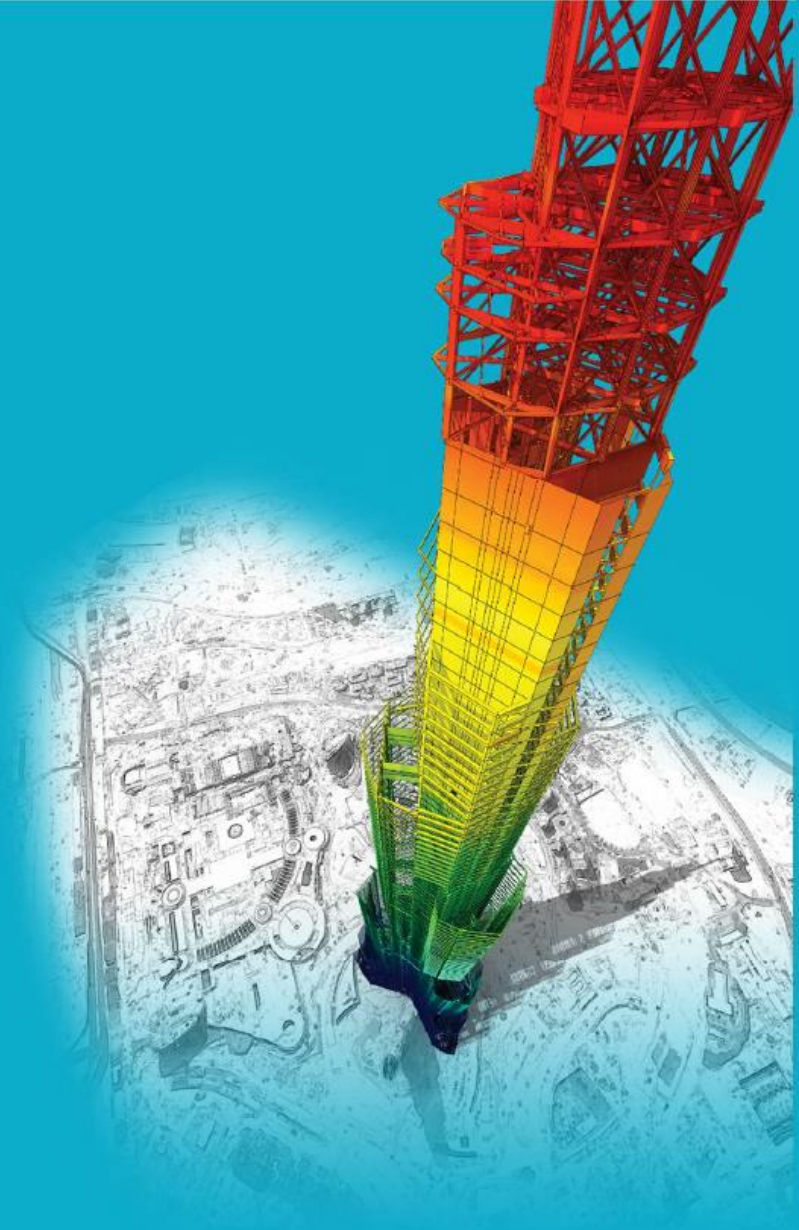


Release Note

Release Date: June. 2024

Product Ver. : midas Gen 2024 (v2.1)



Design System of General Structures

Integrated Design System for Building and General Structures

INDEX

midas Gen

- *Added TWN-USD 112 (Taiwan)*
- *Improved Steel Design, Irregularity Check and other features according to IS Code (India)*
- *Added 100:30:30 Rule according to Eurocode 8*
- *Added Detail Report for Cyclic Shear Resistance Check*
- *Improved Construction Stage Analysis Control Data (Setting of Load Case)*
- *Added Cold Formed Material of TIS 1228-2018 (Thailand)*
- *Added Cold Formed Section of TIS 1228-2018 (Thailand)*
- *Added Static Seismic Load and Response Spectrum Function according to EC-8(2004) Malaysia N.A.*
- *ETC*
 1. *Improved Rebar Size Dialog box in Meshed Design*
 2. *Improved Shear Span in RC members under Eurocode 8 (Pushover Hinge)*
 3. *Improved Wall Design Force as per EC8*

Design+

- *Added Member Design Module for IS :456-2000. (Column, Basement Wall, Shear Wall Module)*
- *Improved Link Option*
- *Added Eurocode 2 in Batch Design*
- *Improved Batch Wall Design*
- *Improved Anchor Bolt Design in Base Plate*
- *Improved Start Page*

midas **Gen**

Add TWN-USD 112 (Taiwan)

Design Code Dialog Box in TWN-111

Concrete Design

Design Code : TWN-USD111

☒ Apply Special Provisions for Seismic Design
☐ Consider strong column-weak beam on last floor

Shear for Design Update by Code

$R^*V_c(a_1 \cdot \sum(M_{pr})/L > \max(V_{u1}, V_{u2})/2)$, R = 0

Method
☒ MAX(V_{u1}, V_{u2}) ☐ MIN(V_{u1}, V_{u2}) ☐ V_{u1} ☐ V_{u2}

$V_{u1}, V_g + a_1 \cdot \sum(M_{pr})/L$, a1 = 0
 $V_{u2}, V_g + a_2 \cdot V_{eq}$, a2 = 0

SCWB Design/Checking Method
☐ Design Strength ☒ Nominal Strength
☐ Don't consider the k1 factor
 Reduction factor of column : 0.65

Member Types to be excluded in Seismic Design
☒ Sub-Beam ☒ Cantilever
☒ Underground Beam/Column

☐ Torsion Design
 Torsion Reduction Factor for Beam : 1

Moment Redistribution Factor for Beam : 1
 Moment Calculation Method for Beam
☐ Equivalent Rebar ☒ Each Rebar

☐ Use Subdivided Force for Beam Assigned as Member

P-M Curve Calculation Method
☐ Keep P Constant
☒ Keep M/P Constant

☐ Check the interaction for biaxial shear
 fs of Main bar in Beam Design
☒ $2/3 \cdot f_y$ ☐ By Program

Design Code Dialog Box in TWN-112

Concrete Design

Design Code : TWN-USD112

☐ Check Beam Deflection
☒ Apply Special Provisions for Seismic Design
☐ Seismic Design Parameter
☐ Consider strong column-weak beam on last floor

Shear Wall Type
☐ Special RC Structural Wall
 Boundary Element Method
☒ Displacement Based Method
 Deflection Amplification Factor (Cd) 4.50
 Important Factor (Ie) 1.20
☐ Stress Based Method

Shear for Design Update by Code

$R^*V_c(a_1 \cdot \sum(M_{pr})/L > \max(V_{u1}, V_{u2})/2)$, R = 0

Method
☐ MAX(V_{u1}, V_{u2}) ☒ MIN(V_{u1}, V_{u2}) ☐ V_{u1} ☐ V_{u2}

$V_{u1}, V_g + a_1 \cdot \sum(M_{pr})/L$, a1 = 1
 $V_{u2}, V_g + a_2 \cdot V_{eq}$, a2 = 2
 $V_{u2}, V_g + a_2 \cdot V_{eq}$ (Column) , a2 = 2

SCWB Design/Checking Method
☐ Design Strength ☒ Nominal Strength
☐ Don't consider the k1 factor
 Reduction factor of column : 0.65

☐ Beam-Column Joint Design
 Select Check Position
☐ Top ☒ Bottom

Member Types to be excluded in Seismic Design
☒ Sub-Beam ☒ Cantilever
☒ Underground Beam/Column

- Add to check the beam deflection

- Add Special Wall Design

- Add settings for columns in the capacity design

- Add joint design

Improved Steel Design, Irregularity Check & Other Features according to IS Code (India)

The items below have been updated. If you want to know more details, please click on [\[Here\]](#)

- **Added Seismic Provisions for Steel Design as per IS : 18168 -2023**
 1. Additional Seismic Load Combination as per IS : 18168 : 2023
 2. Column to beam strength ratio as per IS : 18168 -2023
 3. Seismic Beam Design for SMRF as per IS : 18168-2023
 4. Seismic Beam Design & Brace Design for SCBF as per IS : 18168-2023
- **Irregularity Check according to IS : 1893 -2016**
 1. Torsional Irregularity & Weight Irregularity
 2. Stiffness Irregularity
 3. Capacity Irregularity
 4. Irregular modes of oscillation
- **Irregularity Check according to IS : 16700 -2023**
 1. Stiffness Irregularity & Capacity Irregularity
 2. Natural modes of vibration
- **Approximate Time period of building according to IS : 16700-2023**
- **Lateral Story Drift Check according to IS : 16700 – 2023**
- **Stability Coefficient Check according to IS : 16700 - 2023**

100:30:30 Rule according to Eurocode 8

Automatic Generation of Load Combinations

Option
☒ Add ☐ Replace

Code Selection
☐ Steel ☒ Concrete ☐ SRC
☐ Cold Formed Steel ☐ Footing
☐ Aluminum

Design Code : Eurocode2:04

National Annex : Italy

☐ Scale Up of Response Spectrum Load Cases

Scale Up Factor : 1 Rx

Factor	Load Case
1.000	Rx
1.000	Ry

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

☒ Consider Orthogonal Effect
 Set Load Cases for Orthogonal Effect...

☒ 100 : 30 : 30 Rule

Define Factors for Variable Actions
 Factors for Variable Actions...

Partial factors for actions
 Gamma_G : 1.3 Gamma_Q : 1.5

☐ Will Execute Construction Stage Analysis
☐ Consider Losses for Prestress Load Cases

Transfer Stage : 1 Define Factors
 Service Load Stage : 1

☐ Consider Imperfection Load
 Set Load Cases and Direction...

Generate Additional Load Combinations
☐ for Non-Dissipative

OK Cancel

Set Load Cases for Orthogonal Effect

100:30 Rule

Orthogonal Loads Group

Define Orthogonal Load Cases

Load Case 1 : Rx(RS)

Load Case 2 : Ry(RS)

Load Case 3 : None

Auto Grouping Generation...

Group No	LC1	LC2	LC3
1	Rx(RS)	Ry(RS)	None

- 100:30 rule is applied when not selecting 'Load case 3'

Set Load Cases for 100:30:30 Rule

Orthogonal Loads Group

Define Orthogonal Load Cases

Load Case 1 : Rx(RS)

Load Case 2 : Ry(RS)

Load Case 3 : Rz(RS)

Auto Grouping Generation...

Group No	LC1	LC2	LC3
1	Rx(RS)	Ry(RS)	Rz(RS)
2	EX(ST)	EY(ST)	EZ(ST)

- 100:30:30 rule is applied when selecting all load cases

No	Name	Active	Type	DL(ST)	LL(ST)	WX(ST)	WY(ST)	EX(ST)	EY(ST)	EZ(ST)
1	cLCB10	Stren	Add	1.0000	0.3000			1.0000	0.3000	0.3000
2	cLCB11	Stren	Add	1.0000	0.3000			1.0000	0.3000	-0.3000
3	cLCB12	Stren	Add	1.0000	0.3000			1.0000	-0.3000	0.3000
4	cLCB13	Stren	Add	1.0000	0.3000			1.0000	-0.3000	-0.3000
5	cLCB14	Stren	Add	1.0000	0.3000			0.3000	1.0000	0.3000
6	cLCB15	Stren	Add	1.0000	0.3000			-0.3000	1.0000	0.3000
7	cLCB16	Stren	Add	1.0000	0.3000			0.3000	1.0000	-0.3000
8	cLCB17	Stren	Add	1.0000	0.3000			-0.3000	1.0000	-0.3000
9	cLCB18	Stren	Add	1.0000	0.3000			0.3000	0.3000	1.0000
10	cLCB19	Stren	Add	1.0000	0.3000			0.3000	-0.3000	1.0000
11	cLCB20	Stren	Add	1.0000	0.3000			-0.3000	0.3000	1.0000
12	cLCB21	Stren	Add	1.0000	0.3000			-0.3000	-0.3000	1.0000
13	cLCB22	Stren	Add	1.0000	0.3000			-1.0000	-0.3000	-0.3000
14	cLCB23	Stren	Add	1.0000	0.3000			-1.0000	-0.3000	0.3000
15	cLCB24	Stren	Add	1.0000	0.3000			-1.0000	0.3000	-0.3000
16	cLCB25	Stren	Add	1.0000	0.3000			-1.0000	0.3000	0.3000
17	cLCB26	Stren	Add	1.0000	0.3000			-0.3000	-1.0000	-0.3000
18	cLCB27	Stren	Add	1.0000	0.3000			0.3000	-1.0000	-0.3000
19	cLCB28	Stren	Add	1.0000	0.3000			-0.3000	-1.0000	0.3000
20	cLCB29	Stren	Add	1.0000	0.3000			0.3000	-1.0000	0.3000
21	cLCB30	Stren	Add	1.0000	0.3000			-0.3000	-0.3000	-1.0000
22	cLCB31	Stren	Add	1.0000	0.3000			-0.3000	0.3000	-1.0000
23	cLCB32	Stren	Add	1.0000	0.3000			0.3000	-0.3000	-1.0000
24	cLCB33	Stren	Add	1.0000	0.3000			0.3000	0.3000	-1.0000

