

Release Note

Release Date : Dec. 2024

Product Ver. : CIVIL 2025 (v1.1)



Enhancements

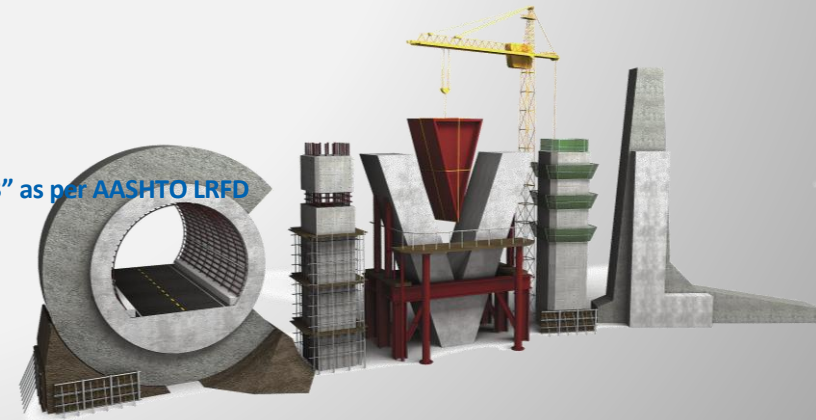
Enhancements in CIVIL 2025 (v1.1)

- Pre & Post processing

- 1.CQC 3 Directional Combination for Response Spectrum
- 2.Considering Elastic/General Link Forces in Moving Load Tracer
- 3.B-double rating vehicle as per AS 5100.7
- 4.Considering two trucks for substructure members or Elastic/General Link as per AASHTO LRFD Vehicle Loads
- 5.Moving patch load analysis as per AASHTO LRFD traffic loads
- 6.IRC Fatigue Vehicle
- 7.Time Dependent Materials as per SP/M/022 v 3.4, AS5100.5:2017(Amd 2:2024) and AS3600:2018(Amd 2)
- 8.Addition of Response Spectrum Function as per DPT.1301/1302-61:2018 and Eurocode Malaysia NA
- 9.Addition of H and Channel shape section database as per EN 10365
- 10.Addition of new Design Spectrum Database in Artificial Earthquake Data Generator
- 11.Addition of Element Stiffness Scale Factor

- Design

12. RC Design for 1D Beam & Column, Plate Beam & Column as per BS 5400
13. RC & Steel Design as per CSA S6:19
14. Response Modification Factor by members and components as per AASHTO LRFD
15. Addition of an option “Long-term Section Property of Cracked Composite Section: Rebar Area/3” as per AASHTO LRFD



1. CQC 3 Directional Combination for Response Spectrum

- The CQC3 rule has been developed to estimate the peak value of the combined response due to simultaneous application of the principal components of ground motion.
- The user defines the ratio (γ) of minor to major spectrum, and the program finds the critical angle and provides the maximum response for each component.

▪ Load > Dynamic Loads > RS Load Cases

Response Spectrum Load Cases

Spectrum Load Case

Load Case Name

DirectionX-Y

Excitation Angle0

[deg]

Directional Combination(CQC3)

Ratio of minor to major spectrum0.3

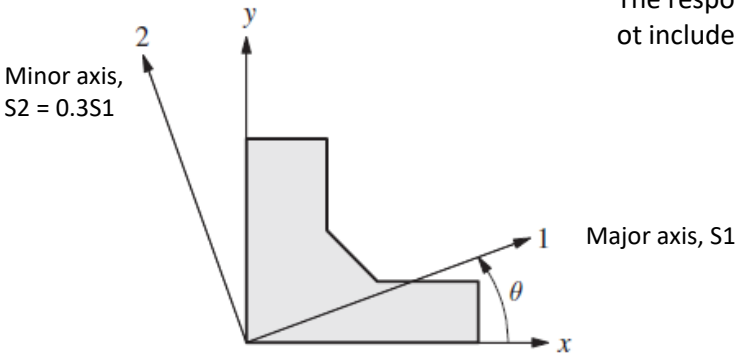
Scale Factor1

Period Modification Factor1

Modal Combination Control

Response Spectrum Load Cases

$$\theta_{cr} = \frac{1}{2} \tan^{-1} \left(\frac{2r_{xy}}{r_x^2 - r_y^2} \right)$$
$$r_{cr} \equiv r_{max} \simeq \left[(1 + \gamma^2) \left(\frac{r_x^2 + r_y^2}{2} \right) + (1 - \gamma^2) \sqrt{\left(\frac{r_x^2 - r_y^2}{2} \right)^2 + r_{xy}^2 + r_z^2} \right]^{1/2}$$

