



- *Introduction to Prestressed Box Girder Design as per Eurocode2-2:05*

midas **Civil**

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“ Complete Prestressed Box Girder Design using *midas Civil* ”

Modeling

- Section defined using midas Civil or imported from CAD
- (Tapered) section with rebars
- 3D Tendon input & check in real time
- Modeling wizard including FCM, ILM, FSM, and MSS

Analysis

- Staged construction considering creep, shrinkage, and modulus of elasticity (CEB-FIP & Eurocode 2)
- Time dependent tendon loss
- Moving load optimizer as per Eurocode 1
- Auto-generation of load combinations as per Eurocode 0

Design

- Ultimate bending resistance
- Shear resistance
- Torsional resistance
- Crack width calculation and control
- Stress limitations for tendons
- Stress limits for concrete at service & construction stages
- Principal stresses for tendons

Check stress for cross section at service loads

Elem	Part	Comp./Tens.	L.Com	Type	CHK	FT (MPa)	FD (MPa)	FTL (MPa)	FBL (MPa)	FTR (MPa)	FBR (MPa)	FMA (MPa)
13 (13)	Compression	LCB172	FV-MN	OK		-4360.5913	-16097.6078	-4360.4279	-16097.5061	-4361.5546	-16097.5096	-16097.5096
13 (14)	Compression	LCB172	FV-MN	OK		-4707.6902	-19279.9129	-4707.1071	-19280.2264	-4708.2014	-19279.5994	-19280.2264
14 (14)	Compression	LCB172	FV-MN	OK		-4636.6710	-19173.7078	-4636.1622	-19174.0030	-4636.6707	-19173.3326	-19174.0030
14 (15)	Compression	LCB172	FV-MN	OK		-5317.3126	-21498.1100	-5316.6196	-21498.5402	-5318.0486	-21498.1988	-21498.5402
15 (15)	Compression	LCB172	FV-MN	OK		-4300.7573	-21465.7176	-4300.0197	-21466.1008	-4301.4368	-21465.3286	-21466.1008
15 (16)	Compression	LCB172	FV-MN	NO		-10424.6249	-24041.3048	-10424.0202	-24041.6109	-10425.5910	-24040.7390	-24041.6109
16 (16)	Compression	LCB172	FV-MN	NO		-10440.7196	-24060.3532	-10440.1086	-24060.6444	-10441.7207	-24060.0611	-24060.6444
16 (17)	Compression	LCB172	FV-MN	NO		-14159.6405	-29691.2093	-14159.0605	-29691.5151	-14170.2034	-29690.9010	-29691.5151
17 (17)	Compression	LCB172	FV-MN	NO		-14174.9550	-29692.7798	-14174.1971	-29693.1241	-14175.9129	-29692.4275	-29693.1241
17 (18)	Compression	LCB172	FV-MN	NO		-11030.4715	-26007.3410	-11030.0400	-26007.6754	-11031.1030	-26007.0307	-26007.6754
18 (18)	Compression	LCB172	FV-MN	NO		-11763.3095	-26060.6750	-11762.3362	-26060.9702	-11763.6834	-26060.1743	-26060.9702
18 (19)	Compression	LCB172	FV-MN	NO		-10103.4109	-23143.4838	-10102.6755	-23143.6731	-10104.1403	-23143.0944	-23143.6731
19 (19)	Compression	LCB172	FV-MN	NO		-9681.8717	-26032.8248	-9680.8463	-26033.1427	-9682.7971	-26032.3548	-26033.1427
19 (20)	Compression	LCB172	FV-MN	NO		-9485.8194	-25390.9444	-9484.8105	-25391.2169	-9486.7104	-25390.5040	-25391.2169
20 (20)	Compression	LCB172	FV-MN	NO		-6565.6568	-25464.2155	-6565.0544	-25464.7038	-6566.5591	-25463.7275	-25464.7038
20 (21)	Compression	LCB172	FV-MN	NO		-4467.8623	-24505.3731	-4466.8631	-24505.6907	-4468.7624	-24504.9666	-24505.6907
21 (21)	Compression	LCB172	FV-MN	OK		-8537.4680	-23644.2814	-8536.7688	-23644.6648	-8538.1712	-23643.9181	-23644.6648
21 (22)	Compression	LCB172	FV-MN	OK		-7984.0678	-21844.0411	-7983.3770	-21844.4018	-7984.7389	-21843.6808	-21844.4018
22 (22)	Compression	LCB172	FV-MN	OK		-7984.3766	-21931.3459	-7983.7820	-21931.6539	-7984.9583	-21931.0360	-21931.6539
22 (23)	Compression	LCB172	FV-MN	OK		-21357.3169	-23593.9186	-21356.7621	-23594.2133	-21357.8710	-23593.6259	-21357.8710
23 (23)	Compression	LCB172	FV-MN	OK		-21364.1442	-23651.2612	-21363.6918	-23651.5007	-21364.5846	-23651.0217	-21364.5846
23 (24)	Compression	LCB172	FV-MN	OK		-22429.4247	-24967.3937	-22428.8938	-24967.6220	-22429.9558	-24967.1655	-22429.9558
24 (24)	Compression	LCB172	FV-MN	OK		-22437.3804	-24980.2637	-22436.8642	-24980.4788	-22437.7866	-24980.0486	-22437.7866
24 (25)	Compression	LCB172	FV-MN	OK		-23311.4035	-26402.5254	-23311.0286	-26402.7328	-23311.8424	-26402.3179	-23311.8424
25 (25)	Compression	LCB172	FV-MN	OK		-23311.6035	-26402.5668	-23311.2286	-26402.7703	-23311.9424	-26402.3613	-23311.9424
25 (26)	Compression	LCB172	FV-MN	OK		-23669.5647	-27376.1642	-23669.1870	-27376.1642	-23669.9425	-27376.1642	-23669.9425
26 (26)	Compression	LCB172	FV-MN	OK		-23669.8960	-27376.1548	-23669.5283	-27376.1548	-23669.9425	-27376.1548	-23669.9425
26 (27)	Compression	LCB172	FV-MN	OK		-24642.8608	-27795.0967	-24642.6112	-27795.1701	-24643.3400	-27795.0322	-24643.3400
27 (27)	Compression	LCB172	FV-MN	OK		-24643.5484	-27795.2402	-24643.1931	-27795.4338	-24643.9130	-27795.0469	-24643.9130
27 (28)	Compression	LCB172	FV-MN	OK		-23629.7196	-27621.5105	-23629.2636	-27621.6979	-23629.9736	-27621.3221	-23629.9736
28 (28)	Compression	LCB172	FV-MN	OK		-23629.3760	-27620.6061	-23628.9201	-27620.7933	-23629.2740	-27620.4186	-23629.2740
29 (29)	Compression	LCB172	FV-MN	OK		-23235.2299	-26699.1593	-23234.9159	-26699.2409	-23235.5019	-26698.9777	-23235.5019
29 (30)	Compression	LCB172	FV-MN	OK		-23236.2425	-26698.3691	-23235.9286	-26698.4504	-23236.2001	-26698.1977	-23236.2001
29 (31)	Compression	LCB172	FV-MN	OK		-22530.5032	-25727.0725	-22530.1949	-25727.2578	-22530.4816	-25726.9933	-22530.4816
30 (30)	Compression	LCB172	FV-MN	OK		-22530.6418	-25727.0395	-22530.3461	-25727.2234	-22530.6195	-25726.9577	-22530.6195

< Design results in tabular format >

midas Civil (Compatibility Model)

Type	Tendon Name	Locate (mm)	Area (mm ²)	Strength (MPa)	E _s (MPa)
1	101	2141.320	1270.600	1900.000	195000.000
2	102	2483.848	1270.600	1900.000	195000.000
3	103	2822.276	1270.600	1900.000	195000.000
4	104	3161.340	1270.600	1900.000	195000.000

Concrete Material Information

Concrete	Material	Strength (MPa)	E _s (MPa)
1	40	40.000	34325.000
2	40	40.000	34325.000

Reinforcement Material Information

Reinforcement	Material	Strength (MPa)	E _s (MPa)
1	400	400.000	200000.000

1.4 Tendon Profile Information

Type	Tendon Name	Locate (mm)	Area (mm ²)	Strength (MPa)	E _s (MPa)
1	101	2141.320	1270.600	1900.000	195000.000
2	102	2483.848	1270.600	1900.000	195000.000
3	103	2822.276	1270.600	1900.000	195000.000
4	104	3161.340	1270.600	1900.000	195000.000

1.5 Concrete Material Information

Concrete	Material	Strength (MPa)	E _s (MPa)
1	40	40.000	34325.000
2	40	40.000	34325.000

Reinforcement Material Information

Reinforcement	Material	Strength (MPa)	E _s (MPa)
1	400	400.000	200000.000

1.6 Tendon Profile Information

Type	Tendon Name	Locate (mm)	Area (mm ²)	Strength (MPa)	E _s (MPa)
1	101	2141.320	1270.600	1900.000	195000.000
2	102	2483.848	1270.600	1900.000	195000.000
3	103	2822.276	1270.600	1900.000	195000.000
4	104	3161.340	1270.600	1900.000	195000.000

1.7 Concrete Material Information

Concrete	Material	Strength (MPa)	E _s (MPa)
1	40	40.000	34325.000
2	40	40.000	34325.000

Reinforcement Material Information

Reinforcement	Material	Strength (MPa)	E _s (MPa)
1	400	400.000	200000.000

1.8 Tendon Profile Information

Type	Tendon Name	Locate (mm)	Area (mm ²)	Strength (MPa)	E _s (MPa)
1	101	2141.320	1270.600	1900.000	195000.000
2	102	2483.848	1270.600	1900.000	195000.000
3	103	2822.276	1270.600	1900.000	195000.000
4	104	3161.340	1270.600	1900.000	195000.000

1.9 Concrete Material Information

Concrete	Material	Strength (MPa)	E _s (MPa)
1	40	40.000	34325.000
2	40	40.000	34325.000

Reinforcement Material Information

Reinforcement	Material	Strength (MPa)	E _s (MPa)
1	400	400.000	200000.000

1.10 Tendon Profile Information

Type	Tendon Name	Locate (mm)	Area (mm ²)	Strength (MPa)	E _s (MPa)
1	101	2141.320	1270.600	1900.000	195000.000
2	102	2483.848	1270.600	1900.000	195000.000
3	103	2822.276	1270.600	1900.000	195000.000
4	104	3161.340	1270.600	1900.000	195000.000