Detail Report for Cyclic Shear Resistance Check

- Only activated for individual load cases
- Report provided separately for wall and Frame

Concrete Design

Set Cyclic Shear Resistance Parameters

Load Case/Combination
c.CB7

Cyclic Shear Resistance Table Type
☐ Show Selected Elements
☒ Show All Elements

Confidence Factor
1.0

Displacement Behavior Factor(qd)
1

Importance Factor(Ie)
1

☒ Print Calculation Report

OK Cancel

Pushover Result

Set Cyclic Shear Resistance Parameters

Pushover Load Case
Y

Step for Demand
☐ Damage Limitation (DL)
☐ Significant Damage (SD)
☐ Near Collapse (NC)
☒ User Defined 20

Cyclic Shear Resistance Table Type
☒ Show Selected Elements
☐ Show All Elements

Confidence Factor
1.0

☒ Print Calculation Report

OK Cancel

Cyclic Shear Resistance Check Report for Frame

MIDAS/Text Editor [Joint Design_CyclicFram.txt]

```

=====
[[[+]]] Element : 1 (Primary), Load = c.CB7, CF = 1.000
=====

*. Pos : 1, Dir : Fy - Mz

( ). Analysis result.
N = 1215.220 kN
V = 124.024 kN
M = 277.415 kN-m
γs = 1.150
K = 2.100
ε = 0.001791
L = 4200.000 mm
D = 585.000 mm
θy = k + ε + L / D = 0.026399

q = 1.000000
θ = 0.000047
μpl = max[ ABS (q*θ / θy) - 1, 0.0 ] = 0.000000
x = 221.717 mm

( ). Material Information.
γel = 1.150
γc = 1.500
γs = 1.150
fc = fck / (CF + γc) = 18.306 MPa
fyw = fywk / (CF + γs) = 238.771 MPa

( ). Section Information.
h = 650.000 mm
Lv = N / V = 2236.782 mm
Ac = 380250.000 mm^2
ρtot = 0.029311

( ). Calculate Vw.
ρw = Asv / (b + s) = 0.078154
z = 585.000 mm
Vw = ρw + b + z + fyw = 7095.785 kN

( ). Calculate VR.
Param1 = (h-x) / 2Lv + min(N, 0.55*Ac*fc) = 116.341 kN
Param2 = 1 - 0.05 + min(5, μpl) = 1.000
Param3 = 0.16 + max(0.5, 100*ρtot) = 0.469
Param4 = 1.0 - 0.16 + min(5, Lv / h) = 0.449
VR = 1/γel * [ Param1 + Param2 + (Param3 + Param4 + sqrt(fc) * Ac + Vw )
= 6569.581 kN
  
```

Cyclic Shear Resistance Check Report for Wall

MIDAS/Text Editor [Joint Design_CyclicWall.txt]

```

=====
[[[+]]] Wall ID : 1, Story : Base:1F (Primary), Load = c.CB7, CF = 1.000
=====

*. Pos : 1, Dir : Fz - My

( ). Analysis result.
N = 3000.861 kN
V = 722.126 kN
M = 3884.590 kN-m
q = 1.000000
θ = 0.002124
μpl = max[ ABS (q*θ / θy) - 1, 0.0 ] = 0.000000
x = 801.902 mm

( ). Material Information.
γel = 1.150
γc = 1.500
γs = 1.150
fc = fck / (CF + γc) = 18.306 MPa
fyw = fywk / (CF + γs) = 238.771 MPa

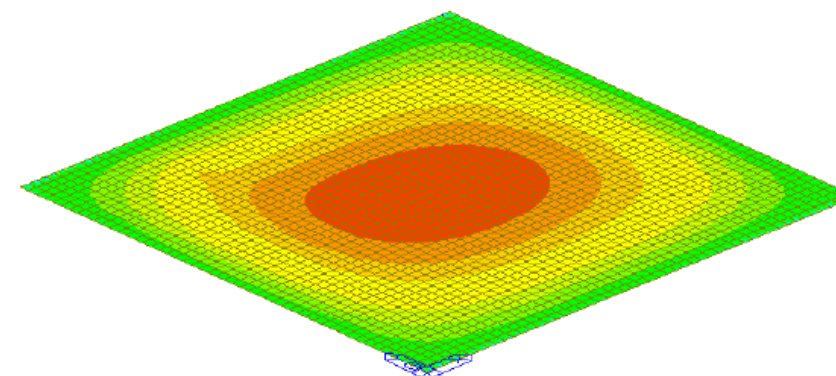
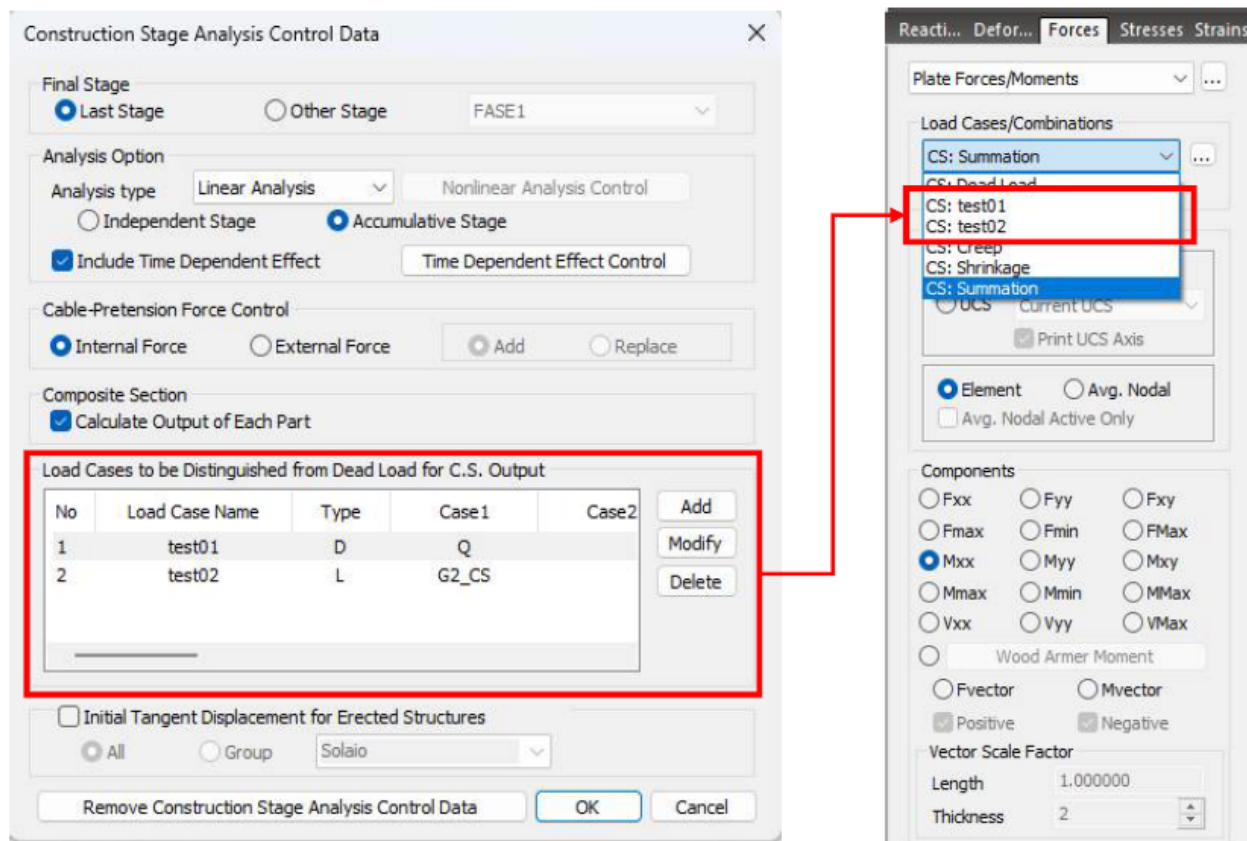
( ). Section Information.
h = 4600.000 mm
Lv = M / V = 5379.384 mm
Ac = 1532220.000 mm^2
ρtot = 0.006569

( ). Calculate Vw.
ρw = Asv / (b + s) = 405.714286
z = 4094.280 mm
Vw = ρw + b + z + fyw = 138818309.343 kN

( ). Calculate VR.
Param1 = (h-x) / 2Lv + min(N, 0.55*Ac*fc) = 1059.374 kN
Param2 = 1 - 0.05 + min(5, μpl) = 1.000
Param3 = 0.16 + max(0.5, 100*ρtot) = 0.105
Param4 = 1.0 - 0.16 + min(5, Lv / h) = 0.813
VR = 1/γel * [ Param1 + Param2 + (Param3 + Param4 + sqrt(fc) * Ac + Vw )
= 120713000.650 kN
  
```

Improvement for Load Case Setting in Construction Stage Analysis Control Data

- Separate analysis results can be obtained for the load case specified by the user. (Previously, only Live Load could be separated from Dead Load.)



Add Cold Formed Material of TIS 1228-2018 (Thailand)

Material Data

General
Material ID: 1 Name: SSCS330

Elasticity Data
Type of Design: Steel

Steel
Standard: TIS 1228-2018(S)
DB: SSCS330
Product: SSCS330
Concrete: SSCS400
Concrete: SSCS490
Concrete: SSCS540

Type of Material
☒ Isotropic ☐ Orthotropic

Steel
Modulus of Elasticity: 2.0300e+05 N/mm²
Poisson's Ratio: 0.3
Thermal Coefficient: 1.1700e-05 1/[C]
Weight Density: 7.850e-05 N/mm³
☐ Use Mass Density: 7.85e-05 N/mm³/g

Concrete
Modulus of Elasticity: 0.0000e+00 N/mm²
Poisson's Ratio: 0
Thermal Coefficient: 0.0000e+00 1/[C]
Weight Density: 0 N/mm³
☐ Use Mass Density: 0 N/mm³/g

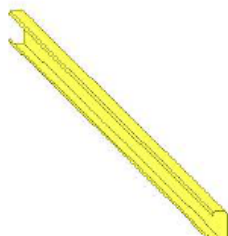
Plasticity Data
Plastic Material Name: NONE

Inelastic Material Properties for Fiber Model & Non-dissipative element
Concrete: None Steel: None
Confined Concrete for Columns: None

Thermal Transfer
Specific Heat: 0 Btu/lb·°F [C]
Heat Conduction: 0 Btu/in·hr·°F [C]
Damping Ratio: 0.02

OK Cancel Apply

- Cold-formed section design is supported for only AISI-CF08.



AISI-CFSD08 Code Checking Result Dialog

Code: AISI-CFSD08 Unit: kN, m Primary Sorting Option: SECT MEMB

Sorted by: ☐ Member ☒ Property Change... Update...

CH	MEMB	SECT	SEL	Section	LCB	Len	Ly	Cb	Ky	Cmy	1/Ap_y	Pu	Muy	Muz	Vuy	Vuz
K	COM	SHR		Material Fy		Lb	Lz		Kz	Cmz	1/Ap_z	Pa	Max	Maz	Vay	Vaz
OK	38	101		LC-150x85x20x4.0	1	5.0000	5.0000	1.000	1.000	1.000	0.0000	-1.1307	0.0000	0.0000	0.45227	
	0.348	0.194		SSCS330	205000	5.0000	5.0000	1.000	1.000	1.000	240.875	3.24875	10.9675	49.5967	38.7450	

- When applied to a cross-section with a thickness exceeding 6mm, the strength value is applied as 0.