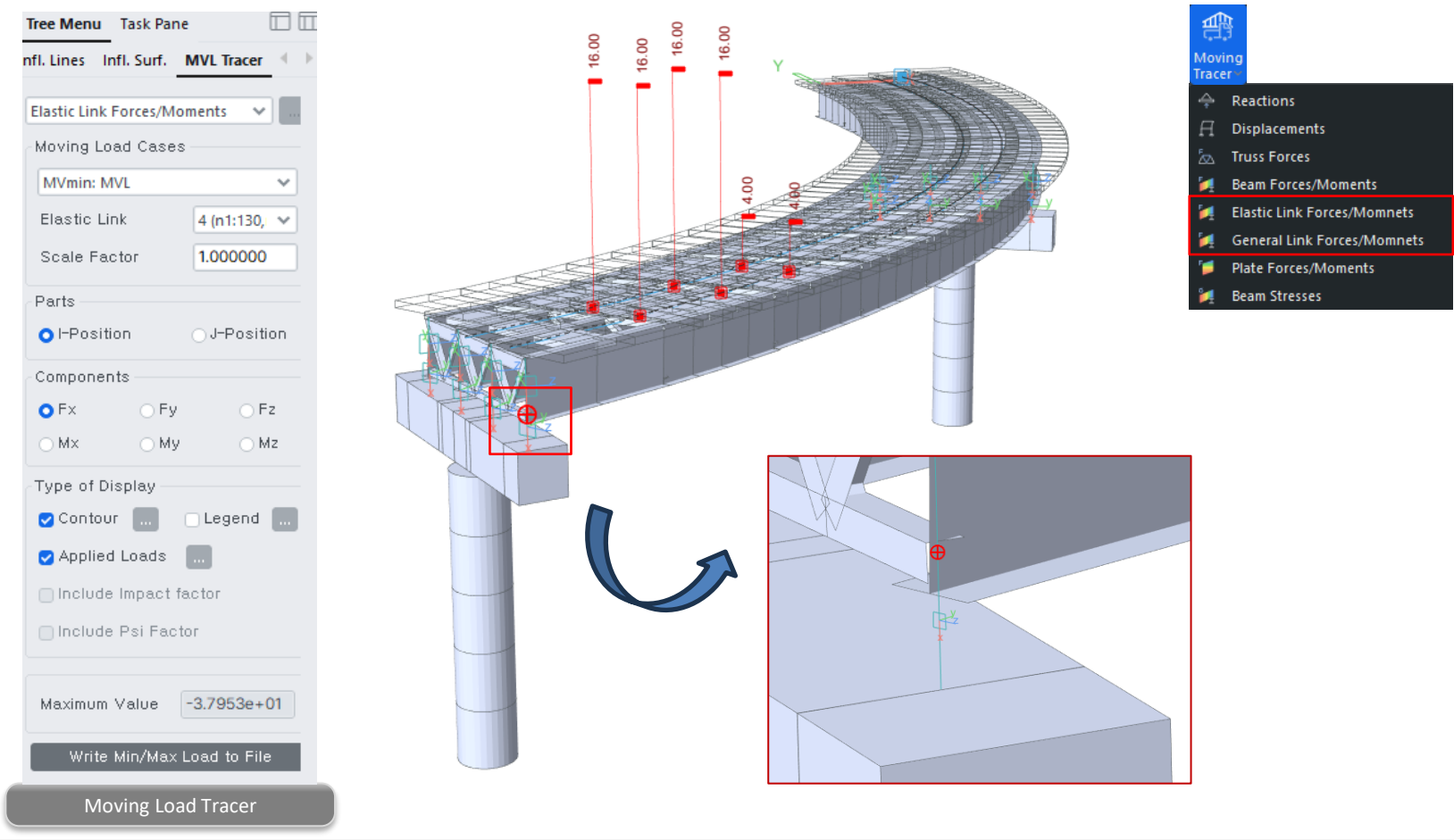


1 and 2: principal axes of ground motion

2. Considering Elastic/General Link Forces in Moving Load Tracer

- Bridge bearings are often simulated with Elastic Links or General Links to represent the stiffness of the bearings.
- Now, Moving Load Tracer supports Elastic Links and General Links to find the critical position of the vehicle loads and to convert it into equivalent static loads.

- **Results > Analysis Result > Moving Tracer > Elastic Link Forces/Moments**
- **Results > Analysis Result > Moving Tracer > General Link Forces/Moments**



3. B-double rating vehicle as per AS 5100.7

- A B-double is defined in the Heavy Vehicle National Law (HVNL) as a combination consisting of a prime mover towing two semitrailers.
- New B-double assessment vehicle DB for Queensland(QLD) and Victoria(VIC) is now available. More than 2 B-double vehicles can be loaded by checking on the option in Moving Load Analysis control.

▪ Load > Moving Load > Moving Load Code : Australia

Define Moving Load Case

Load Case Name: QLD50.5 8G1

Description:

☐ Load Case for Permit Vehicle

☐ Moving Load Optimization

Select Load Model

☐ General

☐ Fatigue

☐ Heavy Load Platform

☐ Rail Traffic Load

☒ B-Double Load

Accompanying Lane Factor

Num of Loaded Lanes: 1, Scale Factor: 1

2, 0.8

3 or more, 0.4

Load Case Data

B-Double Load: QLD-50.5T 8G1 GML 19m B

M1600 or S1600: S1600

Assignment Lanes

Loaded Lane of M1600 or S1600:

Min. Number of Loaded Lanes: 0

Max. Number of Loaded Lanes: 1

Line of Lanes: L3, L4, L5, L6

Selected Lanes: L1, L2

B-Double Lanes: L1

OK, Cancel, Apply

Moving Load Analysis Control Data

Truck/Train Load Control Option

Analysis Method: ☒ Exact, ☐ Pivot, ☐ Quick

Load Point Selection: ☒ Influence Line Dependent Point, ☐ All Points

Influence Generating Points: ☒ Number/Line Element: 3, ☐ Distance between Points: 0.3 m

Analysis Results

Plate: ☐ Center, ☒ Center + Nodal, ☒ Stress, ☒ Concurrent Force

Frame: ☐ Normal, ☒ Normal + Concurrent Force/Stress, ☒ Combined Stress

☒ Concurrent Force of Elastic/General Links

Calculation Filters

☒ Reactions: ☒ All, ☐ Group

☒ Displacements: ☒ All, ☐ Group

☒ Forces/Moments: ☒ All, ☐ Group

☒ Elastic/General Links: ☒ All, ☐ Group

☒ Apply Multiple B-Double Trucks in the Same Lane

Maximum Successive Vehicles: 10

OK, Cancel

Define Standard Vehicular Load

Standard Name: AS 5100.7 - Rating Vehicles

Vehicular Load Properties

Vehicular Load Name: QLD-50.5T 8G2 GML 19m B DOUBLE

Vehicular Load Type: QLD-50.5T 8G2 GML 19m B DOUBLE

☒ T44 Truck Load

☒ L44 Lane Load

VIC-45.5T HML B DOUBLE

VIC-68T HML B DOUBLE

QLD-50.5T 8G1 GML 19m B DOUBLE

QLD-50.5T 8G2 GML 19m B DOUBLE

QLD-62.5T 7G GML B DOUBLE

QLD-68T 7H HML B DOUBLE

No: 1, Load(kN): 63.8, Spacing(m): 3

2, 80.95, 1.2

3, 80.95, 5.5

4, 67.5, 1.2

5, 67.5, 5.5

6, 67.5, 1.2

7, 67.5, end

Min.Distance Between Vehicles: ☐ Slow Moving (8.0 m), ☒ Normal Moving (17.0 m)

Dynamic Load Allowance: ☒ Auto, ☐ User: 0.4

OK, Cancel, Apply

3D model of a bridge with multiple B-double trucks positioned on it, showing the lane configuration and load placement.



National Class 2 B-double Operator's Guide

May 2019

Moving Load Cases

Moving Load Analysis Control

MB-double Vehicles

4. Considering two trucks for substructure members or Elastic/General Links as per ASHTO LRFD vehicle loads

- Although AASHTO LRFD says, "For negative moment between points of contraflexure under a uniform load on all spans, 90 percent of the effect of two design trucks combined with 90 percent of the effect of the design lane load, force components other than negative moment need to be determined based on the two-truck rule in some projects.
- Now, it is possible to select elements or links to apply the two-truck rule to obtain maximum results for all force components in moving load analysis.

Load > Moving Load > Lane Support > Lane Support All Forces/Moments

Tree MenuTask Pane

Infl. LinesInfl. Surf.MVL TracerBatc

Beam Forces/Moments

Moving Load Cases

MVmin: MVL

Key Element338

Scale Factor1.000000

Parts

i

1/4

1/2

3/4

j

Components

Fx

Fy

Fz

Mx

My

Mz

Mb

Mt

Mw

Type of Display

Contour

Legend

Applied Loads

Include Impact factor

Include Psi Factor

Maximum Value-3.0561e+02

Write Min/Max Load to File

Moving Load Tracer

Application of two trucks which gives the maximum axial force of the pier.

A 3D wireframe model of a bridge structure, likely a continuous beam bridge with multiple spans. The bridge is shown in a perspective view, with a coordinate system (X, Y, Z) at one end. Two trucks, represented by red rectangular blocks, are positioned on the bridge deck. The bridge structure is color-coded, with blue and yellow lines indicating different components or load paths. A red circle with a crosshair is visible on the bridge deck, possibly indicating a specific point of interest or a support.

Lane Support

Lane Support-Nega. Moment

Lane Support Reaction

Lane Support All Forces/Moments

Tree MenuTask Pane

Moving Load

Lane Supports(All Forces/Mom)

Option

Add

Delete

Type

Truss

Beam

Plate

Elastic Link

General Link

Select 2 Nodes

No	ID	Type
1	324	Beam
2	335	Beam
3	336	Beam
4	337	Beam
5	338	Beam
6	11	Elastic Link
7	13	Elastic Link
8	15	Elastic Link
9	17	Elastic Link

Lane Support
All Forces/Moments

MIDAS

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5. Moving patch load analysis as per AASHTO LRFD traffic loads

- The tire contact area of a wheel can be applied during moving load analysis. In this version, HL-93TRK, HL-93TDM, and HS20-FTG vehicles of AASHTO LRFD are only supported.
- The design forces of plate elements can be noticeably reduced with the patch/area loads compared to concentrated wheel loads.

