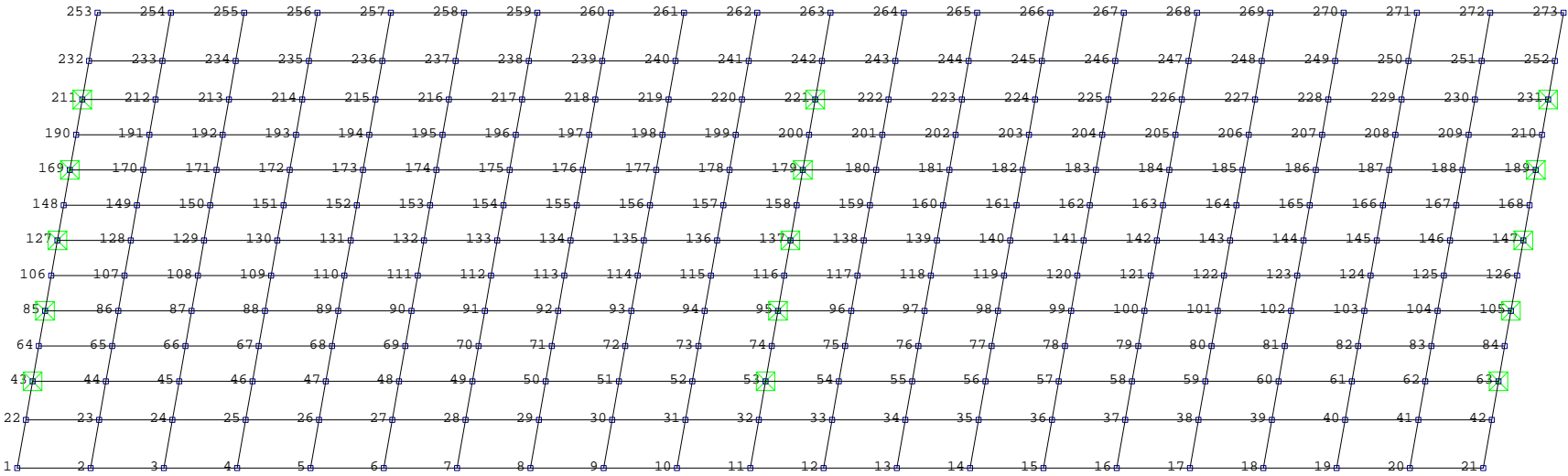
Entry no	Loadcase reference	Load Factor
39	C2	1.000
40	B10	1.500

2 Span Reinforced Concrete Deck Example
Deck with Zero Torsional Member Stiffness

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SCALES
Structure 1:179



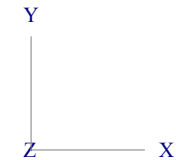
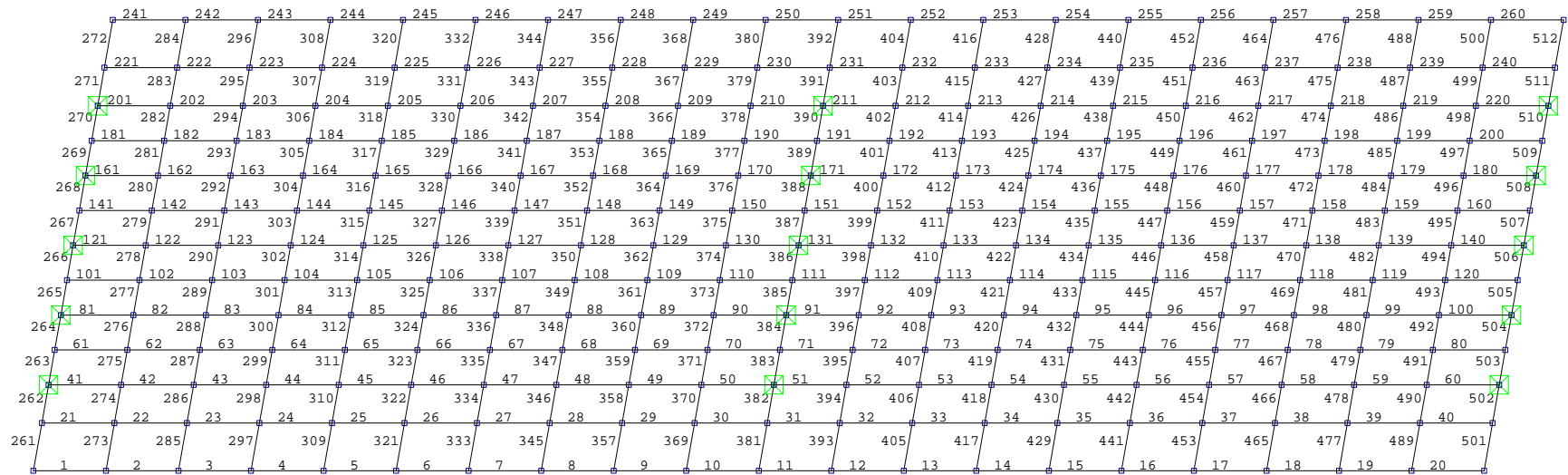
Structure Set : ALL