DB	Es Modulus of Elasticity	v Poisson's Ratio	α Thermal Coefficient	W Weight Density	Fu Tensile Strength	Fy Yield Strength	Limit for Thickness
SSCS330	203,000 Mpa	0.3	11.7 μm/m	7,850 kg/m ³	330 Mpa	205 Mpa	≤ 6mm
SSCS400					400 Mpa	245 Mpa	
SSCS490					490 Mpa	285 Mpa	
SSCS540					540 Mpa	400 Mpa	

Add Cold Formed Section of TIS 1228-2018 (Thailand)

Channel

Section Data

DB/User | Value | SRC | Combined | Tapered | Composite

Section ID: 1

Name: Cold Formed Channel

Sect. Name: TIS 1228(2018)

Offset: Center-Center

☒ Consider Shear Deformation.

☐ Consider Warping Effect(7th DOF)

OK Cancel Apply

Section Properties

	Value	Unit
Area	1.503718e-02	ft ²
Asy	6.361935e-03	ft ²
Asz	8.194491e-03	ft ²
Ixx	1.065243e-06	ft ⁴
Iyy	5.665640e-04	ft ⁴
Izz	1.149349e-04	ft ⁴
Cyp	1.640420e-01	ft
Cym	8.202100e-02	ft
Czp	2.460630e-01	ft
Czm	2.460630e-01	ft
Qyb	8.814152e-02	ft ²
Qzb	1.861063e-02	ft ²
Peri:O	2.015655e+00	ft
Peri:I	0.000000e+00	ft
Center:y	8.202100e-02	ft
Center:z	2.460630e-01	ft
y1	4.202858e-02	ft
z1	2.460630e-01	ft
y2	1.650601e-01	ft
z2	1.804462e-01	ft
y3	4.202858e-02	ft
z3	-2.460630e-01	ft
y4	-8.100291e-02	ft
z4	8.326673e-17	ft

Close

Z-Section

Section Data

DB/User | Value | SRC | Combined | Tapered | Composite

Section ID: 101

Name: C 152x76x17.88

Sect. Name: Z 100x50x20/2.3

Offset: Center-Center

☒ Consider Shear Deformation.

☐ Consider Warping Effect(7th DOF)

OK Cancel Apply

Section Properties

	Value	Unit
Area	5.567094e-03	ft ²
Asy	2.144928e-03	ft ²
Asz	2.361817e-03	ft ²
Ixx	0.000000e+00	ft ⁴
Iyy	9.350045e-05	ft ⁴
Izz	4.031990e-05	ft ⁴
Cyp	1.602690e-01	ft
Cym	1.602690e-01	ft
Czp	1.640420e-01	ft
Czm	1.640420e-01	ft
Qyb	4.593811e-02	ft ²
Qzb	5.113656e-04	ft ²
Peri:O	1.529528e+00	ft
Peri:I	0.000000e+00	ft
Center:y	1.602690e-01	ft
Center:z	1.640420e-01	ft
y1	7.824803e-02	ft
z1	1.640420e-01	ft
y2	1.602690e-01	ft
z2	9.842520e-02	ft
y3	-7.824803e-02	ft
z3	-1.640420e-01	ft
y4	-1.602690e-01	ft
z4	-9.842520e-02	ft

Close

Add Static Seismic Load and Response Spectrum Function according to EC-8(2004) Malaysia N.A.

Static Seismic Load

Add/Modify Seismic Load Specification

Load Case Name : **PHEN**

Seismic Load Code : **Eurocode-8(2004)**

National Annex : **Malaysia**

Description :

Seismic Load Parameters

Ground Type : **B**

Region Type : **Peninsular**

Spectrum Parameters

☒ Type1 ☐ Type2 ☐ User Defined

Soil Factor (S) : **1.4**

T_B : **0.05** T_C : **0.3** T_D : **2.2**

Ref. Peak Ground Acc. (A_{gR}) : **0.08** g

Behavior Factor (q) : **1.5**

Lower Bound Factor (b) : **0.2**

Importance Factor (I) : **1.0**

Structural Parameters

X-Dir. : ☒ Y-Dir. : ☐

Fundamental Period : **1** **0**

Seismic Load Direction Factor (Scale Factor)

X-Direction : **1** Y-Direction : **0**

Seismic Load Profile

Component : ☒ X-Dir ☐ Y-Dir ☐ X & Y Dir ☐ SRSS

Select Profile : ☒ Story Force ☐ Story Shear ☐ Overturning Moment

Story Name	Weight	Elev.	Seismic Force	Added Force
26_CUB_M	58.3536	74600.0	6.4495100	0.0
25_Cub	272.69794	71800.0	29.018588	0.0
24_P18	357.7877	69000.0	36.57568	0.0
23_P17	357.7877	66200.0	36.091642	0.0
22_P16	357.7877	63400.0	33.697403	0.0
21_P15	357.7877	60600.0	32.123164	0.0
20_P14	357.7877	57800.0	30.638526	0.0
19_P13	357.7877	55000.0	29.154687	0.0

File Name : **D:\W06_release\work\W06_Gen\2023\2023_7\1**

Make Seismic Load Calc. Sheet Browse Close

Response Spectrum Function

Generate Design Spectrum

Design Spectrum : **Eurocode-8(2004)**

National Annex : **Malaysia**

Spectrum Type : **Horizontal Design Spectrum**

Ground Type : **B**

Region : **Peninsular**

Spectrum Parameters

☒ Type1 ☐ Type2 ☐ User Defined

Soil Factor (S) : **1.4**

T_B : **0.05** T_C : **0.3** T_D : **2.2**

Ref. Peak Ground Acc. (A_{gR}) : **0.08** g

Importance Factor (I) : **1.0**

Behavior Factor (q) : **1.5**

Lower Bound Factor (b) : **0.2**

Max. Period : **6** (Sec)

OK Cancel

Add/Modify/Show Response Spectrum Functions

Function Name : **EUROCODE-8(2004)**

Spectral Data Type : ☒ Normalized Accel ☐ Acceleration ☐ Velocity ☐ Displacement

Scaling : ☒ Scale Factor **1** ☐ Maximum Value **1** g

Gravity : **9806** mm/sec²

Damping Ratio : **0.05**

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

Period (sec)	Spectral Data (g)
1	0.0000
2	0.0000
3	0.0000
4	0.1200
5	0.1800
6	0.2400
7	0.3000
8	0.3000
9	0.4200
10	0.4800
11	0.5400
12	0.6000
13	0.6600
14	0.7200

Description : **EUROCODE-8(2004) S=1.4, T_B=0.05, T_C=0.30, T_D=2.20, A_{gR}=0.08g, I=1.0, q=1.5, b=0.20**

OK Cancel Apply

Malaysia values for nationally determined parameters described in MS EN 1998-1:2015

Parameter for Horizontal Response Spectrum

In the absence of deep soil effects, and for site specific information Malaysia spectra. Use the table below or refer to Annex C.

Or alternatively, for Malaysia spectra, site natural period (T_s) calculation is required for soil deposit exceeding 30 m in depth (deep geology). Use the table below or refer to Annexes A and D.

Peninsular:

Ground type	S	T _B (s)	T _C (s)	T _D (s)
A	1	0.05	0.2	2.2
B	1.4	0.05	0.3	2.2
C	1.15	0.05	0.5	2.2
D	1.35	0.3	0.8	2.2
E	1.4	0.15	0.5	2.2

Sabah:

Ground type	S	T _B (s)	T _C (s)	T _D (s)
A	1	0.1	0.4	2
B	1.4	0.15	0.4	2
C	1.35	0.15	0.6	2
D	1.35	0.2	0.8	2
E	1.4	0.15	0.5	2

Sarawak:

Ground type	S	T _B (s)	T _C (s)	T _D (s)
A	1	0.05	0.5	1.2
B	1.2	0.15	0.5	1.2
C	1.3	0.2	0.5	1.2
D	1.35	0.2	0.5	1.2
E	1.4	0.15	0.5	1.2

Vertical Parameter for Vertical Response Spectrum

a _{vg} /a _g	T _B (s)	T _C (s)	T _D (s)
0.70	0.05	0.15	1.0

Peninsular:

Ground type	S	T _B (s)	T _C (s)	T _D (s)
A	1	0.1	0.3	2.0
B	1.5	0.1	0.3	1.5
C	1.8	0.1	0.6	1.0
D	1.35	0.1	0.8	1.5
E	1.8	0.1	0.6	2.0

Sabah:

Ground type	S	T _B (s)	T _C (s)	T _D (s)
A	1	0.1	0.3	4.0
B	1.5	0.1	0.3	4.0
C	1.8	0.1	0.6	1.0
D	1.35	0.1	0.8	1.5
E	1.8	0.1	0.6	2.0

Sarawak:

Ground type	S	T _B (s)	T _C (s)	T _D (s)
A	1	0.1	0.3	1.25
B	1.5	0.1	0.3	1.25
C	1.8	0.1	0.6	1.0
D	1.35	0.1	0.8	1.5
E	1.8	0.1	0.6	2.0

Importance factor γ_I

Class I : γ_I = 0.8

Class III : γ_I = 1.2

Class IV : γ_I = 1.5

Items

Detail

Setting of Rebar Size
in Meshed Design

- Improved to use the same dialog box as the 1D member's rebar criteria feature

Rebar Size

KS	JIS	CHS	ASTM	BS/EN	UNI	IS	GB	CSA	SS	GOST	AS/NZS	PNS49
<input type="checkbox"/> D6	<input type="checkbox"/> D6	<input type="checkbox"/> D10	<input type="checkbox"/> #3	<input type="checkbox"/> P5	<input type="checkbox"/> P4	<input type="checkbox"/> P6	<input type="checkbox"/> d4	<input type="checkbox"/> 10M	<input type="checkbox"/> H5	<input type="checkbox"/> d6	<input type="checkbox"/> D6	<input type="checkbox"/> D10
<input checked="" type="checkbox"/> D10	<input type="checkbox"/> D10	<input type="checkbox"/> D13	<input type="checkbox"/> #4	<input type="checkbox"/> P6	<input type="checkbox"/> P5	<input type="checkbox"/> P8	<input type="checkbox"/> d5	<input type="checkbox"/> 15M	<input type="checkbox"/> H6	<input type="checkbox"/> d8	<input type="checkbox"/> D8	<input type="checkbox"/> D12
<input checked="" type="checkbox"/> D13	<input type="checkbox"/> D13	<input type="checkbox"/> D16	<input type="checkbox"/> #5	<input type="checkbox"/> P7	<input type="checkbox"/> P6	<input type="checkbox"/> P10	<input type="checkbox"/> d6	<input type="checkbox"/> 20M	<input type="checkbox"/> H7	<input type="checkbox"/> d10	<input type="checkbox"/> D10	<input type="checkbox"/> D16
<input checked="" type="checkbox"/> D16	<input type="checkbox"/> D16	<input type="checkbox"/> D19	<input type="checkbox"/> #6	<input type="checkbox"/> P8	<input type="checkbox"/> P8	<input type="checkbox"/> P12	<input type="checkbox"/> d8	<input type="checkbox"/> 25M	<input type="checkbox"/> H8	<input type="checkbox"/> d12	<input type="checkbox"/> D12	<input type="checkbox"/> D20
<input type="checkbox"/> D19	<input type="checkbox"/> D19	<input type="checkbox"/> D22	<input type="checkbox"/> #7	<input type="checkbox"/> P9	<input type="checkbox"/> P10	<input type="checkbox"/> P16	<input type="checkbox"/> d10	<input type="checkbox"/> 30M	<input type="checkbox"/> H9	<input type="checkbox"/> d14	<input type="checkbox"/> D16	<input type="checkbox"/> D25
<input type="checkbox"/> D22	<input type="checkbox"/> D22	<input type="checkbox"/> D25	<input type="checkbox"/> #8	<input type="checkbox"/> P10	<input type="checkbox"/> P12	<input type="checkbox"/> P18	<input type="checkbox"/> d12	<input type="checkbox"/> 35M	<input type="checkbox"/> H10	<input type="checkbox"/> d16	<input type="checkbox"/> D20	<input type="checkbox"/> D28
<input type="checkbox"/> D25	<input type="checkbox"/> D25	<input type="checkbox"/> D28	<input type="checkbox"/> #9	<input type="checkbox"/> P11	<input type="checkbox"/> P14	<input type="checkbox"/> P20	<input type="checkbox"/> d14	<input type="checkbox"/> 40M	<input type="checkbox"/> H11	<input type="checkbox"/> d18	<input type="checkbox"/> D22	<input type="checkbox"/> D32
<input type="checkbox"/> D28	<input type="checkbox"/> D28	<input type="checkbox"/> D32	<input type="checkbox"/> #10	<input type="checkbox"/> P12	<input type="checkbox"/> P16	<input type="checkbox"/> P22	<input type="checkbox"/> d16	<input type="checkbox"/> 45M	<input type="checkbox"/> H12	<input type="checkbox"/> d20	<input type="checkbox"/> D24	<input type="checkbox"/> D36
<input type="checkbox"/> D32	<input type="checkbox"/> D32	<input type="checkbox"/> D36	<input type="checkbox"/> #11	<input type="checkbox"/> P13	<input type="checkbox"/> P18	<input type="checkbox"/> P25	<input type="checkbox"/> d18	<input type="checkbox"/> 50M	<input type="checkbox"/> H13	<input type="checkbox"/> d22	<input type="checkbox"/> D25	<input type="checkbox"/> D40
<input type="checkbox"/> D36	<input type="checkbox"/> D36	<input type="checkbox"/> D39	<input type="checkbox"/> #14	<input type="checkbox"/> P16	<input type="checkbox"/> P20	<input type="checkbox"/> P28	<input type="checkbox"/> d20		<input type="checkbox"/> H16	<input type="checkbox"/> d25	<input type="checkbox"/> D28	
<input type="checkbox"/> D38	<input type="checkbox"/> D38	<input type="checkbox"/> D43	<input type="checkbox"/> #18	<input type="checkbox"/> P20	<input type="checkbox"/> P22	<input type="checkbox"/> P32	<input type="checkbox"/> d22		<input type="checkbox"/> H20	<input type="checkbox"/> d28	<input type="checkbox"/> D32	
<input type="checkbox"/> D41	<input type="checkbox"/> D41	<input type="checkbox"/> D50		<input type="checkbox"/> P25	<input type="checkbox"/> P24	<input type="checkbox"/> P36	<input type="checkbox"/> d25		<input type="checkbox"/> H25	<input type="checkbox"/> d32	<input type="checkbox"/> D36	
<input type="checkbox"/> D43	<input type="checkbox"/> D51	<input type="checkbox"/> D57		<input type="checkbox"/> P32	<input type="checkbox"/> P26	<input type="checkbox"/> P40	<input type="checkbox"/> d28		<input type="checkbox"/> H32	<input type="checkbox"/> d36	<input type="checkbox"/> D40	
<input type="checkbox"/> D51				<input type="checkbox"/> P40	<input type="checkbox"/> P30		<input type="checkbox"/> d32		<input type="checkbox"/> H40	<input type="checkbox"/> d40		
<input type="checkbox"/> D57					<input type="checkbox"/> P32		<input type="checkbox"/> d36					
					<input type="checkbox"/> P36		<input type="checkbox"/> d40					
					<input type="checkbox"/> P40							