< Design reports in Excel format >

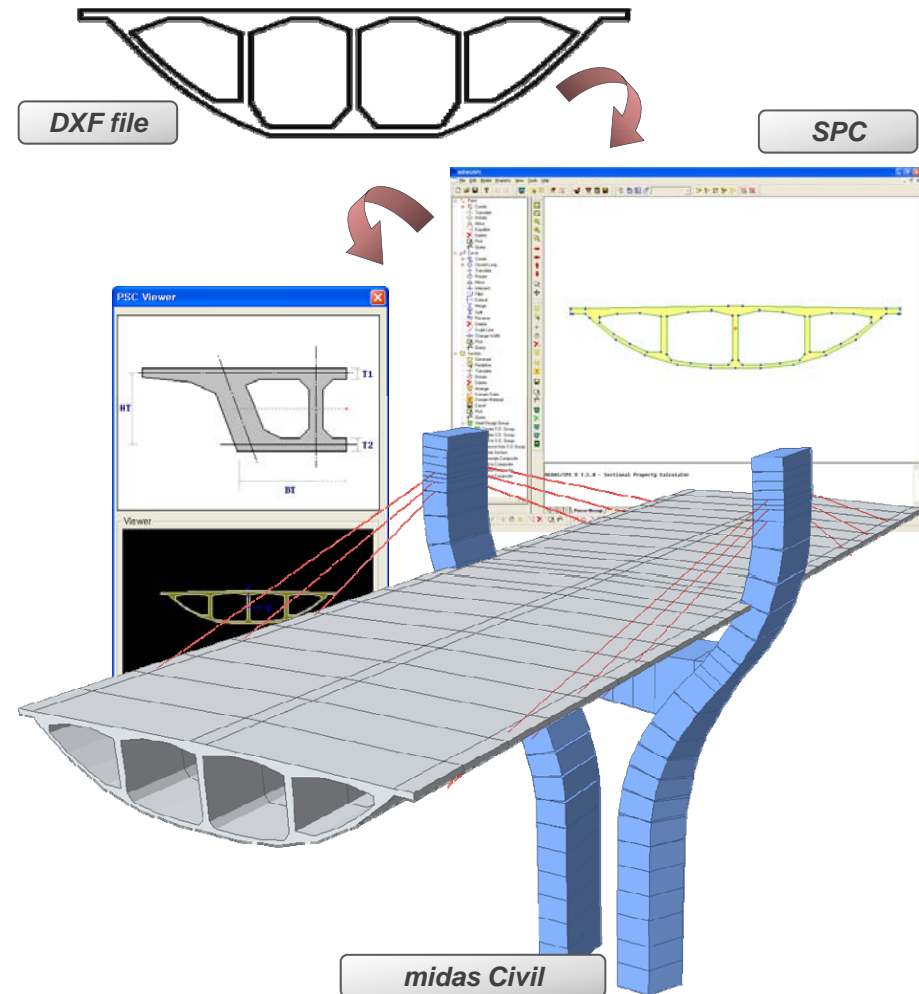
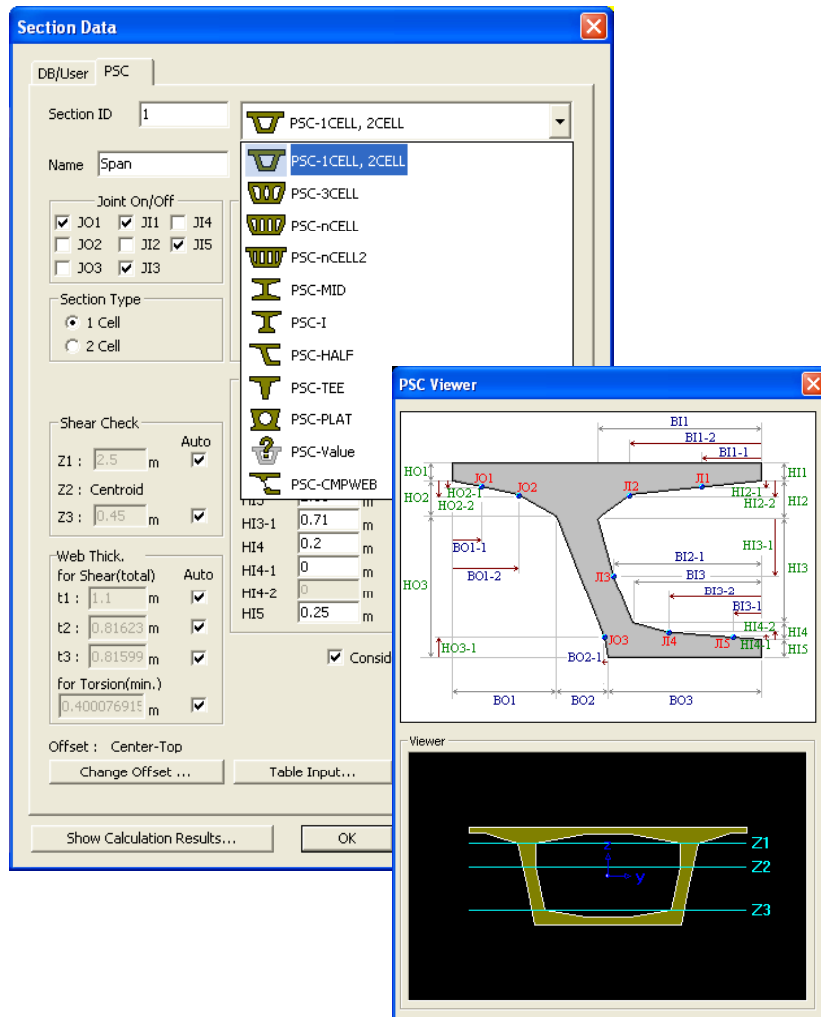
→ 3 limitations of Prestressed Box Girder Bridge Design as per Eurocode 2

Construction stage analysis should be performed since Prestressed Box Girder Bridge needs to be checked during the construction stage and the service state.

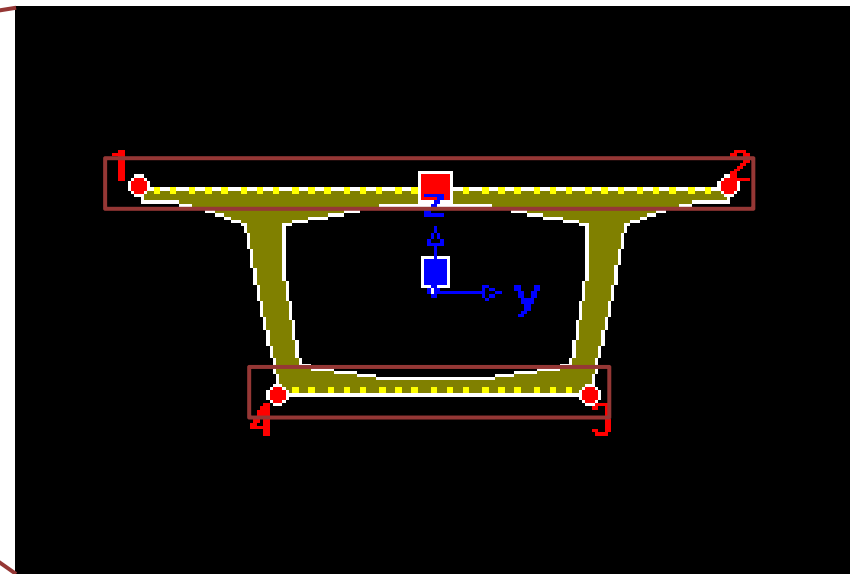
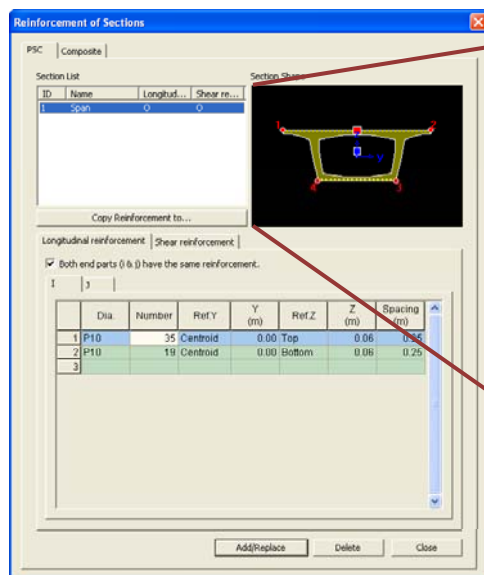
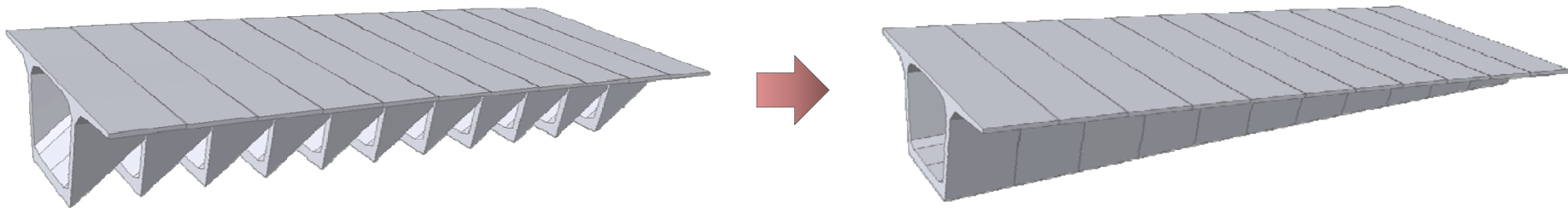
PSC section design can be performed for the Beam Elements only.

Only PSC Type Section can be designed.

→ Section defined using midas Civil or imported from SPC (Sectional Property Calculator)



→ Definition of Tapered Section & Display of Longitudinal Rebars input



→ 3-D Tendon Placement check in real time using Cross Section Viewer & Model View

Add/Modify Tendon Profile

Tendon Name : AIR Group : A1

Tendon Property : Tendon

Assigned Elements : 1to20

Input Type : ☐ 2-D ☒ 3-D

Curve Type : ☒ Spline ☐ Round

Straight Length of Tendon : Begin : 0 m End : 0 m

☐ Typical Tendon No. of Tendons : 1

Transfer Length : User defined Length Begin : 0 m End : 0 m

Profile Reference Axis : ☐ Straight ☐ Curve ☒ Element

Y : 0.0326463 -4.96735

Z : 0.0326463 -4.96735

	x(m)	y(m)	z(m)	fix	Ry(deg)	Rz(deg)
1	0.0000	0.0000	-1.0000		0.00	0.00
2	2.0000	0.0000	-1.2590		0.00	0.00
3	4.0000	0.0000	-1.5352		0.00	0.00
4	6.0000	0.0000	-1.7722		0.00	0.00
5	8.0000	0.0000	-1.9613		0.00	0.00
6	10.0000	0.0000	-2.1028		0.00	0.00
7	12.0000	0.0000	-2.1970		0.00	0.00
8	14.0000	0.0000	-2.2441		0.00	0.00
9	16.0000	0.0000	-2.2500		0.00	0.00

Point of Sym.: ☐ First ☒ Last ☐ Make Symmetric Tendon

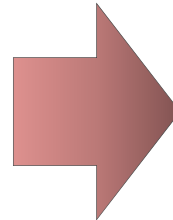
Profile Insertion Point : ☒ End-I ☐ End-J of Elem. 1

x Axis Direction : ☒ I->J ☐ J->I of Elem. 1

x Axis Rot. Angle : 11.31 [deg] ☒ Projection

Offset y : -2.666 m z : 0 m

OK Cancel Apply



Cross Section Viewer

Element No. :

☐ Cross Section

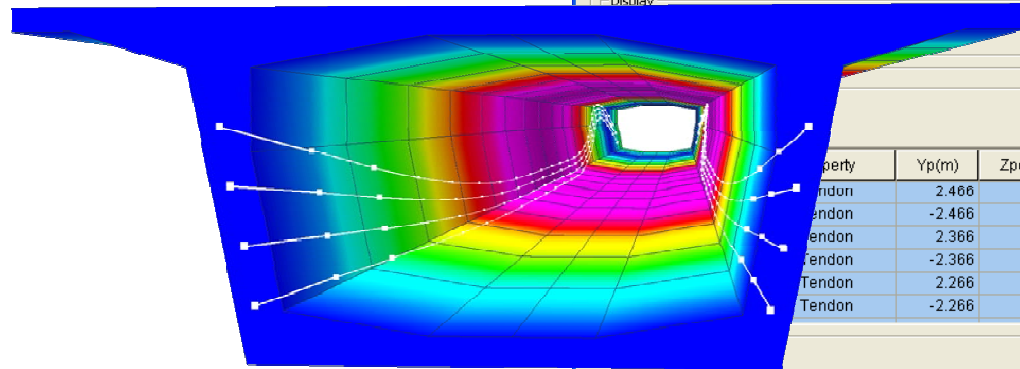
Position Part : ☒ i ☐ 1/4 ☐ 1/2 ☐ 3/4 ☐ j

Direction : ☒ i->j ☐ j->i

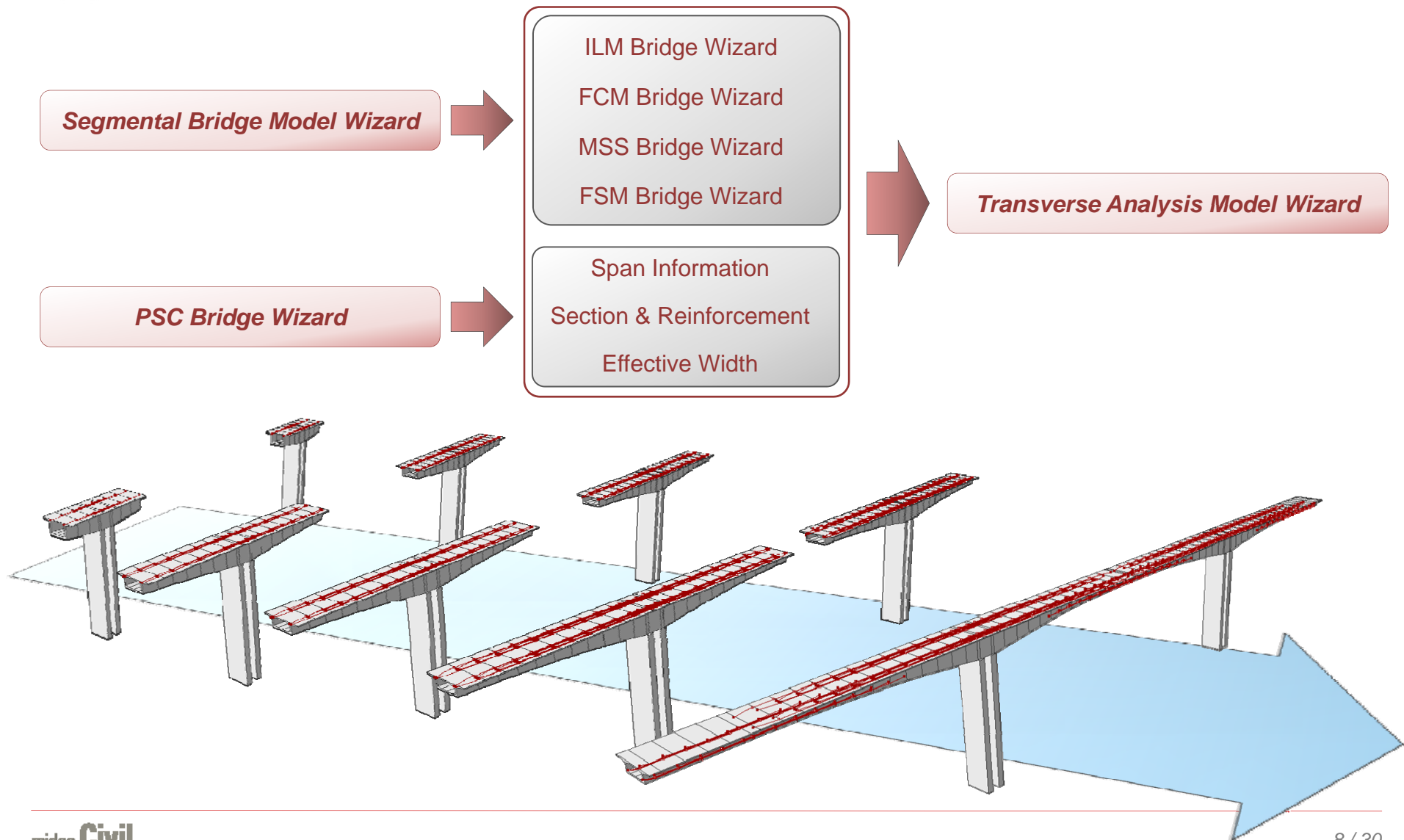
☐ Display ☒ Duct Hole

Property	Yp(m)	Zp(m)	Area(m²)
Tendon	2.466	-1	0.0026353
Tendon	-2.466	-1	0.0026353
Tendon	2.366	-1.5	0.0026353
Tendon	-2.366	-1.5	0.0026353
Tendon	2.266	-2	0.0026353
Tendon	-2.266	-2	0.0026353

