

Release Note

Datum vydání: Květen 2020

Verze: Civil 2020 (v3.1)



DESIGN OF CIVIL STRUCTURES

Integrated Solution System for Bridge and Civil Engineering

Vylepšení

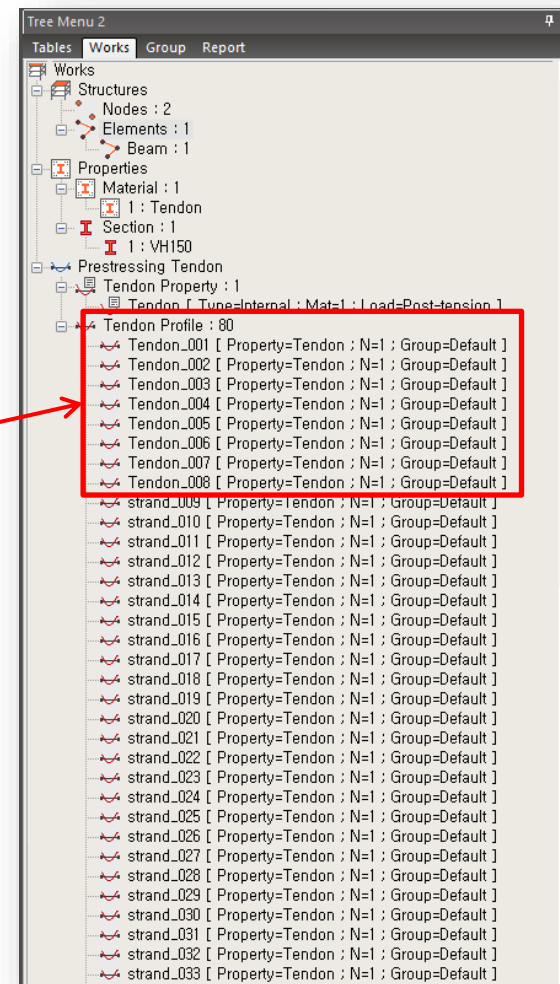
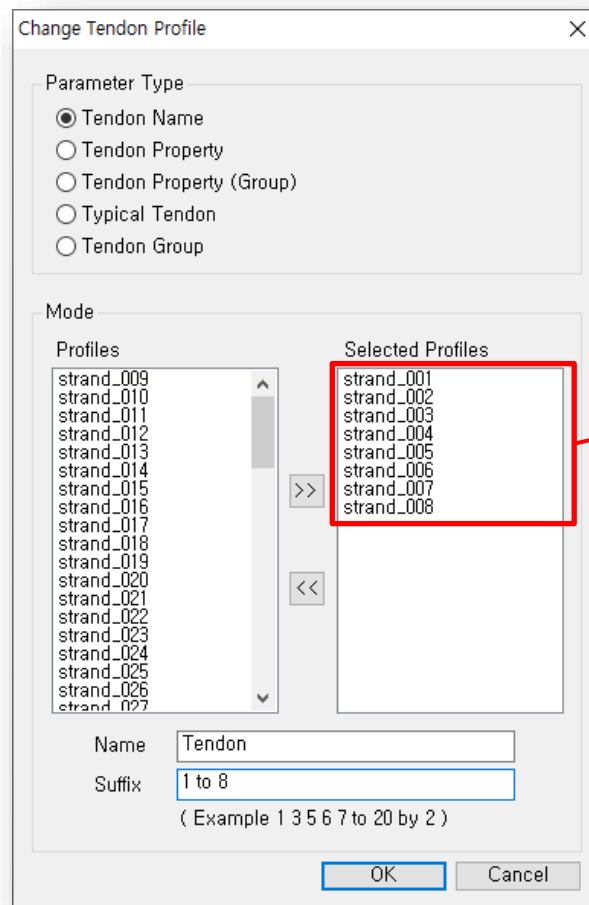
1. Hromadná úprava předpínacích kabelů
2. Parametr tloušťka pro prvky úlohy rovinné deformace
3. Automaticky generovaná rozvržení předpínacích kabelů pro prefabrikované průřezy (typické pro Itálii)
4. Geometricky nelineární fázovaná výstavba s deskovými elementy v modelu
5. Nová okrajová podmínka pro sedla visutých mostů
6. Odpovídající síly na prutové konstrukci pro dynamickou časově závislou analýzu
7. Sestavy zatížení od kolejové dopravy podle australské normy AS 5100.2
8. Zvláštní vozidla podle australské normy AS 5100.2
9. Vozidla pro stanovení zatížitelnosti podle australské normy AS 5100.2
10. Vodorovné síly od dopravy podle australské normy AS 5100.2
11. Vozidla pro stanovení zatížitelnosti podle britské normy CS 454
12. Posouzení předpjatého trámu podle britské normy BS 5400
13. Vylepšení v posudcích podle britské normy CS 454
14. Posudky průřezů z předpjatého/železového betonu a spřažených průřezů podle AASHTO LRFD (8. edice)
15. Posudky spřažených průřezů (ocel-beton) podle AASHTO LRFD (8. edice) AASHTO LRFD 8th Load
16. Automatické generování kombinací podle AASHTO LRFD (8. edice)
17. Kombinace složek seismických účinků podle AASHTO LRFD
18. Návrh a posouzení ŽB prvků podle indické normy IRS (Indian Railway Standard)
19. Automaticky generovaný protokol v polštině



1. Hromadná úprava předpínacích kabelů

- Hromadná úprava předpínacích kabelů
- Najednou lze změnit Tendon Name, Tendon Property, Number of Typical Tendons, Tendon Group

▪ Load > Temp./Prestress > Tendon Profile > Change Tendon Profile



Change Tendon Profile

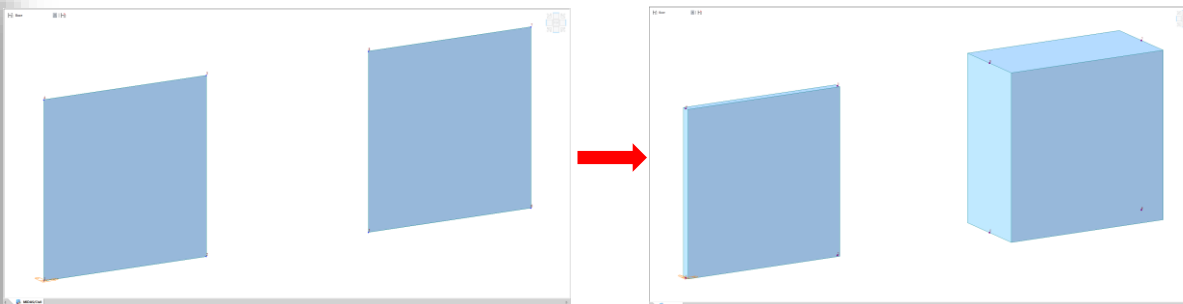
2. Parametr tloušťka pro prvky úlohy rovinné deformace

- V předchozích verzích byla výchozí tloušťka prvku pro úlohy rovinné deformace (plain strain) nastavena na 1m a nemohla být změněna.
- Nyním může být definována skutečná tloušťka, takže u prvků pro úlohy rovinné deformace (plain strain) lze automaticky spočítat vlastní tíhu.

Node/Element > Elements > Create Elements > Plane Strain

Previous Version

Civil 2020 (v3.1)



	No	Type	Material		Section		Thickness		L/AV		Unit Weight (kN/m ³)	Total Weight (kN)
			No	Name	No	Name	No	Name	Type	Value		
▶	1	PLANE ST	1	SS400	-	-	-	-	A	0.0000	76.9822	0.0003
	2	PLANE ST	1	SS400	-	-	-	-	A	0.0000	76.9822	0.0003

Previous Version

	No	Type	Material		Section		Thickness		L/AV		Unit Weight (kN/m ³)	Total Weight (kN)
			No	Name	No	Name	No	Name	Type	Value		
▶	1	PLANE ST	1	SS400	-	-	1	0.1	A	4.0000	76.9800	30.7920
	2	PLANE ST	1	SS400	-	-	2	1	A	4.0000	76.9800	307.9200

Civil 2020 (v3.1)

3. Automaticky generovaná rozvržení předpínacích kabelů pro prefabrikované průřezy (typické pro Itálii)

- Italské průřezy – VH80N, VH100N, VH130N, VH140, VH150 jsou nově přidány pro automatické generování drah předpínacích kabelů.

Structure > Wizard > PSC Bridge > Tendon Template

Tendon Template

Use Prefix Name : strand

Assigned Elements : 1 [Add] [v] [...]

No	Name	Property
1	strand_081	Tendon
2	strand_082	Tendon
3	strand_083	Tendon
4	strand_084	Tendon
5	strand_085	Tendon
6	strand_086	Tendon
7	strand_087	Tendon
8	strand_088	Tendon
9	strand_089	Tendon
10	strand_090	Tendon
11	strand_091	Tendon
12	strand_092	Tendon
13	strand_093	Tendon
14	strand_094	Tendon
15	strand_095	Tendon
16	strand_096	Tendon
17	strand_097	Tendon
18	strand_098	Tendon
19	strand_099	Tendon

[Add] [Modify] [Set Property] [Move/Copy] [Delete] [Import] [Export] [Auto Generation] [Reset Name] [OK] [Cancel] [Apply]

Auto Generation

Name prefix : strand

Tendon Property : Tendon [v] [...]

Tendon Group : Default [v] [...]

Code : Italy [v]

Type : Italy-VH [v]

Name : VH150 [v]

Origin Point : [v] m

Initialize Tendon Tem

[OK] [Cancel]

Tendon

Plane View [v]
Elevation View [v]
Section [v] 1

4 @ 1.420 m

2 @ 0.900 m

2 @ 0.500 m

2.500 m

1.500 m

Pos. : [i] [o]

4. Geometricky nelineární fázovaná výstavba s deskovými elementy v modelu

- Fázovaná výstavba může být provedena na deskových elementech s uvažováním geometrické nelinearity.
- Obdobně jako u prutových prvků lze nyní Lze aplikovat počáteční tangenciální deformaci.

▪ Analysis > Analysis Control > Construction Stage > Initial Displacement for C.S

Construction Stage Analysis Control Data

Final Stage
 Last Stage Other Stage CS22

Restart Construction Stage Analysis Select Stages for Restart...