OK Close

Rebar Information

CHK	Name	Dia (mm)	Area (mm²)	Dia(Out) (mm)	Weight (kg/m)
<input type="checkbox"/>	P5	0.0050	0.0000	0.0050	0.0015
<input type="checkbox"/>	P6	0.0060	0.0000	0.0060	0.0022
<input type="checkbox"/>	P7	0.0070	0.0000	0.0070	0.0030
<input type="checkbox"/>	P8	0.0080	0.0001	0.0080	0.0039
<input type="checkbox"/>	P9	0.0090	0.0001	0.0090	0.0049
<input checked="" type="checkbox"/>	P10	0.0100	0.0001	0.0100	0.0061
<input type="checkbox"/>	P11	0.0110	0.0001	0.0110	0.0073
<input checked="" type="checkbox"/>	P12	0.0120	0.0001	0.0120	0.0087
<input type="checkbox"/>	P13	0.0130	0.0001	0.0130	0.0102
<input type="checkbox"/>	P16	0.0160	0.0002	0.0160	0.0155
<input type="checkbox"/>	P20	0.0200	0.0003	0.0200	0.0242
<input type="checkbox"/>	P25	0.0250	0.0005	0.0250	0.0378
<input type="checkbox"/>	P32	0.0320	0.0008	0.0320	0.0619
<input type="checkbox"/>	P40	0.0400	0.0013	0.0400	0.0967

OK Close

Select a rebar DB code in Preferences

Rebar

Material Code
EN04(RC) ▼

Material DB
Class A ▼

Shear span in RC member
under Eurocode 8
(Pushover Hinge)

- The shear span lengths can be entered for each end.

Component Properties

Component	Hinge Location	Skeleton Curve
<input type="checkbox"/> Fx	1&J-end	Eurocode 8 : 2004
<input type="checkbox"/> Fy	1&J-end	Eurocode 8 : 2004
<input type="checkbox"/> Fz	1&J-end	Eurocode 8 : 2004
<input type="checkbox"/> Mx	1&J-end	Trilinear Type
<input checked="" type="checkbox"/> My	1&J-end	Eurocode 8 : 2004
<input checked="" type="checkbox"/> Mz	1&J-end	Eurocode 8 : 2004

Yield Surface Properties... Masonry Properties... Shear Span(Lv)...

OK Cancel Apply

Shear Span

Comp.	Shear Span (Lv)
I-end	J-end
My	0.1 0.1
Mz	0.1 0.1

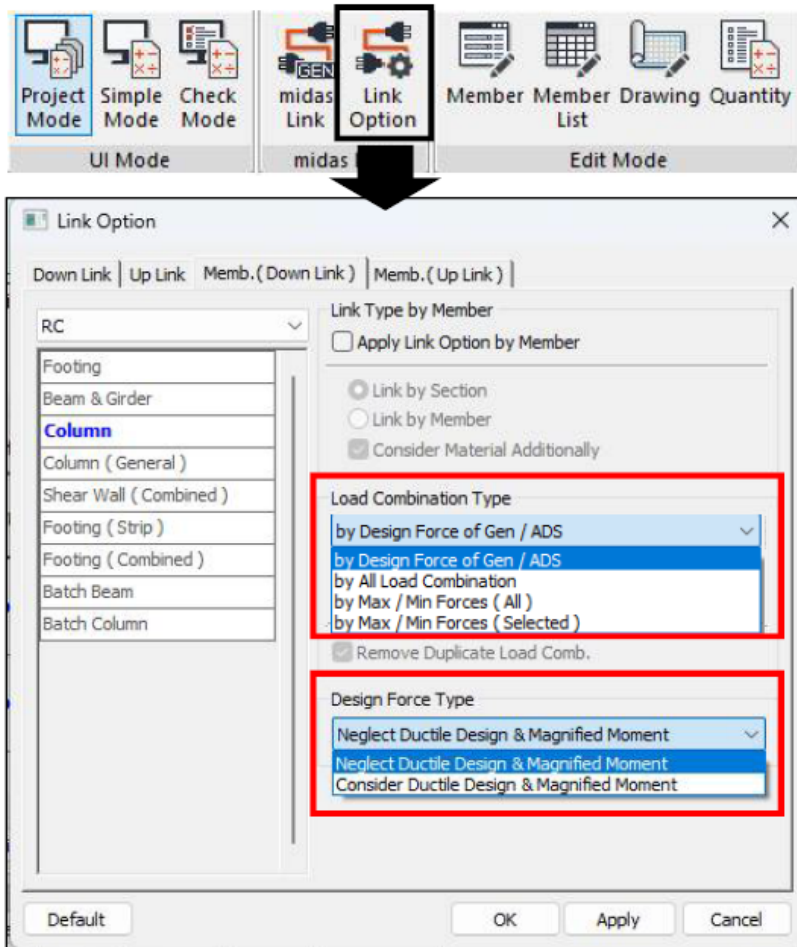
☒ Relative Length

OK Cancel

Items	Detail
<p>Improvement of wall design force as per EC8</p>	<ul style="list-style-type: none"> Generate a wall design forces based on the story with the maximum member force under the dual system. * In the old version, the design member forces had been generated with the member force of the ground Level. <div data-bbox="555 521 1243 943"> <p>Wall design force of a release version</p> <p>RF</p> <p>5F</p> <p>4F</p> <p>3F</p> <p>3F</p> <p>2F</p> <p>1F</p> <p>GL</p> <p>h_{cr} of a release version</p> <p>Wall design force of a current version</p> <p>h_{cr} of a current version</p> </div> <div data-bbox="1294 521 2247 858"> <p>Sample for wall design</p> <p>● Analysis force ● Design force</p> <div data-bbox="1294 586 1753 858"> <p>Design Moment</p> </div> <div data-bbox="1793 586 2247 858"> <p>Design Shear force</p> </div> </div>

midas **Design+**

Improvement of Link Option



"Memb.(Down Link)" > Load Combination Type

[Column & Column(General) & Shear Wall & Footing]

- By Design force of Gen / ADS : Import the design forces used in Gen's design.
- By All Load Combination : Results for all load combinations are imported individually.
- By Max/Min Forces (All) : Import only the Max. and Min. values among member forces from all load combinations.
- By Max/Min Forces (Selected) : Import only the design forces for the selected design components.

[All Batch Design]

- By Design force of Gen / ADS : Import the design forces used in Gen's design.

"Memb.(Down Link)" > Design Force Type

[Column & Column(General) & Shear Wall & Shear Wall (Combined) & Batch Column & Batch Wall]

- Neglect Ductile Design & Magnified Moment
 - : Design forces by strong column-weak beam are not considered
 - : Design forces by 2nd Order Effect (by moment magnification method) are not considered.
 - Consider Ductile Design & Magnified Moment
 - : Design forces by strong column-weak beam are considered
 - : Design forces by 2nd Order Effect (by moment magnification method) are considered.
- * Moment magnification method is not reflected : "2nd Order Effect" option is checked off when importing from Gen.

[Footing & Footing(Combined)]

- Design force of Column : Use the Design forces of column.
- Reaction of Support : Use the forces of reaction result.

Add Eurocode 2 in Batch Design

- There are many inconveniences when performing design in Gen. For example, when a section needs to be added when grouping members or when the cross section needs to be increased according to design results, analysis and design should be performed again. Since these cases must be performed repeatedly, a lot of time and effort are required depending on the magnitude of the building.
- Batch Design is a design feature to provide convenience for these repetitive parts in Gen, and the procedure is as follows.



- The purpose of Batch Design is to quickly create and link the material, cross-section, and rebar information to Gen for analysis and design in Gen. Please use this product with the understanding that design results may differ slightly due to internal differences in design settings for Gen and Design+.
- Design as per EN or IS code is not supported.

❖ **Batch Design Guide : [\[Download\]](#)**

Improved Design Module according to IS Code (India)

The items below have been updated. If you want to know more details, please click on [\[Here\]](#)

- **Added Design Module for IS :456-2000.**

1. Column Module

2. Basement Wall Module

3. Shear Wall Module

Improvement of Anchor Bolt Design in Base Plate

- The anchor design of the base plate was modified to be designed according to the design process of "RC>Anchor Bolt Design".

Design+ 2024 (V1.1)

General
Member Name: BP01
Apply this Member to: Dwg & Report

Section | Plate | Rib | **Bolt**

Anchor Bolt
Install Type: Cast-In-Place Anchor B
Diameter: M12
Length: 22.40
Position (x): 50.00
Position (y): 50.00
Number (x): 2
Number (y): 2
Start Angle: 0

☒ Get number from Rib-Plate Layout
Post-Installed Anchor Bolt Design Data ...