▪ Load > Moving Load (AASHTO LRFD) > Vehicles

Define Standard Vehicular Load

Standard Name
AASHTO LRFD Load

Vehicular Load Properties
Vehicular Load Name
HL-93TRK
Vehicular Load Type
HL-93TRK
Dynamic Load Allowance
33 %

(a)

(b)

Lane Support-Neg. Moment / Reaction		Application
Not assigned		a
Assigned		a,b

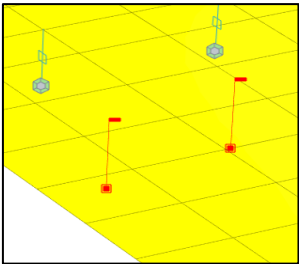
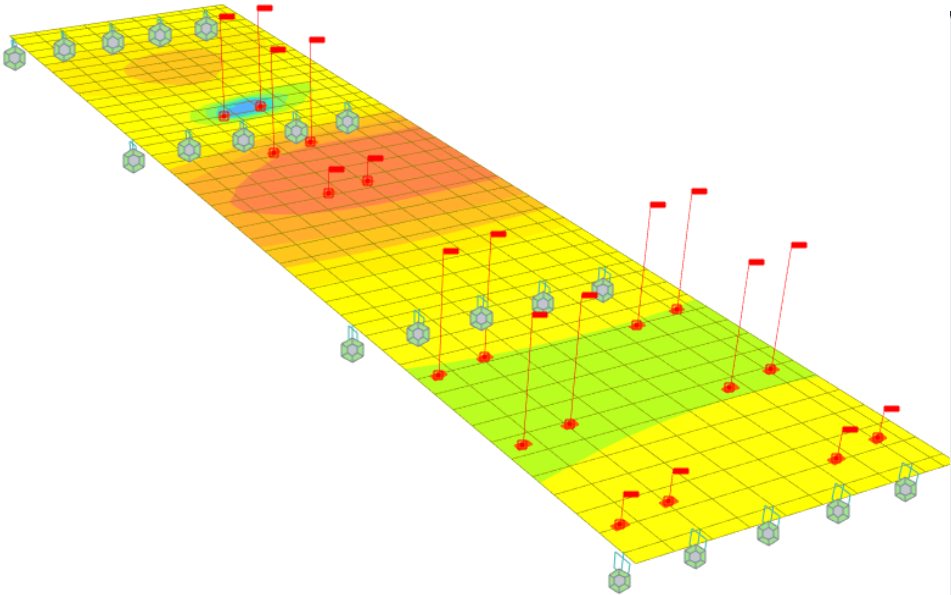
No	Load(kips)	Spacing(in)	W
1	8	168	0.0533333 kips/in
2	32	168	r 90 %
3	32	360	Dist. 600 in

☒ Consider Contact Area
Width 20 in
Length 10 in

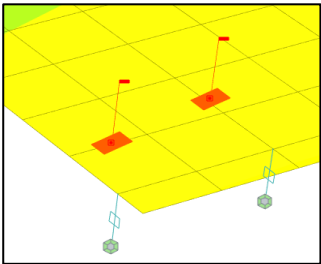
☐ Add Centrifugal Force

OK Cancel Apply

Standard Vehicle



Concentrated wheel loads



Patch/area wheel loads

Define User Defined Vehicular Load

Load Type
☒ Truck/Lane
☐ Legal/Permit Load
☐ Train Load
☐ Permit Truck

Vehicular Load Properties
Vehicular Load Name
HL-93TRK Patch

Truck Load

Lane Load

P#	D#

No	Load(kips)	Spacing(in)
1	8	168
2	32	168
3	32	360

☒ Consider Contact Area
Width 20 in
Length 10 in

Add Insert Modify Delete

W 0 kips/in
PL 0 kips
PLM 0 kips
PLV 0 kips

☐ Add Centrifugal Force

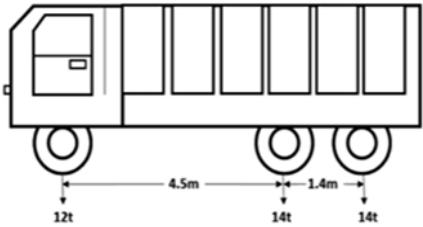
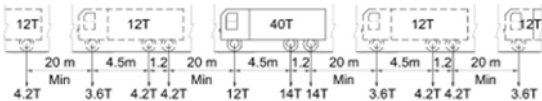
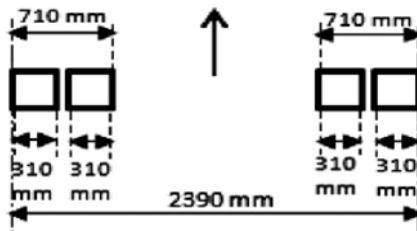
OK Cancel Apply

User-Defined Vehicle

6. Fatigue Vehicle to IRC 6 : Standard Load

- Fatigue Vehicle has been added to existing vehicle library of IRC 6 : Standard Load as per latest amendment to IRC : 6 Fatigue Load Clause 204.6.
- For assessment, impact factor has been replaced with surface roughness impact depending upon type of surface.

▪ Load > Load Type > Moving Load > Moving Load Code > India

S. No.	Claus e No.	AS EXISTS IN THE CODE	PROPOSED NEW CLUAUSE / MODIFICATION	REMARKS
		longitudinal direction of the bridge, shall be used for fatigue assessment with the fatigue load so positioned as to have worst effect on the detail or element of the bridge under consideration. The minimum clearance between outer edge of the wheel of the fatigue vehicle and roadway face of the kerb shall be 150 mm.  Fig. 7A: Fatigue Truck	increased by a dynamic amplification factor, I_{ef} as given below: $I_{ef} = 1.3(1-x/26) > 1.0$ where x = distance of section/detail from nearest expansion joint.  Fig. 7A : Fatigue Load Train NOTE: 1. Fatigue truck of 40 T must be included in Fatigue Load Train 2. Only such number of additional 12 T trucks shall be included in train as can be accommodated in influence line of detail under consideration Direction of Motion  max tyre pressure 5.273kg/cm² Fig. 7B: T Arrangement Transverse Wheel Spacing and Tyre Fig. 7: Fatigue Load (40T) The stress range resulting from the single passage of	second/more vehicles in lane included in line with Euro codes.

Define Standard Vehicular Load

Standard Name

IRC:6 Standard Load

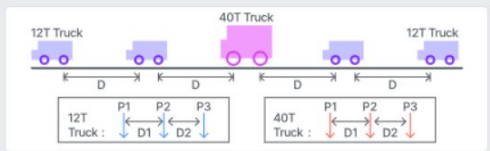
Vehicular Load Properties

Vehicular Load Name

Fatigue Vehicle

Vehicular Load Type

Fatigue Vehicle



Vehicular Load

Axle Loads of 12T Truck

No	Load(kN)	Spacing(m)
1	35.3039	4.5
2	41.1879	1.2
3	41.1879	end

Minimum Distance:
n 30 m

Axle Loads of 40T Truck

No	Load(kN)	Spacing(m)
1	117.68	4.5
2	137.293	1.2
3	137.293	end

Surface Roughness Impact

☐ Surface of good roughness (1.2)

☒ Surface of medium roughness (1.4)

☐ User define 1

OK

Cancel

Apply

6. Fatigue Vehicle to IRC 6 : Standard Load

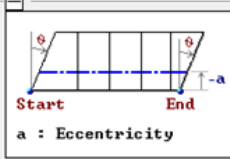
- The Traffic Lane Definitions now include an "EJ" checkbox for specifying expansion joint locations.
- For sections/ details within 6.0 m of the expansion joint, the fatigue load arrived as above shall further be increased by a dynamic amplification factor, I_{ej} .