Analysis Option
 Analysis type Nonlinear Analysis Nonlinear Analysis Control
 Independent Stage Accumulative Stage
 Include Equilibrium Element Nodal Forces
 Include P-Delta Effect P-Delta Analysis Control
 Include Time Dependent Effect Time Dependent Effect Control

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

No	Load Case Name	Type	Case1	Case2	Add	Modify	Delete
<							>

Cable-Pretension Force Control
 Internal Force External Force Add Replace

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 Displacement for C.S.
 Initial Tangent Displacement for Erected Structures
 All Group SG5
 Lack-of-Fit Force Control SG6
 Apply Camber Displacement to C.S. (if Defined)

Consider Stress Decrease at Lead Length Zone by Post-tension
 Linear Interpolation Constant : Stress +

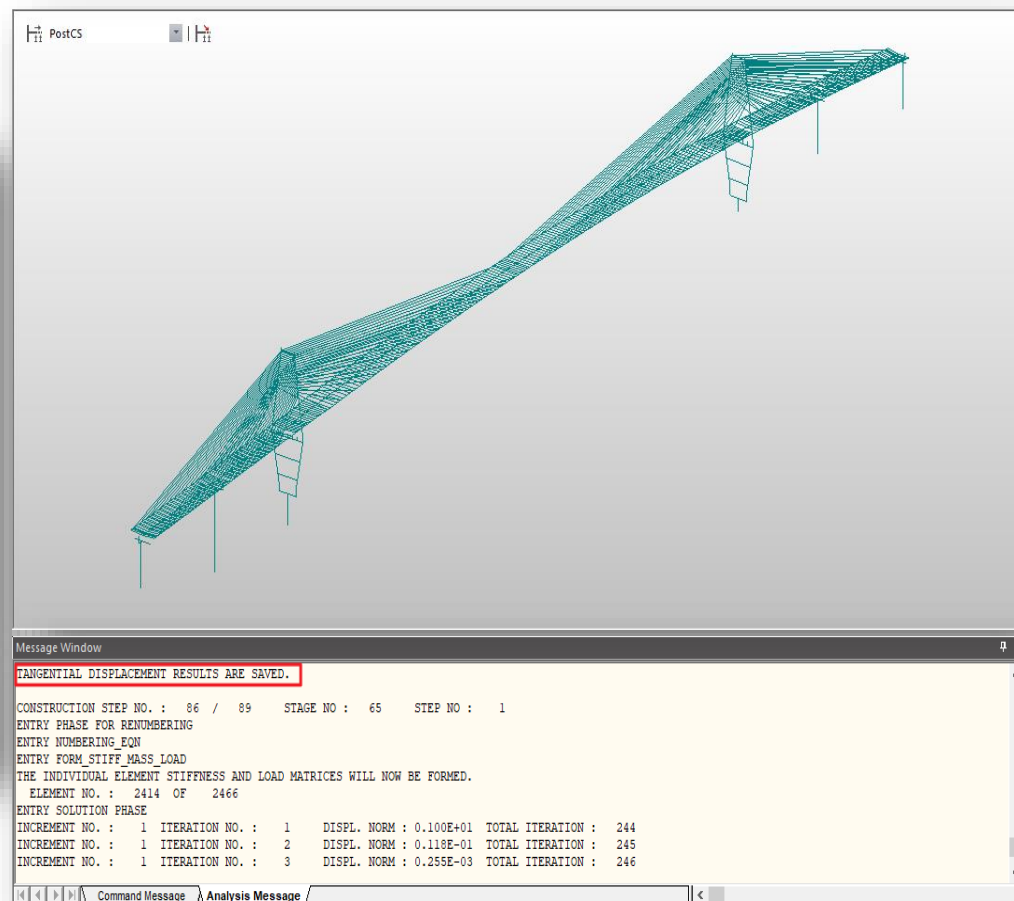
Beam Section Property Changes
 Constant Change with Tendon

Frame Output
 Calculate Concurrent Forces of Frame
 Calculate Output of Each Part of Composite Section
 Self-Constrained Forces & Stresses

Save Output of Current Stage(Beam/Truss)
 Remove Construction Stage Analysis Control Data

OK Cancel

Construction Stage Analysis Control



5. Nová okrajová podmínka pro sedla visutých mostů

- U spojitých visutých mostů může být nastaven posun sedla vůči pylonu před samotnou montáží hlavního nosného lana
- Lanové sedlo je simulováno speciální okrajovou podmínkou - Elastic Link: saddle type.

- **Boundary > Link > Elastic Link > Type: Saddle**
- **Load > Construction Stage > C.S Loads > Set-Back Loads for Nonlinear Construction Stage**

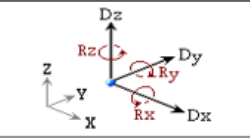
Set-Back Loads for Nonlinear

Load Case Name
SW

Load Group Name
Default

Options
 Add Replace Delete

Saddle Type Elastic-Link
Displacement (Local Direction)

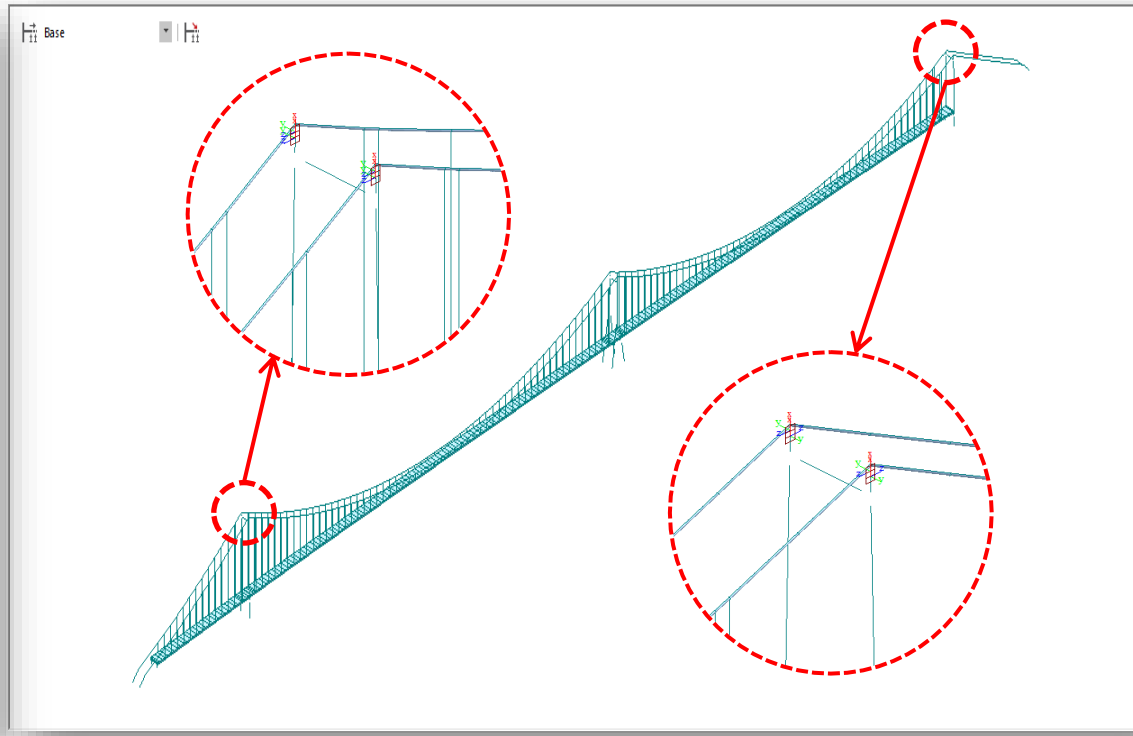


Dx: 0 m
Dy: 0 m
Dz: 0 m

Saddle Type Elastic-Link

ID	Node1	Node2
15	4123	4901
16	4223	4902
17	8232	8902
18	8132	8901

Apply Close



Apply set-back to Elastic Link representing top tower saddles

Tree Menu 2

Tables Works Group Report

- Works
 - Analysis Control Data
 - Construction Stage Analysis [Stage>Last]
 - Structures
 - Nodes : 1465
 - Elements : 1025
 - Properties
 - Material : 11
 - Section : 244
 - Boundaries
 - Supports : 13
 - Elastic Link : 387
 - Rigid Link : 400
 - Static Loads
 - Static Load Case 1 [SW : Pylon, Main cable, Hanger
 - Static Load Case 2 [MC-wrapping ; Wrapping, Main
 - Static Load Case 3 [MC-clamp ; Cable clamps]
 - Static Load Case 4 [MC-socket ; Hanger socket on i
 - Static Load Case 5 [MC-handrail ; Hand rail, post, M
 - Static Load Case 6 [DECK-SW ; Deck, selfweight (in
 - Static Load Case 7 [DECK-DW ;]
 - Static Load Case 8 [MC-Setback ; Set-back]**
 - Etc. Loads
 - Set-Back for Construction Stage : 4**

Elastic Link

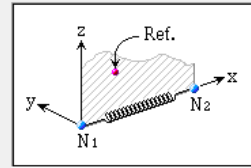
Boundary Group Name
Default

Options
 Add Delete

Start Link Number : 1

Elastic Link Data

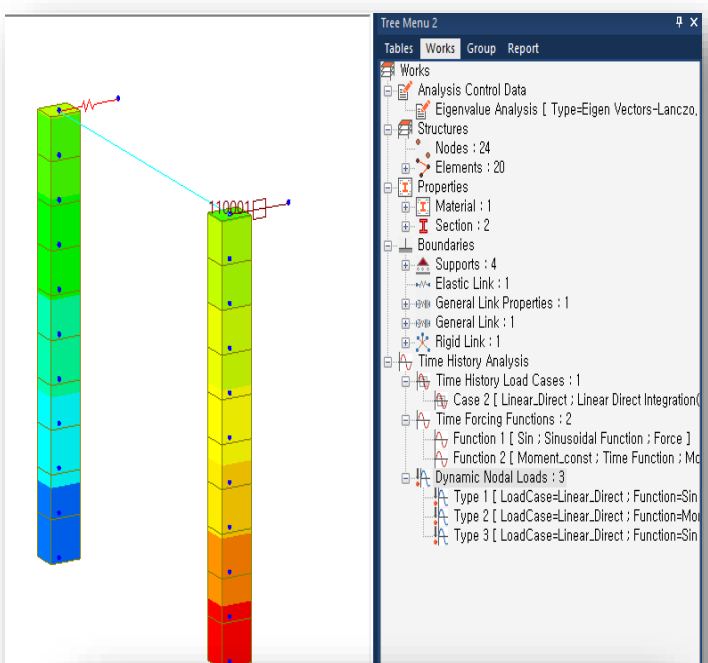
Type Saddle



6. Odpovídající síly na prutové konstrukci pro dynamickou časově závislou analýzu

- Odpovídající síly z dynamické časově závislé analýzy.
- Pouze pro prutové konstrukce.