Double click to Zoom

Section & Layout (Plan Only) | ☒ Mesh Line | ☒ Contour | ☒ Value

Check Items	Value	Criteria	Remark
Bearing Stress (MPa)	Comp. (MPa) 6.908 Tens. (kN) -12.39	26.52 25.45	OK(0.280) OK(0.487)
Base Plate	Mxx (kN.m/m) -6.585 Myy (kN.m/m) -8.257	13.54 13.54	OK(0.487) OK(0.610)
Rib Plate	Mu (kN.m) 1.701 Vu (kN) 39.49	3.007 77.36	OK(0.566) OK(0.510)
Wing Plate	Mu (kN.m) - Vu (kN) -	- -	- -
Anchor Bolt	Vu (kN) 1.414 Tu (kN) -12.39 Length (mm) 269	13.57 25.45 267	OK(0.104) OK(0.487) OK(0.994)
Edge Distance (mm)	Tension -	-	-

Design+ 2024 (V2.1)

General
Member Name: BP02
Apply this Member to: Dwg & Report

Section | Plate | Rib | **Anchor** | Layout

Anchor
Install Type: Cast-In-Place Anchor I
Anchor Type: Headed Stud
Diameter: M8
Length (lef): 150.00
Pullout Strength (No): 30.00
Dist. of J/L-Bolt (eh): 30.00

Strength Reduction Factor
Concrete, Tension: 0.650
Concrete, Shear: 0.750
Anchor, Tension: 0.750
Anchor, Shear: 0.650

Design
Breakout Strength Coefficient (kc): 24.000

Bond Stress of Adhesive Anchor
T_{cr}: 1.40 MPa
T_{upper}: 2.10 MPa

RC Section
☒ Crack ☐ Uncrack

Double click to Zoom

Section & Layout (Plan Only) | ☒ Mesh Line | ☒ Contour | ☒ Value

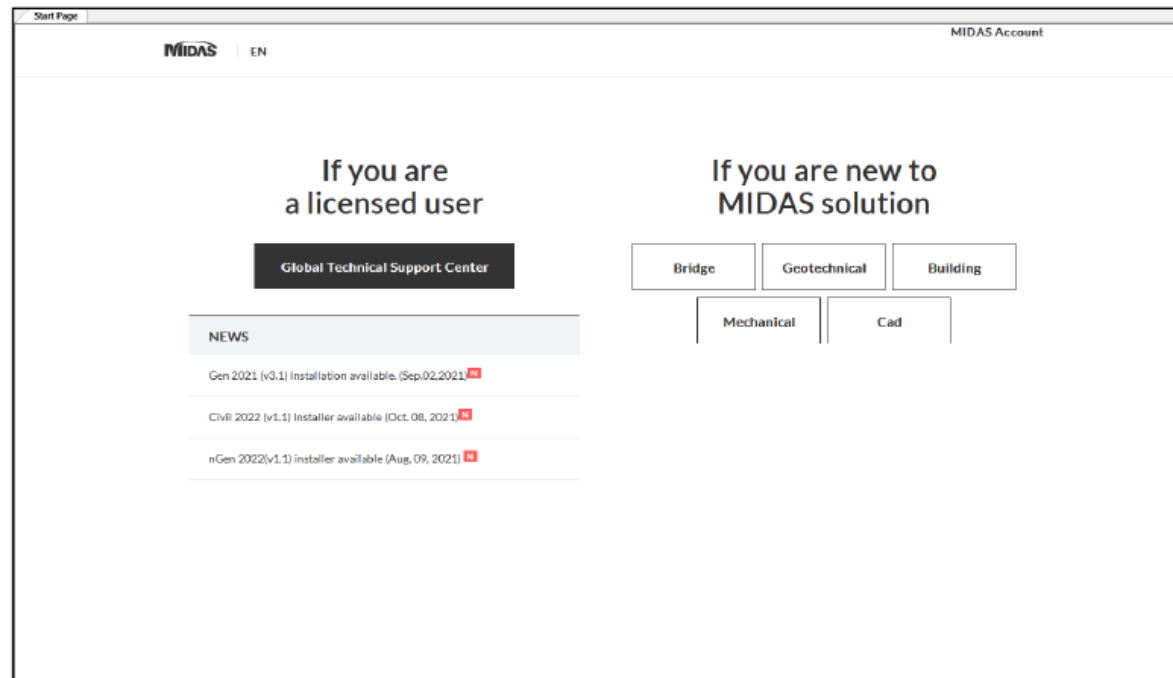
Calculation Result:

Check Items	Value	Criteria	Remark
Splitting Failure	Minimum Edge Distance (mm) - Limit of Embedment Depth (mm) -	- -	- -
Anchor (Tens.)	Steel Strength (kN) 11.65 Pullout Strength of Anchor (kN) 11.65 Concrete Breakout Strength (kN) 58.30 Concrete Side-Face Blowout Strength (kN) - Bond Strength of Adhesive Anchor (kN) -	15.08 18.82 1241 - -	OK(0.773) OK(0.619) OK(0.047) - -
Anchor (Shear)	Steel Strength (kN) 1.179 Pullout Strength of Anchor (kN) - Concrete Breakout Strength-X (kN) - Concrete Breakout Strength-Y (kN) -	10.46 - - -	OK(0.113) - - -
Anchor (Ratio)	Tension - Shear - Combined 0.773	- - 1.000	OK(0.773) OK(0.113) OK(0.773)

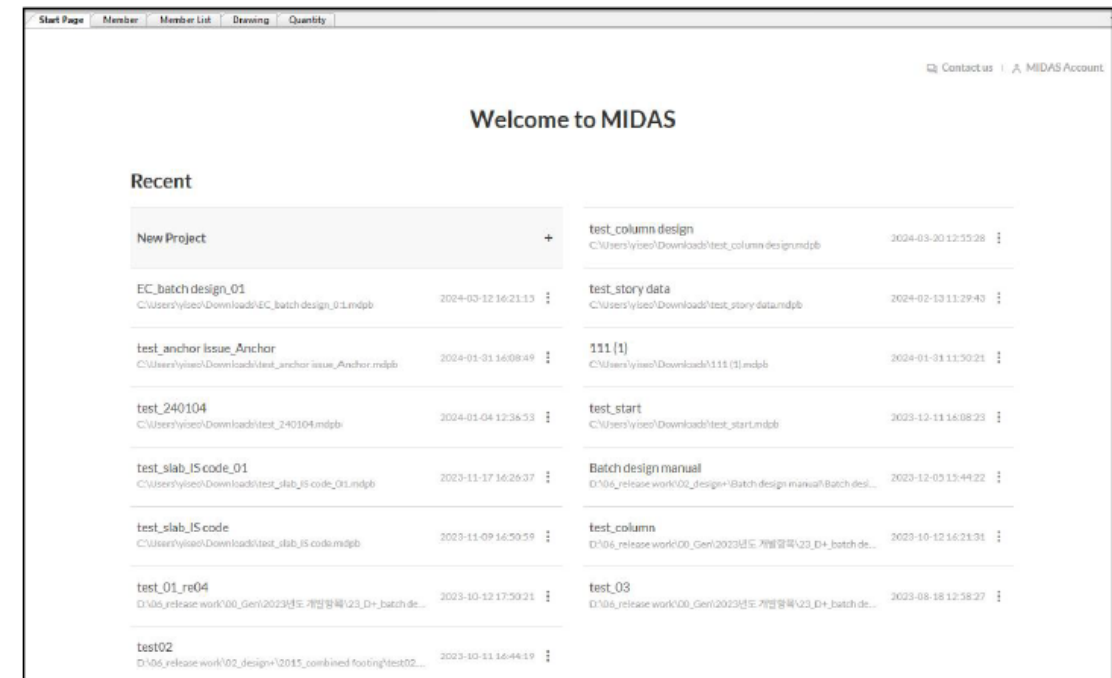
Improvement of Start Page

- Supports recent project list

Design+ 2024 (V1.1)



Design+ 2024 (V2.1)



Thank you

Improvement of IS code in midas Gen

- **Added Seismic Provisions for Steel Design as per IS : 18168 -2023**
 1. Additional Seismic Load Combination as per IS : 18168 : 2023
 2. Column to beam strength ratio as per IS : 18168 -2023
 3. Seismic Beam Design for SMRF as per IS : 18168-2023
 4. Seismic Beam Design & Brace Design for SCBF as per IS : 18168-2023
- **Irregularity Check according to IS : 1893 -2016**
 1. Torsional Irregularity & Weight Irregularity
 2. Stiffness Irregularity
 3. Capacity Irregularity
 4. Irregular modes of oscillation
- **Irregularity Check according to IS : 16700 -2023**
 1. Stiffness Irregularity & Capacity Irregularity
 2. Natural modes of vibration
- **Added Column Module for IS :456-2000.**
- **Added Basement Wall Module for IS :456-2000.**
- **Added Shear Wall Module for IS :456-2000**

Added Seismic Provisions for Steel Design as per IS : 18168 -2023

1. Additional Seismic Load Combination as per IS : 18168 : 2023

Load Combinations

General | Steel Design | Concrete Design | SRC Design | Cold Formed Steel Design | Footing Design | Aluminum Design

Load Combination List

No	Name	Active	Type	Description
25	sLCB2	Streng	Add	0.9D - 1.5(1.0)RS X
26	sLCB2	Streng	Add	0.9D - 1.5(1.0)RS Y
27	sLCB2	Streng	Add	ASC: 1.2D+3EL2
28	sLCB2	Streng	Add	ASC: 0.9D+3EL2
29	sLCB2	Streng	Add	ASC: 1.2D-3EL2
30	sLCB3	Streng	Add	ASC: 0.9D-3EL2
31	sLCB3	Streng	Add	ASC: 1.2D+2.5RS1
32	sLCB3	Streng	Add	ASC: 1.2D+2.5RS1
33	sLCB3	Streng	Add	ASC: 0.9D+2.5RS1
34	sLCB3	Streng	Add	ASC: 0.9D+2.5RS1
35	sLCB3	Streng	Add	ASC: 1.2D-2.5RS1
36	sLCB3	Streng	Add	ASC: 1.2D-2.5RS1
37	sLCB3	Streng	Add	ASC: 0.9D-2.5RS1
38	sLCB3	Streng	Add	ASC: 0.9D-2.5RS1
39	sLCB3	Streng	Add	1.2D + 0.5(L) + 2.5EQ XP
40	sLCB4	Streng	Add	1.2D + 0.5(L) + 2.5EQ YP
41	sLCB4	Streng	Add	1.2D + 0.5(L) - 2.5EQ XP
42	sLCB4	Streng	Add	1.2D + 0.5(L) - 2.5EQ YP
43	sLCB4	Streng	Add	1.2D + 0.5(L) + 2.5RS X
44	sLCB4	Streng	Add	1.2D + 0.5(L) + 2.5RS Y
45	sLCB4	Streng	Add	1.2D + 0.5(L) - 2.5RS X
46	sLCB4	Streng	Add	1.2D + 0.5(L) - 2.5RS Y

Automatic Generation of Load Combinations

Option: ☒ Add ☐ Replace

Code Selection: ☒ Steel ☐ Concrete ☐ SRC ☐ Cold Formed Steel ☐ Footing ☐ Aluminum

Design Code: IS:800-2007

Scale Up of Response Spectrum Load Cases: Scale Up Factor: 1 RS X

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

Consider Orthogonal Effect: ☐ 100 : 30 Rule ☐ SRSS(Square-Root-of-Sum-of-Squares)

Generate Additional Load Combinations: ☒ for Special Seismic Load ☐ for Vertical Seismic Forces

Factors for Seismic Design...

File Name: D:\Testing\GEN\IS-18168-2023\Load combination\R7\Load co

1. Additional Seismic load Combination

According to Clause 5.5 of IS : 18168 -2023

For Seismic analysis of steel buildings, in addition to the load combination as per IS : 1893 : 2016 & those in Table 4 of IS : 800 : 2007, load combination mentioned below, must be also considered.

$$1) 1.2 DL + \gamma_{LL} LL \pm 1.0 EL_m$$

$$2) 0.9DL \pm 1.0 EL_m$$

$$1.2 DL + \gamma_{LL} LL \pm 1.0 EL_m \dots\dots(1)$$

$$0.9 DL \pm 1.0 EL_m \dots\dots(2)$$

where

DL = Dead load as per IS 875 (Part 1);

γ_{LL} = Partial safety factor for live load

= 0.25 for live load class less than or equal to 3.0 kN/m²
0.50 for live load class more than 3.0 kN/m²;

LL = Imposed load as per IS 875 (Part 2);

EL_m = Estimated maximum equivalent earthquake force induced in the structure = ΩEL ;

Ω = Overstrength factor = 2.5 for SCBFs and EBFs = 3.0 for SMRFs; and

EL = Earthquake load as per IS 1893 (Part 1).