▪ **Load > Load Type > Moving Load > Moving Load Code > India**

Define Design Traffic Line Lane

Lane Name : Fatigue Load

Traffic Lane Properties



Start End

a : Eccentricity

Eccentricity : 0 m

Wheel Spacing: 1.68 m

☒ IF/CDA : 1

☐ Span Length : 0 m

Vehicular Load Distribution

☒ Lane Element ☐ Cross Beam

Cross Beam Group

Skew

Start 0 End 0 [deg]

Moving Direction

☐ Forward ☐ Backward ☒ Both

Selection by

☒ 2 Points ☐ Picking ☐ Number

23.25, 0, 0 m

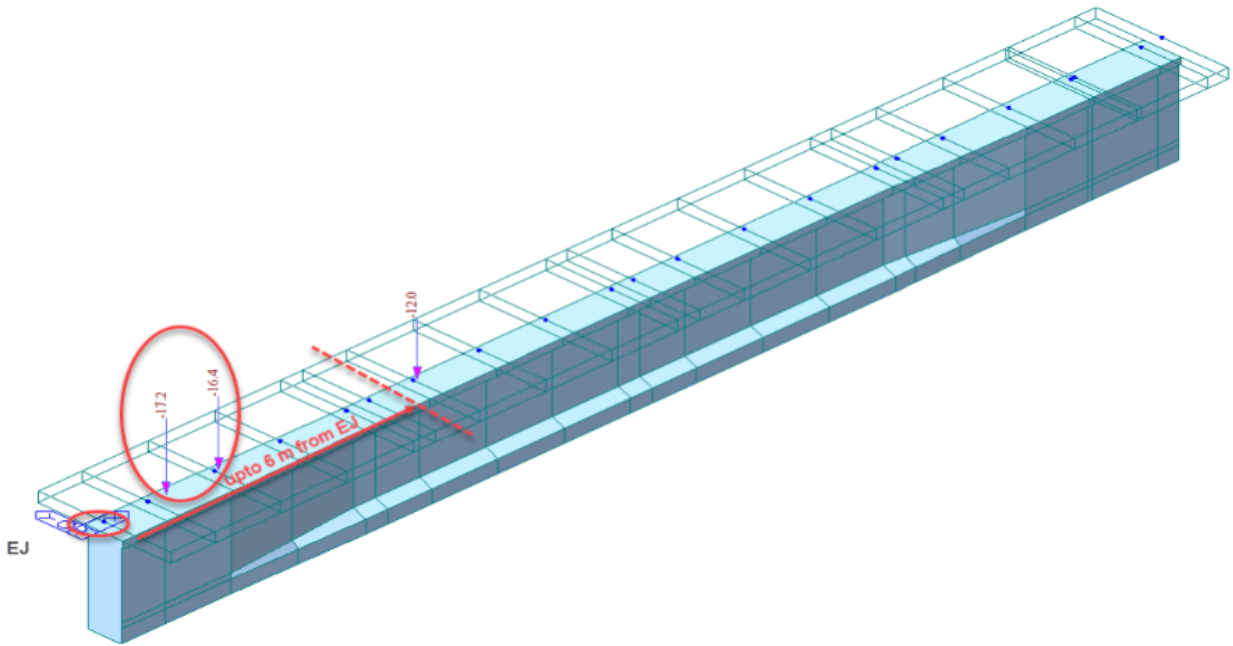
24.475, 0, 0 m

Operations

Add Insert Delete

No	Eccen. (m)	Span (m)	IF/CDA	EJ
1	0	-	1	☒
2	n	-	1	☐

OK Cancel Apply



$$I_{ej} = 1.3 \left(1 - \left(\frac{x}{26} \right) \right) \geq 1$$

x = distance of section/detail from nearest expansion joint

7. Time Dependent Materials as per the latest Australian and New Zealand Standards

- Time Dependent Materials (Creep, Shrinkage and Compressive Strength) as per the following Australian and New Zealand Standards are updated: SP/M/022 v 3.4, AS5100.5:2017(Amd 2:2024) and AS3600:2018(Amd 2).

- **Properties > Time Dependent Material > Creep/Shrinkage**
- **Properties > Time Dependent Material > Comp. Strength**

Add/Modify Time Dependent Material (Creep / Shrinkage)

Name : C35

Code : AS 3600-2018 Amd 2:2021

AUSTRALIA

Compressive strength of concrete at the age of 28 days : 35 N/mm²

Exposure Environment
☒ Arid ☐ Interior

Hypothetical Thickness :
h = 2 Ag / u (Ag : Section Area, u : Perimeter in contact with atmosphere)

Drying Basic Shrinkage Strain (10⁻⁶) (390~1100)
☒ 800.0 ☐ User Define

Age of concrete at the beginning of shrinkage : 3 day

Add/Modify Time Dependent Material (Creep / Shrinkage)

Name : C35

Code : AS 5100.5-2017 Amd 2:2024

AUSTRALIA

Compressive strength of concrete at the age of 28 days : 35 N/mm²

Exposure Environment
☒ Arid ☐ Interior ☐ Temperate Inland ☐ Tropical or Near Coastal

Hypothetical Thickness :
h = 2 Ag / u (Ag : Section Area, u : Perimeter in contact with atmosphere)

Drying Basic Shrinkage Strain (10⁻⁶) (390~1100)
☒ 800.0 ☐ User Define

Age of concrete at the beginning of shrinkage : 3 day

Add/Modify Time Dependent Material (Creep / Shrinkage)

Name : C35

Code : NZ Bridge(SP/M/022 Amd 4:2022)

New Zealand

Compressive strength of concrete at the age of 28 days : 35 N/mm²

Relative Humidity Factor for Shrinkage (0.21~0.74) : 0.74

Hypothetical Thickness : 100 mm
h = 2 Ag / u (Ag : Section Area, u : Perimeter in contact with atmosphere)

Drying Basic Shrinkage Strain (10⁻⁶) (390~1100)
720(Wangarei, Auckland Hunua, Hamilton) 720

Age of concrete at the beginning of shrinkage : 3 day

Modification factor for aggregate type (0.8~1.4) : 1

Add/Modify Time Dependent Material (Creep / Shrinkage)

Name : C35

Code : AS 3600-2018 Amd 2:2021

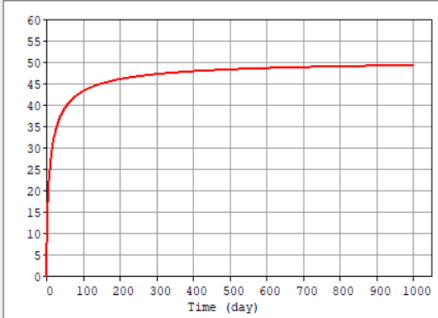
Type
☒ Code ☐ User

Development of Strength
Code : AS 3600-2018 Amd 2:2021

Concrete Compressive Strength at 28 Days (f28) : 35 N/mm²

Scale Factor : 1.0

Graph Options
☐ X-axis log scale ☐ Y-axis log scale



Redraw Graph

Creep & Shrinkage

Compressive Strength

8. Addition of Response Spectrum Function as per DPT.1301/1302-61:2018 and Eurocode Malaysia NA

- Design Spectrums for Thailand specifications(DPT.1301/1302-61:2018) and Eurocode Malaysian National Annex are added.

