

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	650	650	650	650	650	650	650
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	580	200	200	200	200	200
Width of Siffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	971.0	1,050.0	1,370.0	1,437.0	1,552.0	1,677.0	1,688.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>								
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre Neutral Axis	mm	549	612	1,479	1,500	1,533	1,566	1,568
Depth of equivalent stress block	mm	420	467	1,130	1,147	1,172	1,197	1,199
Average stress in Prestress stell at nominal bending resistance	Mpa	1,566	1,557	1,298	1,316	1,346	1,374	1,376
Nominal Resistance	N.mm	7.06E+09	7.57E+09	7.32E+09	7.89E+09	8.88E+09	9.99E+09	1.01E+10
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	N.mm	7.06E+09	7.57E+09	7.32E+09	7.89E+09	8.88E+09	9.99E+09	1.01E+10
<b>Checking</b>								
Factored Bending Moment due to External Loads	N.mm	0.00E+00	7.76E+08	3.93E+09	4.61E+09	5.80E+09	7.32E+09	7.70E+09

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13
<b>Sectional Properties</b>							
Depth of Girder	H	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	bd	650	650	650	650	650	650
Depth of Deck Slap	hd	210	210	210	210	210	210
Total width of Webs	bw	200	200	200	200	200	200
Width of Sffit Slap	bs	650	650	650	650	650	650
Depth of Soffit Slap	hs	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>							
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	Ap	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6
<b>Area of Tensile Reinforcement</b>							
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	dp	1,677.0	1,552.0	1,437.0	1,370.0	1,050.0	970.0
Area of Compressive Reinforcement	Ast	0.0	0.0	0.0	0.0	0.0	0.0
<b>Area of Compressive Reinforcement</b>							
Distance from extreme compressive fibre of Compressive Reinforcement	dsc	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>							
Stress block factor	$\beta_1$	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre Neutral Axis	c	1,566	1,533	1,500	1,479	612	549
Depth of equivalent stress block	a	1,197	1,172	1,147	1,130	467	420
Average stress in Prestress stell at nominal bending resistance	fps	1,374	1,346	1,316	1,298	1,557	1,566
Nominal Resistance	Mn	9.99E+09	8.88E+09	7.89E+09	7.32E+09	7.57E+09	7.06E+09
Flexural Resistance factor	$\phi$	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	Mr	9.99E+09	8.88E+09	7.89E+09	7.32E+09	7.57E+09	7.06E+09
<b>Checking</b>							
Factored Bending Moment due to External Loads	Mu	7.32E+09	5.80E+09	4.61E+09	3.93E+09	7.76E+08	0.00E+00

(2) Checking Nominal Shear Strength of Section during Construction Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	650	650	650	650	650	650	650
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	580	200	200	200	200	200
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>								
Ap	mm <sup>2</sup>	5,923	5,923	5,923	5,923	5,923	5,923	5,923
<b>Distance from extreme compressive fibre to centroid of Prestressing Cables</b>								
dp	mm	971	1,050	1,370	1,437	1,552	1,677	1,688
<b>Area of Tensile Reinforcement</b>								
Ast	mm <sup>2</sup>	0	0	0	0	0	0	0
<b>Distance from extreme compressive fibre to centroid of Tensile Reinforcement</b>								
dst	mm	0	0	0	0	0	0	0
<b>Area of Compressive Reinforcement</b>								
Asc	mm <sup>2</sup>	0	0	0	0	0	0	0
<b>Distance from extreme compressive fibre to centroid of Compressive Reinforcement</b>								
dsc	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
dv	mm	1,332	1,332	1,332	1,332	1,332	1,332	1,332
bv	mm	650	580	200	200	200	200	200
s	mm <sup>2</sup>	150	150	150	300	300	300	300
α	degree	90	90	90	90	90	90	90
β	degree	6.8	6.8	6.1	6.6	6.3	5.5	5.4
Av	mm <sup>2</sup>	616	616	616	308	308	308	308
ex	mm	-0.000254	-0.000248	-0.000245	-0.000219	-0.000163	-0.000083	-0.000070
θ	degree	27.00	27.00	23.14	25.06	27.00	27.00	27.00
<b>Component of effective prestressed force in the direction of the applied shear</b>								
Vp	N	-5.42E+05	-5.06E+05	-4.25E+05	-3.53E+05	-2.46E+05	-7.94E+04	0.00E+00
Vc	N	3.08E+06	2.75E+06	8.35E+05	9.26E+05	8.86E+05	7.69E+05	7.55E+05
Vs	N	4.19E+06	4.19E+06	4.99E+06	1.14E+06	1.05E+06	1.05E+06	1.05E+06
Vn	N	6.72E+06	6.43E+06	2.24E+06	1.71E+06	1.69E+06	1.74E+06	1.80E+06
φ	degree	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Vr	N	6.05E+06	5.79E+06	2.02E+06	1.54E+06	1.52E+06	1.56E+06	1.62E+06
<b>Checking</b>								
<b>Factored Moment due to External Loads</b>								
Mu	N.mm	0.00E+00	7.76E+08	3.93E+09	4.61E+09	5.80E+09	7.32E+09	7.70E+09
<b>Factored Axial Force due to External Loads</b>								
Nu	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>Factored Shear Force due to External Loads</b>								
Vu	N	8.69E+05	8.09E+05	6.01E+05	5.35E+05	4.19E+05	1.87E+05	0.00E+00

(2) Checking Nominal Shear Strength of Section during Construction Stage - 2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13
<b>Sectional Properties</b>							
Depth of Girder	H	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	bd	650	650	650	650	650	650
Depth of Deck Slap	hd	210	210	210	210	210	210
Total width of Webs	bw	200	200	200	200	200	200
Width of Soffit Slap	bs	650	650	650	650	650	650
Depth of Soffit Slap	hs	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>							
Distance from extreme compressive fibre to centroid of Prestressing Cables	Ap	5,923	5,923	5,923	5,923	5,923	5,923
<b>Area of Tensile Reinforcement</b>							
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	dp	1,677	1,552	1,437	1,370	1,050	971
Area of Compressive Reinforcement	Ast	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	dsc	0	0	0	0	0	0
<b>Calculation of Mr</b>							
Effective shear Depth	dv	1,332	1,332	1,332	1,332	1,332	1,332
Effective web width	bv	200	200	200	200	580	650
Spacing of stirrups	s	300	150	150	150	150	150
Angle of inclination of transverse reinforcement to longitudinal axis of girder	$\alpha$	90	90	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension	$\beta$	5.5	6.3	6.8	6.8	6.8	6.8
Area of shear reinf. within a distance	Av	308	616	616	616	616	616
Strain in the tensile reinforcement	ex	-0.000083	-0.000163	-0.000225	-0.000257	-0.000248	-0.000254
Inclination angle of diagonal compressive stress	$\theta$	27.00	27.00	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	Vp	7.94E+04	2.46E+05	3.53E+05	4.25E+05	5.06E+05	5.42E+05
Nominal Resistance of Concrete	Vc	7.69E+05	8.86E+05	9.48E+05	9.48E+05	2.75E+06	3.08E+06
Nominal Resistance of Reinforcement	Vs	1.05E+06	4.19E+06	4.19E+06	4.19E+06	4.19E+06	4.19E+06
Nominal Resistance	Vn	1.89E+06	2.91E+06	3.02E+06	3.09E+06	7.44E+06	7.81E+06
Resistance factor for shear	$\phi$	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	Vr	1.71E+06	2.62E+06	2.71E+06	2.78E+06	6.70E+06	7.03E+06
<b>Checking</b>							
Factored Moment due to External Loads	Mu	7.32E+09	5.80E+09	4.61E+09	3.93E+09	7.76E+08	0.00E+00
Factored Axial Force due to External Loads	Nu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	Vu	1.87E+05	4.19E+05	5.35E+05	6.01E+05	8.09E+05	8.69E+05

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slab	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slab	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	580	200	200	200	200	200
Width of Soffit Slab	mm	650	650	650	650	650	650	650
Depth of Soffit Slab	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,181.0	1,260.0	1,580.0	1,647.0	1,762.0	1,887.0	1,898.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>								
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	mm	565	629	1,541	1,558	1,586	1,621	1,615
Depth of equivalent stress block	mm	432	481	1,178	1,191	1,212	1,232	1,234
Average stress in Prestress steel at nominal bending resistance	Mpa	1,611	1,600	1,352	1,367	1,391	1,415	1,417
Nominal Resistance	N.mm	1.00E+10	1.07E+10	1.28E+10	1.34E+10	1.45E+10	1.58E+10	1.59E+10
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	N.mm	1.00E+10	1.07E+10	1.28E+10	1.34E+10	1.45E+10	1.58E+10	1.59E+10
<b>Checking</b>								
Factored Bending Moment due to External Loads	N.mm	1.25E+08	1.04E+09	4.95E+09	5.77E+09	7.14E+09	8.85E+09	8.95E+09

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13	Section 14
<b>Sectional Properties</b>								
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slab	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slab	mm	210	210	210	210	210	210	210
Total width of Webs	mm	200	200	200	200	200	200	200
Width of Soffit Slab	mm	650	650	650	650	650	650	650
Depth of Soffit Slab	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,887.0	1,762.0	1,647.0	1,580.0	800.0	879.0	2,060.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	7,603.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0	2,060.0	2,060.0	1,955.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0	2,060.0	2,060.0	2,060.0
<b>Calculation of Mr</b>								
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	mm	1,612	1,586	1,558	1,541	582	540	176
Depth of equivalent stress block	mm	1,232	1,212	1,191	1,178	445	413	134
Average stress in Prestress steel at nominal bending resistance	Mpa	1,415	1,391	1,367	1,352	1,481	1,540	1,816
Nominal Resistance	N.mm	1.58E+10	1.45E+10	1.34E+10	1.28E+10	5.11E+09	6.14E+09	5.60E+09
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0	0.8
Factored Resistance	N.mm	1.58E+10	1.45E+10	1.34E+10	1.28E+10	5.11E+09	6.14E+09	4.20E+09
<b>Checking</b>								
Factored Bending Moment due to External Loads	N.mm	8.22E+09	6.02E+09	4.54E+09	3.67E+09	1.50E+09	2.30E+09	2.30E+09

(4) Checking Nominal Shear Strength of Section at Service Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	580	200	200	200	200	200
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>								
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm2	5,923	5,923	5,923	5,923	5,923	5,923	5,923
<b>Area of Tensile Reinforcement</b>								
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	1,181	1,260	1,580	1,647	1,762	1,887	1,898
Area of Compressive Reinforcement	mm2	0	0	0	0	0	0	0
<b>Distance from extreme compressive fibre to centroid of Compressive Reinforcement</b>								
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
Effective shear Depth	mm	1,483	1,483	1,483	1,483	1,483	1,483	1,483
Effective web width	mm	650	580	200	200	200	200	200
Spacing of stirrups	mm2	150	150	150	300	300	300	300
<b>Angle of inclination of transverse reinforcement to longitudinal axis of girder</b>								
Factor indicating ability of diagonally cracked concrete to transmit tension	degree	90	90	90	90	90	90	90
<b>Area of shear reinf. within a distances</b>								
Strain in the tensile reinforcement	mm2	616	616	616	308	308	308	308
Inclination angle of diagonal compressive stress	degree	-0.000200	-0.000196	-0.000178	-0.000155	-0.000107	-0.000033	-0.000029
Component of effective prestressed force in the direction of the applied shear		27.00	27.00	22.17	24.07	27.00	27.00	27.00
Nominal Resistance of Concrete	N	-5.42E+05	-5.06E+05	-4.25E+05	-3.53E+05	-2.46E+05	-7.94E+04	0.00E+00
Nominal Resistance of Reinforcement	N	3.43E+06	3.04E+06	7.31E+05	9.30E+05	8.88E+05	7.98E+05	7.94E+05
Nominal Resistance	N	4.66E+06	4.66E+06	5.83E+06	1.33E+06	1.17E+06	1.17E+06	1.17E+06
Resistance factor for shear	N	7.55E+06	7.19E+06	2.54E+06	1.91E+06	1.81E+06	1.88E+06	1.96E+06
Factored Resistance	N	0.9	0.9	0.9	0.9	0.9	0.9	0.9
<b>Checking</b>								
Factored Moment due to External Loads	N	6.79E+06	6.47E+06	2.29E+06	1.72E+06	1.63E+06	1.70E+06	1.76E+06
Factored Axial Force due to External Loads	N.mm	1.25E+08	1.04E+09	4.95E+09	5.77E+09	7.14E+09	8.85E+09	8.95E+09
Factored Shear Force due to External Loads	N	6.37E+05	4.80E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	1.17E+06	1.09E+06	8.02E+05	7.07E+05	5.29E+05	2.55E+05	1.88E+05

(4) Checking Nominal Shear Strength of Section at Service Stage - 2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13
<b>Sectional Properties</b>							
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	650	650
Depth of Deck Slap	mm	210	210	210	210	210	2,035
Total width of Webs	mm	200	200	200	200	580	650
Width of Soffit Slap	mm	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>							
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm <sup>2</sup>	5,923	5,923	5,923	5,923	5,923	5,923
<b>Area of Tensile Reinforcement</b>							
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	1,887	1,762	1,647	1,580	800	879
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0
<b>Compressive Reinforcement</b>							
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	2,060	2,060
<b>Calculation of Mr</b>							
Effective shear Depth	mm	1,483	1,483	1,483	1,483	1,483	1,483
Effective web width	mm	200	200	200	200	580	650
Spacing of stirrups	mm <sup>2</sup>	300	150	150	150	150	150
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90	90	90
<b>Factor indicating ability of diagonally cracked concrete to transmit tension</b>							
Area of shear reinf. within a distances	mm <sup>2</sup>	5.4	6.3	6.8	6.8	6.0	5.7
Strain in the tensile reinforcement	degree	-0.000063	-0.000163	-0.000233	-0.000266	-0.000133	-0.000107
Inclination angle of diagonal compressive stress	degree	27.00	27.00	27.00	27.00	27.00	27.00
<b>Component of effective prestressed force in the direction of the applied shear</b>							
Nominal Resistance of Concrete	N	7.94E+04	2.46E+05	3.53E+05	4.25E+05	5.06E+05	5.42E+05
Nominal Resistance of Reinforcement	N	8.33E+05	9.85E+05	1.06E+06	1.06E+06	2.71E+06	2.89E+06
Nominal Resistance	N	1.17E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06
Resistance factor for shear	N	2.08E+06	3.21E+06	3.32E+06	3.39E+06	7.87E+06	8.09E+06
Factored Resistance	N	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	N	1.87E+06	2.89E+06	2.99E+06	3.05E+06	7.08E+06	7.28E+06
<b>Checking</b>							
Factored Moment due to External Loads	N.mm	8.22E+09	6.02E+09	4.54E+09	3.67E+09	1.50E+09	2.30E+09
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	3.26E+05	6.12E+05	6.95E+05	7.89E+05	1.10E+06	1.18E+06