2 Span Reinforced Concrete Deck Example
Deck with Zero Torsional Member Stiffness

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SCALES
Structure 1:179



Structure Set : ALL

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Support Reactions

Loadcase B1 : Concrete Dead

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	583.579
53	0.000	0.000	1897.377
63	0.000	0.000	609.076
85	0.000	0.000	140.256
95	0.000	0.000	612.363
105	0.000	0.000	133.288
127	0.000	0.000	391.791
137	0.000	0.000	1170.397
147	0.000	0.000	391.791
169	0.000	0.000	133.268
179	0.000	0.000	612.363
189	0.000	0.000	140.239
211	0.000	0.000	609.086
221	0.000	0.000	1897.377
231	0.000	0.000	583.588

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-58454.046

198517.989

-9905.840

Reaction

58454.046

-198517.989

9905.840

Support Reactions

Loadcase B2 : Surfacing

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	28.490
53	0.000	0.000	107.625
63	0.000	0.000	30.640
85	0.000	0.000	24.833
95	0.000	0.000	78.812
105	0.000	0.000	26.385
127	0.000	0.000	32.838
137	0.000	0.000	104.174
147	0.000	0.000	32.838
169	0.000	0.000	26.384
179	0.000	0.000	78.812
189	0.000	0.000	24.832
211	0.000	0.000	30.641
221	0.000	0.000	107.625
231	0.000	0.000	28.491

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-4504.917

15299.318

-763.420

Reaction

4504.917

-15299.318

763.420

Cross Sectional Area of Deck = □

(2x0.507 + 2x0.804 + 9x0.867) = 10.425 sq. m. □

Total mass of deck = 10.425x25x38 = 9904 kN □

Hence 9906 kN OK

Total mass of surfacing = 0.125x7.3x38x22 = 763 kN □

Hence 763 kN OK

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Support Reactions

Loadcase B3 : F'way Dead

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	81.932
53	0.000	0.000	237.452
63	0.000	0.000	84.041
85	0.000	0.000	-15.374
95	0.000	0.000	-10.718
105	0.000	0.000	-20.567
127	0.000	0.000	26.781
137	0.000	0.000	68.910
147	0.000	0.000	26.781
169	0.000	0.000	-20.569
179	0.000	0.000	-10.718
189	0.000	0.000	-15.376
211	0.000	0.000	84.041
221	0.000	0.000	237.452
231	0.000	0.000	81.933

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-4933.209

16753.858

-836.000

Reaction

4933.209

-16753.858

836.000

Support Reactions

Loadcase B4 : Parapet

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	10.260
53	0.000	0.000	27.556
63	0.000	0.000	10.172
85	0.000	0.000	-4.289
95	0.000	0.000	-6.683
105	0.000	0.000	-4.755
127	0.000	0.000	2.868
137	0.000	0.000	5.739
147	0.000	0.000	2.868
169	0.000	0.000	-4.755
179	0.000	0.000	-6.683
189	0.000	0.000	-4.289
211	0.000	0.000	10.172
221	0.000	0.000	27.556
231	0.000	0.000	10.260