Close



→ Prestressed Box Girder Model generation including staged construction, rebars, and tendons



→ Staged Construction considering creep, shrinkage, and modulus of elasticity

Time Dependent Effect

☒ Creep & Shrinkage

Type

☐ Creep ☐ Shrinkage ☒ Creep & Shrinkage

Creep

Convergence for Creep Iteration

Number of Iterations: Tolerance:

☐ Only User's Creep Coefficient

☐ Internal Time Step for Creep:

☒ Auto Time Step Generation for Large Time Gap

T : Time Gap	T > 10	T > 100	T > 1000	T > 5000	T > 10000
	<input type="text" value="2"/>	<input type="text" value="5"/>	<input type="text" value="7"/>	<input type="text" value="10"/>	<input type="text" value="20"/>

☒ Tendon Tension Loss Effect (Creep & Shrinkage)

☒ Consider Re-Bar Confinement Effect

☒ Variation of Comp. Strength

☒ Tendon Tension Loss Effect (Elastic Shortening)

Construction Stage Analysis Control Data

Final Stage: ☒ Last Stage ☐ Other Stage

☐ Restart Construction Stage Analysis

Analysis Option

☒ Include Nonlinear Analysis ☐ Accumulative Stage

☐ Include Equilibrium Element Nodal Forces

☐ Include P-Delta Effect Only

☒ Include Time Dependent Effect

Time Dependent Effect

☒ Creep & Shrinkage

Type

☐ Creep ☐ Shrinkage ☒ Creep & Shrinkage

Convergence for Creep Iteration

Number of Iterations: Tolerance:

☐ Only User's Creep Coefficient

☐ Internal Time Step for Creep:

☒ Auto Time Step Generation for Large Time Gap

T : Time Gap	T > 10	T > 100	T > 1000	T > 5000	T > 10000
	<input type="text" value="2"/>	<input type="text" value="5"/>	<input type="text" value="7"/>	<input type="text" value="10"/>	<input type="text" value="20"/>

☒ Tendon Tension Loss Effect (Creep & Shrinkage)

☒ Consider Re-Bar Confinement Effect

☒ Variation of Comp. Strength

☒ Tendon Tension Loss Effect (Elastic Shortening)

Nonlinear Analysis

Number of Load Steps:

Maximum Number of Iterations/ Load Step:

Convergence Criteria

☐ Energy Norm ☒ Displacement Norm ☐ Force Norm

Cable-Pre-tension Force Control

☒ Internal Force ☐ External Force

Frame Output

☐ Calculate Concurrent Forces of Frame

☒ Calculate Output of Each Part of Composite Section

Load Cases to be Distinguished from Dead Load for C.S. Output

Load Case:

Load Case:

Load Type for C.S. (Direction Load):

Initial Force Control

☐ Convert Final Stage Member Forces to Initial Forces for Post C.S.

☐ Truss ☐ Beam

☐ Change Cable Element to Equivalent Truss Element for Post C.S.

☐ Apply Initial Member Force to C.S.

Initial Tangent Displacement for Erected Structures

☒ All ☐ Group

☐ Load of Pt Force Control

☐ Consider Stress Decrease at Load Length Zone by Post-tension

☒ Linear Interpolation ☐ Constant ☐ Stress

Beam Section Property Changes

☐ Constant ☒ Change with Tendon

☒ Save Output of Current Stage(Beam/Truss)

Construction Stage Analysis Control

→ Tendon Loss by Friction, Anchorage Slip, Elastic Shortening, Creep, Shrinkage and Relaxation

Elem	Part	Stress (Immediate Loss) (tonf/m ²)	Elastic Deform. Loss (tonf/m ²)	Stress(Elastic Loss)/ Stress (Immediate Loss)	Creep/Shrinkage Loss (tonf/m ²)	Relaxation Loss (tonf/m ²)	Stress(All Loss)/ Stress(Immediate Loss)	Effective Num.
The Loss of tendon group [Top-P 1-1] at the stage of [CS15]								
Tendon Group	Top-P 1-1	Stage	CS15	Apply				
7 I	110687.5790		-1503.1204	0.9864	-2001.5266	-1781.4910	0.9522	1.0000
7 J	119519.1913		-1312.9539	0.9890	-1683.7269	-1923.6338	0.9588	1.0000
8 I	116158.3065		-1567.3373	0.9865	-2058.4493	-1897.9622	0.9524	2.0000
8 J	120289.2121		-1437.5402	0.9880	-1728.7034	-1966.3609	0.9573	2.0000
9 I	117096.8201		-1601.7405	0.9863	-2560.0828	-1954.0997	0.9478	4.0000
			-1269.3180	0.9895	-2170.9805	-2018.4493	0.9548	4.0000
			-1575.9778	0.9868	-2625.2251	-2021.4559	0.9462	6.0000
			-1228.2175	0.9899	-2390.6729	-2061.2880	0.9533	6.0000
			-1543.2128	0.9872	-2984.8731	-2074.6478	0.9454	8.0000
			-1207.2216	0.9901	-2510.7456	-2100.9499	0.9524	8.0000
			-1499.5523	0.9877	-3059.8470	-2116.0764	0.9452	10.0000
			-1175.1961	0.9904	-2603.4411	-2135.5507	0.9519	10.0000
			-1456.1471	0.9881	-3117.3407	-2152.6191	0.9451	12.0000
			-1169.5774	0.9905	-2695.1804	-2167.2901	0.9511	12.0000
			-1305.2973	0.9894	-2762.0238	-2177.5484	0.9494	13.0000
			-1091.6720					
			-1205.4594					
			-935.5443					
			-1070.9621					
			-854.3351					
			-974.9152					
			-807.2095					
			-915.3349					
18 J	124391.1551		-781.4001					
19 I	124104.2791		-960.3571					
19 J	123778.5924		-842.8446					
20 I	123778.5924		-843.4929					
20 J	123690.4758		-760.0768					
21 I	123690.4758		-768.7559					
21 J	123575.9243		-774.6983					
22 I	123575.9243		-767.2548					
22 J	123614.9472		-843.5500					
23 I	123614.9472		-841.3832					

Tendon Coordinates...

Tendon Elongation...

Tendon Arrangement...

Tendon Loss...

Tendon Approximate Loss...

Tendon Weight...

Tendon Stress Limit Check...

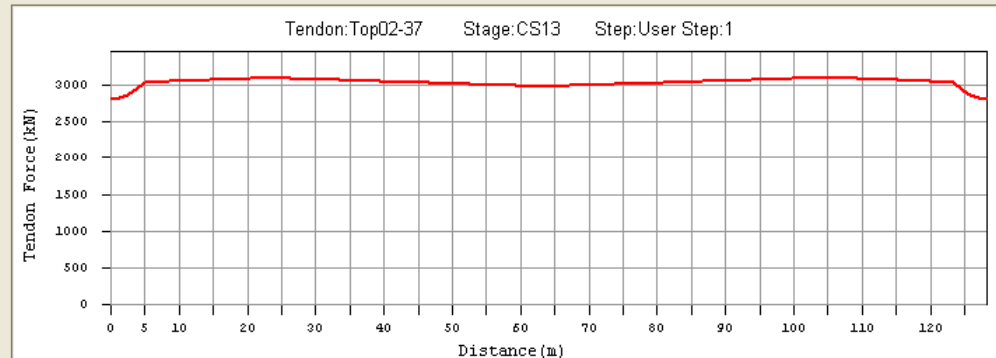
Tendon Time-dependent Loss Graph

Tendon : Top02-37

Stage : CS13

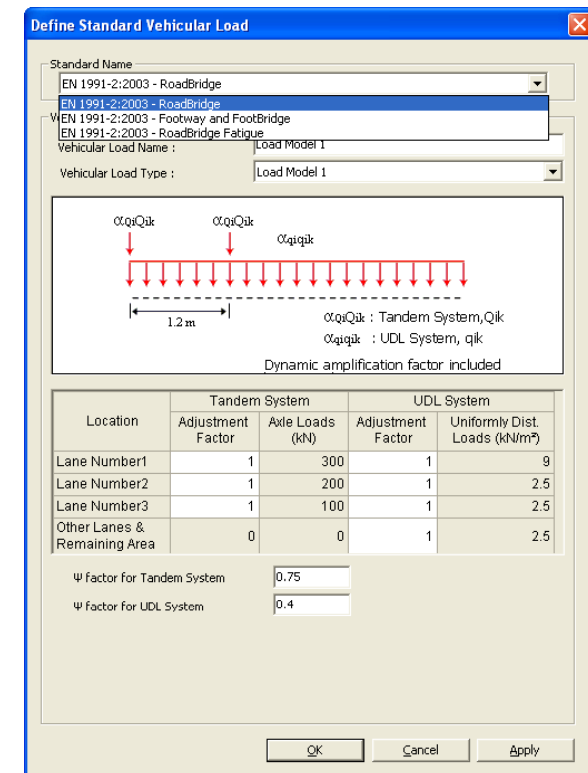
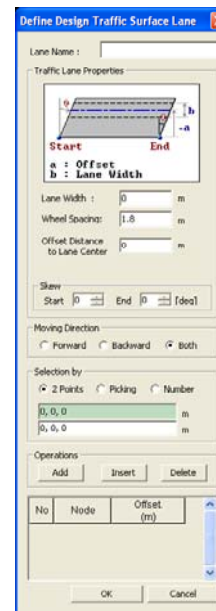
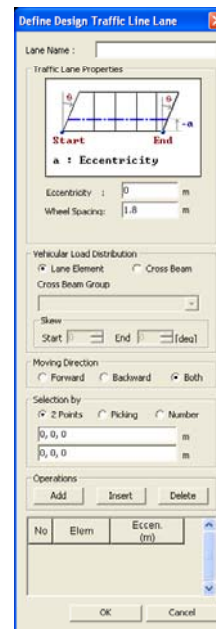
Step : User Step:1

Animate



Close

→ Defining Moving Load as per Eurocode in 3 steps



on the Beam Elements

on the Plate Elements

Step 1

Select Moving Load Code

Step 2

Define Traffic Line Lane
or
Traffic Surface Lane

Step 3

Define Standard Vehicular Load
or
User-defined Vehicular Load

→ Auto-generation of Load Combinations as per Eurocode 0

Automatic Generation of Load Combinations

Option
☒ Add ☐ Replace

Code Selection
☐ Steel ☒ Concrete ☐ SRC ☐ Footing
 Design Code : Eurocode 0

Manipulation of Construction Stage Load Case
☐ ST Only ☐ CS Only ☒ ST+CS
 ST : Static Load Case CS : Construction Stage

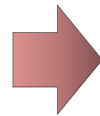
☐ Will Execute Construction Stage Analysis

☐ Consider Losses for Prestress Load Cases
 Transfer Stage : 1 Define Factors
 Service Load Stage : 1

Type of Load	Load Factor		
Permanent	<input type="radio"/> 1.00	<input type="radio"/> 1.35	<input checked="" type="radio"/> Both
Prestress	<input type="radio"/> 1.00	<input type="radio"/> 1.30	<input checked="" type="radio"/> Both
Settlement	<input type="radio"/> 1.00	<input type="radio"/> 1.35	<input checked="" type="radio"/> Both

Leading Variables
☒ Select All
☒ Traffic Loads ☒ Wind Loads ☒ Thermal Act.
☒ Snow Loads ☒ Construction Loads