**Checking Stress during construction**  
 Load Combinations for Checking Stress during  
 construction stage

Stress checking during construction stage (AASHTO 5.9.4.2)

COMBINATION 14		COMBINATION 14	
Section	Load type	Factor	
	Girder Selfweight G_DC	1.00	
	Slab+Dia. Selfweight S_D	1.00	
	Prestress PS	1.00	
Section	N(T)	V(T)	M(T.m)
SEC-1	633.99	3.70	0.00
SEC-2	633.99	3.35	-40.47
SEC-3	644.24	-2.44	-38.74
SEC-4	653.03	0.41	-38.79
SEC-5	661.26	3.37	-39.88
SEC-6	661.23	4.54	-22.73
SEC-7	656.44	0.00	4.87
SEC-8	661.23	-4.54	-22.73
SEC-9	661.26	-3.37	-39.88
SEC-10	653.03	-0.41	-38.79
SEC-11	644.24	2.44	-38.74
SEC-12	633.99	-3.35	-40.47
SEC-13	633.99	-3.70	0.00

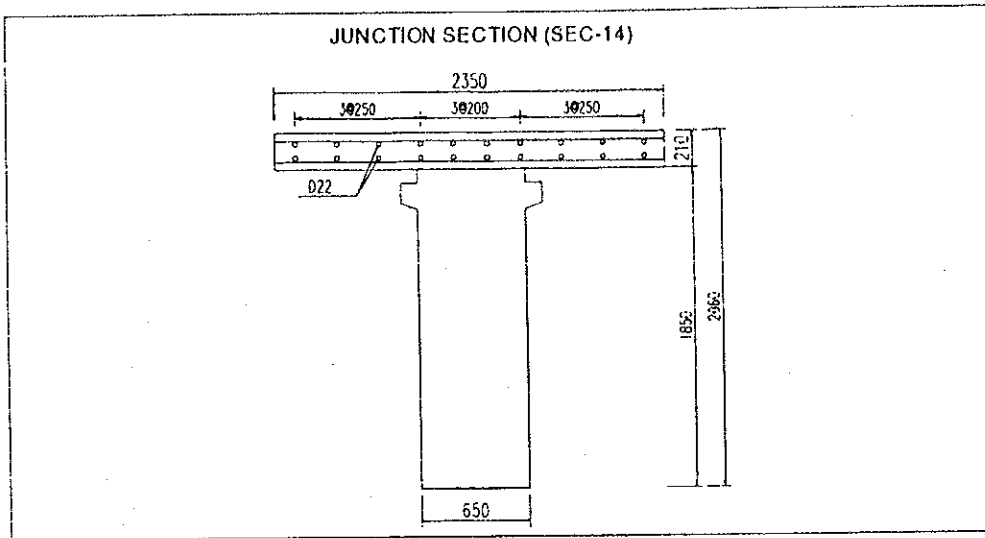
Section	COMBINATION 14		
	$\sigma_1$ (T/m <sup>2</sup> )	Checking	$\sigma_2$ (T/m <sup>2</sup> )
SEC-1	512.28	OK	512.28
SEC-2	448.35	OK	664.46
SEC-3	816.99	OK	1062.95
SEC-4	829.94	OK	1075.49
SEC-5	839.05	OK	1090.00
SEC-6	893.84	OK	1035.68
SEC-7	973.71	OK	943.32
SEC-8	893.84	OK	1035.68
SEC-9	839.05	OK	1090.00
SEC-10	829.94	OK	1075.49
SEC-11	816.99	OK	1062.95
SEC-12	448.35	OK	664.46
SEC-13	512.28	OK	512.28

Checking Stress at service stage  
Load Combinations for Checking Stress at service stage

Section	COMBINATION 11			COMBINATION 12			COMBINATION 13		
	N(T)	V(T)	M(T.m)	N(T)	V(T)	M(T.m)	N(T)	V(T)	M(T.m)
			Factor			Factor			Factor
SEC-1	766.13	28.67	16.87	766.13	17.37	11.11	770.93	18.22	14.45
SEC-2	734.64	26.57	-9.54	734.64	15.68	-17.72	739.30	16.53	-16.59
SEC-3	597.59	11.91	52.29	597.59	2.18	8.54	601.44	3.79	12.66
SEC-4	580.08	13.93	63.55	580.08	2.77	11.44	583.93	5.29	16.57
SEC-5	542.35	11.97	78.42	542.35	0.83	10.13	546.21	4.36	17.74
SEC-6	488.87	9.35	119.82	488.87	0.66	38.79	492.74	4.81	49.73
SEC-7	475.48	-2.29	135.06	475.48	-11.37	51.84	479.34	-5.67	65.64
SEC-8	488.87	-6.41	90.83	488.87	-16.83	19.04	492.74	-8.73	34.71
SEC-9	542.35	-14.05	17.62	542.35	-24.91	-35.54	546.21	-15.23	-16.12
SEC-10	580.08	-7.90	-7.32	580.08	-22.18	-53.91	583.93	-10.12	-29.29
SEC-11	597.59	-6.70	-20.29	597.59	-21.11	-68.01	601.44	-8.69	-38.80
SEC-12	734.64	-21.00	-74.96	734.64	-35.65	-160.84	739.30	-21.95	-92.62
SEC-13	766.13	-22.18	-48.81	766.13	-37.04	-145.37	770.93	-22.63	-67.46
			Load type			Load type			Load type
			Girder Selfweight G_DC			Girder Selfweight G_DC			Girder Selfweight G_DC
			Slab+Dia. Selfweight S_D			Slab+Dia. Selfweight S_D			Slab+Dia. Selfweight S_D
			Surface + Railings DW			Surface + Railings DW			Surface + Railings DW
			Max. Live Load LL_MAX			Max. Live Load LL_MAX			Max. Live Load LL_MAX
			Min. Live Load LL_MIN			Min. Live Load LL_MIN			Min. Live Load LL_MIN
			Max. Impact IM_MAX			Max. Impact IM_MAX			Max. Impact IM_MAX
			Min. Impact IM_MIN			Min. Impact IM_MIN			Min. Impact IM_MIN
			Creep Diff. CR_D			Creep Diff. CR_D			Creep Diff. CR_D
			Shrinkage Diff. SH_D			Shrinkage Diff. SH_D			Shrinkage Diff. SH_D
			Temperature Diff. TG			Temperature Diff. TG			Temperature Diff. TG
			Creep CR			Creep CR			Creep CR
			Prestress PS			Prestress PS			Prestress PS



## Stress Check at Junction of the Girders



Moment due to Service Load	$M =$	145.4 tf.m	
Tensile Reinforcement	$A_s = 2 \times D22$ (Nos=2x10=20)		
Stress of Concrete	$f_{cj} =$	159.4 t/m <sup>2</sup>	< 1835.5 t/m <sup>2</sup>
Stress of Tensile Reinf.	$f_s =$	-816.5 t/m <sup>2</sup>	> -17896.1 t/m <sup>2</sup>

Design of connector at the interface between girder and deck slab (AASHTO 5.8.4):

$$V_h = V_u / d_e$$

Horizontal Shear per unit length of girder  $V_h$  due to Vertical Shear  $V_u$   
 Distance from the centroid of tensile steel to the midthickness of the deck

Required area of reinforcement:

$$A_{s,r} \geq \max \{ 0.35 b_v / f_y; (V_h - c b_v - \mu P_c) / \mu f_y \}$$

Width of the interface between the girder and the deck:

Yield strength of reinforcement

Cohesion factor

Friction factor

Permanent net compressive force normal to the shear plan

$$b_v = 600 \text{ mm}$$

$$f_y = 390 \text{ MPa}$$

$$c = 0.17 \text{ MPa}$$

$$\mu = 0.7$$

$$P_c = 58750 \text{ N}$$

Section	SEC-1	SEC-2	SEC-3	SEC-4	SEC-5	SEC-6	SEC-7	SEC-8	SEC-9	SEC-10	SEC-11	SEC-12	SEC-13
$d_e$ (mm)	1076	1155	1475	1542	1657	1782	1793	1782	1657	1542	1475	1155	1076
Interface Shear(N):													
Girder Selfweight G_DC	349173	320848	239289	210674	165110	73982	0	-73982	-165110	-210674	-239289	-320848	-349173
Slab+Dia. Selfweight S_D	218990	207799	153657	139138	108891	48396	0	-48396	-108891	-139138	-153657	-207799	-218990
Surface + Railings DW	135318	121234	53097	39796	1731	-5341	-64779	-51323	-125929	-104385	-122656	-187797	-201881
Max. Live Load LL_MAX	96340	92551	74826	79660	70061	41824	31107	21337	10855	20465	18301	13409	13377
Min. Live Load LL_MIN	-7825	-7885	-14884	-23194	-32610	-38268	-52533	-74715	-89260	-111124	-114509	-121680	-123617
Max. Impact IM_MAX	31792	30542	24692	26288	23120	13802	10265	7041	3582	6753	6039	4425	4414
Min. Impact IM_MIN	-2582	-2602	-4912	-7654	-10761	-12629	-17336	-24656	-29456	-36671	-37788	-40154	-40794
Creep Diff. CR_D	1179148	873859	-551084	-809192	-1259938	-1784325	-1868829	-1784325	-1259938	-809192	-551084	873859	1179148
Shrinkage Diff. SH_D	69672	67595	55911	55947	56043	56195	56210	56195	56043	55947	55911	67595	69672
Temperature Diff. TG	94058	91253	75480	75529	75659	75863	75884	75863	75659	75529	75480	91253	94058
Creep CR	7009	8037	8030	8034	8036	8035	9181	10279	9654	9162	13526	-4416	-3326
Total	2181500	1813719	133897	-174125	-751287	-1471570	-1750961	-1787311	-1504075	-1095532	-897429	329681	587298
Min	2042961	1680139	14584	-310920	-887840	-1578093	-1862203	-1915060	-1637228	-1270545	-1074066	150013	405096
$A_{s,r}$ required (mm <sup>2</sup> )	7840	6493	339	988	3101	5630	6670	6864	5846	4503	3783	1057	2000
Area of Stirrups (mm <sup>2</sup> )	3695	3695	3695	924	924	924	924	924	924	924	3695	3695	3695
Area of Dowel bars (mm <sup>2</sup> )	(D14 @ 150)	(D14 @ 150)	(D14 @ 150)	(D14 @ 300)	(D14 @ 300)	(D14 @ 300)	(D14 @ 300)	(D14 @ 300)	(D14 @ 300)	(D14 @ 300)	(D14 @ 150)	(D14 @ 150)	(D14 @ 150)
Total Connector Area (mm <sup>2</sup> )	10066	10066	10066	7295	7295	7295	7295	7295	7295	7295	10066	10066	10066
Checking	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

## Design of Deck Slab

### Summary of Bending Moment:

#### Bending Moment due to Live Load:

##### (a) Continuous Slab

1) Effective Span Length	1.700 m	
2) Load	10.000 T	
3) Impact Factor IM	33%	
4) Positive Moment	$M=0.8*(1+IM)*(0.12S+0.07)$	2.92 T.m/m
5) Negative Moment	$M=- (1+IM)*(0.15S+0.125)*$	-5.05 T.m/m

##### (2) Cantilever Slab

1) Effective Span Length	0.100 m < 0.5m --> ignore	
2) Load	10.000 T	
3) Impact Factor IM	33%	
4) Negative Moment		M= 0.00 T.m/m

#### Bending Moment due to Self-weight of Slab:

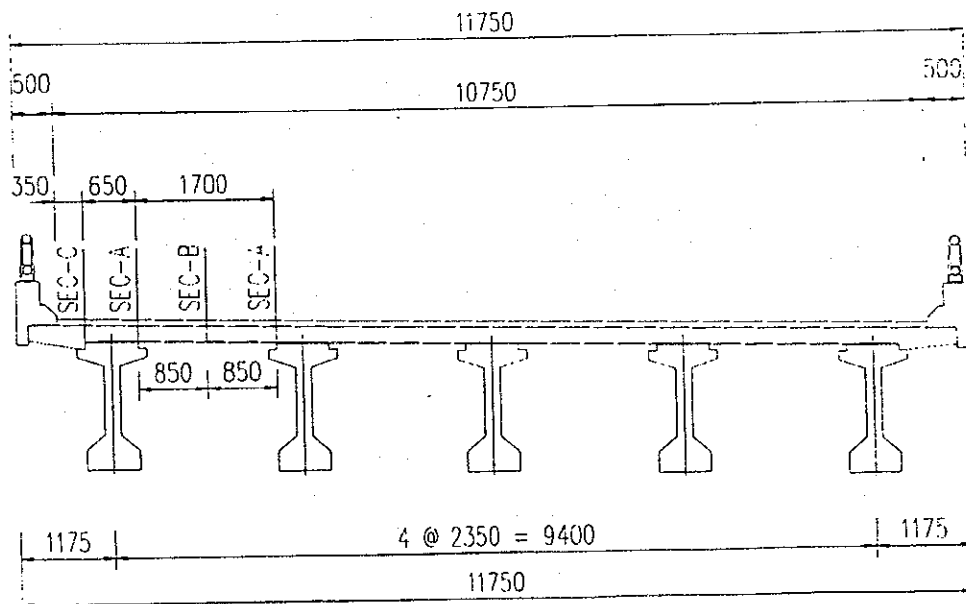
Section	A	B	C
Bending Moment (T.m)	-0.152	0.152	-0.150

#### Bending Moment due to Asphalt Concrete:

Section	A	B	C
Bending Moment (T.m)	-0.050	0.050	-0.030

#### Bending Moment due to Parapet & Railings:

Section	A	B	C
Bending Moment (T.m)	0.000	0.000	-0.424

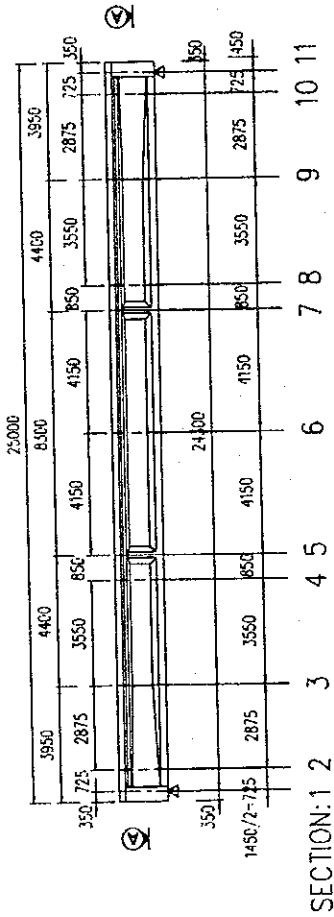


Checking Nominal Flexural Strength of Deck Slab (Article 5.7.3.2.2 AASHTO)