Factors for Seismic Design

Special Seismic Loads

Over-Strength & Safety Factor

Load Case: EQ XP(ST)

Factor: 3

Load Case Factor

Load Case	Factor
EQ XP(ST)	3
EQ YP(ST)	3
RS X(RS)	2.5

Vertical Seismic Forces

Vertical Force Factor: 0.2

Dialog box for assigning concerned Overstrength factor (2.5,3.0) and Partial safety factor (0.25, 0.3) has been added.

Added Seismic Provisions for Steel Design as per IS : 18168 -2023

2. Column to beam strength ratio as per IS : 18168 -2023

The screenshot shows the 'Steel Design Code' dialog box on the left and the 'Steel Strong Column-Weak Beam Ratio' table on the right. The dialog box has the following settings:

- Design Code: IS:800-2007
- ☒ All Beams/Girders are Laterally Braced
- ☒ Apply Special Provisions for Seismic Design
- Combined Ratio Method for Circular Section: ☒ SRSS(Square root of sum of square)
- Seismic Load Resisting System: Special Moment Resisting Frames
- ☒ Consider strong column-weak beam on last floor

The table shows the following data:

Node	Column Local Axis	LCB	Column Strength (kN-m)	Beam Strength (kN-m)	Ratio	Remark
Acceptance Limit for SCWB C/B Flexural Capacity Ratio: 1						
Input Acceptance Limit Value and Press 'Apply' button to change value.					1.00	Apply
2	Local y	LCB	225.6269	343.0218	0.66	N/A
2	Local z	LCB	690.2307	411.6261	1.68	OK
4	Local y	LCB	121.7592	214.2330	0.57	N/A
4	Local z	LCB	785.0620	115.3562	6.81	OK
6	Local y	LCB	121.7448	96.1302	1.27	OK
6	Local z	LCB	784.9653	550.2155	1.43	OK
8	Local y	LCB	121.7872	107.1165	1.14	OK
8	Local z	LCB	785.2362	275.1077	2.85	OK
9	Local y	LCB	34.4310	540.5467	0.06	N/A
9	Local z	LCB	176.0889	540.5467	0.33	N/A
10	Local y	LCB	37.5810	214.2330	0.18	N/A
10	Local z	LCB	192.1989	275.1077	0.70	N/A
11	Local y	LCB	37.5785	107.1165	0.35	N/A
11	Local z	LCB	192.1860	550.2155	0.35	N/A
12	Local y	LCB	37.5929	107.1165	0.35	N/A
12	Local z	LCB	192.2595	275.1077	0.70	N/A
14	Local y	LCB	121.7400	246.8916	0.49	N/A
14	Local z	LCB	784.9300	550.2155	1.43	OK
16	Local y	LCB	121.7821	107.1165	1.14	OK
16	Local z	LCB	785.2028	275.1077	2.85	OK
17	Local y	LCB	37.5791	107.1165	0.35	N/A
17	Local z	LCB	192.1893	550.2155	0.35	N/A
18	Local y	LCB	37.5914	107.1165	0.35	N/A
18	Local z	LCB	192.2523	275.1077	0.70	N/A
20	Local y	LCB	121.7742	214.2330	0.57	N/A
20	Local z	LCB	785.1559	296.2699	2.65	OK
22	Local y	LCB	121.8186	107.1165	1.14	OK
22	Local z	LCB	785.4405	275.1077	2.86	OK
23	Local y	LCB	37.5871	214.2330	0.18	N/A
23	Local z	LCB	192.2302	275.1077	0.70	N/A
24	Local y	LCB	37.6015	107.1165	0.35	N/A
24	Local z	LCB	192.3037	275.1077	0.70	N/A
26	Local y	LCB	121.8214	107.1165	1.14	OK
26	Local z	LCB	785.4589	275.1077	2.86	OK
27	Local y	LCB	37.6022	107.1165	0.35	N/A
27	Local z	LCB	192.3074	275.1077	0.70	N/A

1.Column to beam strength ratio

According to Clause 8.2 of IS : 18168 -2023

For Seismic analysis of steel buildings At a Beam-Column joint, the following strength ratio shall be satisfied :

$$\frac{\sum M_{pc}}{\sum M_{bo}} = \frac{\sum Z_{pc} f_{yc} (1 - \frac{P_u}{P_d})}{\sum 1.1 R_y Z_{pb} f_{yb}} > 1.4$$

For clause 8.2.1 following option is added in the design code dialog box under Seismic provisions

The screenshot shows the 'Steel Design Code' dialog box with the following settings:

- Design Code: IS:800-2007
- ☒ All Beams/Girders are Laterally Braced
- ☒ Apply Special Provisions for Seismic Design
- Combined Ratio Method for Circular Section: ☒ SRSS(Square root of sum of square)
- Seismic Load Resisting System: Special Moment Resisting Frames
- ☒ Consider strong column-weak beam on last floor

8.2 Column to Beam Strength Ratio

At a beam-column joint, the following strength ratio shall be satisfied:

$$\frac{\sum M_{pc}}{\sum M_{bo}} = \frac{\sum Z_{pc} f_{yc} (1 - \frac{P_u}{P_d})}{\sum 1.1 R_y Z_{pb} f_{yb}} > 1.4$$

where Z_{pc} and Z_{pb} are the plastic section modulus of column and beam cross-sections respectively, f_{yc} and f_{yb} are the characteristic yield strength of column and beam cross-sections respectively, P_u is the maximum factored axial compressive load and P_d is the design strength under axial compression, and R_y is the material uncertainty factor corresponding to the grade of steel in beams.

8.2.1 The above requirement need not be satisfied at the roof level.

Added Seismic Provisions for Steel Design as per IS : 18168 -2023

3. Seismic Beam Design for SMRF as per IS : 18168-2023

Steel Design Code

Design Code : **IS:800-2007**

☒ All Beams/Girders are Laterally Braced
☐ Check Beam/Column Deflection
☒ **Apply Special Provisions for Seismic Design**

Combined Ratio Method for Circular Section

☒ SRSS(Square root of sum of square)
☐ Linear Sum

Seismic Load Resisting System

System : **Special Moment Resisting Frames**

☒ Consider storey drift on last floor

OK Close

Limiting (b/t) and (d/t) ratio check

```
( ). Check flange width to thickness ratio for seismic provision  
[ IS:18168-2023 6.1, Table 2 ]  
-. e = SQRT( 250/fy ) = 0.67  
-. b/t = BTR = 5.23  
-. BTR < 9.0*e/SQRT(Ry) --> NOT ACCEPTABLE
```

```
( ). Check web depth to thickness ratio for seismic provision  
[ IS:18168-2023 6.1, Table 2 ]  
-. e = SQRT( 250/fy ) = 0.67  
-. d/t = HTR = 42.31  
-. HTR < 44.5*e/SQRT(Ry) --> NOT ACCEPTABLE
```

Slenderness ratio check

```
( ). Check slenderness ratio for Seismic Provision  
[ IS:18168:2003 6.2]  
for the portion near to beam-column joint  
-. l/r = 85.2 < 25 --> NG  
For remaining portion  
-. l/r = 85.2 < 0.10*E/Ry*fy --> NG
```

Shear Strength check

```
( ). Check ratio of shear strength for seismic provision [IS:18168-2023 6.4.1 & 8.4]  
-. Plastic hinge strength, Mp = 1.1*Ry*fy*Zp = 246.27 kN-m.  
-. Vses(D+L) = 13.50 kN.  
-. Vses = Vses(D+L) + ((Mp+Mp)/(L-db)) = 210.51 kN.  
Vses = 210.51  
-. ----- = 0.118 < 1.000 --> O.K.  
Vdz 1787.48
```

```
( ). Check ratio of shear strength for seismic provision [IS:18168-2023 6.4.1 & 8.4]  
-. Plastic hinge strength, Mp = 1.1*Ry*fy*Zp = 1734.27 kN-m.  
-. Vses(D+L) = 23.38 kN.  
-. Vses = Vses(D+L) + ((Mp+Mp)/(L-db)) = 1410.80 kN.  
Vses = 1410.80  
-. ----- = 0.958 < 1.000 --> O.K.  
Vdz 1472.24
```

1. Seismic provisions for steel design of Special moment resisting frame and Special Concentrically braced frame

For Seismic design of steel buildings, as per Section 12 of IS : 18168-2023 Two types of Seismic load Resisting system are added i.e. Special moment resisting frame (SMRF) & Special concentrically braced frame (SCBF).

2. Seismic provisions for Beam design under SMRF are added

As per Clause 12.1.4.1 and Section 6 of IS : 18168-2023 following checks are added under special seismic provision.

- Limiting Flange width to thickness ratio , web depth to thickness ratio checks as per Table 2 of IS:18168-2023.
- Slenderness check as per Clause 6.2 of IS :18168-2023.
- Shear Capacity check as per clause 6.4.1 and clause 8.4 of IS :18168-2023

Added Seismic Provisions for Steel Design as per IS : 18168 -2023

4. Seismic Beam Design & Brace Design for SCBF as per IS : 18168-2023

Limiting (b/t) and (d/t) ratio check

```
( ).Check flange width to thickness ratio for seismic provision  
[ IS:18168-2023 6.1, Table 2 ]  
-. e      = SQRT( 250/fy )    =    0.91  
-. b/t     = BTR              =    5.65  
-. BTR < 11.3*e/SQRT(Ry) --> O.K.
```

```
( ).Check web depth to thickness ratio for seismic provision  
[ IS:18168-2023 6.1, Table 2 ]  
-. e      = SQRT( 250/fy )    =    0.91  
-. d/t     = HTR              =   32.96  
-. HTR < 44.4*e/SQRT(Ry) --> O.K.
```

Slenderness ratio check

```
( ). Check slenderness ratio for Seismic Provision  
[ IS:18168:2003 6.2]  
-. 1/r = 149.4 < 160 --> O.K.
```

1. Seismic provisions for Beam design under SCBF are added

As per Clause 12.2.4.4 and Section 6 of IS : 18168-2023 following checks are added under special seismic provision.

a) Limiting Flange width to thickness ratio , web depth to thickness ratio checks as per Table 2 of IS :18168-2023.

b) Slenderness check as per Clause 6.2 of IS:18168-2023.

c) Shear Capacity check as per clause 6.4.1 and clause 8.4 of IS :18168-2023

2. Seismic provisions for Brace design under SCBF are added

As per Clause 12.2.4.2 and Section 10 of IS : 18168-2023 following checks are added under special seismic provision.

a) Limiting Flange width to thickness ratio , web depth to thickness ratio checks as per Table 2 of IS :18168-2023.

b) Slenderness check as per Clause 10.2 of IS :18168-2023.

Irregularity Check according to IS : 1893 -2016

1. Torsional Irregularity & Weight Irregularity

- Results > Results Tables > Story> Irregularity check parameter > IS : 1893-2016 > Torsional Irregularity / Weight Irregularity check

Torsional Irregularity Chec

Load Case	Story	Level (m)	Story Height (m)	Average Value of Extreme Points		Maximum Value		Remark
				1.4*Story Drift (m)	1.2*Story Drift (m)	Node	Story Drift (m)	
EXP	12F	40.50	3.15	0.0016	0.0014	353	0.0012	Regular
EXP	11F	37.35	3.15	0.0026	0.0022	321	0.0018	Regular
EXP	10F	34.20	3.15	0.0035	0.0030	289	0.0025	Regular
EXP	9F	31.05	3.15	0.0043	0.0037	257	0.0031	Regular
EXP	8F	27.90	3.15	0.0050	0.0043	225	0.0036	Regular
EXP	7F	24.75	3.15	0.0055	0.0047	193	0.0040	Regular
EXP	6F	21.60	3.15	0.0059	0.0051	161	0.0042	Regular
EXP	5F	18.45	3.15	0.0062	0.0053	129	0.0044	Regular
EXP	4F	15.30	3.15	0.0063	0.0054	97	0.0045	Regular
EXP	3F	12.15	3.15	0.0063	0.0054	65	0.0045	Regular
EXP	2F	9.00	3.15	0.0059	0.0050	1	0.0042	Regular
EXP	1F	5.00	4.00	0.0047	0.0040	33	0.0033	Regular