Results > Results Tables > Beam > View by Max Value Item



Tree Menu 2

- Works
 - Analysis Control Data
 - Eigenvalue Analysis [Type=Eigen Vectors-Lanczo.
 - Structures
 - Nodes : 24
 - Elements : 20
 - Properties
 - Material : 1
 - Section : 2
 - Boundaries
 - Supports : 4
 - Elastic Link : 1
 - General Link Properties : 1
 - General Link : 1
 - Rigid Link : 1
 - Time History Analysis
 - Time History Load Cases : 1
 - Case 2 [Linear_Direct : Linear Direct Integration
 - Time Forcing Functions : 2
 - Function 1 [Sin : Sinusoidal Function ; Force]
 - Function 2 [Moment_Const ; Time Function ; Mo
 - Dynamic Nodal Loads : 3
 - Type 1 [LoadCase=Linear_Direct ; Function=Sin
 - Type 2 [LoadCase=Linear_Direct ; Function=Mo
 - Type 3 [LoadCase=Linear_Direct ; Function=Sin

Beam Forces Table

Elem	Load	Part	Axial (kN)	Shear-y (kN)	Shear-z (kN)	Torsion (kN-m)	Moment-y (kN-m)	Moment-z (kN-m)
41	MSE(ma)	J[23]	7.47	0.00	2.89	0.00	0.00	
41	MSE(ma)	J[24]	7.47	0.00	2.89	0.00	9.92	
42	MSE(ma)	J[24]	2173.37	0.00	310.20	0.00	9233.57	
42	MSE(ma)	J[25]	2173.37	0.00	310.20	0.00	8599.10	
43	MSE(ma)	J[25]	2223.34	0.00	278.02	0.00	8599.10	
43	MSE(ma)	J[26]	2223.34	0.00	278.02	0.00	6128.84	
44	MSE(ma)	J[26]	2140.57	0.00	253.99	0.00	6128.84	
44	MSE(ma)	J[27]	2140.57	0.00	253.99	0.00	4418.04	
45	MSE(ma)	J[27]	1996.63	0.00	210.71	0.00	4418.04	
45	MSE(ma)	J[28]	1996.63	0.00	210.71	0.00	2750.17	
46	MSE(ma)	J[28]	1841.19	0.00	170.51	0.00	2750.17	
46	MSE(ma)	J[29]	1841.19	0.00	170.51	0.00	1411.97	
47	MSE(ma)	J[29]	1703.47	0.00	127.41	0.00	1411.97	
47	MSE(ma)	J[30]						
48	MSE(ma)	J[30]						
48	MSE(ma)	J[31]						
49	MSE(ma)	J[31]						
49	MSE(ma)	J[32]						
50	MSE(ma)	J[32]						
50	MSE(ma)	J[33]						
50	MSE(ma)	J[33]						
51	MSE(ma)	J[33]						
51	MSE(ma)	J[34]						
51	MSE(ma)	J[34]						
52	MSE(ma)	J[34]						
52	MSE(ma)	J[36]						
53	MSE(ma)	J[36]						
53	MSE(ma)	J[37]						

- Copy
- Find...
- Sorting Dialog...
- Style Dialog...
- Show Graph...
- Activate Records...
- Export to Excel...
- View by Load Cases...
- View by Max Value Item...**
- Dynamic Report Table...

Beam Force

Elem	Load	Part	Component	Axial (kN)	Shear-y (kN)	Shear-z (kN)	Torsion (kN-m)	Moment-y (kN-m)	Moment-z (kN-m)
41	MSE(max)	J[23]	Axial	7.47	0.00	2.79	-0.00	-0.00	0.00
41	MSE(max)	J[23]	Shear-y	2.92	0.00	0.17	-0.00	-0.00	0.00
41	MSE(max)	J[23]	Shear-z	7.28	0.00	2.89	-0.00	-0.00	0.00
41	MSE(max)	J[23]	Torsion	-5.74	-0.00	-1.75	0.00	-0.00	-0.00
41	MSE(max)	J[23]	Moment-y	-3.50	-0.00	-1.14	-0.00	0.00	-0.00
41	MSE(max)	J[23]	Moment-z	3.01	0.00	0.21	-0.00	-0.00	0.00
41	MSE(max)	J[24]	Axial	7.47	0.00	2.79	-0.00	-8.39	-0.00
41	MSE(max)	J[24]	Shear-y	2.92	0.00	0.17	-0.00	-0.52	-0.00
41	MSE(max)	J[24]	Shear-z	7.28	0.00	2.89	-0.00	-8.69	-0.00
41	MSE(max)	J[24]	Torsion	-5.74	-0.00	-1.75	0.00	5.25	0.00
41	MSE(max)	J[24]	Moment-y	-7.26	-0.00	-3.30	-0.00	9.92	-0.00
41	MSE(max)	J[24]	Moment-z	-5.82	-0.00	-1.82	0.00	5.48	0.00
42	MSE(max)	J[24]	Axial	2173.37	0.00	211.19	0.00	9233.39	-0.00
42	MSE(max)	J[24]	Shear-y	686.57	0.00	-125.55	0.00	2128.66	-0.00
42	MSE(max)	J[24]	Shear-z	1323.12	0.00	310.20	0.00	5925.36	-0.00
42	MSE(max)	J[24]	Torsion	613.28	0.00	-109.56	0.00	1846.23	-0.00
42	MSE(max)	J[24]	Moment-y	2173.33	0.00	211.41	0.00	9233.57	-0.00
42	MSE(max)	J[24]	Moment-z	-102.76	-0.00	-28.39	-0.00	-275.41	0.00
42	MSE(max)	J[25]	Axial	2173.37	0.00	211.19	0.00	8599.02	-0.00
42	MSE(max)	J[25]	Shear-y	686.57	0.00	-125.55	0.00	2505.79	-0.00
42	MSE(max)	J[25]	Shear-z	1323.12	0.00	310.20	0.00	4993.61	-0.00
42	MSE(max)	J[25]	Torsion	613.28	0.00	-109.56	0.00	2175.32	-0.00
42	MSE(max)	J[25]	Moment-y	2173.36	0.00	211.08	0.00	8599.10	-0.00
42	MSE(max)	J[25]	Moment-z	559.89	-0.00	227.68	-0.00	2386.86	0.00
43	MSE(max)	J[25]	Axial	2223.34	0.00	258.20	0.00	8599.10	-0.00
43	MSE(max)	J[25]	Shear-y	884.02	0.00	-18.70	0.00	2491.19	-0.00

Result By Max Value-[Beam Force]

Concurrent Forces Table

7. Sestavy zatížení od kolejové dopravy podle australské normy AS 5100.2

- 300 LA, 150 LA, uživatelsky definované sestavy zatížení od kolejové dopravy.
- Různé dynamické součinitele pro ohybové momenty a další.

▪ Load > Moving Load > Moving Load Code> Australia

Define Standard Vehicular Load

Standard Name
AS 5100.2 - Rail Traffic Load

Vehicular Load Properties

Vehicular Load Name : 300LA

Vehicular Load Type : 300LA

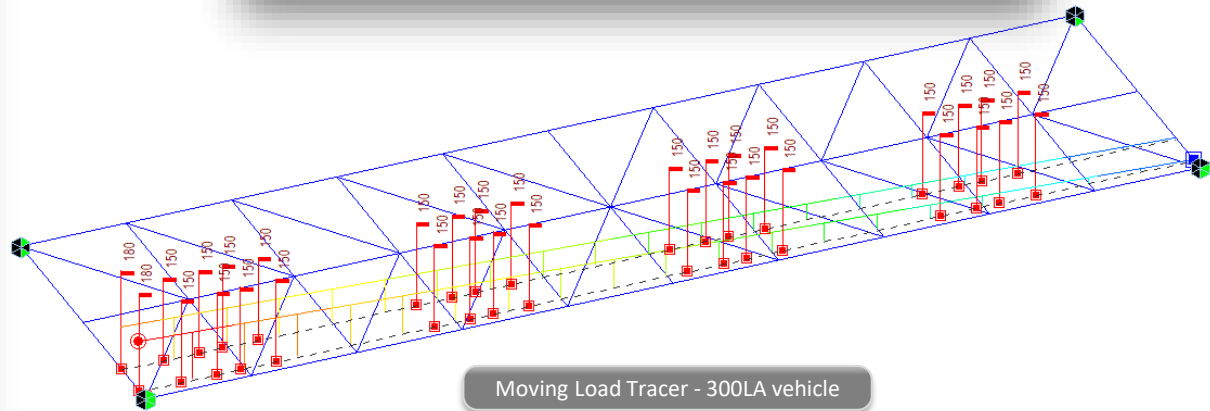
Dynamic Load Allowance :
 0 Bending Moment
 0 All Other Effects

No	Load(kN)	Spacing(m)
1	360	2
2	300	1.7
3	300	1.1
4	300	1.7
5	300	end

Distance Between Group

Dmin = 12m
 Dmax = 20m
 Increment of Dist(Dinc)
 1 m
 D = Dmin+Dinc, Dmin+2Dinc
 Dmin+3Dinc, ... Dmax