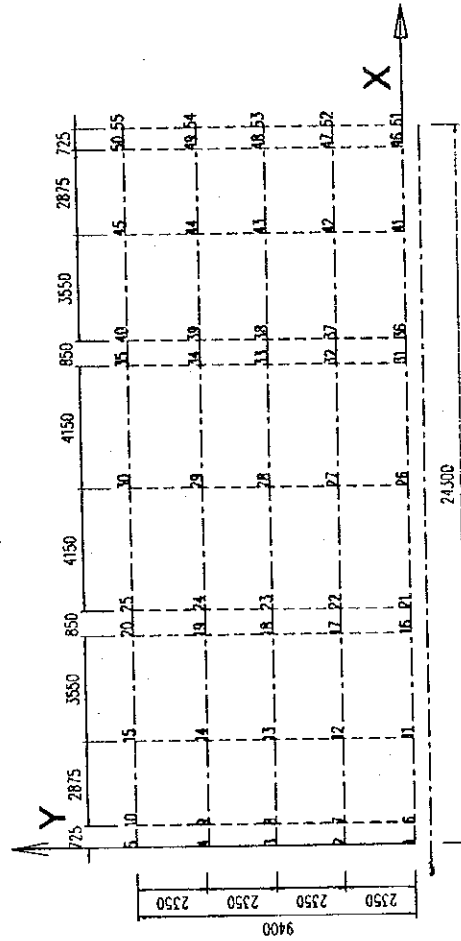
	Section A	Section B	Section C
<b>Sectional Properties</b>			
Depth of Slab	H 210 mm	210 mm	210 mm
Width of Slab	ds 1000 mm	1000 mm	1000 mm
Area of Tensile Reinforcement	A <sub>st</sub> 1885 mm <sup>2</sup>	1885 mm <sup>2</sup>	1885 mm <sup>2</sup>
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	d <sub>st</sub> 162 mm	162 mm	162 mm
Area of Compressive Reinforcement	A <sub>sc</sub> 0 mm <sup>2</sup>	0 mm <sup>2</sup>	0 mm <sup>2</sup>
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	d <sub>sc</sub> 48 mm	48 mm	48 mm
<b>Calculation of Mr</b>			
Stress block factor	β <sub>1</sub> 0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	c 28 mm	28 mm	28 mm
Depth of equivalent stress block	a 22 mm	22 mm	22 mm
Nominal Resistance	M <sub>n</sub> 111,144,141 N.mm	111,144,141 N.mm	111,144,141 N.mm
Flexural Resistance factor	φ 0.9	0.9	0.9
Factored Resistance	M <sub>r</sub> 100,029,726 N.mm	100,029,726 N.mm	100,029,726 N.mm
<b>Checking</b>			
Factored Bending Moment due to External Loads	M <sub>u</sub> 91,089,350 N.mm	53,663,150 N.mm	7,617,528 N.mm
	OK	OK	OK

- 2.4 PC COMPOSITE I BEAM (SIMPLE SPAN)  
 (1) PC COMPOSITE I BEAM (SIMPLE SPAN),  
 CASE 1

Structural Views, Design Sections  
**ELEVATION**  
 (SCALE 1 : 250)



**SECTION A - A**  
 (SCALE 1 : 250)





Summary of Sectional Forces:

Section	S.W of girder			S.W of Deck Slab+Diaphragms			S.W of Surface		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	0.00	20.76	0.00	0.00	14.99	0.00	0.00	11.98	-1.55
SEC-2	0.00	19.08	14.44	0.00	14.10	10.54	0.00	10.85	6.72
SEC-3	0.00	14.53	62.75	0.00	10.55	45.97	0.00	7.06	31.51
SEC-4	0.00	7.74	102.27	0.00	6.17	75.64	0.00	1.55	46.51
SEC-5	0.00	6.39	108.28	0.00	5.12	80.44	0.00	0.23	47.26
SEC-6	0.00	0.00	121.19	0.00	0.00	91.07	0.00	-0.13	59.96
SEC-7	0.00	-6.39	108.28	0.00	-5.12	80.44	0.00	-0.23	47.14
SEC-8	0.00	-7.74	102.27	0.00	-6.17	75.64	0.00	-1.55	46.51
SEC-9	0.00	-14.53	62.75	0.00	-10.55	45.97	0.00	-6.39	31.22
SEC-10	0.00	-19.08	14.44	0.00	-14.10	10.54	0.00	-10.85	6.72
SEC-11	0.00	-20.76	0.00	0.00	-14.99	0.00	0.00	-11.98	-1.55

Section	Prestress			LiveLoad max			LiveLoad min		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	376.83	-34.64	0.00	0.00	9.27	2.68	0.00	-0.30	-2.61
SEC-2	376.83	-32.49	-53.02	0.00	8.90	5.23	0.00	-0.30	-0.22
SEC-3	383.09	-26.09	-139.56	0.00	8.25	24.06	0.00	-1.19	-0.08
SEC-4	389.95	-18.93	-217.17	0.00	6.57	42.60	0.00	-2.29	-1.93
SEC-5	395.20	-11.66	-230.19	0.00	6.15	46.00	0.00	-2.66	-2.58
SEC-6	397.67	0.04	-260.13	0.00	3.34	50.79	0.00	-3.34	-2.07
SEC-7	395.20	11.69	-229.84	0.00	2.66	46.00	0.00	-6.15	-2.58
SEC-8	389.95	18.91	-216.80	0.00	2.29	42.60	0.00	-6.57	-1.93
SEC-9	383.09	26.01	-139.26	0.00	1.19	24.06	0.00	-8.25	-0.08
SEC-10	376.83	32.37	-52.99	0.00	0.30	5.23	0.00	-8.90	-0.22
SEC-11	376.83	34.64	0.00	0.00	0.30	2.68	0.00	-9.27	-2.61

Section	Impact max			Impact min		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	0.00	3.06	0.89	0.00	-0.10	-0.86
SEC-2	0.00	2.94	1.73	0.00	-0.10	-0.07
SEC-3	0.00	2.72	7.94	0.00	-0.39	-0.03
SEC-4	0.00	2.17	14.06	0.00	-0.76	-0.64
SEC-5	0.00	2.03	15.18	0.00	-0.88	-0.85
SEC-6	0.00	1.10	16.76	0.00	-1.10	-0.68
SEC-7	0.00	0.88	15.18	0.00	-2.03	-0.85
SEC-8	0.00	0.76	14.06	0.00	-2.17	-0.64
SEC-9	0.00	0.39	7.94	0.00	-2.72	-0.03
SEC-10	0.00	0.10	1.73	0.00	-2.94	-0.07
SEC-11	0.00	0.10	0.89	0.00	-3.06	-0.86

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,450	1,450	1,450	1,450	1,450	1,450	1,450
Width of Deck Slap	mm	600	600	600	600	600	600	600
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	576	200	200	200	200	200
Width of Siffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	3,553.6	3,553.6	3,553.6	3,553.6	3,553.6	3,553.6	3,553.6
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	778.0	843.0	1,070.0	1,261.0	1,291.0	1,360.0	1,291.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>								
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre Neutral Axis	mm	343	385	954	992	997	1,008	997
Depth of equivalent stress block	mm	262	294	729	758	762	770	762
Average stress in Prestress stell at nominal bending resistance	Mpa	1,630	1,622	1,395	1,450	1,458	1,474	1,458
Nominal Resistance	N.mm	3.74E+09	4.02E+09	4.06E+09	5.14E+09	5.32E+09	5.72E+09	5.32E+09
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	N.mm	3.74E+09	4.02E+09	4.06E+09	5.14E+09	5.32E+09	5.72E+09	5.32E+09
<b>Checking</b>								
Factored Bending Moment due to External Loads	N.mm	0.00E+00	3.75E+08	1.63E+09	2.67E+09	2.83E+09	3.18E+09	2.83E+09

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11
<b>Sectional Properties</b>					
Depth of Girder	H	1,450	1,450	1,450	1,450
Width of Deck Slap	bd	600	600	600	600
Depth of Deck Slap	hd	210	210	210	210
Total width of Webs	bw	200	200	576	650
Width of Siffit Slap	bs	650	650	650	650
Depth of Soffit Slap	hs	250	250	250	250
Total Area of Prestressing Cables	Ap	3,553.6	3,553.6	3,553.6	3,553.6
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	dp	1,261.0	1,070.0	843.0	778.0
Area of Tensile Reinforcement	Ast	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	dst	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	Asc	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre of Compressive Reinforcement	dsc	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>					
Stress block factor	$\beta 1$	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre Neutral Axis	c	992	954	385	343
Depth of equivalent stress block	a	758	729	294	262
Average stress in Prestress stell at nominal bending resistance	fps	1,450	1,395	1,622	1,630
Nominal Resistance	Mn	5.14E+09	4.06E+09	4.02E+09	3.74E+09
Flexural Resistance factor	$\phi$	1.0	1.0	1.0	1.0
Factored Resistance	Mr	5.14E+09	4.06E+09	4.02E+09	3.74E+09
<b>Checking</b>					
Factored Bending Moment due to External Loads	Mu	2.67E+09	1.63E+09	3.75E+08	0.00E+00

(2) Checking Nominal Shear Strength of Section during Construction Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,450	1,450	1,450	1,450	1,450	1,450	1,450
Width of Deck Slap	mm	600	600	600	600	600	600	600
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	576	200	200	200	200	200
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>	mm <sup>2</sup>	3,554	3,554	3,554	3,554	3,554	3,554	3,554
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	778	843	1,070	1,261	1,291	1,360	1,291
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
Effective shear Depth	mm	1,044	1,044	1,044	1,044	1,044	1,044	1,044
Effective web width	mm	650	576	200	200	200	200	200
Spacing of stirrups	mm	150	150	150	300	300	300	300
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		6.3	6.2	5.4	5.1	5.1	4.9	5.4
Area of shear reinf. within a distance	mm <sup>2</sup>	616	616	616	308	308	308	308
Strain in the tensile reinforcement		-0.000162	-0.000154	-0.000117	-0.000030	-0.000024	-0.000006	-0.000069
Inclination angle of diagonal compressive stress	degree	27.00	27.00	23.40	27.00	27.00	27.00	27.00
<b>Component of effective prestressed force in the direction of the applied shear</b>								
Vp	N	-3.46E+05	-3.25E+05	-2.61E+05	-1.89E+05	-1.17E+05	4.15E+02	1.17E+05
Vc	N	2.25E+06	1.96E+06	5.88E+05	5.60E+05	5.55E+05	5.40E+05	5.92E+05
Vs	N	3.28E+06	3.28E+06	3.86E+06	8.20E+05	8.20E+05	8.20E+05	8.20E+05
Vn	N	5.19E+06	4.92E+06	1.83E+06	1.19E+06	1.26E+06	1.36E+06	1.53E+06
Resistance factor for shear		0.9	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	N	4.67E+06	4.42E+06	1.64E+06	1.07E+06	1.13E+06	1.22E+06	1.38E+06
<b>Checking</b>								
Factored Moment due to External Loads	N.mm	0.00E+00	3.75E+08	1.63E+09	2.67E+09	2.83E+09	3.18E+09	2.83E+09
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	5.36E+05	4.98E+05	3.76E+05	2.09E+05	1.73E+05	0.00E+00	1.73E+05

(2) Checking Nominal Shear Strength of Section during Construction Stage - 2/2

Sectional Properties	Unit	Section 8	Section 9	Section 10	Section 11
Depth of Girder	mm	1,450	1,450	1,450	1,450
Width of Deck Slap	mm	600	600	600	600
Depth of Deck Slap	mm	210	210	210	210
Total width of Webs	mm	200	200	576	650
Width of Soffit Slap	mm	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	3,554	3,554	3,554	3,554
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,261	1,070	843	778
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0
Calculation of Mr					
Effective shear Depth	mm	1,044	1,044	1,044	1,044
Effective web width	mm	200	200	576	650
Spacing of stirrups	mm <sup>2</sup>	300	150	150	150
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		5.5	6.8	6.1	5.7
Area of shear reinf. within a distances	mm <sup>2</sup>	308	616	616	616
Strain in the tensile reinforcement		-0.000088	-0.000208	-0.000148	-0.000107
Inclination angle of diagonal compressive stress	degree	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	N	1.89E+05	2.60E+05	3.24E+05	3.46E+05
Nominal Resistance of Concrete	N	6.07E+05	7.43E+05	1.94E+06	2.03E+06
Nominal Resistance of Reinforcement	N	8.20E+05	3.28E+06	3.28E+06	3.28E+06
Nominal Resistance	N	1.62E+06	2.35E+06	5.54E+06	5.66E+06
Resistance factor for shear		0.9	0.9	0.9	0.9
Factored Resistance	N	1.45E+06	2.11E+06	4.99E+06	5.09E+06
Checking					
Factored Moment due to External Loads	N.mm	2.67E+09	1.63E+09	3.75E+08	0.00E+00
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	2.09E+05	3.76E+05	4.98E+05	5.36E+05

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -1/2

	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>							
Depth of Girder	1,660	1,660	1,660	1,660	1,660	1,660	1,660
Width of Deck Slab	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slab	210	210	210	210	210	210	210
Total width of Webs	650	576	200	200	200	200	200
Width of Soffit Slab	650	650	650	650	650	650	650
Depth of Soffit Slab	250	250	250	250	250	250	250
Total Area of Prestressing Cables	3,553.6	3,553.6	3,553.6	3,553.6	3,553.6	3,553.6	3,553.6
Distance from extreme compressive fibre to centroid of Prestressing Cables	988.0	1,053.0	1,280.0	1,471.0	1,501.0	1,570.0	1,501.0
Area of Tensile Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>							
Stress block factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	352	395	995	1,024	1,028	1,037	1,028
Depth of equivalent stress block	269	302	760	783	786	792	786
Average stress in Prestress steel at nominal bending resistance	1,674	1,665	1,455	1,497	1,503	1,516	1,503
Nominal Resistance	5.30E+09	5.70E+09	7.41E+09	8.61E+09	8.80E+09	9.24E+09	8.80E+09
Flexural Resistance factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	5.30E+09	5.70E+09	7.41E+09	8.61E+09	8.80E+09	9.24E+09	8.80E+09
<b>Checking</b>							
Factored Bending Moment due to External Loads	7.09E+07	5.35E+08	2.39E+09	3.91E+09	4.14E+09	4.73E+09	4.14E+09