OK Cancel



Load Combinations

General Steel Design Concrete Design SRC Design

Load Combination List

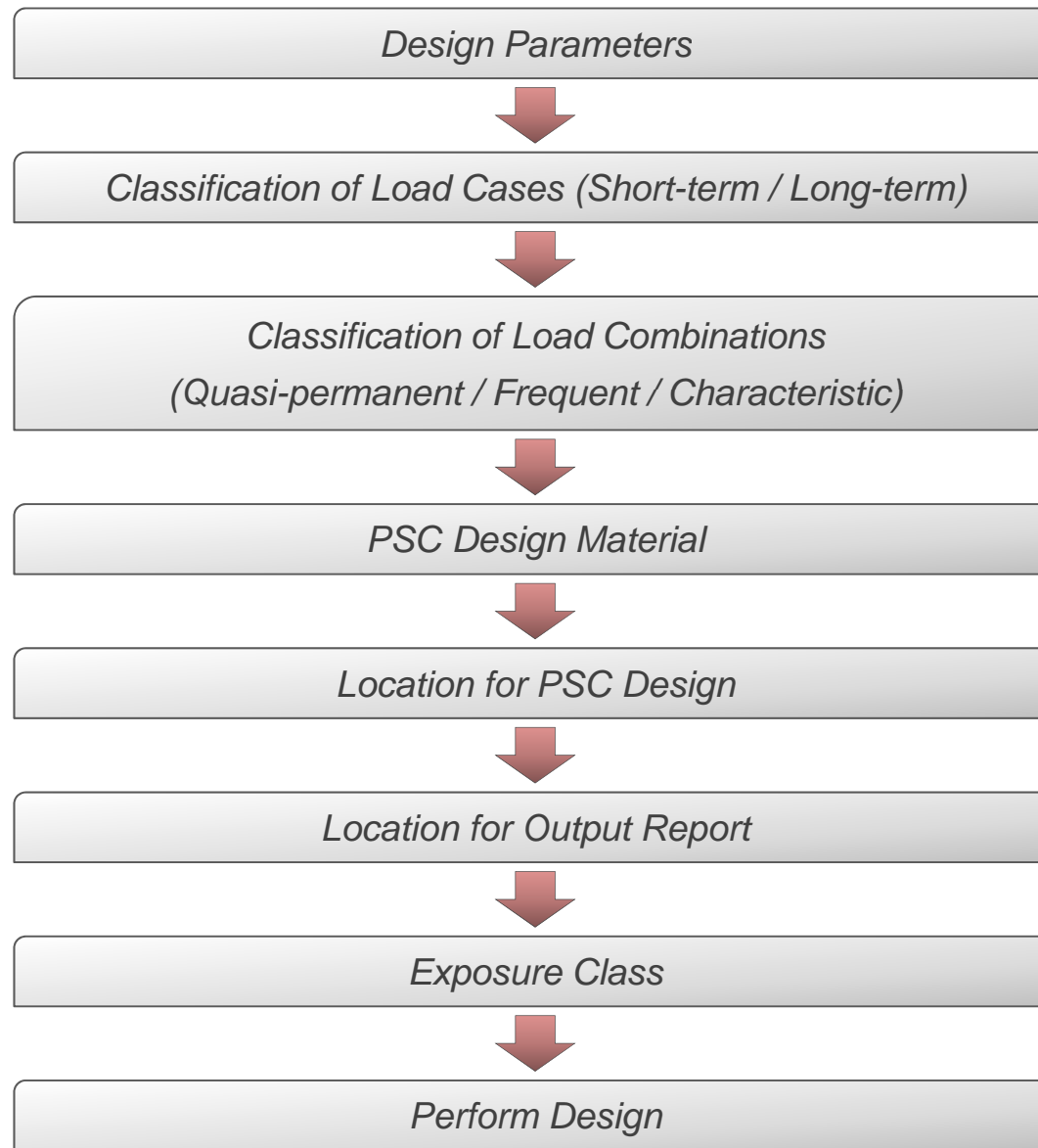
No	Name	Active	Type	E	Description
1	cLCB1	Stren	Add		1.35Permanent+1.35M[1]+1
2	cLCB2	Stren	Add		1.35Permanent+1.35M[1]+1
3	cLCB3	Stren	Add		1.35Permanent+1.35M[1]+1
4	cLCB4	Stren	Add		1.35Permanent+1.35M[1]+1
5	cLCB5	Stren	Add		1.35Permanent+1.35M[1]+1
6	cLCB6	Stren	Add		1.35Permanent+1.35M[1]+1
7	cLCB7	Stren	Add		1.35Permanent+1.35M[1]+1
8	cLCB8	Stren	Add		1.35Permanent+1.35M[1]+1
9	cLCB9	Stren	Add		1.0Permanent+1.35M[1]+1
10	cLCB10	Stren	Add		1.0Permanent+1.35M[1]+1
11	cLCB11	Stren	Add		1.0Permanent+1.35M[1]+1
12	cLCB12	Stren	Add		1.0Permanent+1.35M[1]+1
13	cLCB13	Stren	Add		1.0Permanent+1.35M[1]+1
14	cLCB14	Stren	Add		1.0Permanent+1.35M[1]+1
15	cLCB15	Stren	Add		1.0Permanent+1.35M[1]+1
16	cLCB16	Stren	Add		1.0Permanent+1.35M[1]+1
17	cLCB17	Stren	Add		1.35Permanent+1.3PS+1.5
18	cLCB18	Stren	Add		1.35Permanent+1.3PS+1.5
19	cLCB19	Stren	Add		1.35Permanent+1.3PS-1.5
20	cLCB20	Stren	Add		1.35Permanent+1.3PS-1.5
21	cLCB21	Stren	Add		1.35Permanent+1.0PS+1.5

Load Cases and Factors

LoadCase	Factor
Self(ST)	1.3500
Non-Struct	1.3500
2nd Dead(S)	1.3500
MV 1(MV)	1.3500
PS(ST)	1.3000
Wind(ST)	1.5000
SM(SM)	1.3500
Dead Load(1.3500
Erection Lo	1.3500
Creep Seco	1.3500
Shrinkage	1.3500
Tendon Se	1.3000
*	

Copy Import... Auto Generation... Spread Sheet Form

File Name: Browse Make Load Combination Sheet Close



Select National Annex

Define Design
ParametersModify Design
ParametersSelect Output
Parameters

PSC Design Parameters

Design Code : Eurocode2-2:05 National Annex : Recommended

Input Parameters

Design Parameters (Ultimate limit states)

Moment resistance
☐ Consider tendons in tensile zone ☒ Consider all tendons

Shear resistance
 Strut angle for shear resistance : 45 (Degree)

Cement Class
 Class R (s=0.20)

☒ User Input Data

Modify design parameters be found National Annex ...

Output parameters

Ultimate limit states

☒ Ultimate bending resistance
☒ Shear resistance
☒ Torsional resistance

Serviceability limit states

☒ Stress for cross section at a construction stage
☒ Stress for cross section at service loads
☒ Principal stress at a construction stage
☒ Principal stress at service loads
☒ Tensile stress for prestressing steel
☒ Crack control

Select All Unselect All

OK Cancel

Design parameters be found National Annex

Eurocode2-2:05 / Recommended Update by Code

Partial factors for materials (Ultimate limit states)

Persistent & Transient
 Concrete : 1.5
 Reinforcing steel : 1.15
 Prestressing steel : 1.15

Accidental
 Concrete : 1.2
 Reinforcing steel : 1
 Prestressing steel : 1

Partial factors for materials (Serviceability limit states)

Concrete : 1 Reinforcing/Prestressing steel : 1

Coefficient for long term effects

Alpha cc : 0.85 Alpha ct : 1

Stress limitation

Concrete
 k1 : 0.6 k3 : 0.8 k4 : 1 k6 : 0.7

Prestressing steel
 k1 : 0.8 k2 : 0.9 k5 : 0.75 k7 : 0.75 k8 : 0.85

Reducing factor for Principal stress

Construction stage
 Comp. : 1 Tens. : 1

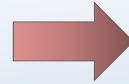
Serviceability limit states
 Comp. : 1 Tens. : 1

Crack width
 k3 : 3.4 k4 : 0.425

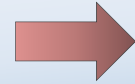
OK Cancel



Classify Load Cases



Classify Load Combinations



Short/Long term Load Case

Long-term

- Self
- Non-Structure Dead
- 2nd Dead

Short-term

- PS
- Wind
- Uniform Temp(+)
- Uniform temp (-)
- Temp Grad (+)
- Temp Grad (-)
- Temp Grad (+)
- Temp Grad (-)

<-

->

OK Close

- **Long-Term**
 - ✓ Self-Weight
 - ✓ and other Dead Loads
- **Short-Term**
 - ✓ Wind Load
 - ✓ Temperature Load
 - ✓ Moving Load
 - ✓ Misc.

Serviceability Load Combination Type

Serviceability

Quasi-permanent

- cLCB199
- cLCB200
- cLCB201
- cLCB202

Frequent

- cLCB181
- cLCB182
- cLCB183
- cLCB184

Characteristic

- cLCB161
- cLCB162
- cLCB163
- cLCB164

OK Close

***These Load Combinations are used
in determining the crack width limits
and calculating stresses***

Modify concrete and steel material properties for design

Modify Concrete Materials

Material List

ID	Name	fc fck R	Main-bar	Sub-bar
1	C40/50	40	S400	S400

Concrete Material Selection

Code : EN(RC) Grade : C40/50

Specified Compressive Strength (fc|fck) : 40 N/mm²

Rebar Selection

Code : EN(RC)

Grade of Main Rebar : S400 Fy : 400 N/mm²

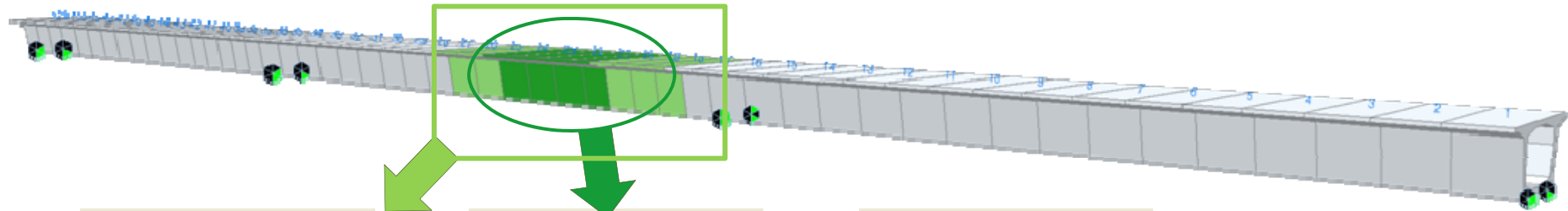
Grade of Sub-Rebar : S400 Fys : 400 N/mm²

Modify Close

C12/15
C16/20
C20/25
C25/30
C30/37
C35/45
C40/50
C45/55
C50/60

S220
S250
S300
S400
S460
S500

***This modification will be used only for the designing and strength verification.
The analysis results remain unaffected.***



Position for PSC Design

Option
☒ Add/Replace ☐ Delete

Moment Resistance
☐ None ☐ I ☐ J ☒ I & J

Shear Resistance
☐ None ☐ I ☐ J ☒ I & J

Apply Close

Using this function we can select the elements to be checked

Position for PSC Output

Option
☒ Add/Replace ☐ Delete

Moment Resistance
 Positive Moment
☐ None ☐ I ☐ J ☒ I & J

Negative Moment
☐ None ☐ I ☐ J ☒ I & J

Shear Resistance
☐ None ☐ I ☐ J ☒ I & J

Torsional Resistance
☐ None ☐ I ☐ J ☒ I & J

Apply Close

Using this feature we can select the elements to be produced in output report (in excel sheet)

Exposure Class

Option
☒ Add/Replace ☐ Delete

☒ Both end parts(i & j) have the same exposure class

I J

Exposure Class
 Top : X0
 Bottom : X0

Apply Close

This feature enables the user to provide exposure classes specific to each element

***Note:**

Output Report (in Excel sheet) can be produced only for those elements which have been assigned to 'Position for PSC Design' Option

Check Flexure Strength...

Check Shear Strength...

Check Combined Shear and Torsion Strength...

Check stress for cross section at a construction stage...

Check tensile stress for Prestressing tendons...

Check stress for cross section at service loads...

Principal stress at a construction stage...

Principal stress at service loads...

Check crack width at service loads...