OK Cancel Apply



300LA Train

8. Zvláštní vozidla podle australské normy AS 5100.2

- HLP320, HLP400, uživatelsky definovaná zvláštní vozidla

▪ **Load > Moving Load > Moving Load Code > Australia**

Define Standard Vehicular Load ✕

Standard Name
AS 5100.2 - Heavy Load Platform

Vehicular Load Properties

Vehicular Load Name : HLP320

Vehicular Load Type : HLP320

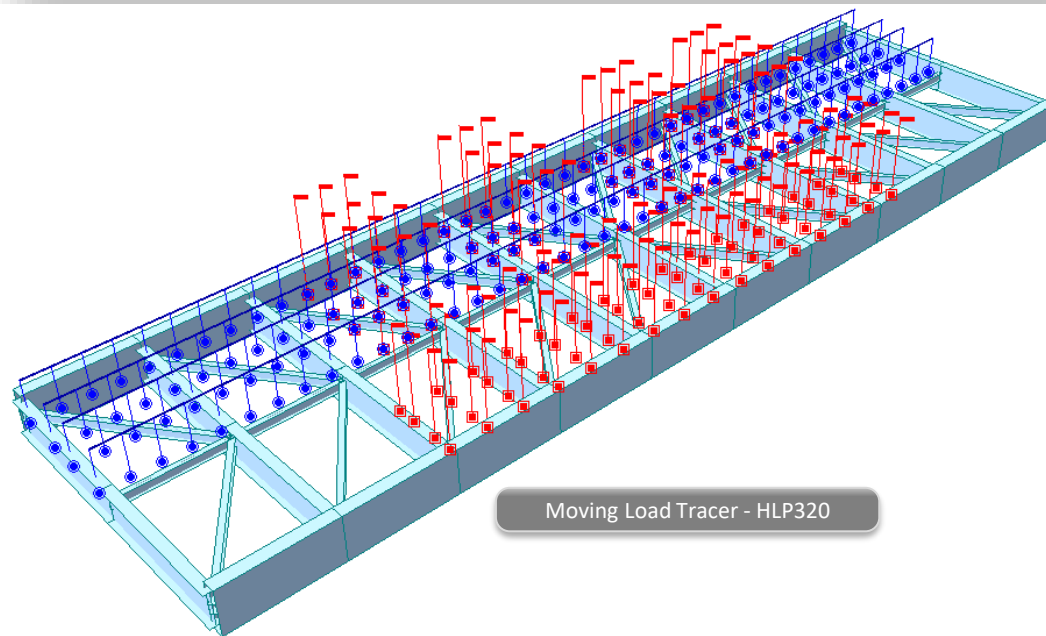
Dynamic Load Allowance : 0.1

P = kN

D = m

Number of Axles = 16

HLP320 Heavy Load Platform



Moving Load Tracer - HLP320

9. Vozidla pro stanovení zatížitelnosti podle australské normy AS 5100.2

- T44, L44, uživatelsky zadaná vozidla pro stanovení zatížitelnosti

▪ **Load > Moving Load > Moving Load Code > Australia**

Define Standard Vehicular Load ✕

Standard Name
AS 5100.7 - Rating Vehicles

Vehicular Load Properties

Vehicular Load Name : T44

Vehicular Load Type : T44 Truck Load

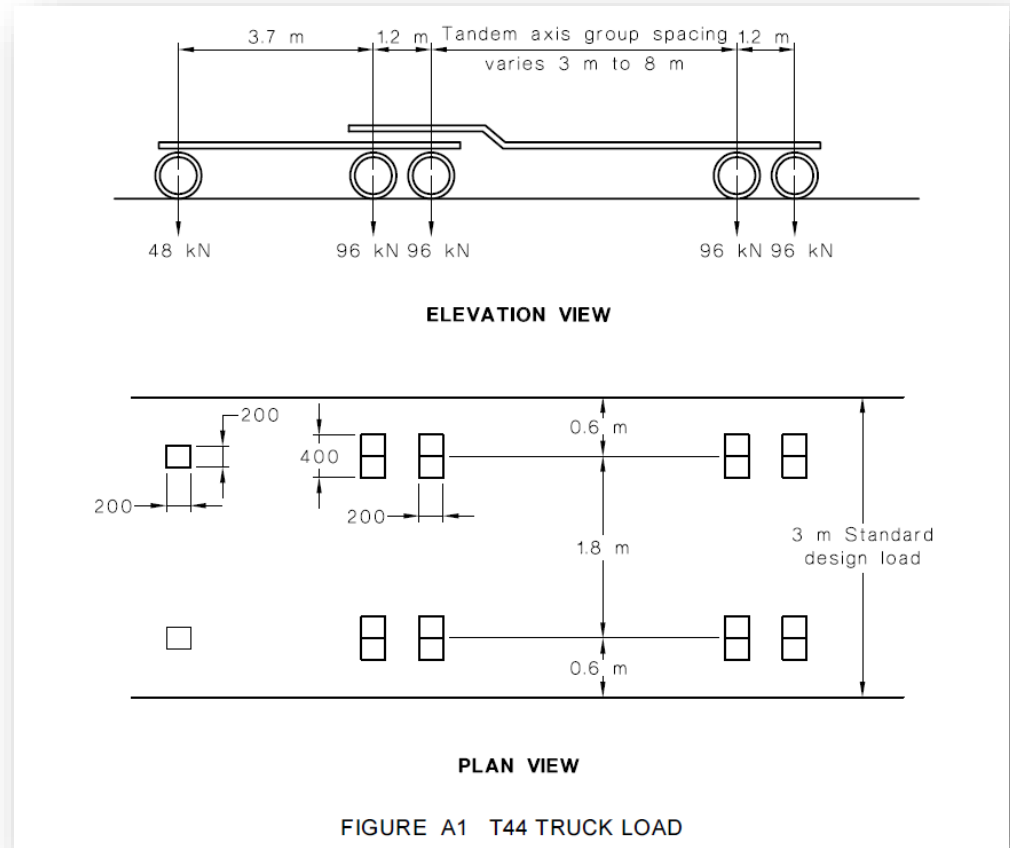
Dynamic Load Allowance : 0

P1 P2 P3 P4 P5

D1 D2 D3-D4 D5

No	Load(kN)	Spacing(m)
1	48	3.7
2	96	1.2
3	96	3
4	96	8
5	96	1.2

T44 Rating Vehicle



10. Vodorovné síly od dopravy podle australské normy AS 5100.2

- Odstrředivé síly, brzdné a rozjezdové síly vygenerované jako statické zatěžovací stavy.

■ Moving Tracer > Moving Load Converted to Static Load

Moving Load Converted to Static Load ✕

Vertical Loads

Centrifugal Forces

Height of Forces from the top of the rail m

Design Speed m/sec

Radius of Curve m

Super Elevation (Road Traffic) %

Direction of Centrifugal Forces with reference to Vehicle Direction

Right-to-Left Direction Left-to-Right Direction

Longitudinal Force

Total Length of the Bridge (Rail Traffic) m

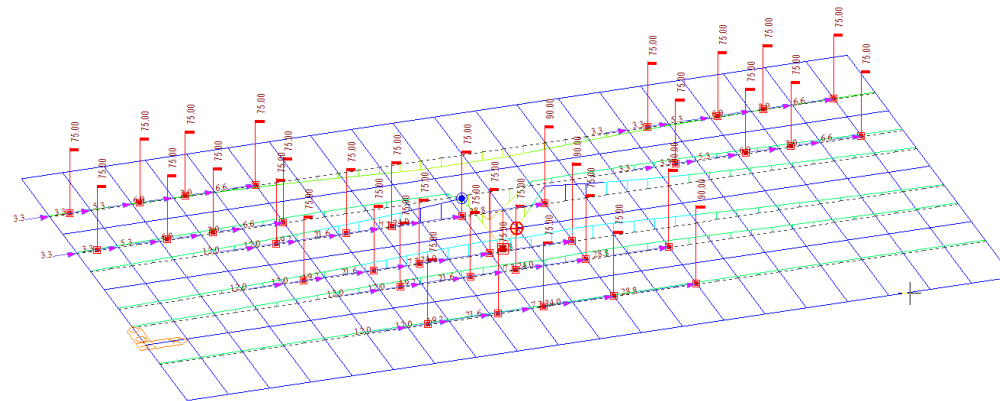
Traction Force

Braking Force

File Name

...

Conversion to Static Loads



9.7 Horizontal forces

9.7.1 Centrifugal forces

For rail bridges on horizontal curves, allowance shall be made for the centrifugal effects of rail traffic load by applying a centrifugal force (F_c) corresponding to each axle load horizontally through a point 2 m above the top of the rail.

The horizontal centrifugal force resulting from rail traffic loads shall be proportional to the design rail traffic load, and for each a (a) Braking forces:

$$F_c = \frac{V^2 A}{rg} \quad \text{BF} = 200 + 15L_{LF} \quad \dots 9.7.2.2(1)$$

where

BF = longitudinal braking force, in kilonewtons

L_{LF} = total length of the bridge, in metres

where

V = design speed, in metres per

A = axle load, in kilonewtons (b)

r = radius of curve, in metres

g = acceleration due to gravit;

The specified centrifugal force shall n

Centrifugal and nosing forces due to r

(b) Traction forces:

$$\text{TF} = 200 + 25L_{LF} \quad \text{for} \quad L_{LF} \leq 25 \text{ m} \quad \dots 9.7.2.2(2)$$

$$825 + 15(L_{LF} - 25) \quad \text{for} \quad 25 \text{ m} < L_{LF} \leq 50 \text{ m} \quad \dots 9.7.2.2(3)$$

$$1200 + 7.5(L_{LF} - 50) \quad \text{for} \quad 50 \text{ m} < L_{LF} \leq 250 \text{ m} \quad \dots 9.7.2.2(4)$$

$$2700 + 5.0(L_{LF} - 250) \quad \text{for} \quad 250 \text{ m} < L_{LF} \quad \dots 9.7.2.2(5)$$

where

TF = longitudinal traction force, in kilonewtons

L_{LF} = total length of the bridge, in metres

11. Vozidla pro stanovení zatížitelnosti podle britské normy CS 454

- Úplný model 1 (normální doprava, 26 t, 18 t, 7.5 t, 3 t)
- Včetně součinitelů zohledňující počet zatížených pruhů, povrch vozovky a intenzitu dopravy

▪ **Load > Moving Load > Moving Load Code > BS**

Define Standard Vehicular Load

Standard Name: CS 454 Assessment

Vehicular Load Properties

Vehicular Load Name: A-4AXLE

Vehicular Load Type: ALL MODEL 1

Sub Type: A-4AXLE

* A-4AXLE		
No	P (kN)	D (m)
1	64	1.2
2	64	3.9
3	113	1.3
4	74	end

O1 = 1 m, O2 = 1 m

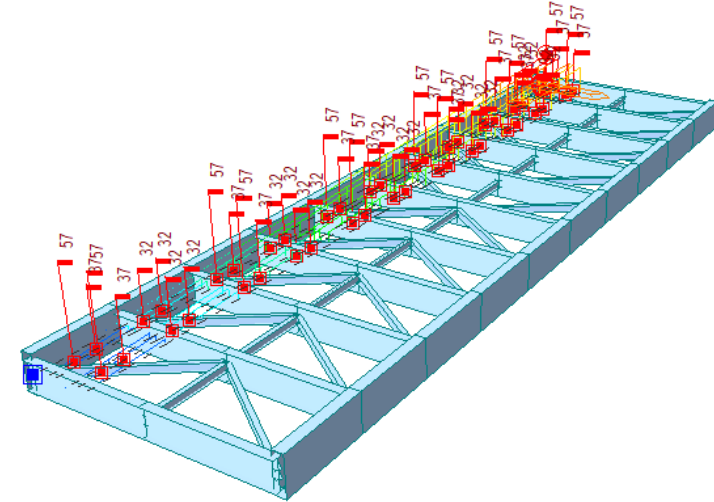
Loading Case: Single Convoy

Road Surface: Good Poor

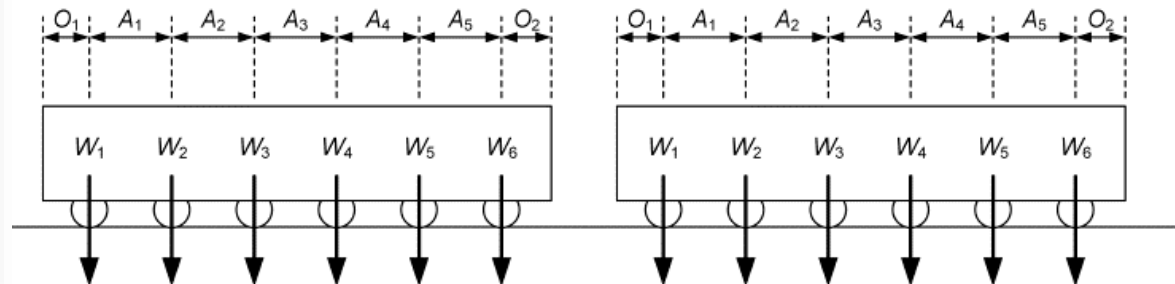
Traffic Flow Category: High Medium Low

OK Cancel Apply

- A-4AXLE
- B-4AXLE
- C-5AXLE
- D-5AXLE_1
- D-5AXLE_2
- E-5AXLE_1
- E-5AXLE_2
- F-6AXLE_1
- F-6AXLE_2
- G-6AXLE_1
- G-6AXLE_2
- H-5AXLE_1
- H-5AXLE_2
- I-3AXLE
- J-3AXLE
- K-3AXLE_1
- K-3AXLE_2
- L-3AXLE_1
- L-3AXLE_2
- M-2AXLE
- N-2AXLE
- O-2AXLE