▪ Load > Dynamic Loads > RS Functions

Generate Design Spectrum

Design Spectrum DPT.1301/1302-61:2018

Region

☒ Bangkok

☐ Regeion except Bangkok

Method

☐ By Graph 1.4.6~7

☐ By Table 1.4-4~5

Seismic Zone

Seismic Zone 1

Design Spectral Acceleration

Site Class Sd

☐ by Code

Ss 0.750 S1 0.300

Fa 1.2 Sd1 0.6 g

Fv 1.8 Sd1 0.36 g

Category

Risk Category II

Importance 1.00

Structural Parameters

Response Mod. Factor 4.00

Damping Ratio 0.025

OK Cancel

Generate Design Spectrum

Design Spectrum Eurocode-8(2004)

National Annex Malaysia

Spectrum Type Horizontal Elastic Spectru

Ground Type B

Region Peninsular

Spectrum Parameters

☒ Shallow ... ☐ Deep S... ☐ User Defined

Soil Factor (S) Tb Tc Td

1.4 0.05 0.3 2.2

Ref. Peak Ground Acc. (AgR) 0.08 g

Importance Factor (I) 1.0

Viscous Damping Ratio (xi) 5 %

Max. Period 6 (Sec)

OK Cancel

Add/Modify/Show Response Spectrum Functions

Function Name EURO2004 H-ELASTIC

Spectral Data Type

☒ Normalized Accel.

☐ Acceleration

☐ Velocity

☐ Displacement

Scaling

☒ Scale Factor 1

☐ Maximum Value 0 g

Gravity 9.806 m/sec²

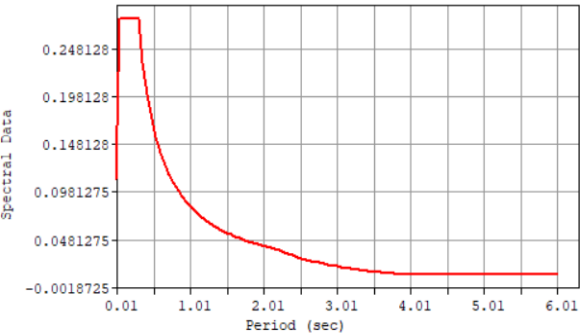
Damping Ratio 0.05

Graph Options

☐ X-axis log scale

☐ Y-axis log scale

Period (sec)	Spectral Data (g)
1	0.0000
2	0.0500
3	0.0600
4	0.1200
5	0.1800
6	0.2400
7	0.3000
8	0.3600
9	0.4200
10	0.4800
11	0.5400
12	0.6000
13	0.6600
14	0.7200
15	0.7800
16	0.8400
17	0.9000
18	0.9600
19	1.0200



Description EURO2004 H-ELA: G=B,S=1.40,Tb=0.05,Tc=0.30,Td=2.20,AgR=0.08g,I=1.0,Damping=5.00

OK Cancel Apply

DPT1301/1302-61 Design Spectrum

MY EN 1998 Design Spectrum

Response Spectrum Function

MIDAS

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- AGS (Artificial Data Generation System for windows) extracts artificial earthquake and design response spectrum using the design spectrum of each standard. Following design spectra are now added: Taiwan (2022), IS1938(2016), NSR-10, P100-1(2013), NTC 2018, DBWH-LRFD BDS(2013), AS 5100.2(2017), IRC:SP:114-2018, KBC(2016), China (GB/T 51408-2021), China(JTG/T 2231-01-2020), China (GB50011-2019), China (CJJ 166-2011), Japan(Bridge2017), Japan(Bridge 2012)

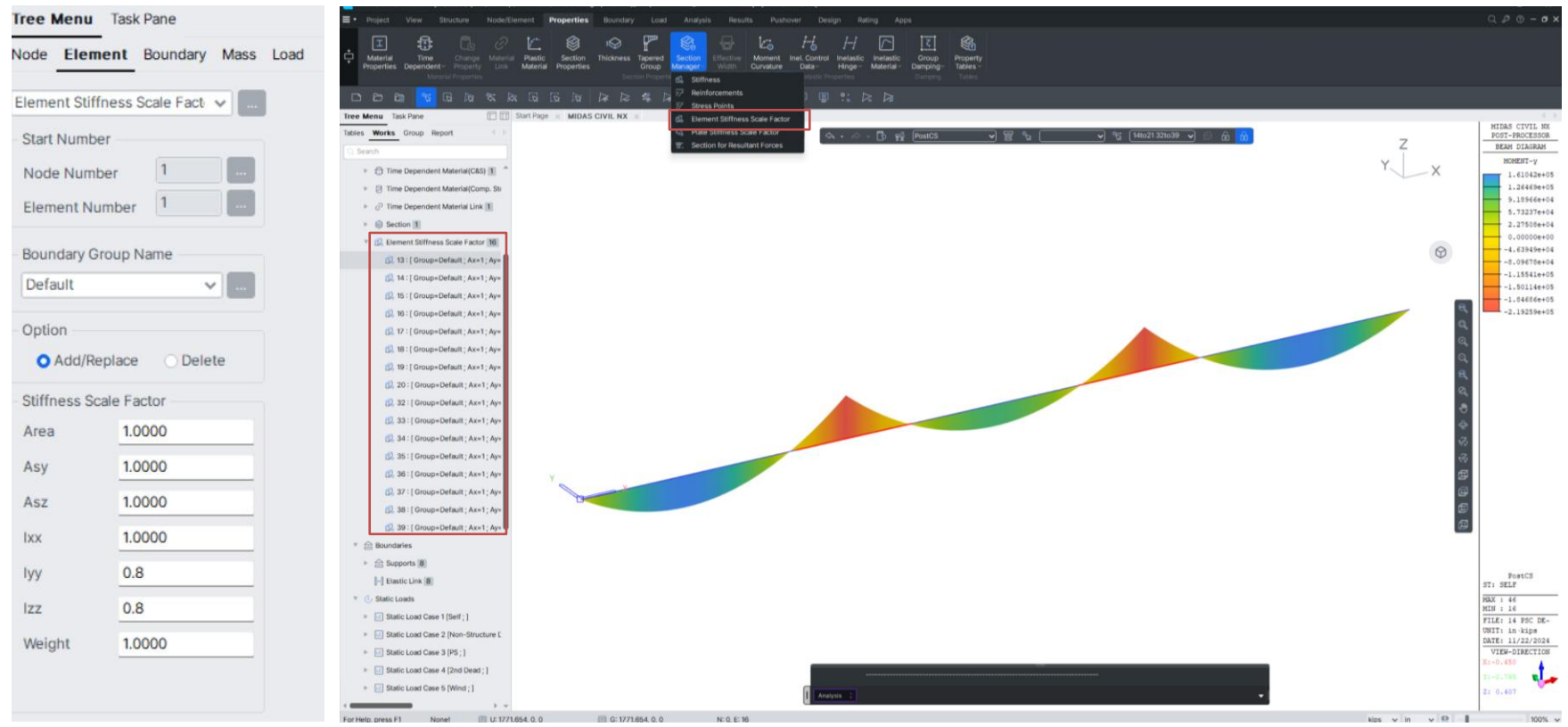
Figure 10 shows the comparison of two methods for generating artificial earthquake acceleration time history. The figure is divided into three parts:

- Left Panel:** A screenshot of the "Generate Design Spectrum" dialog box. The "Design Spectrum" dropdown menu is open, showing a list of standards. "China(GB/T 51408-2021)" is selected. Other options include "KDS(41-17-00:2019)", "KDS(17-10-00:2018)", "KBC(2016)", "KBC(2009)", "KBC(2005)", "Korea(Arch. 2000)", "Korea(Arch. 1992)", "Korea(Bridge)", "IBC2000(ASCE7-98)", "UBC(1997)", "UBC 88-94", "NBC(1995)", "Eurocode-8(2004)", "Eurocode-8(1996) Design", "Eurocode-8(1996) Elastic", "China(GB/T 51408-2021)", "China(JTG/T 2231-01-2020)", "China(GB50011-2019)", "China(CJJ 166-2011)", "China(GB50111-2006)", "China(GB50011-2001)", "China Shanghai(DGJ08-9-20)", "China(JTJ004-89)", "China(JTG/T B02-01-2008)", "China(GBJ11-87)", "Japan(Arch. 2000)", "Japan(Bridge2017)", "Japan(Bridge2012)", "Japan(Bridge2002)", "Taiwan(2022)", "Taiwan(2006)", "TaiwanBrg(89) Horizontal", "TaiwanBrg(89) Vertical", "IS 1893(2016)", "IS 1893(2002)", "NSR-10", "P100-1(2013)", "NTC2018", "DPWH-LRFD BSIDS(2013)", "AS 5100.2(2017)", and "IRC:SP:114-2018".
- Middle Panel:** A screenshot of the "Add/Modify Artificial Earthquake" dialog box. The "Function Name" is "P100-1(2013) H-ELASTIC". The "Data Type" is "Normalized Accel.". The "Graph Options" are "X-axis log scale" and "Y-axis log scale". The "Design Spectrum" section shows "Envelope Function" with "Rise Time" (1 sec), "Level Time" (2 sec), and "Total Time" (3 sec). The "Generation Options" section shows "Max. Iterations" (1), "Damping Ratio" (0.02), and "Random Seed" (1732259852). The "Graph Type" is "Spectrum Graph". The "Scaling" section shows "Max. Accel. [g]" (0). The "Generate Acceleration" button is visible. Below the dialog box, a graph shows "Spectrum Data" (red line) and "Artificial Earthquake" (green line) plotted against "Period".
- Right Panel:** A screenshot of the "Acceleration Data" graph. The "Data Type" is "Normalized Accel.". The "Graph Options" are "X-axis log scale" and "Y-axis log scale". The graph shows "Acceleration Data" (red line) plotted against "Time". The "Acceleration Data" legend is visible at the bottom.

10. Addition of Element Stiffness Scale Factor

- Apply scale factors to the cross-sectional linear elements (Truss, Tension-only, Compression-only, Cable, Gap, Hook & Beam Elements). Specific stiffness may be reduced such as the case where the flexural stiffness of girders in the negative moment region may require reduction to reflect cracked sections of concrete.

■ Properties > Section Manager > Element Stiffness Scale Factor



Element Stiffness Scale Factor

11. RC Design for 1D Beam & Column, Plate Beam & Column as per BS 5400

- Design and checking of RC frame elements to BS 5400 are newly introduced in midas.
- This feature can be applied to piers or RC beams.

Design > RC Design > RC Code Design > Beam/Column Design

BS 5400-4:1990 RC-Beam Design Result Dialog

Code : BS 5400-4:1990 Unit : N mm Primary Sorting Option

Sorted by ☒ Member ☐ Section

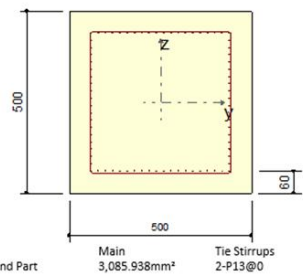
Negative Moment

Positive Moment

Shear Force

MEMB	Section	f _{cu}	POS	CHK	N(-) M	x/d	AsTop	LCB	x/d	AsBot	v	LCB	Asw	Stirrups
SECT	Bc	Hc	f _y											
Span	bf	hf	f _{yv}											
1	Beam	40.0000	I	OK	3.2E+08	1.1M	0.148	1454.4	0.00000	1.1F	0.033	324.32	2.10109	1.1F 3.1385 2.0-P10 @
1	400.0 600.0 500.000	M	OK	2.6E+08	1.1M	0.119	1181.7	0.00000	1.1F	0.033	324.32	1.99919	1.1F 3.1385 2.0-P10 @	
600.00	0.000 0.000 500.000	J	OK	1.6E+08	1.1M	0.072	714.16	2.6E+07	1.1+	0.033	324.32	1.84195	1.1F 3.1385 2.0-P10 @	
4	Beam	40.0000	I	OK	1.2E+08	1.1M	0.052	515.25	6.2E+07	1.1+	0.033	324.32	1.78849	1.1F 3.1385 2.0-P10 @
1	400.0 600.0 500.000	M	OK	7.8E+07	1.1M	0.034	336.96	1.3E+08	1.1+	0.059	582.50	1.69427	1.1F 3.1385 2.0-P10 @	
600.00	0.000 0.000 500.000	J	OK	1.1E+07	1.1M	0.033	324.32	1.7E+08	1.1+	0.076	755.35	1.52049	1.1F 3.1385 2.0-P10 @	
5	Beam	40.0000	I	OK	0.00000	1.1F	0.033	324.32	1.9E+08	1.1+	0.087	962.47	1.47462	1.1F 3.1385 2.0-P10 @
1	400.0 600.0 500.000	M	OK	0.00000	1.1F	0.033	324.32	2.4E+08	1.1+	0.111	1099.0	1.36893	1.1F 3.1385 2.0-P10 @	
600.00	0.000 0.000 500.000	J	OK	0.00000	1.1F	0.033	324.32	2.7E+08	1.1+	0.124	1229.8	1.21194	1.1F 3.1385 2.0-P10 @	
6	Beam	40.0000	I	OK	0.00000	1.1F	0.033	324.32	2.8E+08	1.1+	0.129	1284.7	1.16201	1.1F 3.1385 2.0-P10 @
1	400.0 600.0 500.000	M	OK	0.00000	1.1F	0.033	324.32	3.2E+08	1.1+	0.148	1466.6	1.05584	1.1F 3.1385 2.0-P10 @	
600.00	0.000 0.000 500.000	J	OK	0.00000	1.1F	0.033	324.32	3.4E+08	1.1+	0.158	1572.6	0.90097	1.1F 3.1385 2.0-P10 @	
7	Beam	40.0000	I	OK	0.00000									
1	400.0 600.0 500.000	M	OK	0.00000										
600.00	0.000 0.000 500.000	J	OK	0.00000										
MEMB	Section	f _{cu}	POS	CHK	Concrete	Reinforcement	Crack Control	Deflection Control						
SECT	Bc	Hc	f _y		Top-s	Top-s	Top-s	Top-s						
Span	bf	hf	f _{yv}		Top-s	Top-s	Top-s	Top-s						
1	Beam	40.0000	I	OK	0.00000	19.0000	14.8439	25.0000	224.277					
1	400.0 600.0 500.000	M	OK	0.00000	19.0000	12.2975	25.0000	185.082	375.000					
600.00	0.000 0.000 500.000	J	OK	1.09297	25.0000	0.02960	25.0000	120.502	375.000					
5	Beam	40.0000	I	OK	9.48113	25.0000	0.32206	25.0000	1.45241					
1	400.0 600.0 500.000	M	OK	11.7197	25.0000	0.00000	19.0000	0.00000	375.000					
600.00	0.000 0.000 500.000	J	OK	12.9874	25.0000	0.00000	19.0000	0.00000	375.000					
6	Beam	40.0000	I	OK	13.4231	25.0000	0.00000	19.0000	0.00000	375.000				
1	400.0 600.0 500.000	M	OK	15.1537	25.0000	0.00000	19.0000	0.00000	375.000					
600.00	0.000 0.000 500.000	J	OK	16.1686	25.0000	0.00000	19.0000	0.00000	375.000					
7	Beam	40.0000	I	OK	16.3488	25.0000	0.00000	19.0000	0.00000	375.000				
1	400.0 600.0 500.000	M	OK	17.0753	25.0000	0.00000	19.0000	0.00000	375.000					
600.00	0.000 0.000 500.000	J	OK	17.3767	25.0000	0.00000	19.0000	0.00000	375.000					
8	Beam	40.0000	I	OK	17.3767	25.0000	0.00000	19.0000	0.00000	375.000				
1	400.0 600.0 500.000	M	OK	17.0753	25.0000	0.00000	19.0000	0.00000	375.000					
600.00	0.000 0.000 500.000	J	OK	16.3488	25.0000	0.00000	19.0000	0.00000	375.000					
9	Beam	40.0000	I	OK	16.1686	25.0000	0.00000	19.0000	0.00000	375.000				
1	400.0 600.0 500.000	M	OK	15.1537	25.0000	0.00000	19.0000	0.00000	375.000					
600.00	0.000 0.000 500.000	J	OK	13.4231	25.0000	0.00000	19.0000	0.00000	375.000					
10	Beam	40.0000	I	OK	12.9874	25.0000	0.00000	19.0000	0.00000	375.000				
1	400.0 600.0 500.000	M	OK	11.7197	25.0000	0.00000	19.0000	0.00000	375.000					
600.00	0.000 0.000 500.000	J	OK	9.48113	25.0000	0.32206	25.0000	1.45241	375.000					
12	Beam	40.0000	I	OK	1.09297	25.0000	0.02960	25.0000	120.502	375.000				