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-448.474

1523.078

-76.000

Reaction

448.474

-1523.078

76.000

Total mass of parapet = $2 \times 38 \times 1.0 = 76 \text{ kN}$ □

Hence 76 kN OK

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Support Reactions

Loadcase B5 : HL:HA Span 1

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	183.763
53	0.000	0.000	319.469
63	0.000	0.000	-52.814
85	0.000	0.000	146.196
95	0.000	0.000	196.388
105	0.000	0.000	-6.274
127	0.000	0.000	203.563
137	0.000	0.000	268.463
147	0.000	0.000	-27.716
169	0.000	0.000	144.292
179	0.000	0.000	201.836
189	0.000	0.000	-16.043
211	0.000	0.000	223.846
221	0.000	0.000	256.485
231	0.000	0.000	-26.780

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-11888.592

20780.584

-2014.672

Reaction

11888.592

-20780.584

2014.672

Support Reactions

Loadcase B6 : HL:HA Spans 1 and 2

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	100.331
53	0.000	0.000	368.624
63	0.000	0.000	78.123
85	0.000	0.000	82.182
95	0.000	0.000	256.187
105	0.000	0.000	71.131
127	0.000	0.000	112.052
137	0.000	0.000	343.237
147	0.000	0.000	86.685
169	0.000	0.000	84.313
179	0.000	0.000	256.828
189	0.000	0.000	65.088
211	0.000	0.000	114.755
221	0.000	0.000	357.992
231	0.000	0.000	76.028

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-14478.587

46955.596

-2453.557

Reaction

14478.587

-46955.596

2453.557

Total HA load = $2 \times (19 \times 46.7 + 120) = 2014.6 \text{ kN}$ □

Hence 2014.7 kN OK

Total HA load = $2 \times (38 \times 29.4 + 120) = 2474.4 \text{ kN}$ □

Hence 2453.6 kN OK

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Support Reactions

Loadcase B7 : HL:HB Sag Span 1

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	177.936
53	0.000	0.000	315.995
63	0.000	0.000	-58.019
85	0.000	0.000	164.539
95	0.000	0.000	253.626
105	0.000	0.000	-10.831
127	0.000	0.000	201.395
137	0.000	0.000	319.813
147	0.000	0.000	-33.591
169	0.000	0.000	82.931
179	0.000	0.000	216.144
189	0.000	0.000	-18.012
211	0.000	0.000	274.309
221	0.000	0.000	358.307
231	0.000	0.000	-37.207

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-13377.307

24181.528

-2207.336

Reaction

13377.307

-24181.528

2207.336

Total HA + HB load = $(19 \times 46.7 + 120) + 4 \times 10 \times 30 = 2207.3$ kN

Hence 2207.3 kN OK

Support Reactions

Loadcase B8 : HL:HB Hog Span 1 & 2

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	97.510
53	0.000	0.000	388.505
63	0.000	0.000	75.984
85	0.000	0.000	81.973
95	0.000	0.000	285.775
105	0.000	0.000	79.997
127	0.000	0.000	95.745
137	0.000	0.000	344.530
147	0.000	0.000	75.401
169	0.000	0.000	39.937
179	0.000	0.000	185.969
189	0.000	0.000	31.760
211	0.000	0.000	110.605
221	0.000	0.000	449.052
231	0.000	0.000	84.034

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-14271.605

47131.974

-2426.779

Reaction

14271.605

-47131.974

2426.779

Total HA + HB load = $(38 \times 29.4 + 120) + 4 \times 10 \times 30 = 2437.2$ kN

Hence 2426.8 kN OK

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Support Reactions

Loadcase B10 : HL:Accidental Wheel Sag Span

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	-75.489
53	0.000	0.000	-77.172
63	0.000	0.000	1.959
85	0.000	0.000	43.463
95	0.000	0.000	53.267
105	0.000	0.000	-9.384
127	0.000	0.000	34.225
137	0.000	0.000	42.552
147	0.000	0.000	-6.656
169	0.000	0.000	-76.609
179	0.000	0.000	18.822
189	0.000	0.000	-0.344
211	0.000	0.000	228.775
221	0.000	0.000	190.645
231	0.000	0.000	-18.055

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Sum of Forces

-3815.689

Moments about Axis Y (kN.m)

3772.748

Forces in Direction Z (kN)