Moving Load Tracer – ALL Model 1 A Convoy



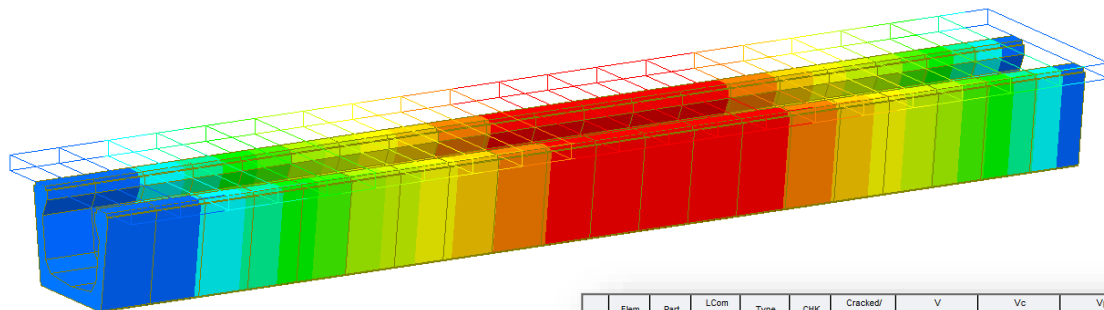
300LA Train

ALL Model 1 Convoy

12. Posouzení předpjatého trámu podle britské normy BS 5400

- MSÚ: Ohyb, smyk, kroucení
- MSP: Omezení napětí, trhliny

■ PSC > Design Parameter > BS 5400



PSC Design Parameters

Design Code: BS 5400-4:1990

User Input Data

Input Parameters

Principal Stress Limitation

Serviceability Limit States

Comp. 20 N/mm² Tens. 1 N/mm²

Construction Stage

Comp. 20 N/mm² Tens. 1 N/mm²

Output Parameters

Serviceability Limit States

Concrete stress limitation under service loads
 Concrete stress limitation at Construction Stage
 Principal stress under service loads
 Principal stress at Construction Stage
 Tensile stress for prestressing steel

Ultimate limit states

Bending resistance
 Shear resistance
 Torsional resistance

Select All Unselect All

OK Cancel

Elem	Part	LCom Name	Type	CHK	Cracked/UnCracked	V (kN)	Vc (kN)	Vp (kN)
31	[31]	clCB1	FX-MAX	OK	UnCracked	3697.7653	5600.6276	1069.4979
31	[32]	clCB1	FX-MAX	OK	UnCracked	4300.0696	6718.8185	2089.7983
32	[32]	clCB1	FX-MAX	OK	UnCracked	4307.9589	6718.6466	2089.7048
32	[33]	clCB1	FX-MAX	OK	UnCracked	4994.0855	7756.5974	3043.3164
33	[33]	clCB1	FX-MAX	OK	UnCracked	5096.0264	7756.3981	3043.1926
33	[34]	clCB1	FX-MAX	OK	UnCracked	5719.3801	8677.3702	3899.5326
34	[34]	clCB1	FX-MAX	OK	UnCracked	5783.4813	8676.4566	3898.9226
34	[35]	clCB8	FZ-MAX	OK	UnCracked	6490.1368	6486.1565	2029.9368
35	[35]	clCB8	FZ-MAX	OK	UnCracked	6489.9510	6485.9617	2029.8289
35	[36]	clCB8	FZ-MAX	OK	UnCracked	7429.1905	4429.1410	291.5115
36	[36]	clCB9	FZ-MIN	OK	UnCracked	-7790.3355	4428.9545	291.4776
36	[37]	clCB9	FZ-MIN	OK	UnCracked	-6962.3546	5153.2856	963.5172
37	[37]	clCB9	FZ-MIN	OK	UnCracked	-6962.4360	5152.5049	963.1935
37	[38]	clCB1	FX-MAX	OK	UnCracked	-5996.8881	6486.6041	2181.7369
38	[38]	clCB1	FX-MAX	OK	UnCracked	-6306.8902	8359.3716	3162.8951
38	[39]	clCB1	FX-MAX	OK	UnCracked	-5283.1850	8926.0487	3678.6665
39	[39]	clCB1	FX-MAX	OK	UnCracked	-5587.7388	8925.3904	3678.2591
39	[40]	clCB1	FX-MAX	OK	UnCracked	-4564.0558	8883.8478	3652.2015
40	[40]	clCB1	FX-MAX	OK	UnCracked	-4887.5397	7726.5373	2895.2502
40	[41]	clCB1	FX-MAX	OK	UnCracked	-3865.8775	7147.4793	2354.1593
41	[41]	clCB1	FX-MAX	OK	UnCracked	-4186.7548	7146.7462	2353.7085
41	[42]	clCB1	FX-MAX	OK	UnCracked	-3177.8515	5622.5204	968.4353
42	[42]	clCB1	FX-MAX	OK	UnCracked	-2272.7099	5622.1340	968.2604
42	[43]	clCB1	FX-MAX	OK	UnCracked	-1725.7445	4611.5058	59.1826
43	[43]	clCB1	FX-MAX	OK	UnCracked	-1725.7820	4611.4441	59.1790
43	[44]	clCB1	FX-MAX	OK	UnCracked	-1178.6167	4548.8947	11.5620
44	[44]	clCB1	FX-MAX	OK	UnCracked	-1178.8348	4548.8863	11.5620
44	[45]	clCB1	FX-MAX	OK	UnCracked	-831.8694	4521.4062	2.0371
45	[45]	clCB1	FX-MAX	OK	UnCracked	-631.8804	4521.3875	2.0371
45	[46]	clCB1	FX-MAX	OK	UnCracked	-84.9151	4502.6167	2.7656
46	[46]	clCB1	FX-MAX	OK	UnCracked	-84.9273	4502.5904	2.7656
46	[47]	clCB1	FX-MAX	OK	UnCracked	462.0381	4500.9674	21.8337
47	[47]	clCB1	FX-MAX	OK	UnCracked	462.0311	4500.7999	21.8327
47	[48]	clCB1	FX-MAX	OK	UnCracked	1008.9965	4652.9981	356.1016
48	[48]	clCB1	FX-MAX	OK	UnCracked	1009.0100	4652.8649	356.0749

Shear Strength MIDAS/Civil Check Flexure Strength Check Shear Strength

PSC Design Result Table

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34			
1. Design Condition			Design code	Element	Node(I/J)																															
			BS 5400-4:1990	16	J																															
■ Section Properties			Section Type																																	
			Non-Composite																																	
- Gross section			H	3000.000 (mm)	A _g	6.209E+06 (mm ²)	S _x	6.505E+09 (mm ³)																												
			B	8500.000 (mm)	I _y	7.867E+12 (mm ⁴)	S _y	4.399E+09 (mm ³)																												
			C _{cp}	1209.410 (mm)																																
			C _{cm}	1790.590 (mm)																																
- Transformed section			H	3000.000 (mm)	A _g	6.439E+06 (mm ²)	S _x	6.790E+09 (mm ³)																												
			B	8500.000 (mm)	I _y	8.116E+12 (mm ⁴)	S _y	4.497E+09 (mm ³)																												
			C _{cp}	1195.243 (mm)																																
			C _{cm}	1804.757 (mm)																																
■ Partial Safety Factors			- Partial Safety Factors for Ultimate Limit State																																	
			γ _{mc} for Concrete		Characteristic																															
					1.5																															
			γ _{ms} for Reinforce/Prestress		1.15																															
- Partial Safety Factors for Serviceability Limit State			Type of Stress		γ _{mc} for concrete																															
			Triangular Compressive		1.25																															
			Uniform Compressive		1.67																															
			Pre-tension		1.25																															
			Post-tension		1.55																															
■ Material			- Concrete																																	

PSC Design Detail Report

13. Vylepšení v posudcích podle britské normy CS 454

- Posouzení na MSP pro průřezy kategorie 3
- Posouzení na MSÚ a MSP pro volné předpínací kabely

Rating > Bridge Rating Design > CS 454/19

Section for Assessment Check

Option
 Add/Replace Delete

Position
 I J I & J

Class Category
 Class 1
 Class 2
 Class 3

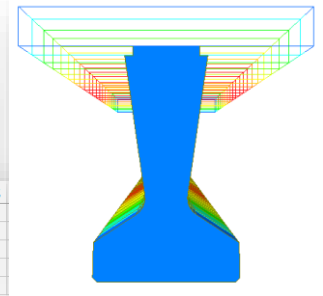
Tendon Type for Class 3
 Type C : Pre-tensioned tendons distributed close to the tension faces