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11
<b>Sectional Properties</b>					
Depth of Girder	mm	1,660	1,660	1,660	1,660
Width of Deck Slab	mm	2,035	2,035	2,035	650
Depth of Deck Slab	mm	210	210	210	250
Total width of Webs	mm	200	200	576	650
Width of Soffit Slab	mm	650	650	650	2,035
Depth of Soffit Slab	mm	250	250	250	210
<b>Total Area of Prestressing Cables</b>					
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm <sup>2</sup>	3,553.6	3,553.6	3,553.6	3,553.6
<b>Area of Tensile Reinforcement</b>					
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	1,471.0	1,280.0	1,053.0	672.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0
<b>Distance from extreme compressive fibre to centroid of Compressive Reinforcement</b>					
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0.0	0.0	0.0	1,660.0
<b>Calculation of Mr</b>					
Stress block factor		0.76	0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	mm	1,024	995	395	336
Depth of equivalent stress block	mm	783	760	302	257
Average stress in Prestress steel at nominal bending resistance	Mpa	1,497	1,455	1,665	1,599
Nominal Resistance	N.mm	8.61E+09	7.41E+09	5.70E+09	3.09E+09
Flexural Resistance factor		1.0	1.0	1.0	1.0
Factored Resistance	N.mm	8.61E+09	7.41E+09	5.70E+09	3.09E+09
<b>Checking</b>					
Factored Bending Moment due to External Loads	N.mm	3.91E+09	2.39E+09	5.35E+08	7.09E+07

(4) Checking Nominal Shear Strength of Section at Service Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,660	1,660	1,660	1,660	1,660	1,660	1,660
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	576	200	200	200	200	200
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	3,554	3,554	3,554	3,554	3,554	3,554	3,554
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	988	1,053	1,280	1,471	1,501	1,570	1,501
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
Effective shear Depth	mm	1,195	1,195	1,195	1,195	1,195	1,195	1,195
Effective web width	mm	650	576	200	200	200	200	200
Spacing of stirrups	mm	150	150	150	300	300	300	300
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		6.1	6.1	5.9	5.4	5.4	5.3	5.6
Area of shear reinf. within a distance	mm <sup>2</sup>	616	616	616	308	308	308	308
Strain in the tensile reinforcement		-0.000143	-0.000139	-0.000140	-0.000069	-0.000066	-0.000053	-0.000102
Inclination angle of diagonal compressive stress	degree	27.00	27.00	25.11	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	N	-3.46E+05	-3.25E+05	-2.61E+05	-1.89E+05	-1.17E+05	4.15E+02	1.17E+05
Nominal Resistance of Concrete	N	2.49E+06	2.19E+06	7.40E+05	6.78E+05	6.74E+05	6.62E+05	7.09E+05
Nominal Resistance of Reinforcement	N	3.76E+06	3.76E+06	4.08E+06	9.39E+05	9.39E+05	9.39E+05	9.39E+05
Nominal Resistance	N	5.89E+06	5.62E+06	2.13E+06	1.43E+06	1.50E+06	1.60E+06	1.76E+06
Resistance factor for shear		0.9	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	N	5.31E+06	5.06E+06	1.92E+06	1.28E+06	1.35E+06	1.44E+06	1.59E+06
<b>Checking</b>								
Factored Moment due to External Loads	N.mm	7.09E+07	5.35E+08	2.39E+09	3.91E+09	4.14E+09	4.73E+09	4.14E+09
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	8.42E+05	7.85E+05	6.11E+05	3.50E+05	2.91E+05	7.87E+04	2.48E+05



(4) Checking Nominal Shear Strength of Section at Service Stage - 2/2

	Unit	Section 8	Section 9	Section 10	Section 11
<b>Sectional Properties</b>					
Depth of Girder	H	1,660	1,660	1,660	1,660
Width of Deck Slap	bd	2,035	2,035	2,035	650
Depth of Deck Slap	hd	210	210	210	250
Total width of Webs	bw	200	200	576	650
Width of Soffit Slap	bs	650	650	650	2,035
Depth of Soffit Slap	hs	250	250	250	210
Total Area of Prestressing Cables	Ap	3,555	3,556	3,557	3,558
Distance from extreme compressive fibre to centroid of Prestressing Cables	dp	1,471	1,280	1,053	672
Area of Tensile Reinforcement	Ast	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	dst	0	0	0	1,660
Area of Compressive Reinforcement	Asc	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	dsc	0	0	0	1,660
<b>Calculation of Mr</b>					
Effective shear Depth	dv	1,195	1,195	1,195	1,195
Effective web width	bv	200	200	576	650
Spacing of stirrups	s	300	150	150	150
Angle of inclination of transverse reinforcement to longitudinal axis of girder	$\alpha$	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension	$\beta$	5.8	6.8	5.5	5.4
Area of shear reinf. within a distance	Av	308	616	616	616
Strain in the tensile reinforcement	$\epsilon_x$	-0.000116	-0.000211	-0.000085	-0.000066
Inclination angle of diagonal compressive stress	$\theta$	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	Vp	1.89E+05	2.60E+05	3.24E+05	3.46E+05
Nominal Resistance of Concrete	Vc	7.28E+05	8.51E+05	1.99E+06	2.19E+06
Nominal Resistance of Reinforcement	Vs	9.39E+05	3.76E+06	3.76E+06	3.76E+06
Nominal Resistance	Vn	1.86E+06	2.65E+06	6.07E+06	6.29E+06
Resistance factor for shear	$\phi$	0.9	0.9	0.9	0.9
Factored Resistance	Vr	1.67E+06	2.39E+06	5.47E+06	5.66E+06
<b>Checking</b>					
Factored Moment due to External Loads	Mu	3.91E+09	2.39E+09	5.35E+08	7.09E+07
Factored Axial Force due to External Loads	Nu	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	Vu	2.88E+05	4.72E+05	6.60E+05	7.16E+05

**Checking Stress during construction stage**  
 Load Combinations for Checking Stress during construction stage

COMBINATION 14			
	Load type	Factor	
	Girder Selfweight G_DC	1.00	
	Slab+Dia. Selfweight S_D	1.00	
	Prestress PS	1.00	
Section	N(T)	V(T)	M(T.m)
SEC-1	376.83	1.12	0.00
SEC-2	376.83	0.68	-28.03
SEC-3	383.09	-1.01	-30.84
SEC-4	389.95	-5.02	-39.26
SEC-5	395.20	-0.14	-11.47
SEC-6	397.67	0.04	-17.87
SEC-7	395.20	0.18	-11.12
SEC-8	389.95	5.00	-38.88
SEC-9	383.09	0.93	-30.54
SEC-10	376.83	-0.80	-28.01
SEC-11	376.83	-1.12	0.00

Stress checking during construction stage (AASHTO 5.9.4.2)

Section	COMBINATION 14		
	$\sigma_1(\text{T/m}^2)$	Checking	$\sigma_p(\text{T/m}^2)$ Checking
SEC-1	414.39	OK	414.39
SEC-2	321.53	OK	579.01
SEC-3	507.15	OK	816.68
SEC-4	480.25	OK	865.21
SEC-5	258.55	OK	615.65
SEC-6	454.42	OK	915.97
SEC-7	260.03	OK	614.13
SEC-8	482.08	OK	863.40
SEC-9	508.70	OK	815.14
SEC-10	321.64	OK	578.88
SEC-11	414.39	OK	414.39

Checking Stress at service stage  
Load Combinations for Checking Stress at service stage

Section	COMBINATION 11			COMBINATION 12			COMBINATION 13		
	N(I)	V(T)	M(T.m)	N(T)	V(T)	M(T.m)	N(T)	V(T)	M(T.m)
SEC-1	376.83	22.96	1.30	376.83	12.78	-4.33	376.83	13.10	-1.55
SEC-2	376.83	21.01	-15.74	376.83	11.21	-21.54	376.83	11.54	-21.31
SEC-3	383.09	14.83	26.27	383.09	4.78	0.58	383.09	6.05	0.67
SEC-4	389.95	3.52	52.57	389.95	-5.91	5.19	389.95	-3.47	7.25
SEC-5	395.20	6.63	54.74	395.20	-2.75	3.05	395.20	0.09	5.79
SEC-6	397.67	3.47	66.13	397.67	-3.65	9.88	397.67	-0.09	12.09
SEC-7	395.20	2.78	54.97	395.20	-6.60	3.28	395.20	-0.05	6.02
SEC-8	389.95	5.89	52.94	389.95	-3.54	5.56	389.95	3.45	7.62
SEC-9	383.09	-4.19	26.29	383.09	-14.24	0.60	383.09	-5.46	0.69
SEC-10	376.83	-11.33	-15.72	376.83	-21.13	-21.51	376.83	-11.66	-21.28
SEC-11	376.83	-12.78	1.30	376.83	-22.96	-4.33	376.83	-13.10	-1.55

Stress checking at Service stage (AASHTO 5.9.4.2)

Section	COMBINATION 11		COMBINATION 12		COMBINATION 13	
	$\sigma_c$ (T/m <sup>2</sup> )	Checking	$\sigma_c$ (T/m <sup>2</sup> )	Checking	$\sigma_c$ (T/m <sup>2</sup> )	Checking
SEC-1	283.40	OK	276.85	OK	280.08	OK
SEC-2	278.72	OK	272.08	OK	272.34	OK
SEC-3	407.30	OK	381.34	OK	381.43	OK
SEC-4	440.24	OK	392.78	OK	394.84	OK
SEC-5	358.40	OK	299.13	OK	302.27	OK
SEC-6	461.05	OK	405.08	OK	407.27	OK
SEC-7	358.66	OK	299.39	OK	302.53	OK
SEC-8	440.61	OK	393.15	OK	395.21	OK
SEC-9	407.32	OK	381.36	OK	381.45	OK
SEC-10	278.75	OK	272.11	OK	272.37	OK
SEC-11	283.40	OK	276.85	OK	280.08	OK

Design of connectors at the interface between girder and deck slab (AASHTO 5.8.4):

$$V_h = V_o / d_e$$

Horizontal Shear per unit length of girder  $V_h$  due to Vertical Shear  $V_o$   
 Distance from the centroid of tensile steel to the midthickness of the deck

$$d_e$$

$$A_v$$

Required area of reinforcement:

$$A_v \geq \max \{ 0.35 b_v / f_y; (V_h - c b_v - \mu P_c) / \mu f_y \}$$

Width of the interface between the girder and the deck:

Yield strength of reinforcement

Cohesion factor

Friction factor

Permanent net compressive force normal to the shear plane

$$b_v = 600 \text{ mm}$$

$$f_y = 390 \text{ MPa}$$

$$c = 0.17 \text{ MPa}$$

$$\mu = 0.7$$

$$P_c = 58750 \text{ N}$$

Section	SEC-1	SEC-2	SEC-3	SEC-4	SEC-5	SEC-6	SEC-7	SEC-8	SEC-9	SEC-10	SEC-11
$d_c$ (mm)	883	948	1175	1366	1396	1465	1396	1366	1175	948	883
Interface Shear(N):											
Girder Selfweight G_DC	203618	187087	142459	75906	62712	0	-62712	-75906	-142459	-187087	-203618
Slab+Dia. Selfweight S_D	147002	138230	103446	60495	50211	0	-50211	-60495	-103446	-138230	-147002
Surface + Railings DW	117478	106439	69244	15192	2250	-1303	-2250	-15192	-62664	-106439	-117478
Max. Live Load LL_MAX	90890	87319	80917	64387	60324	32786	26113	22476	11706	2982	2937
Min. Live Load LL_MIN	-2937	-2982	-11706	-22476	-26113	-32786	-60324	-64387	-80917	-87319	-90890
Max. Impact IM_MAX	29994	28815	26703	21248	19907	10819	8617	7417	3863	984	969
Min. Impact IM_MIN	-969	-984	-3863	-7417	-8617	-10819	-19907	-21248	-26703	-28815	-29994
Total	588982	547890	422769	237228	195403	42302	-80442	-121699	-293000	-427790	-464192
Min	464192	427790	299580	121699	80442	44908	195403	237228	416190	547890	588982
$A_v$ required (mm <sup>2</sup> )	2006	1856	1398	718	565	13	565	718	1373	1856	2006
Area of Stirrups (mm <sup>2</sup> )	3695 (D14@150)	3695 (D14@150)	3695 (D14@150)	924 (D14@300)	924 (D14@300)	924 (D14@300)	924 (D14@300)	924 (D14@300)	3695 (D14@150)	3695 (D14@150)	3695 (D14@150)
Area of Dowel bars (mm <sup>2</sup> )	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)	3770 (D20@150)
Total Connector Area (mm <sup>2</sup> )	7464	7464	7464	4694	4694	4694	4694	4694	7464	7464	7464
Checking	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

## Design of Deck Slab

### Summary of Bending Moment:

#### Bending Moment due to Live Load:

##### (a) Continuous Slab

1) Effective Span Length	1.700 m	
2) Load	10.000 T	
3) Impact Factor IM	33%	
4) Positive Moment	$M=0.8*(1+IM)*(0.12S+0.07)$	2.92 T.m/m
5) Negative Moment	$M=-(1+IM)*(0.15S+0.125)*$	-5.05 T.m/m

##### (2) Cantilever Slab

1) Effective Span Length	0.100 m < 0.5m --> ignore	
2) Load	10.000 T	
3) Impact Factor IM	33%	
4) Negative Moment		M= 0.00 T.m/m

#### Bending Moment due to Self-weight of Slab:

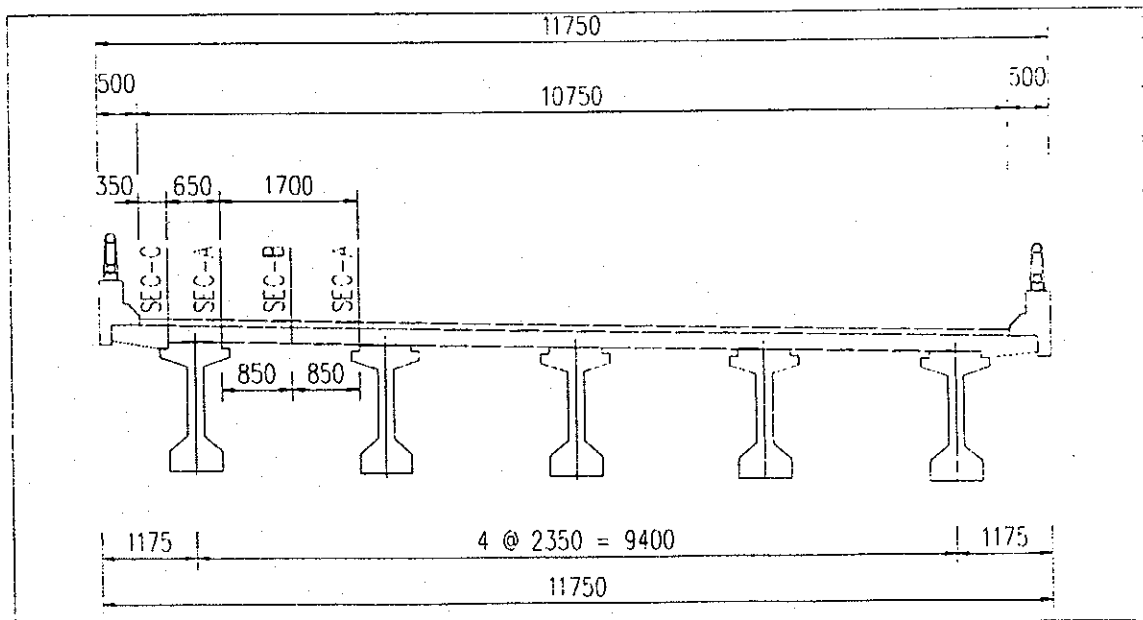
Section	A	B	C
Bending Moment (T.m)	-0.152	0.152	-0.150