-350.000

Reaction

3815.689

-3772.748

350.000

Support Reactions

Loadcase B11 : HL:Accidental Wheel Hog Span

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	5.718
53	0.000	0.000	-56.108
63	0.000	0.000	-91.888
85	0.000	0.000	-8.014
95	0.000	0.000	19.566
105	0.000	0.000	70.628
127	0.000	0.000	-7.236
137	0.000	0.000	40.340
147	0.000	0.000	23.468
169	0.000	0.000	7.000
179	0.000	0.000	-34.137
189	0.000	0.000	-22.100
211	0.000	0.000	-29.810
221	0.000	0.000	290.617
231	0.000	0.000	141.954

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Sum of Forces

-3815.689

Moments about Axis Y (kN.m)

10256.499

Forces in Direction Z (kN)

-350.000

Reaction

3815.689

-10256.499

350.000

Total accidental wheel load = $2 \times (100 + 75) = 350 \text{ kN}$ □

Hence 350 kN OK

Total accidental wheel load = $2 \times (100 + 75) = 350 \text{ kN}$ □

Hence 350 kN OK

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

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Support Reactions

Loadcase B12 : Footway Sag Span 1

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	63.672
53	0.000	0.000	90.493
63	0.000	0.000	-7.531
85	0.000	0.000	-8.892
95	0.000	0.000	-6.915
105	0.000	0.000	-1.017
127	0.000	0.000	23.533
137	0.000	0.000	25.058
147	0.000	0.000	-4.055
169	0.000	0.000	-13.948
179	0.000	0.000	-0.891
189	0.000	0.000	-2.294
211	0.000	0.000	68.657
221	0.000	0.000	82.211
231	0.000	0.000	-4.080

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-1793.894

3204.312

-304.000

Reaction

1793.894

-3204.312

304.000

Support Reactions

Loadcase B13 : Footway Hog Spans 1 & 2

Analysed at 10:45 hrs on 11/11/14

Joint	Moment X (kN.m)	Moment Y (kN.m)	Force Z (kN)
43	0.000	0.000	56.613
53	0.000	0.000	164.068
63	0.000	0.000	58.069
85	0.000	0.000	-10.627
95	0.000	0.000	-7.415
105	0.000	0.000	-14.215
127	0.000	0.000	18.504
137	0.000	0.000	47.610
147	0.000	0.000	18.504
169	0.000	0.000	-14.216
179	0.000	0.000	-7.415
189	0.000	0.000	-10.628
211	0.000	0.000	58.069
221	0.000	0.000	164.068
231	0.000	0.000	56.613

Support Reactions**Equilibrium Check**

Moments about Axis X (kN.m)

Moments about Axis Y (kN.m)

Forces in Direction Z (kN)

Sum of Forces

-3408.399

11575.393

-577.600

Reaction

3408.399

-11575.393

577.600

Total footway load = $2.0 \times 19 \times 2 \times 4.0 = 304 \text{ kN}$ □

Hence 304 kN OK

Total footway load = $2.0 \times 38 \times 2 \times 3.8 = 577.6 \text{ kN}$ □

Hence 577.6 kN OK

2 Span Reinforced Concrete Deck Example
 Deck with Torsional Member Stiffness

10:50 : 11/11/14

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Longitudinals : Minimum Member End Forces

Loadcase C1 : Dead Load SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-57.992	-1265.111h	342.495
50	53	-41.420	-1364.481h	-450.342
50	53	-41.420	-1364.481h	-450.342

Longitudinals : Maximum Member End Forces

Loadcase C1 : Dead Load SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
184	193	34.839	669.089s	32.227
44	47	32.858	698.130s	-5.596
211	221	-41.420	-1364.481h	450.342

Longitudinals : Minimum Member End Forces

Loadcase C2 : Dead Load ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-67.964	-1490.276h	403.555
50	53	-48.986	-1605.518h	-529.178
50	53	-48.986	-1605.518h	-529.178

Longitudinals : Maximum Member End Forces

Loadcase C2 : Dead Load ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
184	193	40.952	788.046s	38.265
44	47	38.790	822.259s	-6.507
211	221	-48.986	-1605.518h	529.178

Longitudinals : Minimum Member End Forces

Loadcase C3 : Permanent Loads SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
190	199	-70.931	-886.065h	-309.431
211	221	-53.933	-1621.429h	468.812
50	53	-53.933	-1621.428h	-468.812