- 3) Material
- Concrete
- $f_{cu} = 50.000\text{MPa}$, $E_c = 34,000.000\text{MPa}$
- Reinforcement
- $f_y = 500.000\text{MPa}$, $f_{ty} = 500.000\text{MPa}$, $E_s = 200,000.000\text{MPa}$
- 4) Length
- L = 3.000m
- 5) Reinforcement Data

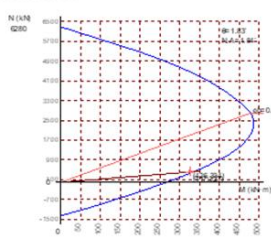


2. Axial and moment capacity (End, 1.00L)

LCB	cLCB1+MY	
N / N _u	417.334kN / 425.555kN = 0.981	OK
M _y / M _{uy}	326.609kN-m / 334.053kN-m = 0.978	OK
M _x / M _{ux}	10.433kN-m / 10.671kN-m = 0.978	OK
M / M _u	326.775kN-m / 334.224kN-m = 0.978	OK
p _{min} , p , p _{max}	p _{min} = 0.01000 ≤ p = 0.01234 ≤ p _{max} = 0.06000	OK

* cLCB1+MY : ULS Comb 1: 1.26SD+1.92SDW+1.6SM[1]

1) PM Interaction curve



N _u (kN)	M _u (kN-m)
6,279.993	0.000
5,283.093	196.278
4,653.899	299.038
4,056.509	376.060
3,514.092	429.011
3,064.424	463.095
2,804.477	479.667
2,541.871	485.772
2,064.719	483.011
1,448.480	452.833
665.294	369.387
353.285	203.994
-1,341.712	0.000

Design Result Table

Detailed Calculation Report

12. RC Design for 1D Beam & Column, Plate Beam & Column as per BS 5400

- Design and checking of RC plate elements to BS 5400 are newly introduced in midas.
- This feature can be applied to culvert, pier walls or slabs where the stresses are distributed in one way.

Design > RC Design > RC Code Design > Plate Beam/Column Design

Plate Beam Design Result Dialog

Code : BS 5400-4:1990 Unit : kN, m / m

Sub-Domain	SEL	Major Dir	CHK	Pos	Req_As	Elem.	Node	LCB_M	M	M_u	Ratio_M	Elem.	Node	LCB_V	v
TC	☐	Dir1	OK	Pos	0.0020	521	567	2	117.005	117.096	0.9992	541	609	2	817.429
				Neg	0.0003	541	608	2	0.00000	18.9725	0.0000				
TE	☐	Dir1	OK	Pos	0.0014	461	525	2	86.8913	86.7653	0.9991	441	504	2	1480.82
				Neg	0.0022	421	3	2	125.078	125.169	0.9993				
BC	☐	Dir1	OK	Pos	0.0003	740	797	2	0.00000	25.8236	0.0000	740	798	2	611.203
				Neg	0.0016	700	756	2	117.729	117.829	0.9991				
BE	☐	Dir1	OK	Pos	0.0019	620	1	2	137.500	137.613	0.9992	620	672	2	1591.02
				Neg	0.0012	660	714	2	93.1388	93.2218	0.9991				

☐ Connect Mod

Select All

Detail...

Graphic...

Close

Plate Beam/Column Design Result Table

Preview Window

Name: TC(Dir1) Print Print All Close Save

1. Design Condition

Design Type : Plate Beam (1D)
Sub-Domain : TC
Design Code : BS 5400-4:1990
Unit System : kN, m / m
Material Data : fcu = 24000, fy = 460000, fyt = 250000 KPa
Thickness : 0.23 m

2. Section Diagram

Element No : 521

Rebar Pattern Top Required Rebar Area = 0.00027 m²/m
Bot Required Rebar Area = 0.00199277 m²/m
Required Stirrups Spacing : 2.0-P13 @0.040

3. Bending Moment Capacity

	Top(Negative)	Bottom(Positive)
Mu	0.00	117.01
Element No.	541	521
Load Combination	cLCB2	cLCB2
M	18.97	117.10
Check Ratio (Mu/Mr)	0.0000	0.9992