Ultimate Limit State check



Stresses at construction stages and at service load

**Note. Following sign convention is used for stresses;*

- Compression: (+)

- Tension: (-)

	Elem	Part	Positive/ Negative	LCom Name	Design Situations	Type	CHK	M_Ed (kN-m)	M_Rd (kN-m)	M_Ed/M_Rd	Aps (m²)
▶	1	I[1]	Negative	cLCB40	Persistent & T	FZ-MIN	OK	-16431.6494	52640.2385	-0.3121	0.0211
	1	I[1]	Positive	cLCB87	Persistent & T	FZ-MAX	OK	0.0000	75949.7083	0.0000	0.0211
	1	J[2]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-15949.1274	43589.9099	-0.3659	0.0211
	1	J[2]	Positive	cLCB55	Persistent & T	FX-MAX	OK	17341.5172	85000.0368	0.2040	0.0211
	2	I[2]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-15949.1102	43589.9099	-0.3659	0.0211
	2	I[2]	Positive	cLCB55	Persistent & T	FX-MAX	OK	17341.5404	85000.0368	0.2040	0.0211
	2	J[3]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-19645.4835	34283.5153	-0.5730	0.0211
	2	J[3]	Positive	cLCB55	Persistent & T	FX-MAX	OK	41494.7573	94306.4315	0.4400	0.0211
	3	I[3]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-19645.5501	34283.5153	-0.5730	0.0211
	3	I[3]	Positive	cLCB55	Persistent & T	FX-MAX	OK	41494.6674	94306.4315	0.4400	0.0211
	3	J[4]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-24624.6408	26905.5155	-0.9152	0.0211
	3	J[4]	Positive	cLCB55	Persistent & T	FX-MAX	OK	62817.8669	101684.4313	0.6178	0.0211
	4	I[4]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-24624.8600	26905.5155	-0.9152	0.0211
	4	I[4]	Positive	cLCB55	Persistent & T	FX-MAX	OK	62817.5709	101684.4313	0.6178	0.0211
	4	J[5]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-30490.3271	21370.6918	-1.4267	0.0211
	4	J[5]	Positive	cLCB55	Persistent & T	FX-MAX	OK	81625.4210	106944.7961	0.7632	0.0211
	5	I[5]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-30490.2685	21370.7173	-1.4267	0.0211
	5	I[5]	Positive	cLCB55	Persistent & T	FX-MAX	OK	81625.5002	106944.7961	0.7632	0.0211
	5	J[6]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-35685.7651	17883.0839	-1.9955	0.0211
	5	J[6]	Positive	cLCB55	Persistent & T	FX-MAX	OK	99128.6243	110100.7194	0.9003	0.0211
	6	I[6]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-35685.3210	17883.0689	-1.9955	0.0211
	6	I[6]	Positive	cLCB55	Persistent & T	FX-MAX	OK	99129.2238	110100.7194	0.9004	0.0211
	6	J[7]	Negative	cLCB72	Persistent & T	FX-MIN	OK	-41218.8117	16732.6645	-2.4634	0.0211
	6	J[7]	Positive	cLCB55	Persistent & T	FX-MAX	NG	114569.2672	111148.0318	1.0308	0.0211
	7	I[7]	Negative	cLCB72	Persistent & T	FY-MIN	OK	-41218.5199	16732.6509	-2.4634	0.0211
	7	I[7]	Positive	cLCB55	Persistent & T	FY-MAX	NG	114569.6611	111148.0318	1.0308	0.0211
	7	J[8]	Negative	cLCB72	Persistent & T	FY-MIN	OK	-48457.5889	16692.0780	-2.9030	0.0211
	7	J[8]	Positive	cLCB55	Persistent & T	FY-MAX	NG	126915.2947	111145.7938	1.1419	0.0211

- **Type:** Displays the set of member forces corresponding to moving load case for which the maximum stresses are produced
- **M_Ed:** Design moment
- **M_Rd:** Moment resistance

	Elem	Part	Max/Min	LCom Name	Design Situations	Type	CHK	V_Ed (kN)	V_Rd (kN)	V_Rd,c (kN)	V_Rd,s (kN)	V_Rd,max (kN)
▶	1	I[1]	Max	cLCB72	Persistent & T FZ-MAX	OK		-1446.2545	2383.1697	2383.1697	9500.4438	14945.3920
	1	I[1]	Min	cLCB55	Persistent & T FZ-MIN	NG		-13661.0953	9500.4438	5876.1016	9500.4438	14317.8438
	1	J[2]	Max	cLCB72	Persistent & T FZ-MAX	OK		888.9121	2383.1697	2383.1697	9500.4438	15003.4964
	1	J[2]	Min	cLCB55	Persistent & T FZ-MIN	NG		-10566.8124	9500.4438	2094.1205	9500.4438	14362.5395
	2	I[2]	Max	cLCB72	Persistent & T FZ-MAX	OK		888.9059	2383.1697	2383.1697	9500.4438	15002.9836
	2	I[2]	Min	cLCB55	Persistent & T FZ-MIN	NG		-10566.8210	9500.4438	2093.6391	9500.4438	14361.8116
	2	J[3]	Max	cLCB72	Persistent & T FZ-MAX	OK		1570.4139	2383.1697	2383.1697	9500.4438	15068.8629
	2	J[3]	Min	cLCB55	Persistent & T FZ-MIN	OK		-9426.3229	9500.4438	5972.0118	9500.4438	14412.4880
	3	I[3]	Max	cLCB72	Persistent & T FZ-MAX	OK		1570.4171	2383.1697	2383.1697	9500.4438	15068.3314
	3	I[3]	Min	cLCB55	Persistent & T FZ-MIN	OK		-9426.3207	9500.4438	5971.4241	9500.4438	14411.9034
	3	J[4]	Max	cLCB72	Persistent & T FZ-MAX	OK		2008.3367	2383.1697	2383.1697	9500.4438	15140.4958
	3	J[4]	Min	cLCB55	Persistent & T FZ-MIN	OK		-8507.5632	9500.4438	6026.9731	9500.4438	14467.4145
	4	I[4]	Max	cLCB72	Persistent & T FZ-MAX	OK		2008.3391	2383.1697	2383.1697	9500.4438	15139.9599
	4	I[4]	Min	cLCB55	Persistent & T FZ-MIN	OK		-8507.5618	9500.4438	6026.4066	9500.4438	14466.8458
	4	J[5]	Max	cLCB72	Persistent & T FZ-MAX	OK		2413.4203	9500.4438	2383.1697	9500.4438	15203.8579
	4	J[5]	Min	cLCB55	Persistent & T FZ-MIN	OK		-7621.8913	9500.4438	6075.1732	9500.4438	14515.9981
	5	I[5]	Max	cLCB72	Persistent & T FZ-MAX	OK		2413.4035	9500.4438	2383.1697	9500.4438	15203.6336
	5	I[5]	Min	cLCB55	Persistent & T FZ-MIN	OK		-7621.9151	9500.4438	6075.0295	9500.4438	14515.8528
	5	J[6]	Max	cLCB88	Persistent & T FZ-MAX	OK		2882.7944	9500.4438	2183.8911	9500.4438	14498.2726
	5	J[6]	Min	cLCB39	Persistent & T FZ-MIN	OK		-6883.1935	9500.4438	6349.2208	9500.4438	15145.4379
	6	I[6]	Max	cLCB88	Persistent & T FZ-MAX	OK		2882.7966	9500.4438	2183.9959	9500.4438	14498.4311
	6	I[6]	Min	cLCB39	Persistent & T FZ-MIN	OK		-6883.1912	9500.4438	6349.2208	9500.4438	15145.8265
	6	J[7]	Max	cLCB88	Persistent & T FZ-MAX	OK		3434.3217	9500.4438	2152.4981	9500.4438	14450.8064
	6	J[7]	Min	cLCB39	Persistent & T FZ-MIN	OK		-6141.7429	6349.2208	6349.2208	9500.4438	15083.9143
	7	I[7]	Max	cLCB88	Persistent & T FX-MAX	OK		3434.3252	9500.4438	2152.6028	9500.4438	14450.9646
	7	I[7]	Min	cLCB39	Persistent & T FX-MIN	OK		-6141.7383	6349.2208	6349.2208	9500.4438	15084.2157
	7	J[8]	Max	cLCB56	Persistent & T FX-MAX	OK		4625.5469	9500.4438	2118.3416	9500.4438	14399.1617
	7	J[8]	Min	cLCB71	Persistent & T FX-MIN	OK		-5056.0643	6349.2208	6349.2208	9500.4438	15051.3760

- **V_Ed**: Maximum shear force among Strength/Stress load combinations
- **V_Rd**: Shear resistance
- **V_Rd,c**: Shear resistance of concrete
- **V_Rd,s**: Shear resistance of shear reinforcement
- **V_Rd,max**: Maximum V_Rd,s
- **V_Ed/V_Rd**: The ratio of shear force to shear resistance

	Elem	Part	Max/Min	LCom Name	Design Situations	Type	CHK	T _{Ed} (kN-m)	T _{Rd,max} (kN-m)	V _{Ed} (kN)	V _{Rd,max} (kN)	Ratio
▶	1	I[1]	T-Max	cLCB1	Persistent & T	MZ-MIN	OK	-1774.0143	167101.1096	-9175.6014	14930.6323	0.6252
	1	I[1]	V-Max	cLCB72	Persistent & T	MY-MAX	OK	1457.3228	167266.2982	-1446.2545	14945.3920	0.1055
	1	I[1]	V-Min	cLCB55	Persistent & T	MY-MIN	OK	-1457.3228	160242.8843	-13661.0953	14317.8438	0.9632
	1	J[2]	T-Max	cLCB1	Persistent & T	MY-MIN	OK	-1679.0899	167751.4039	-6007.0481	14988.7367	0.4108
	1	J[2]	V-Max	cLCB72	Persistent & T	MZ-MAX	OK	1362.3984	167916.5925	888.9121	15003.4964	0.0674
	1	J[2]	V-Min	cLCB55	Persistent & T	MZ-MIN	OK	-1362.3984	160743.1107	-10566.8124	14362.5395	0.7442
	2	I[2]	T-Max	cLCB1	Persistent & T	MY-MIN	OK	-1636.3531	167743.3769	-6007.0568	14988.0195	0.4105
	2	I[2]	V-Max	cLCB72	Persistent & T	MZ-MAX	OK	1362.3985	167910.8536	888.9059	15002.9836	0.0674
	2	I[2]	V-Min	cLCB55	Persistent & T	MZ-MIN	OK	-1362.3986	160734.9649	-10566.8210	14361.8116	0.7442
	2	J[3]	T-Max	cLCB1	Persistent & T	MY-MIN	OK	-1556.8179	168480.6865	-4930.8164	15053.8987	0.3368
	2	J[3]	V-Max	cLCB72	Persistent & T	MZ-MAX	OK	1282.8634	168648.1632	1570.4139	15068.8629	0.1118
	2	J[3]	V-Min	cLCB55	Persistent & T	MZ-MIN	OK	-1282.8634	161302.1262	-9426.3229	14412.4880	0.6620
	3	I[3]	T-Max	cLCB1	Persistent & T	MY-MIN	OK	-1514.5488	168473.2489	-4930.8132	15053.2342	0.3365
	3	I[3]	V-Max	cLCB72	Persistent & T	MZ-MAX	OK	1282.8637	168642.2143	1570.4171	15068.3314	0.1118
	3	I[3]	V-Min	cLCB55	Persistent & T	MZ-MIN	OK	-1282.8637	161295.5834	-9426.3207	14411.9034	0.6620
	3	J[4]	T-Max	cLCB1	Persistent & T	MY-MIN	OK	-1441.2917	169280.9012	-4141.3163	15125.3986	0.2823
	3	J[4]	V-Max	cLCB72	Persistent & T	MZ-MAX	OK	1209.6066	169449.8666	2008.3367	15140.4958	0.1398
	3	J[4]	V-Min	cLCB55	Persistent & T	MZ-MIN	OK	-1209.6067	161916.8544	-8507.5632	14467.4145	0.5955
	4	I[4]	T-Max	cLCB1	Persistent & T	MY-MIN	OK	-1399.2325	169273.5535	-4141.3142	15124.7421	0.2821
	4	I[4]	V-Max	cLCB72	Persistent & T	MZ-MAX	OK	1209.6071	169443.8683	2008.3391	15139.9599	0.1398
	4	I[4]	V-Min	cLCB55	Persistent & T	MZ-MIN	OK	-1209.6071	161910.4894	-8507.5618	14466.8458	0.5955
	4	J[5]	T-Max	cLCB1	Persistent & T	MY-MIN	OK	-1332.2533	169988.6894	-3393.2170	15188.6401	0.2312
	4	J[5]	V-Max	cLCB72	Persistent & T	MZ-MAX	OK	1142.6278	170159.0042	2413.4203	15203.8579	0.1655
	4	J[5]	V-Min	cLCB55	Persistent & T	MZ-MIN	OK	-1142.6279	162460.5939	-7621.8913	14515.9981	0.5321

- **T_{Ed}**: Maximum torsional moment among Strength/Stress load combinations
- **T_{Rd,max}**: Design torsional resistance moment.
- **V_{Ed}**: Maximum shear force among Strength/Stress load combinations
- **V_{Rd,max}**: The maximum shear resistance of the section.
- **Ratio**: The ratio of $T_{Ed}/T_{Rd,max} + V_{Ed}/V_{Rd,max}$