#### Bending Moment due to Asphalt Concrete:

Section	A	B	C
Bending Moment (T.m)	-0.050	0.050	-0.030

#### Bending Moment due to Parapet & Railings:

Section	A	B	C
Bending Moment (T.m)	0.000	0.000	-0.424



Checking Nominal Flexural Strength of Deck Slab (Article 5.7.3.2.2 AASHTO)

	Section A	Section B	Section C
<b>Sectional Properties</b>			
Depth of Slab	H 210 mm	210 mm	210 mm
Width of Slab	ds 1000 mm	1000 mm	1000 mm
Area of Tensile Reinforcement	$A_{st}$ 1885 mm <sup>2</sup>	1885 mm <sup>2</sup>	1885 mm <sup>2</sup>
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	$d_{st}$ 162 mm	162 mm	162 mm
Area of Compressive Reinforcement	$A_{sc}$ 0 mm <sup>2</sup>	0 mm <sup>2</sup>	0 mm <sup>2</sup>
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	$d_{sc}$ 48 mm	48 mm	48 mm
<b>Calculation of Mr</b>			
Stress block factor	$\beta_1$ 0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	c 28 mm	28 mm	28 mm
Depth of equivalent stress block	a 22 mm	22 mm	22 mm
Nominal Resistance	Mn 111,144,141 N.mm	111,144,141 N.mm	111,144,141 N.mm
Flexural Resistance factor	$\phi$ 0.9	0.9	0.9
Factored Resistance	Mr 100,029,726 N.mm	100,029,726 N.mm	100,029,726 N.mm
<b>Checking</b>			
Factored Bending Moment due to External Loads	Mu 91,089,350 N.mm	53,663,150 N.mm	7,617,528 N.mm
	OK	OK	OK





Summary of Sectional Forces:

Section	S.W of girder			S.W of Deck Slab+Diaphragms			S.W of Surface		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	0.00	31.18	0.00	0.00	18.63	0.00	0.00	14.70	-1.28
SEC-2	0.00	28.61	24.67	0.00	17.61	14.95	0.00	13.42	10.32
SEC-3	0.00	19.70	113.44	0.00	13.08	71.34	0.00	8.38	49.14
SEC-4	0.00	10.22	189.74	0.00	6.79	121.99	0.00	0.46	71.47
SEC-5	0.00	9.29	194.62	0.00	6.17	125.23	0.00	7.65	71.50
SEC-6	0.00	0.00	217.85	0.00	0.00	140.65	0.00	-0.12	90.27
SEC-7	0.00	-9.29	194.62	0.00	-6.17	125.23	0.00	-7.65	71.50
SEC-8	0.00	-10.22	189.74	0.00	-6.79	121.99	0.00	-0.46	71.47
SEC-9	0.00	-19.70	113.44	0.00	-13.08	71.34	0.00	-8.38	49.14
SEC-10	0.00	-28.61	24.67	0.00	-17.61	14.95	0.00	-13.42	10.32
SEC-11	0.00	-31.18	0.00	0.00	-18.63	0.00	0.00	-14.70	-1.28

Section	Prestress			LiveLoad max			LiveLoad min		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	500.98	-52.14	0.00	0.00	10.25	2.88	0.00	-0.34	-2.83
SEC-2	500.98	-48.36	-101.46	0.00	9.89	6.61	0.00	-0.35	-0.10
SEC-3	512.38	-36.39	-264.37	0.00	9.31	33.89	0.00	-1.47	-0.28
SEC-4	524.71	-23.57	-407.57	0.00	7.28	63.58	0.00	-3.16	-4.33
SEC-5	528.64	-10.50	-416.44	0.00	7.07	65.77	0.00	-3.39	-4.84
SEC-6	527.87	0.00	-430.23	0.00	3.96	71.82	0.00	-3.96	-3.97
SEC-7	528.64	10.50	-415.70	0.00	3.39	65.77	0.00	-7.07	-4.84
SEC-8	524.71	23.57	-406.79	0.00	3.16	63.58	0.00	-7.28	-4.33
SEC-9	512.38	36.39	-263.70	0.00	1.47	33.89	0.00	-9.31	-0.28
SEC-10	500.98	48.36	-101.39	0.00	0.35	6.61	0.00	-9.89	-0.10
SEC-11	500.98	52.14	0.00	0.00	0.34	2.88	0.00	-10.25	-2.83

Section	Impact max			Impact min		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	0.00	3.38	0.95	0.00	-0.11	-0.94
SEC-2	0.00	3.26	2.18	0.00	-0.11	-0.03
SEC-3	0.00	3.07	11.18	0.00	-0.49	-0.09
SEC-4	0.00	2.40	20.98	0.00	-1.04	-1.43
SEC-5	0.00	2.33	21.70	0.00	-1.12	-1.60
SEC-6	0.00	1.31	23.70	0.00	-1.31	-1.31
SEC-7	0.00	1.12	21.70	0.00	-2.33	-1.60
SEC-8	0.00	1.04	20.98	0.00	-2.40	-1.43
SEC-9	0.00	0.49	11.18	0.00	-3.07	-0.09
SEC-10	0.00	0.11	2.18	0.00	-3.26	-0.03
SEC-11	0.00	0.11	0.95	0.00	-3.38	-0.94

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	650	650	650	650	650	650
Width of Siffit Slap	mm	250	250	250	250	250	250	250
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>								
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	1,021.0	1,115.0	1,422.0	1,678.0	1,693.0	1,730.0	1,693.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>								
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre Neutral Axis	mm	456	513	1,271	1,322	1,324	1,331	1,324
Depth of equivalent stress block	mm	349	392	972	1,010	1,012	1,017	1,012
Average stress in Prestress steel at nominal bending resistance	Mpa	1,627	1,620	1,394	1,450	1,453	1,459	1,453
Nominal Resistance	N.mm	7.05E+09	7.78E+09	1.00E+10	1.21E+10	1.22E+10	1.25E+10	1.22E+10
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	N.mm	7.05E+09	7.78E+09	1.00E+10	1.21E+10	1.22E+10	1.25E+10	1.22E+10
<b>Checking</b>								
Factored Bending Moment due to External Loads	N.mm	0.00E+00	4.95E+08	2.31E+09	3.90E+09	4.00E+09	4.48E+09	4.00E+09

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11
<b>Sectional Properties</b>					
Depth of Girder	mm	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210
Total width of Webs	mm	200	200	576	650
Width of Siffit Slap	mm	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250
<b>Total Area of Prestressing Cables</b>					
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	1,678.0	1,422.0	1,115.0	1,021.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>					
Stress block factor		0.76	0.76	0.76	0.76
Distance from extreme compressive fibre Neutral Axis	mm	1,322	1,271	513	456
Depth of equivalent stress block	mm	1,010	972	392	349
<b>Average stress in Prestress stell at nominal bending resistance</b>					
Nominal Resistance	Mpa	1,450	1,394	1,620	1,627
Flexural Resistance factor	N.mm	1.21E+10	1.00E+10	7.78E+09	7.05E+09
Factored Resistance	N.mm	1.0	1.0	1.0	1.0
<b>Checking</b>					
Factored Bending Moment due to External Loads	N.mm	3.90E+09	2.31E+09	4.95E+08	0.00E+00

(2) Checking Nominal Shear Strength of Section during Construction Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	576	200	200	200	200	200
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>								
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,021	1,115	1,422	1,678	1,693	1,730	1,693
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
Effective shear Depth	mm	1,332	1,332	1,332	1,332	1,332	1,332	1,332
Effective web width	mm	650	576	200	200	200	200	200
Spacing of stirrups	mm	150	150	150	300	300	300	300
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		6.8	6.8	6.8	6.7	6.7	6.5	6.7
Area of shear reinf. within a distance	mm <sup>2</sup>	616	616	616	308	308	308	308
Strain in the tensile reinforcement		-0.000206	-0.000207	-0.000270	-0.000191	-0.000190	-0.000173	-0.000190
Inclination angle of diagonal compressive stress	degree	27.00	27.00	26.74	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	N	-5.21E+05	-4.84E+05	-3.64E+05	-2.36E+05	-1.05E+05	0.00E+00	1.05E+05
Nominal Resistance of Concrete	N	3.08E+06	2.73E+06	9.45E+05	9.33E+05	9.31E+05	9.03E+05	9.31E+05
Nominal Resistance of Reinforcement	N	4.19E+06	4.19E+06	4.23E+06	1.05E+06	1.05E+06	1.05E+06	1.05E+06
Nominal Resistance	N	6.75E+06	6.43E+06	2.30E+06	1.74E+06	1.87E+06	1.95E+06	2.08E+06
Resistance factor for shear		0.9	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	N	6.07E+06	5.79E+06	2.07E+06	1.57E+06	1.68E+06	1.75E+06	1.87E+06
<b>Checking</b>								
Factored Moment due to External Loads	N.mm	0.00E+00	4.95E+08	2.31E+09	3.90E+09	4.00E+09	4.48E+09	4.00E+09
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	6.23E+05	5.78E+05	4.10E+05	2.13E+05	1.93E+05	0.00E+00	1.93E+05

(2) Checking Nominal Shear Strength of Section during Construction Stage - 2/2

	Unit	Section 8	Section 9	Section 10	Section 11
<b>Sectional Properties</b>					
Depth of Girder	mm	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210
Total width of Webs	mm	200	200	576	650
Width of Soffit Slap	mm	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	4,738	4,738	4,738	4,738
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,678	1,422	1,115	1,021
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement		0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0
<b>Calculation of Mr</b>					
Effective shear Depth	mm	1,332	1,332	1,332	1,332
Effective web width	mm	200	200	576	650
Spacing of stirrups	mm	300	150	150	150
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		67	68	68	68
Area of shear reinf. within a distance	mm <sup>2</sup>	308	616	616	616
Strain in the tensile reinforcement		-0.000191	-0.000270	-0.000207	-0.000206
Inclination angle of diagonal compressive stress	degree	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	N	2.36E+05	3.64E+05	4.84E+05	5.21E+05
Nominal Resistance of Concrete	N	9.33E+05	9.48E+05	2.73E+06	3.08E+06
Nominal Resistance of Reinforcement	N	1.05E+06	4.19E+06	4.19E+06	4.19E+06
Nominal Resistance	N	2.22E+06	3.03E+06	7.40E+06	7.79E+06
Resistance factor for shear		0.9	0.9	0.9	0.9
Factored Resistance	N	1.99E+06	2.73E+06	6.66E+06	7.01E+06
<b>Checking</b>					
Factored Moment due to External Loads	N.mm	3.90E+09	2.31E+09	4.95E+08	0.00E+00
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	2.13E+05	4.10E+05	5.78E+05	6.23E+05

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slab	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slab	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	576	200	200	200	200	200
Width of Soffit Slab	mm	650	650	650	650	650	650	650
Depth of Soffit Slab	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	4,738.1	4,738.1	4,738.1	4,738.1	4,738.1	4,738.1	4,738.1
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,231.0	1,325.0	1,632.0	1,888.0	1,903.0	1,940.0	1,903.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>								
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	mm	466	524	1,314	1,355	1,357	1,362	1,357
Depth of equivalent stress block	mm	356	400	1,004	1,036	1,037	1,041	1,037
Average stress in Prestress steel at nominal bending resistance	Mpa	1,663	1,654	1,441	1,486	1,489	1,494	1,489
Nominal Resistance	N.mm	8.84E+09	9.57E+09	1.17E+10	1.38E+10	1.39E+10	1.42E+10	1.39E+10
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	N.mm	8.84E+09	9.57E+09	1.17E+10	1.38E+10	1.39E+10	1.42E+10	1.39E+10
<b>Checking</b>								
Factored Bending Moment due to External Loads	N.mm	7.43E+07	8.04E+08	3.84E+09	6.45E+09	6.60E+09	7.51E+09	6.60E+09

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11
<b>Sectional Properties</b>					
Depth of Girder	mm	2,060	2,060	2,060	2,060
Width of Deck Slab	mm	2,035	2,035	2,035	650
Depth of Deck Slab	mm	210	210	210	250
Total width of Webs	mm	200	200	576	650
Width of Soffit Slab	mm	650	650	650	2,035
Depth of Soffit Slab	mm	250	250	250	210
Total Area of Prestressing Cables	mm <sup>2</sup>	4,738.1	4,738.1	4,738.1	4,738.1
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,888.0	1,632.0	1,325.0	830.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	2,060.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0.0	0.0	0.0	2,060.0
<b>Calculation of Mr</b>					
Stress block factor		0.76	0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	mm	1,355	1,314	524	444
Depth of equivalent stress block	mm	1,036	1,004	400	339
Average stress in Prestress steel at nominal bending resistance	Mpa	1,486	1,441	1,654	1,581
Nominal Resistance	N.mm	1.38E+10	1.17E+10	9.57E+09	4.95E+09
Flexural Resistance factor		1.0	1.0	1.0	1.0
Factored Resistance	N.mm	1.38E+10	1.17E+10	9.57E+09	4.95E+09
<b>Checking</b>					
Factored Bending Moment due to External Loads	N.mm	6.45E+09	3.84E+09	8.04E+08	7.43E+07