Longitudinals : Maximum Member End Forces

Loadcase C3 : Permanent Loads SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
184	193	28.859	591.987s	18.673
44	47	26.931	600.336s	-18.662
211	221	-53.933	-1621.429h	468.812

Longitudinals : Minimum Member End Forces

Loadcase C4 : Permanent Loads ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
190	199	-83.490	-1049.003h	-364.460
211	221	-64.001	-1913.855h	551.342
50	53	-64.001	-1913.855h	-551.342

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

10:50 : 11/11/14

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Longitudinals : Maximum Member End Forces

Loadcase C4 : Permanent Loads ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
184	193	33.776	695.524s	22.000
44	47	31.679	704.905s	-22.187
211	221	-64.001	-1913.855h	551.342

Longitudinals : Minimum Member End Forces

Loadcase C5 : Dead + HA + Fwy Sag SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-74.666	-1569.708h	363.332
50	53	-52.498	-1682.735h	-599.503
50	53	-52.498	-1682.735h	-599.503

Longitudinals : Maximum Member End Forces

Loadcase C5 : Dead + HA + Fwy Sag SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
185	194	59.879	1176.603s	-37.209
105	110	59.280	1187.837s	-31.877
211	221	-53.521	-1664.649h	479.442

Longitudinals : Minimum Member End Forces

Loadcase C7 : Dead + HB + Fwy Sag SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-79.449	-1580.487h	359.907
211	221	-59.421	-1718.422h	489.023
50	53	-60.454	-1680.970h	-599.860

Longitudinals : Maximum Member End Forces

Loadcase C7 : Dead + HB + Fwy Sag SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
64	67	64.530	1102.148s	76.162
145	152	61.278	1225.720s	-52.260
211	221	-59.421	-1718.422h	489.023

Longitudinals : Minimum Member End Forces

Loadcase C9 : Dead + HA + Fwy + Setl Hog SL

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-86.687	-1914.095h	446.865
50	53	-69.272	-2031.837h	-599.957
50	53	-69.272	-2031.837h	-599.957

Longitudinals : Maximum Member End Forces

Loadcase C9 : Dead + HA + Fwy + Setl Hog SL

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
84	88	41.020	818.051s	38.147
44	47	40.926	851.465s	-7.631
211	221	-68.905	-2029.260h	582.433

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

10:50 : 11/11/14

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Longitudinals : Minimum Member End Forces

Loadcase C11 : Dead + HB + Fwy + Setl Hog SL

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
190	199	-87.619	-1136.632h	-407.896
211	221	-65.844	-2089.357h	598.339
50	53	-68.967	-2048.631h	-596.169

Longitudinals : Maximum Member End Forces

Loadcase C11 : Dead + HB + Fwy + Setl Hog SL

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
104	109	46.026	808.037s	47.162
184	194	39.855	867.359s	6.878
211	221	-65.844	-2089.357h	598.339

Longitudinals : Minimum Member End Forces

Loadcase C6 : Dead + HA + Fwy Sag ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-89.182	-1879.405h	430.385
50	53	-62.494	-2013.467h	-721.297
50	53	-62.494	-2013.467h	-721.297

Longitudinals : Maximum Member End Forces

Loadcase C6 : Dead + HA + Fwy Sag ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
185	194	73.087	1433.388s	-44.989
105	110	72.329	1447.059s	-38.640
211	221	-64.749	-1990.468h	567.334

Longitudinals : Minimum Member End Forces

Loadcase C8 : Dead + HB + Fwy Sag ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-93.801	-1873.661h	425.130
211	221	-71.071	-2036.208h	577.159
50	53	-71.048	-1992.445h	-713.094

Longitudinals : Maximum Member End Forces

Loadcase C8 : Dead + HB + Fwy Sag ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
64	67	76.879	1313.897s	90.907
145	152	73.142	1461.353s	-61.615
211	221	-71.071	-2036.208h	577.159

Longitudinals : Minimum Member End Forces

Loadcase C10 : Dead + HA + Fwy + Setl Hog UL

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-104.306	-2304.382h	537.405
50	53	-83.459	-2445.743h	-722.349
50	53	-83.459	-2445.743h	-722.349