	Elem	Part	Comp./Tens.	Stage	CHK	FT (kN/m ²)	FB (kN/m ²)	FTL (kN/m ²)	FBL (kN/m ²)	FTR (kN/m ²)	FBR (kN/m ²)	FMAX (kN/m ²)	ALW (kN/m ²)
▶	1	I[1]	Compression	CS1	OK	1810.2756	6722.9415	1810.2756	6722.9415	1810.2756	6722.9415	6722.9415	24000.00
	1	J[2]	Compression	CS1	OK	2175.2673	6391.9866	2175.2673	6391.9866	2175.2674	6391.9866	6391.9866	24000.00
	2	I[2]	Compression	CS1	OK	2175.1843	6391.9035	2175.1842	6391.9035	2175.1843	6391.9036	6391.9036	24000.00
	2	J[3]	Compression	CS1	OK	2245.0391	6529.8351	2245.0390	6529.8350	2245.0391	6529.8351	6529.8351	24000.00
	3	I[3]	Compression	CS1	OK	2244.9295	6529.7255	2244.9294	6529.7254	2244.9295	6529.7255	6529.7255	24000.00
	3	J[4]	Compression	CS1	OK	2304.0369	6704.8276	2304.0368	6704.8276	2304.0370	6704.8277	6704.8277	24000.00
	4	I[4]	Compression	CS1	OK	2303.9451	6704.7359	2303.9450	6704.7358	2303.9452	6704.7359	6704.7359	24000.00
	4	J[5]	Compression	CS1	OK	2380.3342	6822.5901	2380.3341	6822.5900	2380.3344	6822.5901	6822.5901	24000.00
	5	I[5]	Compression	CS1	OK	2380.2671	6822.5230	2380.2670	6822.5229	2380.2673	6822.5230	6822.5230	24000.00
	5	J[6]	Compression	CS1	OK	2622.6861	6467.0148	2622.6860	6467.0147	2622.6863	6467.0149	6467.0149	24000.00
	6	I[6]	Compression	CS1	OK	2522.6432	6456.9719	2522.6430	6456.9718	2522.6434	6456.9720	6456.9720	24000.00
	6	J[7]	Compression	CS1	OK	2734.2398	5916.4814	2734.2396	5916.4813	2734.2400	5916.4815	5916.4815	24000.00
	7	I[7]	Compression	CS1	OK	2734.2275	5916.4691	2734.2273	5916.4690	2734.2277	5916.4692	5916.4692	24000.00
	7	J[8]	Compression	CS1	OK	2896.3331	5500.2775	2896.3329	5500.2774	2896.3333	5500.2776	5500.2776	24000.00
	8	I[8]	Compression	CS1	OK	2896.3331	5500.2775	2896.3329	5500.2774	2896.3333	5500.2776	5500.2776	24000.00
	8	J[9]	Compression	CS1	OK	2918.6519	5303.6560	2918.6516	5303.6559	2918.6521	5303.6562	5303.6562	24000.00
	9	I[9]	Compression	CS1	OK	2918.6520	5303.6561	2918.6517	5303.6560	2918.6522	5303.6563	5303.6563	24000.00
	9	J[10]	Compression	CS1	OK	2804.0713	5314.1735	2804.0710	5314.1733	2804.0717	5314.1737	5314.1737	24000.00
	10	I[10]	Compression	CS1	OK	2804.0701	5314.1723	2804.0698	5314.1721	2804.0704	5314.1724	5314.1724	24000.00
	10	J[11]	Compression	CS1	OK	2543.4048	5526.2092	2543.4045	5526.2090	2543.4052	5526.2094	5526.2094	24000.00
	11	I[11]	Compression	CS1	OK	2543.4640	5526.2684	2543.4637	5526.2682	2543.4644	5526.2686	5526.2686	24000.00
	11	J[12]	Compression	CS1	OK	2437.0478	5341.1611	2437.0474	5341.1609	2437.0482	5341.1613	5341.1613	24000.00
	12	I[12]	Compression	CS1	OK	2437.2219	5341.3352	2437.2215	5341.3350	2437.2222	5341.3354	5341.3354	24000.00
	12	J[13]	Compression	CS1	OK	2678.3240	4616.7431	2678.3236	4616.7429	2678.3244	4616.7434	4616.7434	24000.00

- **FT:** Combined Stress due to bending moment about major axis (My) and axial force at Top fiber
- **FB:** Combined Stress due to bending moment about major axis (My) and axial force at Bottom fiber
- **FTL:** Combined Stress due to bending moment about major axis (My), minor axis (Mz) and axial force at Top Left fiber
- **FBL:** Combined Stress due to bending moment about major axis (My), minor axis (Mz) and axial force at Bottom Left fiber
- **FTR:** Combined Stress due to bending moment about major axis (My), minor axis (Mz) and axial force at Top Right fiber
- **FBR:** Combined Stress due to bending moment about major axis (My), minor axis (Mz) and axial force at Bottom Right fiber
- **FMAX:** Maximum combined stress out of the above six.
- **ALW:** Allowable stress of cross section at service limit state

	Tendon	FDL1 (kN/m ²)	FDL2 (kN/m ²)	FLL1 (kN/m ²)	AFDL1 (kN/m ²)	AFDL2 (kN/m ²)	AFL1 (kN/m ²)
►	A1L	1097473.8157	1210684.8086	1040552.9927	1280000.0000	1200000.0000	1200000.0000
	A1R	1097473.8157	1210684.8086	1040552.9946	1280000.0000	1200000.0000	1200000.0000
	A2L	1105210.6018	1216931.5832	1044773.8562	1280000.0000	1200000.0000	1200000.0000
	A2R	1105210.6018	1216931.5832	1044773.8582	1280000.0000	1200000.0000	1200000.0000
	A3L	1112539.9816	1220301.1934	1047042.7256	1280000.0000	1200000.0000	1200000.0000
	A3R	1112539.9816	1220301.1934	1047042.7277	1280000.0000	1200000.0000	1200000.0000
	A4L	1121299.3353	1224198.6513	1050639.7177	1280000.0000	1200000.0000	1200000.0000
	A4R	1121299.3353	1224198.6513	1050639.7199	1280000.0000	1200000.0000	1200000.0000
	B1L	1055622.9510	1191492.9468	1027471.9307	1280000.0000	1200000.0000	1200000.0000
	B1R	1055622.9510	1191492.9468	1027471.9273	1280000.0000	1200000.0000	1200000.0000
	B2L	972983.9148	1149469.2453	990526.1998	1280000.0000	1200000.0000	1200000.0000
	B2R	972983.9148	1149469.2453	990526.1967	1280000.0000	1200000.0000	1200000.0000
	B3L	1090779.7917	1210013.2132	1040534.5417	1280000.0000	1200000.0000	1200000.0000
	B3R	1090779.7917	1210013.2132	1040534.5379	1280000.0000	1200000.0000	1200000.0000
	B4L	1107534.2350	1217784.9247	1047929.0147	1280000.0000	1200000.0000	1200000.0000
	B4R	1107534.2350	1217784.9247	1047929.0112	1280000.0000	1200000.0000	1200000.0000
	C1L	1055702.1700	1191572.2881	1026291.4406	1280000.0000	1200000.0000	1200000.0000
	C1R	1055702.1700	1191572.2881	1026291.4427	1280000.0000	1200000.0000	1200000.0000
	C2L	973161.9637	1149469.4804	988588.6630	1280000.0000	1200000.0000	1200000.0000
	C2R	973161.9637	1149469.4804	988588.6650	1280000.0000	1200000.0000	1200000.0000
	C3L	1090844.3977	1210077.8103	1039597.0839	1280000.0000	1200000.0000	1200000.0000
	C3R	1090844.3977	1210077.8103	1039597.0861	1280000.0000	1200000.0000	1200000.0000

For Post-tensioned:

- **FDL1:** Stress in tendon at anchorages
- **FDL2:** Maximum stress in tendon along the length of the member away from anchorages, immediately after anchor set
- **FLL1:** Maximum stress in tendon after all losses at the last stage
- **AFDL1:** Allowable Stress in Tendon immediately after anchor set at anchorages
- **AFDL2:** Allowable Stress in Tendon immediately after anchor set elsewhere
- **AFL1:** Allowable stress in tendon at service limit state after losses.

For Pre-tensioned:

- **FDL1:** Stress in tendon
- **FDL2:** -
- **FLL1:** Maximum stress in tendon after all losses at the last stage
- **AFDL1:** Allowable Stress in Tendon prior to transfer
- **AFDL2:** -
- **AFL1:** Allowable stress in tendon at service limit state after losses

	Elem	Part	Comp./Tens.	LCom Name	Type	CHK	FT (kN/m ²)	FB (kN/m ²)	FTL (kN/m ²)	FBL (kN/m ²)	FTR (kN/m ²)	FBR (kN/m ²)	FMAX (kN/m ²)
	10	I[10]	Compression	cLCB171	FX-MAX	OK	15938.8954	-16121.5100	15938.6241	-16121.6536	15939.1666	-16121.3664	15939.1666
	10	J[11]	Compression	cLCB171	FX-MAX	OK	16081.0953	-16481.8373	16080.7939	-16481.9968	16081.3967	-16481.6777	16081.3967
	11	I[11]	Compression	cLCB171	FY-MAX	OK	16069.6152	-16461.7426	16069.2864	-16461.9166	16069.9439	-16461.5685	16069.9439
	11	J[12]	Compression	cLCB171	FY-MAX	OK	16117.6931	-16849.3667	16117.3349	-16849.5563	16118.0514	-16849.1770	16118.0514
	12	I[12]	Compression	cLCB171	FY-MAX	OK	16070.4642	-16776.4510	16070.0188	-16776.6868	16070.9096	-16776.2152	16070.9096
	12	J[13]	Compression	cLCB172	FY-MIN	OK	-5039.9478	17013.8597	-5039.4768	17014.1091	-5040.4188	17013.6104	17014.1091
	13	I[13]	Compression	cLCB172	FY-MIN	OK	-4960.9913	16897.6078	-4960.4279	16897.9061	-4961.5546	16897.3096	16897.9061
	13	J[14]	Compression	cLCB172	FY-MIN	OK	-6707.6992	19279.9129	-6707.1071	19280.2264	-6708.2914	19279.5994	19280.2264
	14	I[14]	Compression	cLCB172	FY-MIN	OK	-6635.8710	19173.7078	-6635.1622	19174.0830	-6636.5797	19173.3326	19174.0830
	14	J[15]	Compression	cLCB172	FY-MIN	OK	-8317.3126	21489.1500	-8316.5756	21489.5402	-8318.0496	21488.7598	21489.5402
	15	I[15]	Compression	cLCB172	FY-MIN	OK	-8300.7573	21466.7176	-8300.0187	21466.1086	-8301.4958	21465.3266	21466.1086
	15	J[16]	Compression	cLCB172	FY-MIN	NG	-10424.8249	24641.2049	-10424.0582	24641.6109	-10425.5916	24640.7990	24641.6109
	16	I[16]	Compression	cLCB172	FY-MIN	NG	-10446.7196	24680.3532	-10446.1686	24680.6449	-10447.2707	24680.0615	24680.6449
	16	J[17]	Compression	cLCB172	FY-MIN	NG	-14169.6405	29951.2080	-14169.0605	29951.5151	-14170.2204	29950.9010	29951.5151
	17	I[17]	Compression	cLCB172	FZ-MIN	NG	-14174.8550	29962.7758	-14174.1971	29963.1241	-14175.5129	29962.4275	29963.1241
	17	J[18]	Compression	cLCB172	FZ-MIN	NG	-11800.4715	26087.3410	-11799.8400	26087.6754	-11801.1030	26087.0067	26087.6754
	18	I[18]	Compression	cLCB172	FZ-MIN	NG	-11783.0978	26060.5750	-11782.3362	26060.9782	-11783.8594	26060.1718	26060.9782
	18	J[19]	Compression	cLCB172	FZ-MIN	OK	-10103.4109	23143.4838	-10102.6755	23143.8731	-10104.1463	23143.0944	23143.8731
	19	I[19]	Compression	cLCB172	FZ-MIN	NG	-9681.8717	26932.8248	-9680.9462	26933.3147	-9682.7971	26932.3348	26933.3147
	19	J[20]	Compression	cLCB172	FZ-MIN	NG	-8915.8184	25398.8404	-8914.9185	25399.3169	-8916.7184	25398.3640	25399.3169
	20	I[20]	Compression	cLCB172	FZ-MIN	NG	-8958.5868	25464.2155	-8957.6644	25464.7038	-8959.5091	25463.7272	25464.7038
	20	J[21]	Compression	cLCB172	FZ-MIN	NG	-8487.8823	24505.3731	-8486.9821	24505.8497	-8488.7824	24504.8966	24505.8497
	21	I[21]	Compression	cLCB172	FZ-MIN	OK	-8527.4660	22644.2914	-8526.7608	22644.6648	-8528.1712	22643.9181	22644.6648
	21	J[22]	Compression	cLCB172	MY-MIN	OK	-7894.0579	21844.0413	-7893.3770	21844.4019	-7894.7389	21843.6808	21844.4019
	22	I[22]	Compression	cLCB172	MY-MIN	OK	-7954.3756	21931.3450	-7953.7920	21931.6539	-7954.9593	21931.0360	21931.6539
	22	J[23]	Compression	cLCB171	MY-MAX	OK	21357.3169	-23593.9196	21356.7621	-23594.2133	21357.8718	-23593.6259	21357.8718
	23	I[23]	Compression	cLCB171	MY-MAX	OK	21394.1442	-23651.2612	21393.6918	-23651.5007	21394.5966	-23651.0217	21394.5966
	23	J[24]	Compression	cLCB171	MY-MAX	OK	22429.4247	-24967.3937	22428.9936	-24967.6220	22429.8558	-24967.1655	22429.8558
	24	I[24]	Compression	cLCB171	MY-MAX	OK	22437.3904	-24980.2637	22436.9842	-24980.4788	22437.7966	-24980.0486	22437.7966
	24	J[25]	Compression	cLCB171	MY-MAX	OK	23311.4505	-26402.5254	23311.0586	-26402.7328	23311.8424	-26402.3179	23311.8424

- **FT:** Combined Stress due to bending moment about major axis (My) and axial force at Top fiber
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- **FBL:** Combined Stress due to bending moment about major axis (My), minor axis (Mz) and axial force at Bottom Left fiber
- **FTR:** Combined Stress due to bending moment about major axis (My), minor axis (Mz) and axial force at Top Right fiber
- **FBR:** Combined Stress due to bending moment about major axis (My), minor axis (Mz) and axial force at Bottom Right fiber
- **FMAX:** Maximum combined stress out of the above six.
- **ALW:** Allowable stress of cross section at service limit state