Apply Close

Class Category

Element	Part	Class	Rating Case	Load Effect	sig_c (N/mm ²)	sig_c_lim (N/mm ²)	sig_t (N/mm ²)	sig_t_lim (N/mm ²)	A	Check
12	J[14]	Class 3	SLS1_Fzz(Min)	Positive	15.2245	25.0000	-7.9229	-11.5705	1.4604	OK
12	J[14]	Class 3	SLS1_Mxx(Max)	Positive	15.2245	25.0000	-7.9229	-11.5705	1.4604	OK
12	J[14]	Class 3	SLS1_Mxx(Min)	Positive	15.2245	25.0000	-7.9229	-11.5705	1.4604	OK
12	J[14]	Class 3	SLS1_Myy(Max)	Positive	17.2856	8.1046				
12	J[14]	Class 3	SLS1_Mzz(Max)	Positive	8.1046					
12	J[14]	Class 3	SLS1_Mzz(Min)	Positive	8.1046					
13	I[14]	Class 3	SLS1_Fxx(Max)	Positive	15.6500	8.1046				
13	I[14]	Class 3	SLS1_Fxx(Min)	Positive	8.1046					
13	I[14]	Class 3	SLS1_Fyy(Max)	Positive	8.1046					
13	I[14]	Class 3	SLS1_Fyy(Min)	Positive	8.1046					
13	I[14]	Class 3	SLS1_Fzz(Max)	Positive	16.5127					
13	I[14]	Class 3	SLS1_Fzz(Min)	Positive	15.2245					
13	I[14]	Class 3	SLS1_Mxx(Max)	Positive	15.2245					
13	I[14]	Class 3	SLS1_Mxx(Min)	Positive	15.2245					
13	I[14]	Class 3	SLS1_Myy(Max)	Positive	17.2856					
13	I[14]	Class 3	SLS1_Myy(Min)	Positive	8.1046					
13	I[14]	Class 3	SLS1_Mzz(Max)	Positive	8.1046					
13	I[14]	Class 3	SLS1_Mzz(Min)	Positive	8.1046					
13	J[15]	Class 3	SLS1_Fxx(Max)	Positive	14.2445					
13	J[15]	Class 3	SLS1_Fxx(Min)	Positive	7.6422					
13	J[15]	Class 3	SLS1_Fyy(Max)	Positive	7.6422					
13	J[15]	Class 3	SLS1_Fyy(Min)	Positive	7.6422					
13	J[15]	Class 3	SLS1_Fzz(Max)	Positive	15.8003					
13	J[15]	Class 3	SLS1_Fzz(Min)	Positive	13.8680					
13	J[15]	Class 3	SLS1_Mxx(Max)	Positive	12.8885					
13	J[15]	Class 3	SLS1_Mxx(Min)	Positive	12.8885					
13	J[15]	Class 3	SLS1_Myy(Max)	Positive	16.3155					
13	J[15]	Class 3	SLS1_Myy(Min)	Positive	7.6422					
13	J[15]	Class 3	SLS1_Mzz(Max)	Positive	7.6422					
13	J[15]	Class 3	SLS1_Mzz(Min)	Positive	7.6422					
14	I[15]	Class 3	SLS1_Fxx(Max)	Positive	15.1026					
14	I[15]	Class 3	SLS1_Fxx(Min)	Positive	7.6422					
14	I[15]	Class 3	SLS1_Fyy(Max)	Positive	7.6422					
14	I[15]	Class 3	SLS1_Fyy(Min)	Positive	7.6422					

SLS Reserve Factor Table



5. Serviceability Limit State for a Section

Class 3 Limit Check

- Check If Stresses are Within Class 3 Limits
- * For Bonded Tendons
- Compression
- Service limit load combination : SLS1
- Service limit load combination type : MY-MAX

$$\sigma_{c,min} \leq 0.625 \frac{f_{cu}}{\gamma_{mc}} = \sigma_{c,limit} = 25.00 \text{ (MPa)}$$

- Tension
- Service limit load combination : SLS1
- Service limit load combination type : MY-MAX

$$\sigma_{s,max} \leq \sigma_{limit} * DF + \sigma_{rebar} = \sigma_{s,limit} = -11.31 \text{ (MPa)}$$

where,

- $\sigma_{s,max}$: Tensile stress on the prestressed concrete = -11.29 (MPa)
- $\sigma_{c,min}$: Compressive stress on the prestressed concrete = 18.12 (MPa)
- σ_{limit} : Flexural tensile stresses for class 3 members (Table 25) = -7.80 (MPa)
- DF : Depth factor for class 3 members based on the depth of member = 0.70
- $A_{conc,T}$: Area of concrete in tensile section = 251932.18 (mm²)
- $A_{rebar,T}$: Area of rebar in tensile section = 4909.00 (mm²)
- σ_{rebar} : Increase in the tensile stress limit due to the presence of additional reinforcement = -5.85 (MPa)
- $\sigma_{s,limit}$: Flexural tensile stress limit
- $\sigma_{c,limit}$: Flexural compressive stress limit

Since

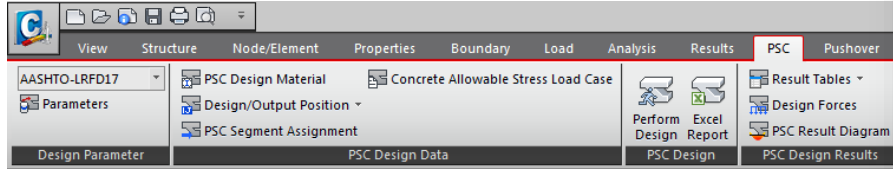
- $\sigma_{s,max} \leq \sigma_{s,limit}$ ∴ OK
- $\sigma_{c,min} \leq \sigma_{c,limit}$ ∴ OK

Serviceability Limit State Check Report

14. Posudky průřezů z předpjatého/železového betonu a spřažených průřezů podle AASHTO LRFD (8. edice)

- 8. edice normy AASHTO LRFD.
- ŽB, komorové předpjaté průřezy, spřažené průřezy.

▪ PSC > Design > AASHTO LRFD 17



Torsional effects shall be investigated where:

$$T_u > 0.25\phi T_{cr} \quad (5.7.2.1-3)$$

- For solid shapes:

$$T_{cr} = 0.126K\lambda\sqrt{f'_c} \frac{A_{cp}^2}{P_c}$$

- For hollow shapes:

$$T_{cr} = 0.126K\lambda\sqrt{f'_c} 2A_o b_o$$

in which:

$$K = \sqrt{1 + \frac{f_{pc}}{0.126\lambda\sqrt{f'_c}}} \leq 2.0$$

5.7.2.6—Maximum Spacing of Transverse Reinforcement

The spacing of the transverse reinforcement shall not exceed the maximum permitted spacing, s_{max} , determined as:

- If $v_u < 0.125 f'_c$, then:

$$s_{max} = 0.8d_v \leq 24.0 \text{ in.} \quad (5.7.2.6-1)$$

- If $v_u \geq 0.125 f'_c$, then:

$$s_{max} = 0.4d_v \leq 12.0 \text{ in.} \quad (5.7.2.6-2)$$

where:

v_u = shear stress calculated in accordance with Article 5.7.2.8 (ksi)

d_v = effective shear depth as defined in Article 5.7.2.8 (in.)

1. Design Condition

Design Code	Element	Node(I/J)
AASHTO-LRFD2017	16	I

Section Properties

- Gross section

H	117.992 (in)
B	492.126 (in)
C ₂₂	42.858 (in)
C ₂₁	75.134 (in)

- Transformed section

H	117.992 (in)
B	492.126 (in)
C ₂₂	43.709 (in)
C ₂₁	74.283 (in)

Materials

- Concrete

f'_c (ksi)	7.000
--------------	-------

* β_1 : 0.85 if f'_c is lower than 4000 psi

- Prestressing steel information

No.	Tendon	B	T
1	S_L8_CS1	B	
2	S_L2_CS1	B	
3	S_L1_CS1	B	
4	S_R3_CS1	B	
5	S_L6_CS1	B	
6	S_R4_CS1	B	
7	S_L5_CS1	B	
8	S_R1_CS1	B	
9	S_R2_CS1	B	
10	S_L7_CS1	B	
11	S_R7_CS1	B	
12	S_L4_CS1	B	
13	S_L3_CS1	B	
14	S_R8_CS1	B	
15	S_R6_CS1	B	
16	S_R5_CS1	B	

* d_p : Distance from extr.

4. Torsional design for a section

■ Case of V_{max} .

- Section type : Segmental-Box

- The Strength Limit Load Combination : cLCB1

- Factored torsional moment : $T_u = -111236.26$ (kips-in)

- Factored shear force : $V_u = 1809.62$ (kips)

- Factored moment : $M_u = 1012397.15$ (kips-in)

- Factored axial force : $N_u = -12515.30$ (kips)

- Resistance factor for shear : $\Phi = 0.90$

- Component of prestressing force in direction of the shear force : $V_p = \Sigma A_{ps} f_{p(z-dir)} = 413.49$ (kips)

1) Notation

A_o = Area enclosed by the shear flow path, including any area of holes therein.
= 35799.879 (in²)

p_n = Perimeter of the centerline of the closed transverse torsion reinforcement.
= 1113.426 (in)

A_{cp} = Total area enclosed by outside perimeter of the concrete section.
= 35799.879 (in²)

p_c = The length of the outside perimeter of concrete section.
= 1113.426 (in)

2) Checking Torsional Effects

- Torsional cracking moment (T_{cr}).
 $b_e = 16.375$ (in) : The effective thickness of shear flow path of elements
 $T_{cr} = 0.126 K \sqrt{f'_c} 2A_o b_e = 781714.14$ (kips-in) (Eq. 5.7.2.1-5)
- $T_u = |-111236.262|$ (kips-in) $\leq 0.25\Phi T_{cr} = 175885.68$ (kips-in) (Eq. 5.7.2.1-3)
 $\therefore T_u \leq 0.25\Phi T_{cr}$ Ignore Torsional Effects.
- Check combined torsional and shear (Eq. 5.12.5.3.8c-6)

$\frac{V_u}{b_v d_v} + \frac{T_u}{2A_o b_e}$	=	0.00 (ksi)	$\geq 0.474 \sqrt{f'_c} =$	0.00 (ksi)	OK
--	---	------------	----------------------------	------------	----

15. Posudky spřažených průřezů (ocel-beton) podle AASHTO LRFD (8. edice)

- 8. edice normy AASHTO LRFD.
- Ocelo-betonové spřažené průřezy

Design > Composite Design > AASHTO - LRFD 17

The screenshot shows the 'Design Parameters' dialog box for Composite Steel Girder Design Parameters. The 'Code' is set to 'AASHTO-LRFD17'. The 'Update by Code' button is visible. The dialog is divided into several sections:

- Strength Resistance Factor:**
 - Resistance factor for yielding (Phi_{L,y}): 0.95
 - Resistance factor for fracture (Phi_{L,u}): 0.8
 - Resistance factor for axial comp. (Phi_{L,c}): 0.9
 - Resistance factor for flexure (Phi_{L,f}): 1
 - Resistance factor for shear (Phi_{L,v}): 1
 - Resistance factor for shear connector (Phi_{L,sc}): 0.85
 - Resistance factor for bearing (Phi_{L,b}): 1
- Girder Type for Box/Tub Section:**
 - Single Box Sections
 - Multiple Box Sections
 - Consider St. Venant Torsion and Distortion Stresses
- Option For Strength Limit State:**
 - Appendix A6 for Negative Flexure Resistance in Web Compact / NonCompact Sections
 - Mn <= 1.3RhMy in Positive Flexure and Compact Sections (6.10.7.1.2-3)
 - Post-buckling Tension-field Action for Shear Resistance (6.10.9.3.2)
- Design Parameters:**
 - Strength Limit State-Flexure
 - Strength Limit State-Shear
 - Service Limit State
 - Constructibility
 - Fatigue Limit State
 - Shear Connectors, Longitudinal Stiffeners, Bearing Stiffener

Buttons for 'OK' and 'Cancel' are at the bottom.