(4) Checking Nominal Shear Strength of Section at Service Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	576	200	200	200	200	200
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	4,738	4,738	4,738	4,738	4,738	4,738	4,738
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,231	1,325	1,632	1,888	1,903	1,940	1,903
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
Effective shear Depth	mm	1,483	1,483	1,483	1,483	1,483	1,483	1,483
Effective web width	mm	650	576	200	200	200	200	200
Spacing of stirrups	mm <sup>2</sup>	150	150	150	300	300	300	300
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		6.3	6.3	5.7	5.2	5.1	5.0	5.2
Area of shear reinf. within a distance	mm <sup>2</sup>	616	616	616	308	308	308	308
Strain in the tensile reinforcement		-0.000165	-0.000160	-0.000146	-0.000044	-0.000032	-0.000011	-0.000042
Inclination angle of diagonal compressive stress	degree	27.00	27.00	23.40	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	N	-5.21E+05	4.84E+05	-3.64E+05	-2.36E+05	-1.05E+05	0.00E+00	1.05E+05
Nominal Resistance of Concrete	N	3.21E+06	2.82E+06	8.85E+05	8.11E+05	7.97E+05	7.72E+05	8.08E+05
Nominal Resistance of Reinforcement	N	4.66E+06	4.66E+06	5.49E+06	1.17E+06	1.17E+06	1.17E+06	1.17E+06
Nominal Resistance	N	7.35E+06	7.00E+06	2.60E+06	1.74E+06	1.86E+06	1.94E+06	2.08E+06
Resistance factor for shear		0.9	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	N	6.62E+06	6.30E+06	2.34E+06	1.57E+06	1.67E+06	1.74E+06	1.87E+06
<b>Checking</b>								
Factored Moment due to External Loads	N.mm	7.43E+07	8.04E+08	3.84E+09	6.45E+09	6.60E+09	7.51E+09	6.60E+09
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	1.08E+06	1.01E+06	7.52E+05	3.89E+05	4.72E+05	9.30E+04	3.53E+05



(4) Checking Nominal Shear Strength of Section at Service Stage - 2/2

	Unit	Section 8	Section 9	Section 10	Section 11
<b>Sectional Properties</b>					
Depth of Girder	mm	2,060	2,060	2,060	2,060
Width of Deck Slap	mm	2,035	2,035	2,035	650
Depth of Deck Slap	mm	210	210	210	250
Total width of Webs	mm	200	200	576	650
Width of Soffit Slap	mm	650	650	650	2,035
Depth of Soffit Slap	mm	250	250	250	210
Total Area of Prestressing Cables	mm <sup>2</sup>	4,738	4,738	4,738	4,738
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,888	1,632	1,325	830
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	2,060
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	2,060
<b>Calculation of Mr</b>					
Effective shear Depth	mm	1,483	1,483	1,483	1,483
Effective web width	mm	200	200	576	650
Spacing of stirrups	mm	300	150	150	150
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		5.3	6.3	6.4	5.8
Area of shear reinf. within a distance	mm <sup>2</sup>	308	616	616	616
Strain in the tensile reinforcement		-0.000049	-0.000164	-0.000165	-0.000119
Inclination angle of diagonal compressive stress	degree	27.00	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	N	2.36E+05	3.64E+05	4.84E+05	5.21E+05
Nominal Resistance of Concrete	N	8.18E+05	9.88E+05	2.85E+06	2.96E+06
Nominal Resistance of Reinforcement	N	1.17E+06	4.66E+06	4.66E+06	4.66E+06
Nominal Resistance	N	2.22E+06	3.33E+06	7.99E+06	8.14E+06
Resistance factor for shear		0.9	0.9	0.9	0.9
Factored Resistance	N	2.00E+06	3.00E+06	7.19E+06	7.32E+06
<b>Checking</b>					
Factored Moment due to External Loads	N.mm	6.45E+09	3.84E+09	8.04E+08	7.43E+07
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	3.25E+05	6.17E+05	8.95E+05	9.68E+05

**Checking Stress during construction stage**  
 Load Combinations for Checking Stress during construction stage

		COMBINATION 14		
		Load type	Factor	
		Girder Selfweight C_DC	1.00	
		Slab+Dia. Selfweight S_D	1.00	
Prestress PS		1.00		
Section	N(T)	V(T)	M(T.m)	
SEC-1	500.98	-2.32	0.00	
SEC-2	500.98	-2.14	-61.84	
SEC-3	512.38	-3.61	-79.59	
SEC-4	524.71	-6.56	-95.84	
SEC-5	528.64	4.96	-96.59	
SEC-6	527.87	0.00	-71.73	
SEC-7	528.64	-4.96	-95.85	
SEC-8	524.71	6.56	-95.05	
SEC-9	512.38	3.61	-78.92	
SEC-10	500.98	2.14	-61.78	
SEC-11	500.98	2.32	0.00	

Stress checking during construction stage (AASHTO 5.9.4.2)

Section	COMBINATION 14		
	$\sigma_t$ (T/m <sup>2</sup> )	Checking	$\sigma_b$ (T/m <sup>2</sup> ) Checking
SEC-1	405.31	OK	405.31 OK
SEC-2	282.55	OK	615.66 OK
SEC-3	495.67	OK	1001.65 OK
SEC-4	464.59	OK	1066.88 OK
SEC-5	186.93	OK	675.52 OK
SEC-6	546.08	OK	995.45 OK
SEC-7	188.78	OK	673.61 OK
SEC-8	467.08	OK	1064.43 OK
SEC-9	497.80	OK	999.54 OK
SEC-10	282.72	OK	615.48 OK
SEC-11	405.31	OK	405.31 OK

Checking Stress at service stage  
Load Combinations for Checking Stress at service stage

Section	COMBINATION I1			COMBINATION I2			COMBINATION I3		
	N(T)	V(T)	M(T.m)	N(T)	V(T)	M(T.m)	N(T)	V(T)	M(T.m)
SEC-1	500.98	23.27	1.79	500.98	12.01	-1.29	500.98	12.37	-1.28
SEC-2	500.98	21.80	-44.48	500.98	10.91	-51.63	500.98	11.28	-51.52
SEC-3	512.38	14.67	5.62	512.38	3.20	-30.75	512.38	4.77	-30.45
SEC-4	524.71	1.64	43.27	524.71	-9.47	-28.97	524.71	-6.10	-24.37
SEC-5	528.64	20.13	44.90	528.64	9.00	-30.23	528.64	12.61	-25.09
SEC-6	527.87	4.10	94.96	527.87	-4.33	14.32	527.87	-0.12	18.54
SEC-7	528.64	-9.00	45.64	528.64	-20.13	-29.49	528.64	-12.61	-24.34
SEC-8	524.71	9.47	44.06	524.71	-1.64	-28.19	524.71	6.10	-23.59
SEC-9	512.38	-3.20	6.28	512.38	-14.67	-30.08	512.38	-4.77	-29.78
SEC-10	500.98	-10.91	-44.42	500.98	-21.80	-51.56	500.98	-11.28	-51.45
SEC-11	500.98	-12.01	1.79	500.98	-23.27	-4.29	500.98	-12.37	-1.28

Stress checking at service stage (AASHTO 5.9.4.2)

Section	COMBINATION 8		COMBINATION 9		COMBINATION 10	
	$\sigma_1$ (T/m <sup>2</sup> )	Checking $\sigma_b$ (T/m <sup>2</sup> )	$\sigma_1$ (T/m <sup>2</sup> )	Checking $\sigma_b$ (T/m <sup>2</sup> )	$\sigma_1$ (T/m <sup>2</sup> )	Checking $\sigma_b$ (T/m <sup>2</sup> )
SEC-1	302.78	OK	297.29	OK	300.01	OK
SEC-2	282.95	OK	276.50	OK	276.60	OK
SEC-3	465.91	OK	435.79	OK	436.04	OK
SEC-4	508.01	OK	448.48	OK	452.27	OK
SEC-5	358.08	OK	290.66	OK	295.28	OK
SEC-6	553.34	OK	486.98	OK	490.46	OK
SEC-7	358.75	OK	291.33	OK	295.94	OK
SEC-8	508.66	OK	449.12	OK	452.92	OK
SEC-9	466.46	OK	436.34	OK	436.59	OK
SEC-10	283.01	OK	276.56	OK	276.66	OK
SEC-11	302.78	OK	297.29	OK	300.01	OK

Horizontal Shear at the interface between girder and deck slab (AASHTO 5.8.4):

Horizontal Shear per unit length of girder  $V_h$  due to Vertical Shear  $V_u$   
 Distance from the centroid of tensile steel to the midthickness of the deck  
 Required area of reinforcement:  
 $A_{vf} \geq \max \{0.35 b_v / f_y; (V_h - c b_v - \mu P_c) / \mu f_y\}$   
 Width of the interface between the girder and the deck:  
 Yield strength of reinforcement  
 Cohesion factor  
 Friction factor  
 Permanent net compressive force normal to the shear plan

$$V_h = V_u / d_e$$

$d_e$

$A_{vf}$

$b_v =$  600 mm

$f_y =$  390 MPa

$c =$  0.17 MPa

$\mu =$  0.7

$P_c =$  58750 N

Section	SEC-1	SEC-2	SEC-3	SEC-4	SEC-5	SEC-6	SEC-7	SEC-8	SEC-9	SEC-10	SEC-11
$d_e$ (mm)	1126	1220	1527	1783	1798	1835	1798	1783	1527	1220	1126
Interface Shear(N):											
Girder Selfweight G_DC	305796	280587	193191	100241	91128	0	-91128	-100241	-193191	-280587	-305796
Slab+Dia. Selfweight S <sub>w</sub>	182694	172712	128249	66545	60495	0	-60495	-66545	-128249	-172712	-182694
Surface + Railings DW	144131	131570	82165	4512	74985	-1145	-74985	-4512	-82165	-131570	-144131
Max. Live Load LL_MAX	100482	96968	91259	71353	69309	38852	33249	30987	14449	3407	3357
Min. Live Load LL_MIN	-3357	-3407	-14449	-30987	-33249	-38852	-69309	-71353	-91259	-96968	-100482
Max. Impact IM_MAX	33159	31999	30115	23547	22872	12821	10972	10226	4768	1124	1108
Min. Impact IM_MIN	-1108	-1124	-4768	-10226	-10972	-12821	-22872	-23547	-30115	-31999	-33159
Total	766263	713837	524979	266198	318790	50529	-182387	-130085	-384387	-580338	-628156
$A_{vf}$ required (mm <sup>2</sup> )	628156	580338	384387	130085	182387	-52818	-318790	-266198	-524979	-713837	-766263
	2656	2464	1772	824	1017	42	1017	824	1772	2464	2656
Area of Stirrups (mm <sup>2</sup> )	3695	3695	3695	924	924	924	924	924	3695	3695	3695
	(D14@150)	(D14@150)	(D14@150)	(D14@300)	(D14@300)	(D14@300)	(D14@300)	(D14@300)	(D14@150)	(D14@150)	(D14@150)
Area of Dowel bars (mm <sup>2</sup> )	4562	4562	4562	4562	4562	4562	4562	4562	4562	4562	4562
	(D22@150)	(D22@150)	(D22@150)	(D22@150)	(D22@150)	(D22@150)	(D22@150)	(D22@150)	(D22@150)	(D22@150)	(D22@150)
Total Connector Area (mm <sup>2</sup> )	8256	8256	8256	5485	5485	5485	5485	5485	8256	8256	8256
Checking	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

## Design of Deck Slab

### Summary of Bending Moment:

#### Bending Moment due to Live Load:

##### (a) Continuous Slab

1) Effective Span Length	1.700 m	
2) Load	10.000 T	
3) Impact Factor IM	33%	
4) Positive Moment	$M=0.8*(1+IM)*(0.12S+0.07)$	2.92 T.m/m
5) Negative Moment	$M=-(1+IM)*(0.15S+0.125)^*$	-5.05 T.m/m

##### (2) Cantilever Slab

1) Effective Span Length	0.100 m < 0.5m --> ignore	
2) Load	10.000 T	
3) Impact Factor IM	33%	
4) Negative Moment		M= 0.00 T.m/m

#### Bending Moment due to Self-weight of Slab:

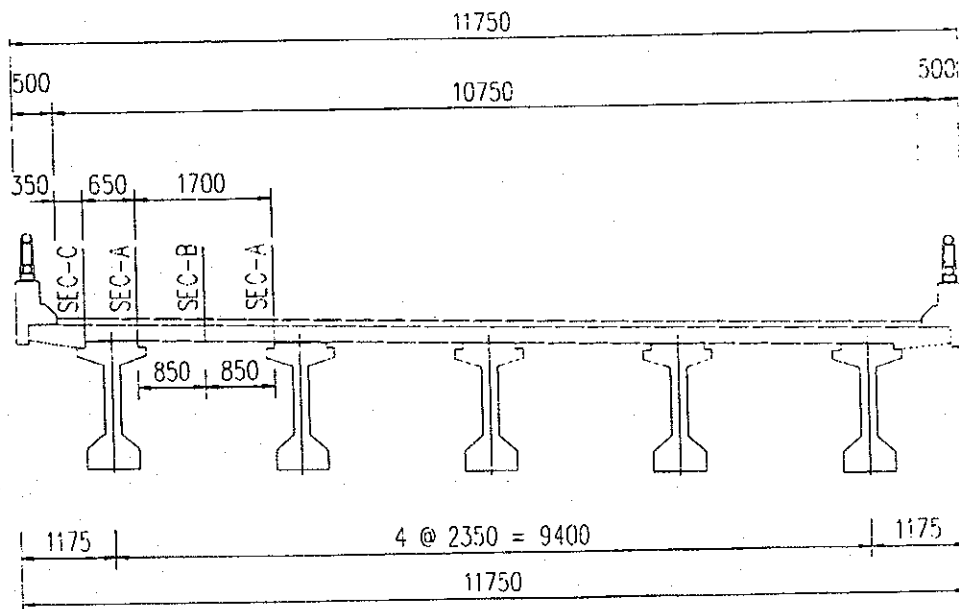
Section	A	B	C
Bending Moment (T.m)	-0.152	0.152	-0.150

#### Bending Moment due to Asphalt Concrete:

Section	A	B	C
Bending Moment (T.m)	-0.050	0.050	-0.030

#### Bending Moment due to Parapet & Railings:

Section	A	B	C
Bending Moment (T.m)	0.000	0.000	-0.424



### Checking Nominal Flexural Strength of Deck Slab (Article 5.7.3.2.2 AASHTO)

			Section A
<b>Sectional Properties</b>			
	Depth of Slab	H	210 mm
	Width of Slab	ds	1000 mm
	Area of Tensile Reinforcement	A <sub>st</sub>	1885 mm <sup>2</sup>
	Distance from extreme compressive fibre to centroid of Tensile Reinforcement	d <sub>st</sub>	162 mm
	Area of Compressive Reinforcement	A <sub>sc</sub>	0 mm <sup>2</sup>
	Distance from extreme compressive fibre to centroid of Compressive Reinforcement	d <sub>sc</sub>	48 mm
<b>Calculation of Mr</b>			
	Stress block factor	β <sub>1</sub>	0.76
	Distance from extreme compressive fibre to the Neutral Axis	c	28 mm
	Depth of equivalent stress block	a	22 mm
	Nominal Resistance	Mn	111,144,141 N.mm
	Flexural Resistance factor	φ	1.0
	Factored Resistance	Mr	111,144,141 N.mm
<b>Checking</b>	Factored Bending Moment due to External Loads	Mu	91,089,350 N.mm
			OK