	Elem	Part	Comp./Tens.	Stage	CHK	Sig_P1 (kN/m ²)	Sig_P2 (kN/m ²)	Sig_P3 (kN/m ²)	Sig_P4 (kN/m ²)	Sig_P5 (kN/m ²)	Sig_P6 (kN/m ²)	Sig_P7 (kN/m ²)	Sig_P8 (kN/m ²)
▶	1	I[1]	Tension	CS1	NG	1810.2756	1810.2756	6722.9415	6722.9415	2718.3338	2718.3338	3935.6962	3935.6962
	1	J[2]	Tension	CS1	NG	2175.2673	2175.2674	6391.9866	6391.9866	2881.2429	2881.2430	3895.8602	3895.8602
	2	I[2]	Tension	CS1	NG	2175.1842	2175.1843	6391.9036	6391.9035	2881.1599	2881.1600	3895.7772	3895.7773
	2	J[3]	Tension	CS1	NG	2245.0390	2245.0391	6529.8351	6529.8350	2959.8716	2959.8717	3994.0705	3994.0706
	3	I[3]	Tension	CS1	NG	2244.9294	2244.9295	6529.7255	6529.7254	2959.7620	2959.7621	3993.9610	3993.9611
	3	J[4]	Tension	CS1	NG	2304.0368	2304.0370	6704.8277	6704.8276	3039.0943	3039.0944	4105.6089	4105.6090
	4	I[4]	Tension	CS1	NG	2303.9450	2303.9452	6704.7359	6704.7358	3039.0025	3039.0027	4105.5172	4105.5173
	4	J[5]	Tension	CS1	NG	2380.3341	2380.3344	6822.5901	6822.5900	3124.1237	3124.1239	4204.5045	4204.5046
	5	I[5]	Tension	CS1	NG	2380.2670	2380.2673	6822.5230	6822.5229	3124.0567	3124.0569	4204.4375	4204.4376
	5	J[6]	Tension	CS1	NG	2522.6859	2522.6863	6457.0149	6457.0147	3185.3775	3185.3777	4146.3886	4146.3888
	6	I[6]	Tension	CS1	NG	2522.6430	2522.6434	6456.9720	6456.9718	3185.3347	3185.3349	4146.3458	4146.3460
	6	J[7]	Tension	CS1	NG	2734.2396	2734.2400	5916.4815	5916.4813	3274.6592	3274.6595	4056.0336	4056.0339
	7	I[7]	Tension	CS1	NG	2734.2273	2734.2277	5916.4692	5916.4690	3274.6470	3274.6472	4056.0214	4056.0217
	7	J[8]	Tension	CS1	NG	2896.3329	2896.3333	5500.2776	5500.2774	3331.5930	3331.5933	3966.0019	3966.0022
	8	I[8]	Tension	CS1	NG	2896.3329	2896.3333	5500.2776	5500.2774	3331.5930	3331.5933	3966.0019	3966.0022
	8	J[9]	Tension	CS1	NG	2918.6516	2918.6521	5303.6562	5303.6559	3317.2424	3317.2428	3898.2782	3898.2786
	9	I[9]	Tension	CS1	NG	2918.6517	2918.6522	5303.6563	5303.6560	3317.2425	3317.2429	3898.2783	3898.2787
	9	J[10]	Tension	CS1	NG	2804.0710	2804.0717	5314.1737	5314.1733	3232.0568	3232.0572	3850.2935	3850.2939
	10	I[10]	Tension	CS1	NG	2804.0698	2804.0704	5314.1724	5314.1721	3232.0555	3232.0559	3850.2923	3850.2927
	10	J[11]	Tension	CS1	NG	2543.4045	2543.4052	5526.2094	5526.2090	3068.9759	3068.9764	3815.0699	3815.0703
	11	I[11]	Tension	CS1	NG	2543.4637	2543.4644	5526.2686	5526.2682	3069.0346	3069.0350	3815.1283	3815.1287
	11	J[12]	Tension	CS1	NG	2437.0474	2437.0482	5341.1613	5341.1609	2921.9684	2921.9689	3627.9058	3627.9062
	12	I[12]	Tension	CS1	NG	2437.2215	2437.2222	5341.3354	5341.3350	2922.1424	2922.1429	3628.0797	3628.0802
	12	J[13]	Tension	CS1	NG	2678.3236	2678.3244	4616.7434	4616.7429	3040.1643	3040.1649	3541.0733	3541.0738

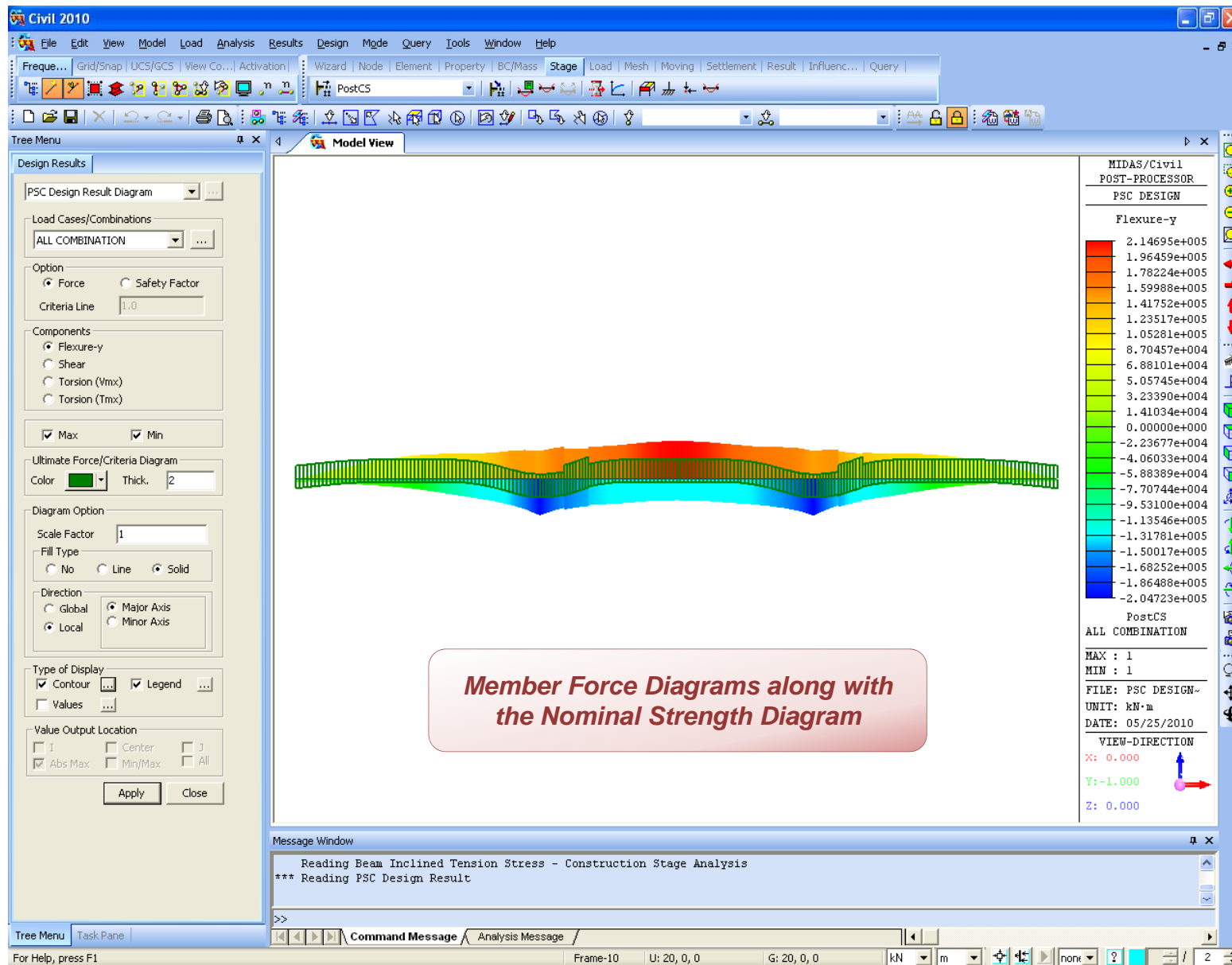
- **Sig_P1:** Principal Stress at the left top of top flange
- **Sig_P2:** Principal Stress at the right top of top flange
- **Sig_P3:** Principal Stress at the right bottom of bottom flange
- **Sig_P4:** Principal Stress at the left bottom of bottom flange
- **Sig_P5:** Principal Stress at the top of left web.(at Z1 Level)
- **Sig_P6:** Principal Stress at the top of right web.(at Z1 Level)
- **Sig_P7:** Principal Stress at the neutral axis in left web.(at Z2 Level)
- **Sig_P8:** Principal Stress at the neutral axis in right web.(at Z2 Level)
- **Sig_P9:** Principal Stress at the bottom of left web.(at Z3 Level)
- **Sig_P10:** Principal Stress at the bottom of right web.(at Z3 Level)
- **Sig_MAX:** The maximum Principal stress among P1-P10.
- **Sig_AP:** Allowable principal stress at neutral axis in the web

	Elem	Part	Comp./Tens.	LCom Name	Type	CHK	Sig_P1 (kN/m ²)	Sig_P2 (kN/m ²)	Sig_P3 (kN/m ²)	Sig_P4 (kN/m ²)	Sig_P5 (kN/m ²)	Sig_P6 (kN/m ²)	Sig_P7 (kN/m ²)
▶	1	I[1]	Tension	cLCB171	FZ-MIN	OK	15.6846	15.6778	8145.7268	8145.8918	6921.0584	7080.4287	15711.5275
	1	J[2]	Tension	cLCB171	FZ-MIN	OK	2171.5881	2171.2465	4137.1771	4137.3582	7892.8235	8002.5282	15195.8740
	2	I[2]	Tension	cLCB172	FZ-MIN	OK	4934.0010	4933.6708	3603.3591	3603.5338	660.3708	855.3523	12964.2699
	2	J[3]	Tension	cLCB172	FZ-MIN	OK	5249.0432	5249.4010	3311.6343	3311.0259	523.7955	702.2449	12985.2727
	3	I[3]	Tension	cLCB172	FZ-MIN	OK	5209.6636	5209.3775	3368.6680	3368.8194	508.6039	688.0623	12964.8009
	3	J[4]	Tension	cLCB172	FZ-MIN	OK	5308.5762	5308.2510	3412.5468	3412.7189	401.4031	554.7334	13020.2472
	4	I[4]	Tension	cLCB172	FZ-MIN	OK	5270.4956	5270.2330	3466.4907	3466.6297	383.5761	539.4014	13004.0291
	4	J[5]	Tension	cLCB172	FZ-MAX	OK	5984.2598	5984.5844	2597.8558	2597.6840	788.0921	893.4870	13071.6452
	5	I[5]	Tension	cLCB172	FZ-MAX	OK	5955.8307	5956.1157	2639.0214	2638.8706	772.5650	879.3602	13060.5499
	5	J[6]	Tension	cLCB172	FZ-MAX	OK	5768.4058	5768.7514	2725.0863	2724.9035	768.0539	900.8954	13002.1792
	6	I[6]	Tension	cLCB172	FZ-MAX	OK	5753.7883	5754.1039	2747.5707	2747.4037	761.3987	894.7505	12996.1036
	6	J[7]	Tension	cLCB171	FX-MAX	OK	13134.9167	13135.2898	0.4666	0.4666	13812.6493	13788.9199	502.5567
	7	I[7]	Tension	cLCB171	FY-MAX	OK	13139.2505	13139.6119	0.4664	0.4664	13815.3439	13791.6116	502.7560
	7	J[8]	Tension	cLCB171	FY-MAX	OK	14464.1396	14464.5613	0.3591	0.3591	14519.5112	14504.2222	270.7518
	8	I[8]	Tension	cLCB171	FX-MAX	OK	14464.6035	14465.0252	0.3591	0.3591	14519.9533	14504.6648	270.7707
	8	J[9]	Tension	cLCB171	FX-MAX	OK	15396.0949	15396.5768	0.2965	0.2965	15012.4522	15004.2803	102.1093
	9	I[9]	Tension	cLCB171	FY-MAX	OK	15396.6983	15397.1801	0.2966	0.2966	15013.0546	15004.8829	102.1205
	9	J[10]	Tension	cLCB171	FY-MAX	OK	15937.6762	15938.2183	0.3050	0.3050	15292.8180	15290.4160	14.8514
	10	I[10]	Tension	cLCB171	FX-MAX	OK	15938.9326	15939.4751	0.3050	0.3050	15293.8898	15291.4882	14.8536
	10	J[11]	Tension	cLCB171	FX-MAX	OK	16081.1305	16081.7333	0.3284	0.3284	15349.8433	15353.6278	6.0339
	11	I[11]	Tension	cLCB171	FY-MAX	OK	16069.6232	16070.2807	0.3288	0.3288	15343.6082	15347.4295	6.0357
	11	J[12]	Tension	cLCB171	FY-MAX	OK	16117.7072	16118.4238	0.3562	0.3562	15318.3904	15319.9260	0.0000
	12	I[12]	Tension	cLCB171	FY-MAX	OK	10070.3923	10071.2030	0.3577	0.3577	15291.1293	15292.7790	0.0000
	12	J[13]	Tension	cLCB172	FY-MIN	OK	1.3279	1.3276	17014.0038	17014.5025	356.8891	286.9806	12768.4976
	13	I[13]	Tension	cLCB172	FY-MIN	OK	1.3490	1.3487	16897.7057	16898.3022	359.3551	289.0005	12788.8049
	13	J[14]	Tension	cLCB172	FY-MIN	OK	1.1182	1.1180	19279.9885	19280.6155	294.0384	230.8496	12659.4276
	14	I[14]	Tension	cLCB172	FY-MIN	OK	1.1303	1.1301	19173.7238	19174.4742	295.6668	232.1449	547.0261
	14	J[15]	Tension	cLCB172	FY-MIN	OK	1.0144	1.0142	21489.1524	21489.9328	236.7778	179.9403	488.2024