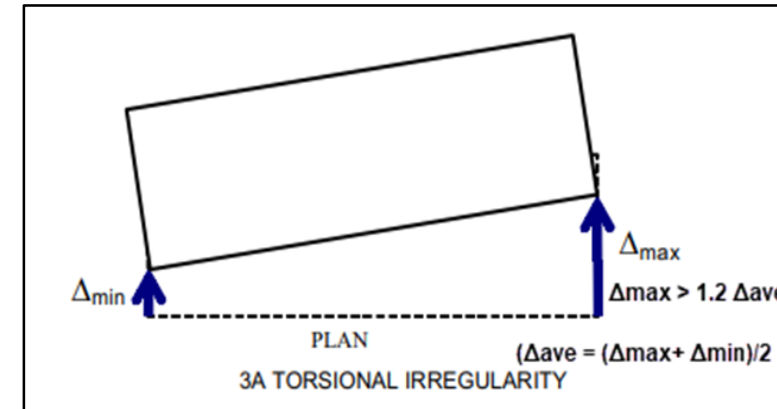
Weight Irregularity Ch

Load Case	Story	Level (m)	Story Height (m)	Story Weight (kN)	1.5*Lower Story Weight (kN)	Story Weight Ratio	Remark
DL	Roof	43.65	0.00	11818.865	20758.417	0.000	Regular
DL	12F	40.50	3.15	13838.944	20758.417	0.667	Regular
DL	11F	37.35	3.15	13838.944	20758.417	0.667	Regular
DL	10F	34.20	3.15	13838.944	20758.417	0.667	Regular
DL	9F	31.05	3.15	13838.944	20758.417	0.667	Regular
DL	8F	27.90	3.15	13838.944	20758.417	0.667	Regular
DL	7F	24.75	3.15	13838.944	20758.417	0.667	Regular
DL	6F	21.60	3.15	13838.944	20758.417	0.667	Regular
DL	5F	18.45	3.15	13838.944	20758.417	0.667	Regular
DL	4F	15.30	3.15	13838.944	20758.417	0.667	Regular
DL	3F	12.15	3.15	13838.944	21059.693	0.657	Regular
DL	2F	9.00	3.15	14039.795	0.000	0.000	Regular
DL	1F	5.00	4.00	945.180	0.000	0.000	Regular

1.Torsional Irregularity Check

According to Table 5-i) of Clause 7.1 of IS : 1893 Part-1 -2016,

"Story Drift of Maximum Value" divided by "Story Drift of Average Value of Extreme Points." If it exceeds 1.2 but less than 1.4, "Irregular-Building Config" is printed, If it exceeds 1.4 "Irregular-Structure Config" is printed. If it is less than 1.2, 'Regular' is printed.



2.Weight Irregularity Check

According to Table 6-ii) of Clause 7.1 of IS : 1893 Part-1 -2016

"Story Weight Ratio", Story Weight divided by 1.5*Story Weight of adjacent lower story, If it exceeds 1.0, "Irregular" is printed. If it is less than 1.0, 'Regular' is printed.

Irregularity Check according to IS : 1893 -2016

2. Stiffness Irregularity

- Results > Results Tables > Story> Irregularity check parameter > **IS : 1893-2016 > Stiffness Irregularity check**

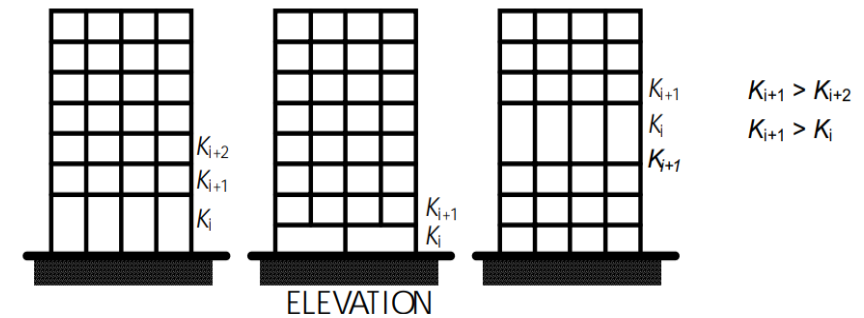
Stiffness Irregularity Chec

	Load Case	Story	Level (m)	Story Height (m)	Story Drift (m)	Story Shear Force (kN)	Story Stiffness (kN/m)	Upper Story Stiffness (kN/m)	Story Stiffness Ratio	Remark
	EXP	12F	40.50	3.15	0.0012	588.84	506898.41	0.00	0.000	Irregular
	EXP	11F	37.35	3.15	0.0018	1170.52	637927.53	506898.41	1.258	Regular
	EXP	10F	34.20	3.15	0.0025	1653.55	657991.75	637927.53	1.031	Regular
	EXP	9F	31.05	3.15	0.0031	2047.09	660336.13	657991.75	1.004	Regular
	EXP	8F	27.90	3.15	0.0036	2360.30	659726.78	660336.13	0.999	Irregular
	EXP	7F	24.75	3.15	0.0039	2602.35	658901.20	659726.78	0.999	Irregular
	EXP	6F	21.60	3.15	0.0042	2782.38	658529.77	658901.20	0.999	Irregular
	EXP	5F	18.45	3.15	0.0044	2909.57	659301.21	658529.77	1.001	Regular
	EXP	4F	15.30	3.15	0.0045	2993.07	663288.06	659301.21	1.006	Regular
	EXP	3F	12.15	3.15	0.0045	3042.03	677823.81	663288.06	1.022	Regular
	EXP	2F	9.00	3.15	0.0042	3065.63	731110.47	677823.81	1.079	Regular
	EXP	1F	5.00	4.00	0.0033	3073.12	922094.54	731110.47	1.261	Regular

3. Stiffness Irregularity(Soft Story) Check

According to Table 6-i) of Clause 7.1 of IS : 1893 Part-1 -2016

When the story stiffness of a particular story is greater than the stiffness of the story below, then the story will be defined as irregular. i.e. if the ratio of Story stiffness divided by the upper story stiffness, IF exceeds 1 "Regular" is printed, If less than 1 "Irregular" is printed in remarks



4A STIFFNESS IRREGULARITY (SOFT STOREY)

Irregularity Check according to IS : 1893 -2016

3. Capacity Irregularity

- Results > Results Tables > Story> Irregularity check parameter > **IS : 1893-2016 > Capacity Irregularity check**

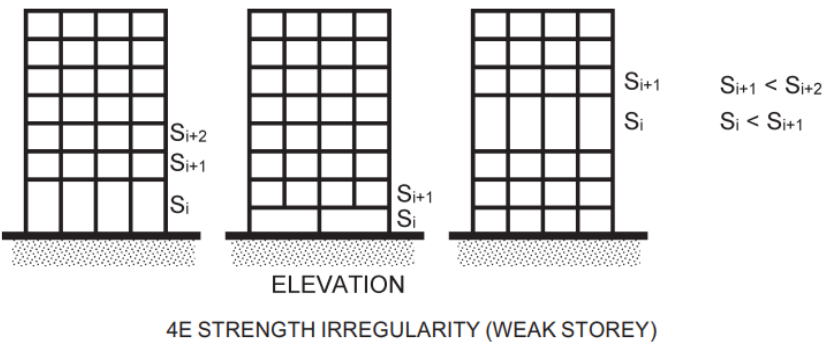
Capacity Irregularity Ch

Story	Level (m)	Story Height (m)	Angle1 (deg)	Story Shear Strength1 (kN)	Upper Story Shear Strength1 (kN)	Story Shear Strength Ratio1	Remark1	Angle2 (deg)	Story Shear Strength2 (kN)	Upper Story Shear Strength2 (kN)	Story Shear Strength Ratio2	Remark2
Angle = 0 [Deg]												
Input angle and press the 'Apply' button to change the angle.				0.00	Apply							
12F	40.50	3.15	0.00	11349.3080	0.0000	0.0000	Regular	90.00	15303.2605	0.0000	0.0000	Regular
11F	37.35	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
10F	34.20	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
9F	31.05	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
8F	27.90	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
7F	24.75	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
6F	21.60	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
5F	18.45	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
4F	15.30	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
3F	12.15	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
2F	9.00	3.15	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular
1F	5.00	4.00	0.00	11349.3080	11349.3080	1.0000	Regular	90.00	15303.2605	15303.2605	1.0000	Regular

4. Capacity Irregularity (Weak Story) check

According to Table 6-v) of Clause 7.1 of IS : 1893 Part-1 -2016

If the ratio of the lateral strength of a story to lateral strength of the story above exceeds 1.0, "Regular" is printed. If it is less than 1.0, 'Irregular' is printed.



Irregularity Check according to IS : 1893 -2016

4. Irregular modes of oscillation

- Results > Results Tables > Story> Irregularity check parameter > IS : 1893-2016 > Mode shapes irregularity check

Irregular modes of oscillation c

Reaction

Displacements

Truss

Cable

Beam

Plate

Plane Stress

Plane Strain

Axisymmetric

Solid

Wall

Elastic Link

General Link

Vibration Mode Shape

Mode Shapes Irregularity Check

Buckling Mode Shape

Nodal Results of RS

Story

Inelastic Hinge

Time History Analysis

Heat of Hydration Analysis

Tendon

Composite Section For C.S.

Displacement Participation Factor

Initial Element Force

Imperfection

Start Page		MIDAS/Gen		Result-[Irregular Mode Check]									
Node	Mode	UX		UY		UZ		RX		RY		RZ	
MODAL IRREGULARITY CHECK													
1.First three lateral translational mode Contribution													
Along X						Along Y							
Mode No	Period	Modal Mass		Mode No	Period	Modal Mass							
1	2.21231	81.8474		2	1.20097	69.4455							
4	0.712644	9.70896		6	0.275954	18.8484							
5	0.401828	3.6644		-									
Sum =		95.2208		Sum =		88.2939							
		>65				>65							
		Remark		OK									
2.Closeness of fundamental period Tx and Ty													
Tmax	Tmin	Tratio(Tmi		Remark									
2.2123	1.20097	0.603177		OK									
		Status		REGULAR									
Eigenvalue Mode /													

4. Irregular modes of oscillation check

According to Table 6-vii) of Clause 7.1 of IS : 1893 Part-1 -2016

- A building is said to be irregular if it satisfies both condition mentioned below :-
- 1) the first three modes contribute less than 65 percent mass participation factor in each principal plan direction.
 - 2) the fundamental lateral natural periods of the building in the two principal plan directions are closer to each other by 10 percent of the larger value.

Hence for the 1st condition If summation of modal mass participation is less than 65 percent “Irregular” is printed, if greater than 65 percent “Regular” is printed.

For 2nd condition if the ratio T_{min} to $0.9 * T_{max}$ exceeds 1 “Irregular” is printed, If less than 1 “Regular” is printed.

Here T_{min} = minimum (T_x and T_y) and T_{max} = maximum (T_x and T_y) , T_x and T_y are fundamental natural period of the building in respective principal plan direction.

For final status , if both condition are “Irregular”, “ Irregular” is printed, if both condition are “Regular”, “ Regular” is printed, if one of the condition is “Regular” and other one is “Irregular”, “Partial Regular” is printed.