			Section B
<b>Sectional Properties</b>			
	Depth of Slab	H	210 mm
	Width of Slab	ds	1000 mm
	Area of Tensile Reinforcement	A <sub>st</sub>	1885 mm <sup>2</sup>
	Distance from extreme compressive fibre to centroid of Tensile Reinforcement	d <sub>st</sub>	162 mm
	Area of Compressive Reinforcement	A <sub>sc</sub>	0 mm <sup>2</sup>
	Distance from extreme compressive fibre to centroid of Compressive Reinforcement	d <sub>sc</sub>	48 mm
<b>Calculation of Mr</b>			
	Stress block factor	β <sub>1</sub>	0.76
	Distance from extreme compressive fibre to the Neutral Axis	c	28 mm
	Depth of equivalent stress block	a	22 mm
	Nominal Resistance	Mn	111,144,141 N.mm
	Flexural Resistance factor	φ	1.0
	Factored Resistance	Mr	111,144,141 N.mm
<b>Checking</b>	Factored Bending Moment due to External Loads	Mu	53,663,150 N.mm
			OK

Section C

Sectional Properties

	Depth of Slab	H	210 mm
	Width of Slab	ds	1000 mm
	Area of Tensile Reinforcement	A <sub>st</sub>	1885 mm <sup>2</sup>
	Distance from extreme compressive fibre to centroid of Tensile Reinforcement	d <sub>st</sub>	162 mm
	Area of Compressive Reinforcement	A <sub>sc</sub>	0 mm <sup>2</sup>
	Distance from extreme compressive fibre to centroid of Compressive Reinforcement	d <sub>sc</sub>	48 mm
Calculation of Mr	Stress block factor	β <sub>1</sub>	0.76
	Distance from extreme compressive fibre to the Neutral Axis	c	28 mm
	Depth of equivalent stress block	a	22 mm
	Nominal Resistance	M <sub>n</sub>	111,144,141 N.mm
	Flexural Resistance factor	φ	1.0
	Factored Resistance	Mr	111,144,141 N.mm
Checking	Factored Bending Moment due to External Loads	Mu	7,617,528 N.mm

OK



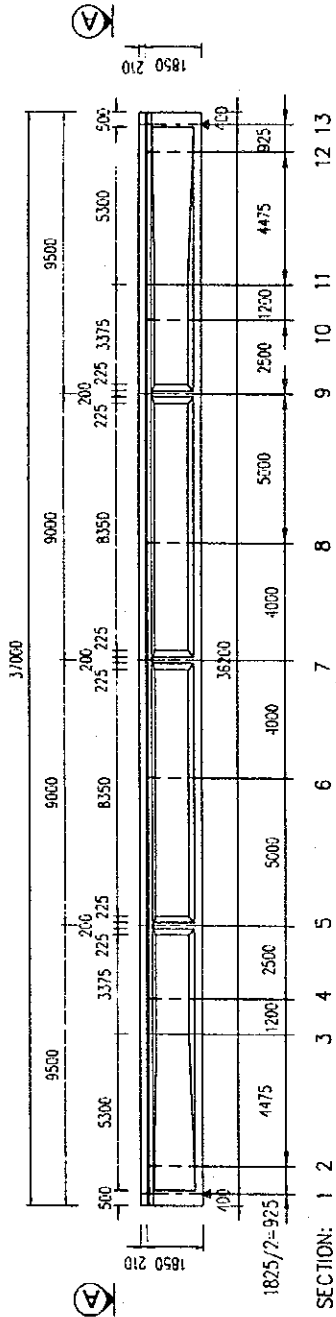
(3) PC COMPOSITE I BEAM (SIMPLE SPAN),  
CASE 3

Structural Views, Design Sections

SIMPLE SPAN L=37.0m, W = 11.75m

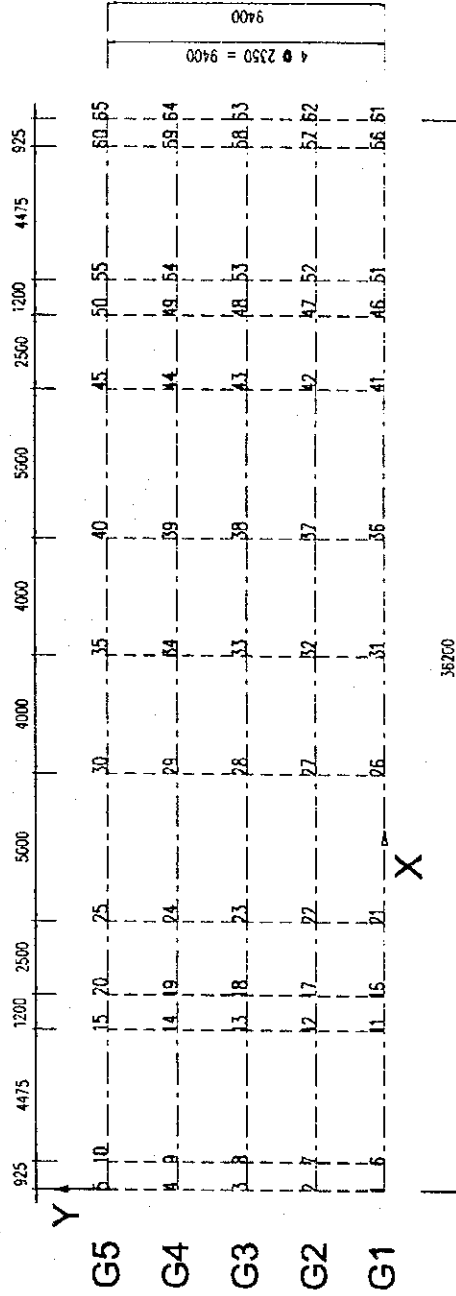
ELEVATION

(SCALE : 1:250)



SECTION A - A

(SCALE : 1:250)



**Summary of sectional Forces:**

Section	S.W of girder			S.W of Deck Slab+Diaphragms			S.W of Surface		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	0.00	35.61	0.00	0.00	22.33	0.00	0.00	16.70	-1.10
SEC-2	0.00	32.72	31.60	0.00	21.19	20.13	0.00	15.27	13.69
SEC-3	0.00	24.40	159.40	0.00	15.67	102.60	0.00	8.87	66.45
SEC-4	0.00	21.48	186.93	0.00	14.19	120.51	0.00	7.00	75.84
SEC-5	0.00	16.84	234.83	0.00	11.10	152.13	0.00	3.12	88.49
SEC-6	0.00	7.54	295.78	0.00	4.94	192.23	0.00	2.23	118.99
SEC-7	0.00	0.00	311.09	0.00	0.00	202.10	0.00	-3.83	116.08
SEC-8	0.00	-7.54	295.78	0.00	-4.94	192.23	0.00	-2.23	118.99
SEC-9	0.00	-16.84	234.83	0.00	-11.10	152.13	0.00	-3.12	88.49
SEC-10	0.00	-21.48	186.93	0.00	-14.19	120.51	0.00	-7.00	75.84
SEC-11	0.00	-24.40	159.40	0.00	-15.67	102.60	0.00	-8.87	66.45
SEC-12	0.00	-32.72	31.60	0.00	-21.19	20.13	0.00	-15.27	13.69
SEC-13	0.00	-35.61	0.00	0.00	-22.33	0.00	0.00	-16.70	-1.10

Section	Prestress			LiveLoad max			LiveLoad min		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	633.99	-54.23	0.00	0.00	11.12	8.25	0.00	-0.33	-4.00
SEC-2	633.99	-50.56	-92.20	0.00	10.75	8.25	0.00	-0.33	-0.39
SEC-3	644.24	-42.51	-300.75	0.00	10.47	44.12	0.00	-1.95	-0.35
SEC-4	653.03	-35.26	-346.23	0.00	10.04	52.83	0.00	-2.28	-0.89
SEC-5	661.26	-24.57	-426.84	0.00	9.13	70.10	0.00	-3.16	-3.26
SEC-6	661.23	-7.94	-510.74	0.00	6.09	87.75	0.00	-3.12	-3.47
SEC-7	656.44	0.00	-508.31	0.00	4.80	94.08	0.00	-4.80	-4.91
SEC-8	661.23	7.94	-510.74	0.00	3.12	87.75	0.00	-6.09	-3.47
SEC-9	661.26	24.57	-426.84	0.00	3.16	70.10	0.00	-9.13	-3.26
SEC-10	653.03	35.26	-346.23	0.00	2.28	52.83	0.00	-10.04	-0.89
SEC-11	644.24	42.51	-300.75	0.00	1.95	44.12	0.00	-10.47	-0.35
SEC-12	633.99	50.56	-92.20	0.00	0.33	8.25	0.00	-10.75	-0.39
SEC-13	633.99	54.23	0.00	0.00	0.33	4.04	0.00	-11.12	-4.00

Section	Impact max			Impact min		
	N (tf)	V (tf)	M (tf.m)	N (tf)	V (tf)	M (tf.m)
SEC-1	0.00	3.67	2.72	0.00	-0.11	-1.32
SEC-2	0.00	3.55	2.72	0.00	-0.11	-0.13
SEC-3	0.00	3.45	14.56	0.00	-0.64	-0.12
SEC-4	0.00	3.31	17.43	0.00	-0.75	-0.29
SEC-5	0.00	3.01	23.13	0.00	-1.04	-1.08
SEC-6	0.00	2.01	28.96	0.00	-1.03	-1.14
SEC-7	0.00	1.58	31.05	0.00	-1.58	-1.62
SEC-8	0.00	1.03	28.96	0.00	-2.01	-1.14
SEC-9	0.00	1.04	23.13	0.00	-3.01	-1.08
SEC-10	0.00	0.75	17.43	0.00	-3.31	-0.29
SEC-11	0.00	0.64	14.56	0.00	-3.45	-0.12
SEC-12	0.00	0.11	2.72	0.00	-3.55	-0.13
SEC-13	0.00	0.11	1.33	0.00	-3.67	-1.32

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	650	650	650	650	650	650	650
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	650	650	650	650	650	650
Width of Siffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	971.0	1,050.0	1,370.0	1,437.0	1,552.0	1,677.0	1,688.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre of Compressive Reinforcement	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>								
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre Neutral Axis	mm	549	612	1,479	1,500	1,533	1,566	1,568
Depth of equivalent stress block	mm	420	467	1,130	1,147	1,172	1,197	1,199
Average stress in Prestress stell at nominal bending resistance	Mpa	1,566	1,557	1,298	1,316	1,346	1,374	1,376
Nominal Resistance	N.mm	7.06E+09	7.57E+09	7.32E+09	7.89E+09	8.88E+09	9.99E+09	1.01E+10
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	N.mm	7.06E+09	7.57E+09	7.32E+09	7.89E+09	8.88E+09	9.99E+09	1.01E+10
<b>Checking</b>								
Factored Bending Moment due to External Loads	N.mm	0.00E+00	7.76E+08	3.93E+09	4.61E+09	5.80E+09	7.32E+09	7.70E+09

(1) Nominal Flexural Strength of Girder during Construction Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13
<b>Sectional Properties</b>							
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	650	650	650	650	650	650
Depth of Deck Slap	mm	210	210	210	210	210	210
Total width of Webs	mm	650	650	650	650	650	650
Width of Siffit Slap	mm	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>							
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	1,677.0	1,552.0	1,437.0	1,370.0	1,050.0	971.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0
<b>Distance from extreme compressive fibre to centroid of Tensile Reinforcement</b>							
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0
<b>Distance from extreme compressive fibre of Compressive Reinforcement</b>							
Calculation of Mr	mm	0.0	0.0	0.0	0.0	0.0	0.0
<b>Stress block factor</b>							
Distance from extreme compressive fibre Neutral Axis	mm	1,566	1,533	1,500	1,479	612	549
Depth of equivalent stress block	mm	1,197	1,172	1,147	1,130	467	420
<b>Average stress in Prestress stell at nominal bending resistance</b>							
Nominal Resistance	Mpa	1,374	1,346	1,316	1,298	1,557	1,566
Flexural Resistance factor	N.mm	9.99E+09	8.88E+09	7.89E+09	7.32E+09	7.57E+09	7.06E+09
Factored Resistance	N.mm	1.0	1.0	1.0	1.0	1.0	1.0
<b>Checking</b>							
Factored Bending Moment due to External Loads	N.mm	7.32E+09	5.80E+09	4.61E+09	3.93E+09	7.76E+08	0.00E+00

(2) Checking Nominal Shear Strength of Section during Construction Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	650	650	650	650	650	650	650
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	650	650	650	650	650	650
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	5,923	5,923	5,923	5,923	5,923	5,923	5,923
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	971	1,050	1,370	1,437	1,552	1,677	1,688
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
Effective shear Depth	mm	1,332	1,332	1,332	1,332	1,332	1,332	1,332
Effective web width	mm	650	580	200	200	200	200	200
Spacing of stirrups	mm <sup>2</sup>	150	150	150	300	300	300	300
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		6.8	6.8	6.1	6.6	6.3	5.5	5.4
Area of shear reinf. within a distance	mm <sup>2</sup>	616	616	616	308	308	308	308
Strain in the tensile reinforcement		-0.000254	-0.000248	-0.000245	-0.000219	-0.000163	-0.000083	-0.000070
Inclination angle of diagonal compressive stress	degree	27.00	27.00	23.14	25.06	27.00	27.00	27.00
Component of effective prestressed force in the direction of the applied shear	N	-5.42E+05	-5.06E+05	-4.25E+05	-3.53E+05	-2.46E+05	-7.94E+04	0.00E+00
Nominal Resistance of Concrete	N	3.08E+06	2.75E+06	8.55E+05	9.26E+05	8.86E+05	7.69E+05	7.55E+05
Nominal Resistance of Reinforcement	N	4.19E+06	4.19E+06	4.99E+06	1.14E+06	1.05E+06	1.05E+06	1.05E+06
Nominal Resistance	N	6.72E+06	6.43E+06	2.24E+06	1.71E+06	1.69E+06	1.74E+06	1.80E+06
Resistance factor for shear		0.9	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	N	6.05E+06	5.79E+06	2.02E+06	1.54E+06	1.52E+06	1.56E+06	1.62E+06
<b>Checking</b>								
Factored Moment due to External Loads	N.mm	0.00E+00	7.76E+08	3.93E+09	4.61E+09	5.80E+09	7.32E+09	7.70E+09
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	8.69E+05	8.09E+05	6.01E+05	5.35E+05	4.19E+05	1.87E+05	0.00E+00