Design Parameters

Code	AASHTO-LRFD 2017
Element	3
Position	1
Moment Type	Beam

I. Design Condition (Positive Flexure)

1. Section Properties

1) Slab Properties

B_s = 240.000 in
 t_s = 10.000 in
 t_{tr} = 5.000 in
 f_c' = 3.000 ksi
 E_c = 3155.924 ksi
 A_c = 0.000 in²
 F_{yr} = 40.000 ksi

2) Girder Properties

[Section]

b_{tc} = 130.000 in b_{tt} = 106.000 in
 t_{tc} = 3.000 in t_{tt} = 1.300 in
 D = 130.384 in t_w = 1.500 in
 H = 134.300 in

Position	Material	Thick(in)	f _y (ksi)	f _u (ksi)	Note
Compression Flange	A36	3.000	36.000	58.000	
Tension Flange	A36	1.300	36.000	58.000	less than 2 in.
Web	A36	1.500	36.000	58.000	less than 2 in.

[Design Strength]

F_{yc} = 36.000 ksi (Compression Flange Yield Strength)
 F_{yw} = 36.000 ksi (Web Yield Strength)
 F_{yt} = 36.000 ksi (Tension Flange Yield Strength)
 E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	f _y (ksi)	H(in)	B(in)	t _w (in)	t _r (in)	d ₀ (in)
Web	1Side	35.000	10.000	10.000	2.000	2.000	100.000

The diagram shows a T-section with a top slab and a vertical web. The slab is wider than the web, and the web is centered under the slab.

Excel Design Report

16. Automatické generování kombinací podle AASHTO LRFD (8. edice)

- Součinitelé zatížení pro extrémní stavy.
- Součinitelé zatížení pro únavu.

▪ Result > Load Combinations > AASHTO LRFD 17

Table 3.4.1-1—Load Combinations and Load Factors

Load Combination Limit State	DC DD DW EH EV ES EL PS CR SH	LL IM CE BR PL LS	Use One of These at a Time													
			WA	WS	WL	FR	TU	TG	SE	EQ	BL	IC	CT	CY		
Strength I (unless noted)	γ_p	1.75	1.00	—	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—	—	
Strength II	γ_p	1.35	1.00	—	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—	—	
Strength III	γ_p	—	1.00	1.4	0	—	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—	—	
Strength IV	γ_p	—	1.00	—	—	1.00	0.50/1.20	—	—	—	—	—	—	—	—	
Strength V	γ_p	1.35	—	—	—	—	—	—	—	—	—	—	—	—	—	

Table 3.4.1-1—Load Combinations and Load Factors

Load Combination Limit State	DC DD DW EH EV ES EL PS CR SH	LL IM CE BR PL LS	Use One of These at a Time													
			WA	WS	WL	FR	TU	TG	SE	EQ	BL	IC	CT	CY		
Strength I (unless noted)	γ_p	1.75	1.00	—	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—	—	
Strength II	γ_p	1.35	1.00	—	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—	—	
Strength III	γ_p	—	1.00	1.00	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—	—	
Strength IV	γ_p	1.35	1.00	1.00	1.00	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—	—	
Strength V	γ_p	1.00	—	—	—	—	—	—	—	—	—	—	—	—	—	
Extreme Event I	γ_{EQ}	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Extreme Event II	γ_p	0.50	—	—	—	—	—	—	—	—	—	—	—	—	—	
Service I	1.00	1.00	—	—	—	—	—	—	—	—	—	—	—	—	—	
Service II	1.00	1.30	—	—	—	—	—	—	—	—	—	—	—	—	—	
Service III	1.00	0.80	—	—	—	—	—	—	—	—	—	—	—	—	—	
Service IV	1.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Fatigue I—LL, IM & CE only	—	1.50	—	—	—	—	—	—	—	—	—	—	—	—	—	
Fatigue II—LL, IM & CE only	—	0.75	—	—	—	—	—	—	—	—	—	—	—	—	—	

Changes of Load Factors

Load Combinations

General | Steel Design | Concrete Design | SRC Design | Composite Steel Girder Design

Load Combination List

No	Name	Active	Type	Description
1	scLCB1	Strengt	Add	Strength-I:1.75M[1] 0.5
2	scLCB2	Strengt	Add	Strength-I:1.75M[1] 0.5
3	scLCB3	Strengt	Add	Strength-I:1.75M[2] 0.5
4	scLCB4	Strengt	Add	Strength-I:1.75M[2] 0.5
5	scLCB5	Strengt	Add	Strength-II:1.35M[1] 0.5
6	scLCB6	Strengt	Add	Strength-II:1.35M[1] 0.5
7	scLCB7	Strengt	Add	Strength-II:1.35M[2] 0.5
8	scLCB8	Strengt	Add	Strength-II:1.35M[2] 0.5
9	scLCB9	Strengt	Add	Strength-III:1.0W[1] 0.5
10	scLCB1	Strengt	Add	Strength-III:1.0W[1] 0.5
11	scLCB1	Strengt	Add	Strength-III:-1.0W[1] 0.5
12	scLCB1	Strengt	Add	Strength-III:-1.0W[1] 0.5
13	scLCB1	Strengt	Add	Strength-III:1.0W[2] 0.5
14	scLCB1	Strengt	Add	Strength-III:1.0W[2] 0.5
15	scLCB1	Strengt	Add	Strength-III:-1.0W[2] 0.5
16	scLCB1	Strengt	Add	Strength-III:-1.0W[2] 0.5
17	scLCB1	Strengt	Add	Strength-III:1.0W[3] 0.5
18	scLCB1	Strengt	Add	Strength-III:1.0W[3] 0.5
19	scLCB1	Strengt	Add	Strength-III:-1.0W[3] 0.5
20	scLCB2	Strengt	Add	Strength-III:-1.0W[3] 0.5
21	scLCB2	Strengt	Add	Strength-III:1.0W[4] 0.5
22	scLCB2	Strengt	Add	Strength-III:1.0W[4] 0.5

Load Cases and Factors

LoadCase	Factor
Strength(MV)	1.7500
Temperature Fall(ST)	0.5000
Dead Load(CS)	1.2500
DC(CS)	1.2500

Automatic Generation of Load Combinations

Option

Add Replace

Code Selection

Steel Concrete SRC Steel Composite

Design Code : AASHTO-LRFD17

Manipulation of Construction Stage Load Case

ST Only CS Only ST+CS

ST : Static Load Case CS : Construction Stage

Load Modifier :

Load Factors for Permanent Loads (Yp)

Seismic Load Combination

Load Factor for Settlement :

Structural Plate Box Structures(Metal Box Culverts)

Live Load Factor for Service III :

Condition for Temperature

Deformation Check All Other Effects

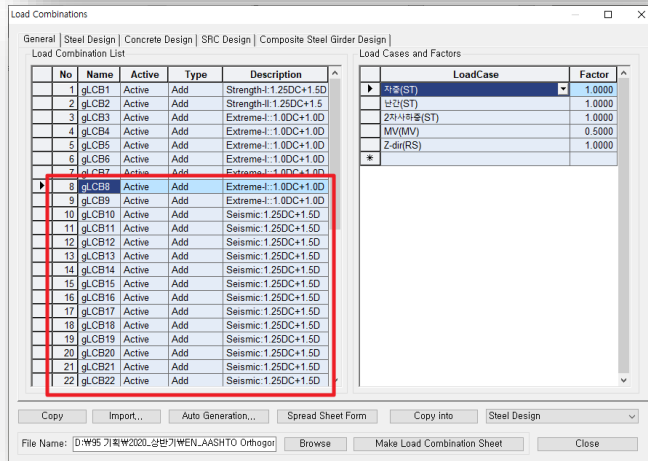
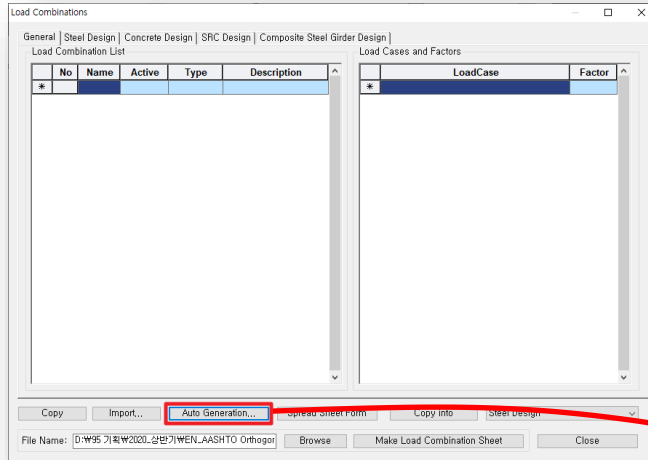
OK Cancel

Automatic Generation of Load Combination

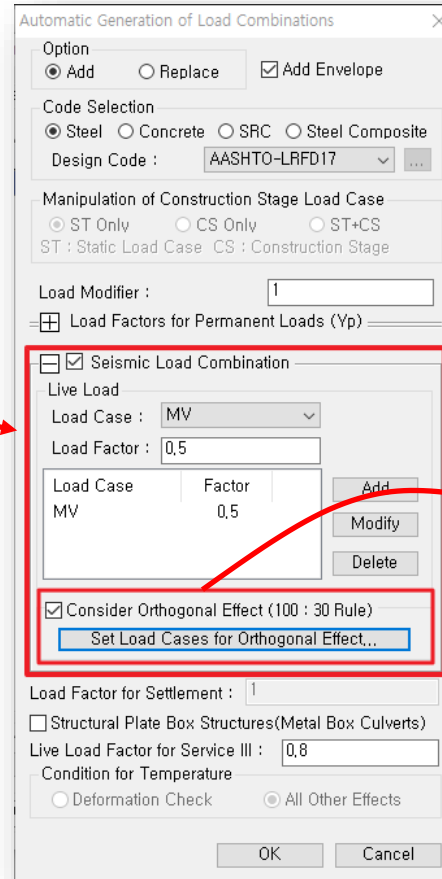
17. Kombinace složek seismických účinků podle AASHTO LRFD

- Automatická generace kombinací podle AASHTO-LRFD 16 a 17 s uvažáním kombinace všech tří ortogonálních složek seismických účinků zatížení.