4. Shear Capacity

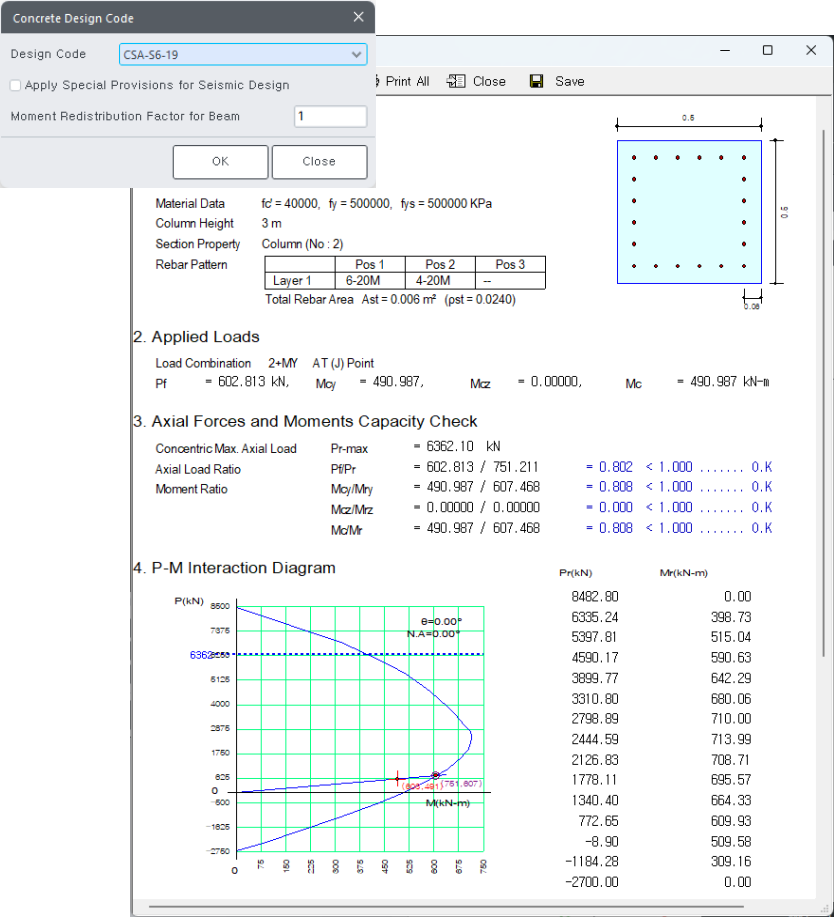
Element No. 541
Load Combination cLCB2
Applied Shear Resistance v = 817.429
Shear Strength (Out of plane) v_uc = 896.654 v_ur = 1441.67
Required Stirrups Spacing 0.04004 m
Shear Ratio vlv_u = 817.429 / 2338.32 = 0.350 < 1.000 0.K

Plate Beam Design Summary

13. RC & Steel Design as per CSA S6:19

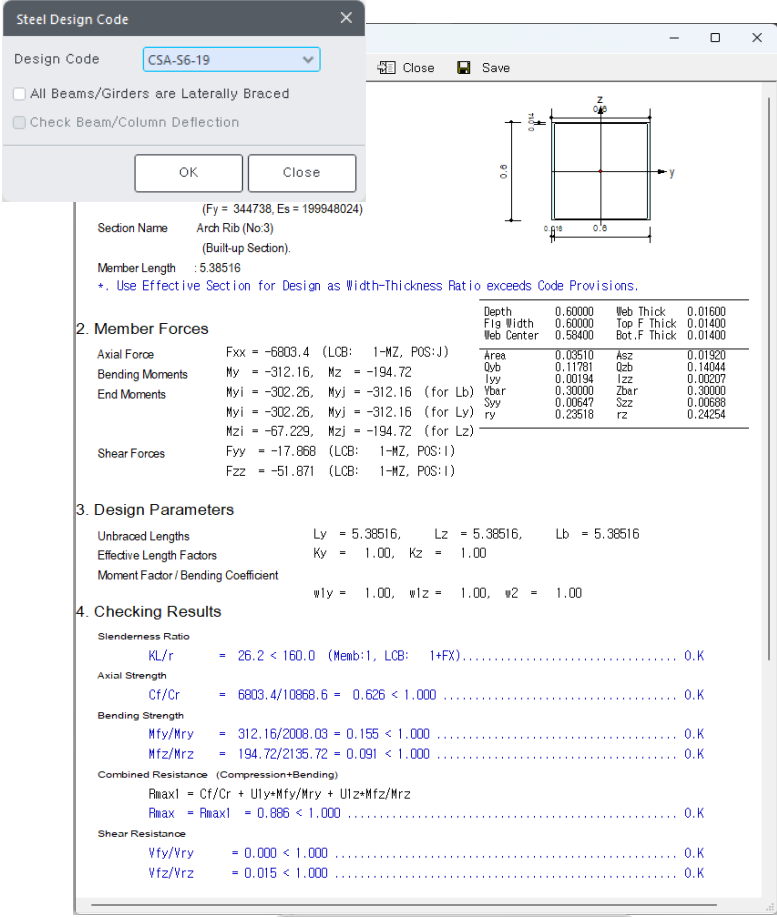
- RC member design and steel member design have been updated as per CSA S6: 19.

Design > RC Design > Design Code Option



RC Design Summary Report

Design > Steel Design > Design Code Option



Steel Design Summary Report

14. Response Modification Factor by members and components as per AASHTO LRFD

- Seismic design force effects for substructures shall be determined by dividing the force effects resulting from elastic analysis by the appropriate response modification factor, R.
- In the previous version, only a single response modification factor could be applied. However, the current version allows for the application of response modification factors based on substructure types and load components.
- Applicable Code: AASHTO-LRFD

Design > RC Design > Design Parameters > Response Modification Factor (R)

Tree MenuTask Pane

GeneralSteelConcreteSRC

Response Modification Factor

Option

Add/Replace

Delete

Response Modification Factor

Fx1

Fy1

Fz1

Mx1

My1.5

Mz1.5

A 3D perspective view of a bridge structure. The bridge deck is supported by two main piers. The piers are labeled with response modification factors: the left pier is labeled 'R1,1,1,1,1,1' and the right pier is labeled 'R1,1,1,1,1,1'. The bridge deck is labeled with 'R1,1,1,1,1,1'. The bridge is shown in a perspective view, with the deck extending into the distance.

Start Page	MIDAS CIVIL NX	Response Modification Factor (R)					
	Elem	R factor for Fx	R factor for Fy	R factor for Fz	R factor for Mx	R factor for My	R factor for Mz
	390	1.00	1.00	1.00	1.00	1.50	1.50
	391	1.00	1.00	1.00	1.00	1.50	1.50
*							

Response Spectrum Modification Factor Dialog

Response Spectrum Modification Factor Table

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15. Addition of an option “Long-term Section Property of Cracked Composite Section: Rebar Area/3” as per AASHTO LRFD

- In previous versions, the long-term section properties of the composite girder subjected to negative moment were calculated as "Steel Section + Long. Reinforcement/3".
- Now, an option is added to determine the section properties as "Steel Section + Long. Reinforcement".

Design > Composite Design > Design Code Option

Composite Steel Girder Design Code

Code: AASHTO-LRFD20 Update by Code

Strength Resistance Factor

Resistance factor for yielding (Phi_y)

0.95

Resistance factor for fracture (Phi_u)

0.8

Resistance factor for axial comp. (Phi_c)

0.9

Resistance factor for flexure (Phi_f)

1

Resistance factor for shear (Phi_v)

1

Resistance factor for shear connector (Phi_sc)

0.85

Resistance factor for bearing (Phi_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)

Long-term Section Property of Cracked Composite Section: Rebar Area/3

Include Normal Stress due to Torsional Warping

Design Parameters

Strength Limit State-Flexure

Strength Limit State-Shear

Service Limit State

Constructibility

Fatigue Limit State

Shear Connectors, Longitudinal Stiffeners, Bearing Stiffener

OK

Cancel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
121																													
122																													
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Design Report

Composite Steel Girder Design Code Option