(2) Checking Nominal Shear Strength of Section during Construction Stage - 2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13
<b>Sectional Properties</b>							
Depth of Girder	mm	1,850	1,850	1,850	1,850	1,850	1,850
Width of Deck Slap	mm	650	650	650	650	650	650
Depth of Deck Slap	mm	210	210	210	210	210	210
Total width of Webs	mm	650	650	650	650	650	650
Width of Soffit Slap	mm	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250
<b>Total Area of Prestressing Cables</b>							
Ap	mm <sup>2</sup>	5,923	5,923	5,923	5,923	5,923	5,923
<b>Distance from extreme compressive fibre to centroid of Prestressing Cables</b>							
dp	mm	1,677	1,552	1,437	1,370	1,050	971
<b>Area of Tensile Reinforcement</b>							
dst	mm <sup>2</sup>	0	0	0	0	0	0
<b>Tensile Reinforcement</b>							
Asc	mm <sup>2</sup>	0	0	0	0	0	0
<b>Area of Compressive Reinforcement</b>							
dsc	mm <sup>2</sup>	0	0	0	0	0	0
<b>Calculation of Mr</b>							
Effective shear Depth	mm	1,332	1,332	1,332	1,332	1,332	1,332
Effective web width	mm	200	200	200	200	580	650
Spacing of stirrups	mm <sup>2</sup>	300	150	150	150	150	150
<b>Angle of inclination of transverse reinforcement to longitudinal axis of girder</b>							
$\alpha$	degree	90	90	90	90	90	90
<b>Factor indicating ability of diagonally cracked concrete to transmit tension</b>							
$\beta$		5.5	6.3	6.8	6.8	6.8	6.8
Av	mm <sup>2</sup>	308	616	616	616	616	616
ex		-0.000083	-0.000163	-0.000225	-0.000257	-0.000248	-0.000254
$\theta$	degree	27.00	27.00	27.00	27.00	27.00	27.00
<b>Component of effective prestressed force in the direction of the applied shear</b>							
Vp	N	7.94E+04	2.46E+05	3.53E+05	4.25E+05	5.06E+05	5.42E+05
Vc	N	7.69E+05	8.86E+05	9.48E+05	9.48E+05	2.75E+06	3.08E+06
Vs	N	1.05E+06	4.19E+06	4.19E+06	4.19E+06	4.19E+06	4.19E+06
Vn	N	1.89E+06	2.91E+06	3.02E+06	3.09E+06	7.44E+06	7.81E+06
$\phi$		0.9	0.9	0.9	0.9	0.9	0.9
Vr	N	1.71E+06	2.62E+06	2.71E+06	2.78E+06	6.70E+06	7.03E+06
<b>Checking</b>							
Factored Moment due to External Loads	Mu	7.32E+09	5.80E+09	4.61E+09	3.93E+09	7.76E+08	0.00E+00
Factored Axial Force due to External Loads	Nu	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	Vu	1.87E+06	4.19E+05	5.35E+05	6.01E+05	8.09E+05	8.69E+05

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -1/2

	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>							
Depth of Girder	2,060	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slab	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slab	210	210	210	210	210	210	210
Total width of Webs	650	650	650	200	200	200	200
Width of Soffit Slab	650	650	650	650	650	650	650
Depth of Soffit Slab	250	250	250	250	250	250	250
Total Area of Prestressing Cables	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6	5,922.6
Distance from extreme compressive fibre to centroid of Prestressing Cables	1,181.0	1,260.0	1,580.0	1,647.0	1,762.0	1,887.0	1,898.0
Area of Tensile Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Area of Compressive Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Calculation of Mr</b>							
Stress block factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Distance from extreme compressive fibre to the Neutral Axis	565	629	1,541	1,558	1,586	1,612	1,615
Depth of equivalent stress block	432	481	1,178	1,191	1,212	1,232	1,234
Average stress in Prestress steel at nominal bending resistance	1,611	1,600	1,352	1,367	1,391	1,415	1,417
Nominal Resistance	1.00E+10	1.07E+10	1.28E+10	1.34E+10	1.45E+10	1.58E+10	1.59E+10
Flexural Resistance factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	1.00E+10	1.07E+10	1.28E+10	1.34E+10	1.45E+10	1.58E+10	1.59E+10
<b>Checking</b>							
Factored Bending Moment due to External Loads	1.76E+08	1.04E+09	5.30E+09	6.21E+09	7.80E+09	9.93E+09	1.03E+10

(3) Nominal Flexural Strength of Girder at Service Stage (AASHTO LRFD 5.7.3.2.2) -2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13
<b>Sectional Properties</b>							
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slab	mm	2,035	2,035	2,035	2,035	2,035	650
Depth of Deck Slab	mm	210	210	210	210	210	250
Total width of Webs	mm	200	200	200	200	580	650
Width of Soffit Slab	mm	650	650	650	650	650	2,035
Depth of Soffit Slab	mm	250	250	250	250	250	210
<b>Total Area of Prestressing Cables</b>							
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,887.0	1,762.0	1,647.0	1,580.0	1,260.0	879.0
Area of Tensile Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0
<b>Distance from extreme compressive fibre to centroid of Tensile Reinforcement</b>							
Area of Compressive Reinforcement	mm <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0
<b>Distance from extreme compressive fibre to centroid of Compressive Reinforcement</b>							
Calculation of Mr	mm	0.0	0.0	0.0	0.0	0.0	2,060.0
Stress block factor		0.76	0.76	0.76	0.76	0.76	0.76
<b>Distance from extreme compressive fibre to the Neutral Axis</b>							
Depth of equivalent stress block	mm	1,612	1,586	1,558	1,541	629	540
Average stress in Prestress steel at nominal bending resistance	Mpa	1,415	1,391	1,367	1,352	1,600	1,540
Nominal Resistance	N.mm	1.58E+10	1.45E+10	1.34E+10	1.28E+10	1.07E+10	6.14E+09
Flexural Resistance factor		1.0	1.0	1.0	1.0	1.0	1.0
Factored Resistance	N.mm	1.58E+10	1.45E+10	1.34E+10	1.28E+10	1.07E+10	6.14E+09
<b>Checking</b>							
Factored Bending Moment due to External Loads	N.mm	9.93E+09	7.80E+09	6.21E+09	5.30E+09	1.04E+09	1.00E+08



(4) Checking Nominal Shear Strength of Section at Service Stage - 1/2

	Unit	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
<b>Sectional Properties</b>								
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	2,035	2,035	2,035
Depth of Deck Slap	mm	210	210	210	210	210	210	210
Total width of Webs	mm	650	580	200	200	200	200	200
Width of Soffit Slap	mm	650	650	650	650	650	650	650
Depth of Soffit Slap	mm	250	250	250	250	250	250	250
Total Area of Prestressing Cables	mm <sup>2</sup>	5,923	5,923	5,923	5,923	5,923	5,923	5,923
Distance from extreme compressive fibre to centroid of Prestressing Cables	mm	1,181	1,260	1,580	1,647	1,762	1,887	1,898
Area of Tensile Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Tensile Reinforcement	mm	0	0	0	0	0	0	0
Area of Compressive Reinforcement	mm <sup>2</sup>	0	0	0	0	0	0	0
Distance from extreme compressive fibre to centroid of Compressive Reinforcement	mm	0	0	0	0	0	0	0
<b>Calculation of Mr</b>								
Effective shear Depth	mm	1,483	1,483	1,483	1,483	1,483	1,483	1,483
Effective web width	mm	650	580	200	200	200	200	200
Spacing of stirrups	mm <sup>2</sup>	150	150	150	300	300	300	300
Angle of inclination of transverse reinforcement to longitudinal axis of girder	degree	90	90	90	90	90	90	90
Factor indicating ability of diagonally cracked concrete to transmit tension		6.8	6.8	3.6	5.2	5.3	3.1	2.6
Area of shear reinf. within a distances	mm <sup>2</sup>	616	616	616	308	308	308	308
Strain in the tensile reinforcement		-0.000209	-0.000204	-0.000151	-0.000122	-0.000063	0.000348	0.000467
Inclination angle of diagonal compressive stress	degree	27.00	27.00	21.68	23.25	26.62	28.70	28.93
Component of effective prestressed force in the direction of the applied shear	N	-5.42E+05	-5.06E+05	-4.25E+05	-3.53E+05	-2.46E+05	-7.94E+04	0.00E+00
Nominal Resistance of Concrete	N	3.43E+06	3.06E+06	5.61E+05	8.09E+05	8.20E+05	4.84E+05	4.11E+05
Nominal Resistance of Reinforcement	N	4.66E+06	4.66E+06	5.97E+06	1.38E+06	1.18E+06	1.08E+06	1.07E+06
Nominal Resistance	N	7.55E+06	7.22E+06	2.54E+06	1.84E+06	1.76E+06	1.49E+06	1.48E+06
Resistance factor for shear		0.9	0.9	0.9	0.9	0.9	0.9	0.9
Factored Resistance	N	6.79E+06	6.49E+06	2.29E+06	1.65E+06	1.58E+06	1.34E+06	1.34E+06
<b>Checking</b>								
Factored Moment due to External Loads	N.mm	1.76E+08	1.04E+09	5.30E+09	6.21E+09	7.80E+09	9.93E+09	1.03E+10
Factored Axial Force due to External Loads	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Factored Shear Force due to External Loads	N	1.23E+06	1.15E+06	8.77E+05	7.85E+05	6.09E+05	3.31E+05	1.37E+05

(4) Checking Nominal Shear Strength of Section at Service Stage - 2/2

	Unit	Section 8	Section 9	Section 10	Section 11	Section 12	Section 13
<b>Sectional Properties</b>							
Depth of Girder	mm	2,060	2,060	2,060	2,060	2,060	2,060
Width of Deck Slap	mm	2,035	2,035	2,035	2,035	2,035	650
Depth of Deck Slap	mm	210	210	210	210	210	250
Total width of Webs	mm	200	200	200	200	580	650
Width of Soffit Slap	mm	650	650	650	650	650	2,035
Depth of Soffit Slap	mm	250	250	250	250	250	210
<b>Total Area of Prestressing Cables</b>							
Ap	mm <sup>2</sup>	5,923	5,923	5,923	5,923	5,923	5,923
<b>Distance from extreme compressive fibre to centroid of Prestressing Cables</b>							
dp	mm	1,887	1,762	1,647	1,580	1,260	879
<b>Area of Tensile Reinforcement</b>							
Ast	mm <sup>2</sup>	0	0	0	0	0	0
<b>Distance from extreme compressive fibre to centroid of Tensile Reinforcement</b>							
dst	mm	0	0	0	0	0	2,060
<b>Area of Compressive Reinforcement</b>							
Asc	mm <sup>2</sup>	0	0	0	0	0	0
<b>Distance from extreme compressive fibre to centroid of Compressive Reinforcement</b>							
dsc	mm	0	0	0	0	0	2,060
<b>Calculation of Mr</b>							
Effective shear Depth	mm	1,483	1,483	1,483	1,483	1,483	1,483
Effective web width	mm	200	200	200	200	580	650
Spacing of stirrups	mm <sup>2</sup>	300	150	150	150	150	150
<b>Angle of inclination of transverse reinforcement to longitudinal axis of girder</b>							
$\alpha$	degree	90	90	90	90	90	90
<b>Factor indicating ability of diagonally cracked concrete to transmit tension</b>							
$\beta$		3.3	5.4	6.1	6.5	6.8	6.2
<b>Area of shear reinf. within a distance</b>							
Av	mm <sup>2</sup>	308	616	616	616	616	616
<b>Strain in the tensile reinforcement</b>							
ex		0.000295	-0.000073	-0.000143	-0.000179	-0.000209	-0.000153
<b>Inclination angle of diagonal compressive stress</b>							
$\theta$	degree	28.59	27.00	27.00	27.00	27.00	27.00
<b>Component of effective prestressed force in the direction of the applied shear</b>							
Vp	N	7.94E+04	2.46E+05	3.53E+05	4.25E+05	5.06E+05	5.42E+05
<b>Nominal Resistance of Concrete</b>							
Vc	N	5.16E+05	8.46E+05	9.49E+05	1.02E+06	3.06E+06	3.14E+06
<b>Nominal Resistance of Reinforcement</b>							
Vs	N	1.09E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06
<b>Nominal Resistance</b>							
Vn	N	1.68E+06	3.21E+06	3.32E+06	3.39E+06	8.23E+06	8.34E+06
<b>Resistance factor for shear</b>							
$\phi$		0.9	0.9	0.9	0.9	0.9	0.9
<b>Factored Resistance</b>							
Vr	N	1.52E+06	2.89E+06	2.99E+06	3.05E+06	7.40E+06	7.51E+06
<b>Checking</b>							
<b>Factored Moment due to External Loads</b>							
Mu	N.mm	9.93E+09	7.80E+09	6.21E+09	5.30E+09	1.04E+09	1.00E+08
<b>Factored Axial Force due to External Loads</b>							
Nu	N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>Factored Shear Force due to External Loads</b>							
Vu	N	2.68E+05	4.84E+05	6.40E+05	7.34E+05	1.04E+06	1.12E+06

**Checking Stress during construction**  
 Load Combinations for Checking Stress during  
 construction stage

Stress checking during construction stage (AASHTO 5.9.4.2)

		COMBINATION 14		
		Load type	Factor	
		Girder Selfweight G_DC	1.00	
		Slab+Dia. Selfweight S_D	1.00	
Prestress PS		1.00		
Section	N(T)	V(T)	M(T.m)	
SEC-1	633.99	3.70	0.00	
SEC-2	633.99	3.35	-10.47	
SEC-3	644.24	-2.44	-38.74	
SEC-4	653.03	0.41	-38.79	
SEC-5	661.26	3.37	-39.88	
SEC-6	661.23	4.54	-22.73	
SEC-7	656.44	0.00	4.87	
SEC-8	661.23	-4.54	-22.73	
SEC-9	661.26	-3.37	-39.88	
SEC-10	653.03	-0.41	-38.79	
SEC-11	644.24	2.44	-38.74	
SEC-12	633.99	-3.35	-10.47	
SEC-13	633.99	-3.70	0.00	

Section	COMBINATION 14		
	$\sigma_1$ (T/m <sup>2</sup> )	Checking	$\sigma_2$ (T/m <sup>2</sup> )
SEC-1	512.28	OK	512.28
SEC-2	448.35	OK	664.46
SEC-3	816.99	OK	1062.95
SEC-4	829.94	OK	1075.49
SEC-5	839.05	OK	1090.00
SEC-6	893.84	OK	1035.68
SEC-7	973.71	OK	943.32
SEC-8	893.84	OK	1035.68
SEC-9	839.05	OK	1090.00
SEC-10	829.94	OK	1075.49
SEC-11	816.99	OK	1062.95
SEC-12	448.35	OK	664.46
SEC-13	512.28	OK	512.28