- **Sig_P1:** Principal Stress at the left top of top flange
- **Sig_P2:** Principal Stress at the right top of top flange
- **Sig_P3:** Principal Stress at the right bottom of bottom flange
- **Sig_P4:** Principal Stress at the left bottom of bottom flange
- **Sig_P5:** Principal Stress at the top of left web.(at Z1 Level)
- **Sig_P6:** Principal Stress at the top of right web.(at Z1 Level)
- **Sig_P7:** Principal Stress at the neutral axis in left web.(at Z2 Level)
- **Sig_P7:** Principal Stress at the neutral axis in left web.(at Z2 Level)
- **Sig_P8:** Principal Stress at the neutral axis in right web.(at Z2 Level)
- **Sig_P9:** Principal Stress at the bottom of left web.(at Z3 Level)
- **Sig_P10:** Principal Stress at the bottom of right web.(at Z3 Level)
- **Sig_MAX:** The maximum Principal stress among P1-P10.
- **Sig_AP:** Allowable principal stress at neutral axis in the web

	Elem	Part	Top/Bottom	LCom Name	Serviceability Load Type	Type	CHK	M_Ed (kN-m)	Sig_T (kN/m ²)	Sig_B (kN/m ²)	Wk (m)	Wmax (m)
▶	1	I[1]	Bottom	cLCB181	Frequent	FX-MAX	OK	-12637.3624	0.0000	0.0000	0.0000	0.0002
	1	I[1]	Top	cLCB198	Frequent	FX-MAX	OK	-12637.3624	-170.9460	24.5982	0.0000	0.0002
	1	J[2]	Bottom	cLCB187	Frequent	FX-MAX	OK	4964.7063	6.8847	-24.9436	0.0000	0.0002
	1	J[2]	Top	cLCB198	Frequent	FX-MIN	OK	-5102.7479	-115.3855	5.6205	0.0000	0.0002
	2	I[2]	Bottom	cLCB187	Frequent	FX-MAX	OK	4964.7235	6.8848	-24.9437	0.0000	0.0002
	2	I[2]	Top	cLCB198	Frequent	FX-MIN	OK	-5102.7307	-115.3851	5.6204	0.0000	0.0002
	2	J[3]	Bottom	cLCB187	Frequent	FX-MAX	OK	18134.5099	23.3938	-78.9789	0.0000	0.0002
	2	J[3]	Top	cLCB198	Frequent	FX-MIN	OK	-1608.5745	-36.3738	1.7718	0.0000	0.0002
	3	I[3]	Bottom	cLCB187	Frequent	FX-MAX	OK	18134.4433	23.3937	-78.9786	0.0000	0.0002
	3	I[3]	Top	cLCB198	Frequent	FX-MIN	OK	-1608.6412	-36.3753	1.7718	0.0000	0.0002
	3	J[4]	Bottom	cLCB187	Frequent	FX-MAX	OK	29405.5575	35.6216	-114.0257	0.0000	0.0002
	3	J[4]	Top	cLCB181	Frequent	FX-MAX	OK	19959.3509	0.0000	0.0000	0.0000	0.0002
	4	I[4]	Bottom	cLCB187	Frequent	FX-MAX	OK	29405.3383	35.6214	-114.0249	0.0000	0.0002
	4	I[4]	Top	cLCB181	Frequent	FX-MAX	OK	19959.1317	0.0000	0.0000	0.0000	0.0002
	4	J[5]	Bottom	cLCB187	Frequent	FX-MAX	OK	39089.9092	45.1461	-139.5876	0.0000	0.0002
	4	J[5]	Top	cLCB181	Frequent	FX-MAX	OK	26494.9671	0.0000	0.0000	0.0000	0.0002
	5	I[5]	Bottom	cLCB187	Frequent	FX-MAX	OK	39089.9678	45.1462	-139.5878	0.0000	0.0002
	5	I[5]	Top	cLCB181	Frequent	FX-MAX	OK	26495.0258	0.0000	0.0000	0.0000	0.0002
	5	J[6]	Bottom	cLCB187	Frequent	FX-MAX	OK	48395.1266	54.3190	-164.4524	0.0000	0.0002
	5	J[6]	Top	cLCB181	Frequent	FX-MAX	OK	32651.4490	0.0000	0.0000	0.0000	0.0002
	6	I[6]	Bottom	cLCB187	Frequent	FX-MAX	OK	48395.5707	54.3195	-164.4539	0.0000	0.0002
	6	I[6]	Top	cLCB181	Frequent	FX-MAX	OK	32651.8931	0.0000	0.0000	0.0000	0.0002
	6	J[7]	Bottom	cLCB187	Frequent	FX-MAX	OK	56558.5637	62.8640	-189.0841	0.0000	0.0002
	6	J[7]	Top	cLCB181	Frequent	FX-MAX	OK	37666.1506	0.0000	0.0000	0.0000	0.0002

- **Serviceability Load Type:** Frequent / Quassi-Static
- **Type:** produce maximum and minimum member force components for the load combinations including moving load cases
- **M_Ed:** Maximum Moment in the Section
- **Sig_T:** Stress at the top
- **Sig_B:** Stress at the bottom
- **Wk:** Crack width
- **Wmax:** Allowable crack limit



The image displays two overlapping software windows from a spreadsheet application, likely Microsoft Excel, used for structural design calculations according to Eurocode 2 (EC2).

Left Window: PSC Design (EC2)_Compleate.xls

- Design Parameters (1.1):**
 - Design Situations: Persistent & Transient
 - Design Situations: Accidental
 - Partial factors for ultimate limit states:
 - γ_c for concrete: 1.500
 - γ_s for reinforcing steel: 1.150
 - γ_s for prestressing steel: 1.150
 - Factor α_{cc} : 0.850 (on the Compression strength)
 - Factor α_{ct} : 1.000 (on the Tensile strength)
- Sectional Information (1.2):**
 - b_w : 8500.000 mm
 - h : 3000.000 mm
 - d_o : 60.000 mm
 - d_t : 2940.000 mm
 - A : 6208720.000 mm²
 - I_y : 7.3
 - I_z : 2.3
 - C_y
 - C_z
- Material Information (1.3):**
 - Concrete Material Information:
 - f_{ck} : 40.000 MPa
 - E_c
 - Reinforcement rebar Material Information:
 - f_{yk} : 400.000 MPa
 - E_s
- Tendon Profile Information (1.4):**

Type	Tendon Name	Locate (mm)
1	B1	2101.325
2	B2	2458.589
3	B3	2602.076
4	B4	2815.340

Right Window: PSC Design (EC2)_Compleate.xls [Compatibility Mode]

- Maximum Torsion Moment (1 Design Load):**
 - Load Combination Name: cLCB15
 - Design Situations: Persistent & Transient
 - Load Combination Type: MZ-MAX
 - N_{Ed} : -23653.257 kN
 - V_{Ed} : -604.746 kN
 - T_{Ed} : 1021.247 kN · m
 - M_{Ed} : 45610.297 kN · m
- Design strength of concrete:**

$$f_{cd} = \alpha_{cc} \cdot f_{ck} / \gamma_c = 22.667 \text{ MPa}$$
- Design strength of Reinforcement rebar:**

$$f_{yd} = f_{yk} / \gamma_{s_rebar} = 347.826 \text{ MPa}$$
- 2 Check Torsional Resistance**
 - Closed Section Part**
 - Design Parameters:**
 - $t_{ef,i}$: 748.133 mm
 - A_k : ##### mm²
 - u_k : 21587.081 mm
 - d : 2940.000 mm
 - α : 90.000 ° (Assumed $\alpha=90^\circ$)
 - θ : 45.000 °
 - where,
 - $t_{ef,i}$ is the effective wall thickness
 - A_k is the area enclosed by the centre-lines of the connecting walls, including inner hollow areas
 - u_k is the perimeter of the area A_k
 - α is the inclination of the torsional shear reinforcement to the longitudinal axis of the beam.
 - θ is the angle of compression struts
 - Calculate maximum torsion resistance, $T_{Rd,max}$:**
 - $T_{Rd,max} = 2 \cdot v \cdot \alpha_{cw} \cdot f_{cd} \cdot A_k \cdot t_{ef,i} \cdot \sin \theta \cdot \cos \theta = 161227.747 \text{ kN} \cdot \text{m}$
 - $T_{Ed} / T_{Rd,max} + V_{Ed} / V_{Rd,max} = 0.048 \leq 1.0$ OK
 - where, $V_{Rd,max} = 14405.842 \text{ kN}$

1. Design Condition

Design Parameters

Sectional Information

Material Information

Tendon Profile Information

2. Ultimate Moment Resistance

Positive Moment

Negative Moment

3. Shear Resistance

Maximum Shear Force

Minimum Shear Force

4. Torsional Resistance

Maximum Shear Force

Minimum Shear Force

Maximum Torsion Moment

5. Crack Width

[Top](#)

Bottom

PSC Design (EC2)_Complete.xls [Compatibility Mode] - Microsoft Excel

	Elem.	Part	Comp./Tens.	Stage	Check	Sig_P1 (MPa)	Sig_P2 (MPa)	Sig_P3 (MPa)	Sig_P4 (MPa)	Sig_P5 (MPa)	Sig_P6 (MPa)	Sig_P7 (MPa)	Sig_P8 (MPa)	Sig_P9 (MPa)	Sig_P10 (MPa)	Sig_MAX (MPa)
2	22	I	Compression	CS2	NG	3.197	3.197	4.600	4.600	3.478	3.478	3.862	3.862	4.437	4.437	4.600
5	22	I	Tension	CS2	NG	0.000	0.000	0.000	0.000	-0.048	-0.048	-0.092	-0.092	-0.048	-0.048	-0.092
6	22	J	Compression	CS2	NG	2.960	2.960	5.475	5.475	3.380	3.380	3.992	3.992	5.098	5.098	5.475
7	22	J	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.021	-0.021	-0.041	-0.041	-0.021	-0.021	-0.041
8	23	I	Compression	CS2	NG	2.960	2.960	5.475	5.475	3.380	3.380	3.992	3.992	5.098	5.098	5.475
9	23	I	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.021	-0.021	-0.041	-0.041	-0.021	-0.021	-0.041
10	23	J	Compression	CS2	NG	3.210	3.210	5.300	5.300	3.588	3.588	4.122	4.122	5.014	5.014	5.300
11	23	J	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.057	-0.057	-0.116	-0.116	-0.067	-0.067	-0.116
12	24	I	Compression	CS2	NG	3.210	3.210	5.300	5.300	3.588	3.588	4.122	4.122	5.014	5.014	5.300
13	24	I	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.057	-0.057	-0.116	-0.116	-0.067	-0.067	-0.116
14	24	J	Compression	CS2	NG	3.547	3.547	4.645	4.645	3.744	3.744	4.024	4.024	4.495	4.495	4.645
15	24	J	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.026	-0.026	-0.057	-0.057	-0.038	-0.038	-0.057
16	25	I	Compression	CS2	NG	3.547	3.547	4.645	4.645	3.744	3.744	4.024	4.024	4.495	4.495	4.645
17	25	I	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.026	-0.026	-0.057	-0.057	-0.038	-0.038	-0.057
18	25	J	Compression	CS4	NG	4.256	4.256	3.018	3.018	4.056	4.056	3.764	3.764	3.214	3.214	4.256
19	25	J	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.006	-0.006	-0.015	-0.015	-0.010	-0.010	-0.015
20	26	I	Compression	CS4	NG	4.256	4.256	3.018	3.018	4.057	4.057	3.764	3.764	3.215	3.215	4.256
21	26	I	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.006	-0.006	-0.015	-0.015	-0.010	-0.010	-0.015
22	26	J	Compression	CS4	NG	4.367	4.367	2.709	2.709	4.091	4.091	3.687	3.687	2.958	2.958	4.367
23	26	J	Tension	CS2	NG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24	27	I	Compression	CS4	NG	4.367	4.367	2.709	2.709	4.091	4.091	3.687	3.687	2.958	2.958	4.367
25	27	I	Tension	CS2	NG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26	27	J	Compression	CS4	NG	4.304	4.304	2.653	2.653	4.034	4.034	3.640	3.640	2.911	2.911	4.304
27	27	J	Tension	CS4	NG	0.000	0.000	0.000	0.000	-0.007	-0.007	-0.018	-0.018	-0.014	-0.014	-0.018

Bending Resistance Shear Resistance Torsional Resistance StressAtCS StressAtLCB **PrincipalStressAtCS** PrincipalStressAtLCB CrackCheck TendonStress

Output Report includes Design Result Tables