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

10:50 : 11/11/14

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Longitudinals : Maximum Member End Forces

Loadcase C10 : Dead + HA + Fwy + Setl Hog UL

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
84	88	49.560	986.616s	45.974
44	47	49.477	1027.537s	-8.573
211	221	-82.999	-2442.523h	700.445

Longitudinals : Minimum Member End Forces

Loadcase C12 : Dead + HB + Fwy + Setl ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
190	199	-104.639	-1355.051h	-486.019
211	221	-78.438	-2490.888h	713.427
50	53	-82.129	-2442.757h	-710.862

Longitudinals : Maximum Member End Forces

Loadcase C12 : Dead + HB + Fwy + Setl ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
104	109	54.674	961.389s	55.804
184	194	47.445	1031.271s	7.805
211	221	-78.438	-2490.888h	713.427

Longitudinals : Minimum Member End Forces

Loadcase C13 : Dead + HA + Fwy Shear Span 1

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-86.778	-1832.236h	427.160
50	53	-60.920	-1963.992h	-703.348
50	53	-60.920	-1963.992h	-703.348

Longitudinals : Maximum Member End Forces

Loadcase C13 : Dead + HA + Fwy Shear Span 1

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
125	131	67.463	1325.305s	-23.371
44	47	66.144	1328.784s	15.579
211	221	-62.836	-1944.565h	563.216

Longitudinals : Minimum Member End Forces

Loadcase C14 : Dead + HB + Fwy Shear Span 1

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
71	74	-85.647	-1821.744h	427.657
50	53	-60.839	-1954.409h	-691.965
50	53	-60.839	-1954.409h	-691.965

Longitudinals : Maximum Member End Forces

Loadcase C14 : Dead + HB + Fwy Shear Span 1

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
124	130	72.433	1248.822s	80.167
184	194	68.585	1366.846s	30.065
211	221	-63.790	-1934.680h	563.540

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

10:50 : 11/11/14

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Longitudinals : Minimum Member End Forces

Loadcase C15 : Dead + Footway Span 1 SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
190	199	-61.206	-664.193h	-309.623
50	53	-40.063	-1405.007h	-473.012
50	53	-40.063	-1405.007h	-473.012

Longitudinals : Maximum Member End Forces

Loadcase C15 : Dead + Footway Span 1 SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
204	214	37.921	716.553s	34.276
44	47	34.883	747.190s	-4.683
211	221	-43.972	-1403.443h	457.469

Longitudinals : Minimum Member End Forces

Loadcase C17 : Dead + Accidental Wheel SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
190	199	-83.284	-699.024h	-333.492
211	221	-58.226	-1497.749h	476.603
210	221	-64.280	-1497.173h	-474.720

Longitudinals : Maximum Member End Forces

Loadcase C17 : Dead + Accidental Wheel SLS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
203	213	69.914	630.908s	117.516
205	215	49.112	892.715s	-8.890
211	221	-58.226	-1497.749h	476.603

Ppt Edge Beam : Minimum Member End Forces

Loadcase C16 : Dead + Footway Span 1 ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
251	263	-26.995	-332.288h	63.214
250	263	-3.403	-334.982h	-57.206
9	10	-16.802	-217.620h	-105.903

Ppt Edge Beam : Maximum Member End Forces

Loadcase C16 : Dead + Footway Span 1 ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
244	256	14.904	231.104s	19.535
4	5	13.604	242.917s	-8.783
252	264	-19.154	-227.989h	99.313

Ppt Edge Beam : Minimum Member End Forces

Loadcase C18 : Dead + Accidental Wheel ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
251	263	-33.664	-360.300h	62.937
250	263	-11.254	-370.206h	-62.636
249	262	-4.870	-274.636h	-112.036

2 Span Reinforced Concrete Deck Example
Deck with Torsional Member Stiffness

10:50 : 11/11/14

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Ppt Edge Beam : Maximum Member End Forces

Loadcase C18 : Dead + Accidental Wheel ULS

Analysed at 10:45 hrs on 11/11/14

Member	Joint	Torque (kN.m)	Bending Moment (kN.m)	Shear Force (kN)
244	256	35.685	246.684s	60.611
246	258	-1.109	330.837s	-74.188
252	264	-23.455	-251.594h	101.778