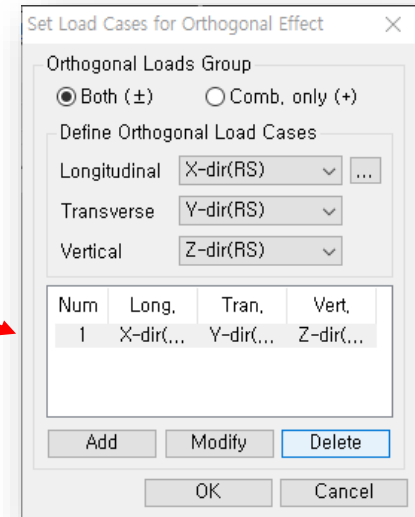
Results > Load Combination > Auto Generation...



Automatic Generation of Load combination



Define Seismic Load Combination



Define Orthogonal RS Loads

18. Návrh a posouzení ŽB prvků podle indické normy IRS (Indian Railway Standard)

- Návrh a posouzení ŽB sloupů a nosníků podle IRS je nyní dostupný.
- Automatický generovaný protokol s podrobnými posudky na MSÚ i MSP, včetně obrázků.

Design > RC Design > IRS



No: 160

1. Design Information

Member Number : 160
 Design Code : IRS
 Unit System : kN, m
 Material Data : fck = 30000, fy = 500000, fyw = 500000 KPa
 Beam Span : 0.472727 m
 Section Property : mid (No: 1)

2. Section Diagram

No: 187

1. Design Condition

Design Code : IRS
 Unit System : kN, m
 Member Number : 187
 Material Data : fck = 30000, fy = 500000, fyw = 500000 KPa
 Column Height : 4.75 m
 Section Property : PIER (No: 12)
 Rebar Pattern : Total Rebar Area Ast = 0.0113097 m² (RhoSt = 0.0100)

2. Applied Loads

Load Combination 36+ AT (J) Point
 N_{Ed} = 2035.00 kN, M_{Edy} = 246.587, M_{Edz} = 1862.67, M_{Ed} = 1878.92 kN-m

3. Axial Forces and Moments Capacity Check

Concentric Max. Axial Load N_{Rdmax} = 39244.8 kN
 Axial Load Ratio N_{Ed}/N_{Rd} = 2035.00 / 4765.59 = 0.427 < 1.000OK
 M_{Edy}/M_{Rdy} = 246.587 / 578.278 = 0.426 < 1.000OK
 Moment Ratio M_{Edz}/M_{Rdz} = 1862.67 / 4361.91 = 0.427 < 1.000OK
 M_{Ed}/M_{Rd} = 1878.92 / 4400.07 = 0.427 < 1.000OK

4. P-M Interaction Diagram

N(kN)	M _{Rd} (kN-m)	N _{Rd} (kN)	M _{Rd} (kN-m)
39244.78	0.00	39244.78	0.00
35689.30	1608.83	35689.30	1608.83
30608.49	3591.27	30608.49	3591.27
25788.21	4874.66	25788.21	4874.66
21810.48	5379.97	21810.48	5379.97
18652.82	5931.38	18652.82	5931.38
16185.09	6013.27	16185.09	6013.27
13940.09	5952.35	13940.09	5952.35
11488.38	5744.15	11488.38	5744.15
8463.42	5280.91	8463.42	5280.91

MIDAS/Text Editor - [RCCT girder IRS RC design.rcs]

```

.MIDAS/Civil - RC-BEAM Analysis/Design Program.
*.PROJECT      :
*.DESIGN CODE  : IRS,          *.UNIT SYSTEM : kN, m
*.MEMBER       : Member Type = BEAM,  MEMB = 160
*.DESCRIPTION OF BEAM DATA (ISEC = 1) : mid
Section Type : Tee-Section (TEE)
Beam Length (Span)      = 0.473 m.
Section Depth (Hc)      = 1.450 m.
Section Width (Bc)      = 0.300 m.
Width of Flange (bf)    = 2.800 m.
Depth of Flange (hf)    = 0.250 m.
    
```

MIDAS/Text Editor - [RCCT girder IRS RC design.rcs]

MIDAS/Civil - RC-Column Design [IRS]

```

.MIDAS/Civil - RC-COLUMN Analysis/Design Program.
*.PROJECT      :
*.DESIGN CODE  : IRS,          *.UNIT SYSTEM : kN, m
*.MEMBER       : Member Type = COLUMN,  MEMB = 187,  LCB = 36+,  POS = J
*.DESCRIPTION OF COLUMN DATA (ISEC = 12) : PIER
Column Height (L)      = 4.750 m.
Section Type : SOLID ROUND (SR)
Section Diameter (D)   = 1.200 m.
Concrete Strength (fck) = 30000.000 KPa.
Main Rebar Strength (fy) = 500000.000 KPa.
Ties/Spirals Strength (fyw) = 500000.000 KPa.
Modulus of Elasticity (Es) = 200000000.000 KPa.
*.REINFORCEMENT PATTERN :
Concrete Cover to C.O.R. (do) = 0.065 m.
Total Rebar Area       = 0.01131 m^2.
*.Ties : Failure
[[[*]]] CALCULATE SLENDERNESS RATIOS, MAGNIFIED FORCES/MOMENTS.
( ) . Factored forces/moments caused by unit load case. Unit : kN, m.
*.Load combination ID = 36+
Load Case  N_Ed_max  Myi  Myj  Mzi  Mzj
DL         2070.96   -1.03  -5.29  0.00  0.00
LL         -6.43    0.00  -5.29  1120.50  1109.33
DL+LL     2064.53   -1.03  -5.29  1120.50  1109.33
Others    -29.52    48.47  251.88  304.79  753.34
DL+LL+Others 2035.00  47.44  246.59  1425.29  1862.67
( ) . Check slenderness ratios of BRACED/UNBRACED frame.
-. End Moments (My1) = 1.03 kN-m.
    
```

Concrete Design Code

Design Code :

Apply Special Provisions for Seismic Design

Moment Redistribution Factor for Beam :

Torsion Design

OK Close

Code option for IRS RC Design

Graphic report for Beam and Column design

Detailed report for Beam and Column Design

19. Automacký generovaný protokol v polštině

- Automacký generovaný podrobný protokol v polštině s posudky pro předpjaté a sprážené průřezy (typu beton-beton, ocelo-beton).
- Posudky dle Eurokódu.

▪ PSC Box&Composite > Design > Report

Select Print Language
 Select the language for print.
 Language : English
 English
 Czech
 Polish
 OK

Numer elementu	1075
Position Information	I

1.Przypadek wymiarowania

1.1 Parametry wymiarowania

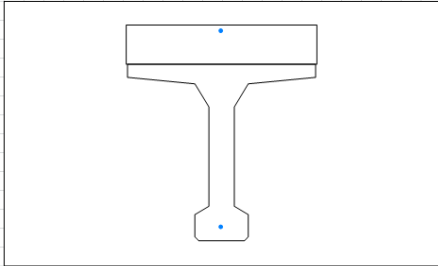
- Współczynniki częściowe dla SGU (EN 1992-1-1:2004, 2.4.2.4)

Przypadki wymiarowania	γ_c dla betonu	γ_s dla stali zbrojenowej	γ_s dla stali sprężającej
Staly i zmienny	1.500	1.150	1.150
Wyjątkowy	1.200	1.000	1.000

- Współczynnik α_{cc} , α_{ct} : współczynnik długoterminowych wpływów na wytrzymałość na ściskanie i zginanie.
 α_{cc} = 0.850 (dla wytrzymałości na ściskanie)
 α_{ct} = 1.000 (dla wytrzymałości na rozciąganie)

1.2 Informacje o przekroju

Informacje o przekroju	Przechr. zast.(ciąg., zbroj.) (Dźwigar)	Przechr. zas. (Po ścis.) (Dźwigar + Płyta)
A (mm ²)	515465.603	952336.200
I_y (mm ⁴)	137162101892.318	224570272776.134
y_{st} (mm)	-	512.636
y_{sb} (mm)	-	212.636
y_1 (mm)	543.286	212.636
y_2 (mm)	806.714	1137.364
Z_{st} (mm ³)	-	438069976.161
Z_{sb} (mm ³)	-	1056127262.797
Z_1 (mm ³)	46047196.375	1056127262.797
Z_2 (mm ³)	189305140.655	197447956.212



1.3 Dane materiałowe

■ Dźwigar (EN 1992-1-1:2004, Table 3.1)

- Informacje o betonie

PSC Design Report

▪ Steel Composite > Design > Report

Select Print Language
 Select the language for print.
 Language : English
 English
 Czech
 Polish
 OK

Numer elementu	2
Położenie elementu	I

1 Przypadek wymiarowania

1.1 Parametry do wymiarowania

■ Współczynniki częściowe

γ_c dla betonu	0.60	γ_s dla sworzni z łbem	1.10
γ_s dla stali zbrojenowej	0.70	γ_{F1} dla równow. zakresu zmienności naprężeń o st	0.90
γ_{M2} dla stali konstrukcyjnej	0.80	γ_{M2} dla wytrzymałości zmęczeniowej	0.80
γ_{M1} dla stali konstrukcyjnej	0.90	$\gamma_{M1,s}$ dla wytrzymałości zmęczeniowej przy ścianiu	0.70

1.2 Dane materiałowe

■ Stal konstrukcyjna

f_{sk} = 440.000 MPa E_s = 210000.000 MPa

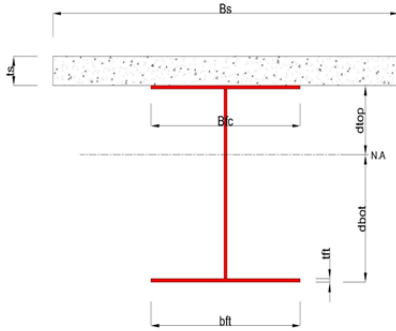
■ Beton

f_{ck} = 40.000 MPa E_{cm} = 35000.000 MPa

■ Zbrojenie

f_{yk} = 400.000 MPa E_r = 210000.000 MPa

1.3 Informacje o przekroju



Steel Composite Design Report