Irregularity Check according to IS : 16700 -2023

1. Stiffness Irregularity & Capacity Irregularity

- Results > Results Tables > Story> Irregularity check parameter > IS : 16700-2023 > Stiffness Irregularity check / Capacity Irregularity check

Stiffness Irregularity Chec

	Load Case	Story	Level (m)	Story Height (m)	Story Drift (m)	Story Shear Force (kN)	Story Stiffness (kN/m)	Upper Story Stiffness (kN/m)	Story Stiffness Ratio	Remark
	EX	13F	34.10	2.37	-0.0001	237.93	3051251.0	0.00	0.000	Irregular
	EX	12F	32.80	1.30	0.0003	299.56	1076140.7	-3051251.07	0.353	Irregular
	EX	11F	30.00	2.80	0.0007	527.39	724971.58	1076140.74	0.674	Irregular
	EX	10F	27.20	2.80	0.0007	858.20	1161068.0	724971.58	1.602	Regular
	EX	9F	24.40	2.80	0.0007	1158.13	1553532.5	1161068.07	1.338	Regular
	EX	8F	21.60	2.80	0.0007	1428.56	1915197.4	1553532.51	1.233	Regular
	EX	7F	18.80	2.80	0.0007	1668.01	2255651.5	1915197.43	1.178	Regular
	EX	6F	16.00	2.80	0.0007	1886.17	2597632.5	2255651.59	1.152	Regular
	EX	5F	13.20	2.80	0.0007	2076.23	2944598.8	2597632.50	1.134	Regular
	EX	4F	10.40	2.80	0.0007	2233.21	3307545.7	2944598.80	1.123	Regular
	EX	3F	7.60	2.80	0.0006	2356.89	3708006.5	3307545.70	1.121	Regular
	EX	2F	4.50	3.10	0.0047	2450.48	518907.56	3708006.57	0.140	Irregular
	EX	1F	0.00	4.50	0.0133	2496.55	188326.13	518907.56	0.363	Irregular
	EX	B1	-3.50	3.50	0.0078	2496.55	322089.17	188326.13	1.710	Regular
	EX	B2	-4.50	1.00	0.0006	2496.55	3918566.2	322089.17	12.166	Regular

Capacity Irregularity Check

	Story	Level (m)	Story Height (m)	Angle1 (Deg)	Story Shear Strength1 (kN)	Upper Story Shear Strength1 (kN)	Story Shear Strength Ratio1	Remark1	Angle2 (Deg)	Story Shear Strength2 (kN)	Upper Story Shear Strength2 (kN)	Story Shear Strength Ratio2	Remark2
				Angle = 0 [Deg] Input angle and press the 'Apply' button to change the angle.	0.00	Apply							
	13F	34.10	2.37	0.00	1225.7204	0.0000	0.0000	Regular	90.00	5494.3922	0.0000	0.0000	Regular
	12F	32.80	1.30	0.00	3252.2616	1225.7204	2.6533	Regular	90.00	0.0000	5494.3922	0.0000	Irregular
	11F	30.00	2.80	0.00	24385.1941	3252.2616	7.4979	Regular	90.00	0.0000	0.0000	0.0000	Irregular
	10F	27.20	2.80	0.00	24385.1941	24385.1941	1.0000	Regular	90.00	0.0000	0.0000	0.0000	Irregular
	9F	24.40	2.80	0.00	24385.1941	24385.1941	1.0000	Regular	90.00	0.0000	0.0000	0.0000	Irregular
	8F	21.60	2.80	0.00	24401.1017	24385.1941	1.0007	Regular	90.00	0.0000	0.0000	0.0000	Irregular
	7F	18.80	2.80	0.00	24401.1017	24401.1017	1.0000	Regular	90.00	0.0000	0.0000	0.0000	Irregular
	6F	16.00	2.80	0.00	26422.2531	24401.1017	1.0828	Regular	90.00	2021.1514	0.0000	0.0000	Irregular
	5F	13.20	2.80	0.00	26526.9082	26422.2531	1.0040	Regular	90.00	2125.8065	2021.1514	1.0518	Regular
	4F	10.40	2.80	0.00	26526.9082	26526.9082	1.0000	Regular	90.00	2125.8065	2125.8065	1.0000	Regular
	3F	7.60	2.80	0.00	26526.9082	26526.9082	1.0000	Regular	90.00	2125.8065	2125.8065	1.0000	Regular
	2F	4.50	3.10	0.00	9275.0574	26526.9082	0.3496	Irregular	90.00	9275.0574	2125.8065	4.3631	Regular
	1F	0.00	4.50	0.00	10629.0326	9275.0574	1.1460	Regular	90.00	10629.0326	9275.0574	1.1460	Regular
	B1	-3.50	3.50	0.00	11265.6844	10629.0326	1.0599	Regular	90.00	11265.6844	10629.0326	1.0599	Regular
	B2	-4.50	1.00	0.00	11265.6844	11265.6844	1.0000	Regular	90.00	11265.6844	11265.6844	1.0000	Regular

1.Stiffness Irregularity Check

According to Clause 5.3 a) of IS : 16700-2023,

Lateral stiffness of any story shall not be less than 70 percent of that of the story above. Hence the story stiffness ratio If it exceeds 0.7 "Irregular" is printed. If it is less than 0.7, 'Regular' is printed.

2.Capacity Irregularity Check

According to Clause 5.3 b) of IS : 1893 Part-1 -2016,

Lateral strength of any story shall not be less than 90 percent of that of the story above. Hence the story strength ratio If it exceeds 0.9 "Irregular" is printed. If it is less than 0.7, 'Regular' is printed.

Irregularity Check according to IS : 16700 -2023

2. Natural modes of vibration

- Results > Results Tables > Story> Irregularity check parameter > **IS : 16700-2023 > mode shape irregularity check**

Mode shape Irregularity Ch

Reaction

Displacements

Truss

Cable

Beam

Plate

Plane Stress

Plane Strain

Axisymmetric

Solid

Wall

Elastic Link

General Link

Vibration Mode Shape

Mode Shapes Irregularity Check

Buckling Mode Shape

Nodal Results of RS

Story

Inelastic Hinge

Time History Analysis

Heat of Hydration Analysis

Tendon

Composite Section For C.S.

Displacement Participation Factor

Initial Element Force

Imperfection

Node	Mode	UX	UY	UZ	RX	RY	RZ
MODAL IRREGULARITY CHECK							
1.Fundamental Translation Natural period check							
Along X				Along Y			
Mode No	Period	Mode No	Period				
8	1.31481	7	1.71358				
	<=8		<=8				
	Remark	OK					
2.Torsional-Translational Fundamental natural period							
Mode	Torsional Period(sec)	Minimum Translational peri	Ratio(Ttor/0.9Ttrans,min)	Remark			
9	1.2021	1.3148	1.0159	NG			
Eigenvalue Mode							

3. Mode shape irregularity Check

According to Clause 5.5.1 of IS : 16700-2023

The natural period of fundamental torsional mode of vibration (T_{tor}) shall not exceed 0.9 times the smaller of the natural periods of the fundamental translational modes of vibration ($T_{trans,min}$) in each of the orthogonal directions in plan. Hence if the ratio of T_{tor} to $0.9 * T_{trans,min}$ exceeds 1 “Irregular” is printed, If less than 1 “Regular” is printed.

According to Clause 5.5.2 of IS : 1893 Part-1 -2016

The fundamental translational natural Period (T_x and T_y) in any of the two horizontal plan directions, shall not exceed 8s. hence here IF $T_x, T_y < 8$ sec, “Regular” is printed, IF exceed s 8s “Irregular” is printed.

Approximate Time period of building according to IS : 16700-2023

1. Approximate Time period

- From the Main Menu select Load > Static Load > Lateral > Seismic Loads > Add > **Structural parameters > Period Calculator**

Approximate Time peri

IS 1893:2016 Period Calculator

X- Direction Period

☒ 1. $T = 0.075 h^{(0.75)}$

☐ 2. $T = 0.080 h^{(0.75)}$

☐ 3. $T = 0.085 h^{(0.75)}$

☐ 4. $T = 0.075 h^{(0.75)} / \sqrt{A_w}$

☐ 5. $T = 0.09 h / \sqrt{d}$

☐ 6. $T = 0.0644 h^{(0.9)}$

☐ 7. $T = 0.0672 h^{(0.75)}$

h : 36.47 (m)

Aw : 0 (m²)

d : 17.25 (m)

Y- Direction Period

☒ 1. $T = 0.075 h^{(0.75)}$

☐ 2. $T = 0.080 h^{(0.75)}$

☐ 3. $T = 0.085 h^{(0.75)}$

☐ 4. $T = 0.075 h^{(0.75)} / \sqrt{A_w}$

☐ 5. $T = 0.09 h / \sqrt{d}$

☐ 6. $T = 0.0644 h^{(0.9)}$

☐ 7. $T = 0.0672 h^{(0.75)}$

h : 36.47 (m)

Aw : 0 (m²)

d : 47.65 (m)

Note: Formula 6 and 7 in both the direction are applicable only if $h > 50$

OK Cancel

1. Approximate Fundamental Natural period According to Clause 6.3.4 of IS : 16700-2023

The approximate fundamental natural period for buildings of height greater than 50 m is given by following expressions :-

$$T_a = 0.0644H^{0.9} \text{ for Concrete MRF systems}$$

$$T_a = 0.0672H^{0.75} \text{ for all other concrete structural systems}$$

Lateral Story Drift Check according to IS : 16700 - 2023

1. Lateral story drift check

- Results > Results Tables > Story> check parameter > IS : 16700-2023 > Story drift

Story Drift Parameters

Response Modification Coefficient

3

Deflection Amplification Factor(Cd)

1

Importance Factor(Ie)

1.5

Scale Factor

1

Allowable story drift ratio

0.002

Allowable single story drift ratio

0.0025

Vertical Load Combination

OK

Load Case

S.F.

Scale Factor

1.0

Add

Modify

Delete

Define Beta

Fixed (1.0)

User Define

Story

Beta

Add

Delete

OK

Cancel

Result-Story Drift

Story Height (m)	Allowable Single Story Drift Ratio	Allowable Story Drift Ratio	Node	Maximum Drift of All Vertical Elements				Drift at the Center of Mass								
				Story Drift (m)	Story Drift Ratio	Story Drift Ratio/Allowable Single Drift	Remark	Story Drift (m)	Story Drift Ratio	Story Drift Ratio/Allowable Single Drift	Remark					
0025 Allowable Story Drift Ratio=0.002																
ick 'Set Story Drift Parameters...' menu to																
change RMC or Allowable Story Drift Ratio / Allowable Single Story Drift Ratio																
3.1500	0.0025	0.0020	353	0.0012	0.0004	0.149	OK	0.187	OK	0.0012	0.0004	0.148	OK	0.184	OK	
3.1500	0.0025	0.0020	321	0.0018	0.0008	0.235	OK	0.294	OK	0.0018	0.0008	0.233	OK	0.291	OK	
3.1500	0.0025	0.0020	289	0.0025	0.0008	0.321	OK	0.401	OK	0.0025	0.0008	0.319	OK	0.399	OK	
3.1500	0.0025	0.0020	257	0.0031	0.0010	0.396	OK	0.494	OK	0.0031	0.0010	0.394	OK	0.492	OK	
3.1500	0.0025	0.0020	225	0.0036	0.0011	0.456	OK	0.570	OK	0.0036	0.0011	0.454	OK	0.568	OK	
3.1500	0.0025	0.0020	193	0.0040	0.0013	0.503	OK	0.629	OK	0.0039	0.0013	0.502	OK	0.627	OK	
3.1500	0.0025	0.0020	161	0.0042	0.0013	0.538	OK	0.673	OK	0.0042	0.0013	0.537	OK	0.671	OK	
EXP 6F	3.1500	0.0025	0.0020	129	0.0044	0.0014	0.562	OK	0.703	OK	0.0044	0.0014	0.560	OK	0.700	OK
EXP 5F	3.1500	0.0025	0.0020	97	0.0045	0.0014	0.575	OK	0.718	OK	0.0045	0.0014	0.573	OK	0.716	OK
EXP 4F	3.1500	0.0025	0.0020	65	0.0045	0.0014	0.571	OK	0.714	OK	0.0045	0.0014	0.570	OK	0.712	OK
EXP 3F	3.1500	0.0025	0.0020	1	0.0042	0.0013	0.533	OK	0.667	OK	0.0042	0.0013	0.532	OK	0.666	OK
EXP 2F	3.1500	0.0025	0.0020	33	0.0033	0.0008	0.334	OK	0.417	OK	0.0033	0.0008	0.333	OK	0.417	OK
EXP 1F	4.0000	0.0025	0.0020													

Lateral Story drift check

1. Lateral Story drift check

According to Clause 5.4.1 of IS : 16700-2023

When design lateral forces are applied on the building, the maximum inter-story lateral drift ratio (Δ_{Max}/h_i) limited to 1/500. For a single story the drift limit may be relaxed to $h_i/400$.

Hence input for allowable limit for single story is added, And if the story drift ratio exceeds the allowable limit "N.G" is printed else "OK" is printed

Note : For story drift calculation only two methods i.e. Maximum Drift of All vertical Elements and Drift at center of mass are considered for now.

Stability Coefficient Check according to IS : 16700 - 2023

1. Stability Coefficient check

- Results > Results Tables > Story> check parameter > **IS : 16700-2023 > Stability Coefficient**

Stability Coefficient Parameters

Response reduction factor

3

Allowable limit

0.2

Vertical Load Combination

DL

Scale Factor

1

Load Ca... S.F

Add

Modify

Stability Coefficient check

Start Page MIDAS/Gen Result-[Stability Coefficient]

	Load Case	Story	Story Height (m)	Vertical Load (kN)	Story Shear Force (kN)	Story Drift (m)	Response Reduction factor (m)	Stability Coefficient (θ)	Allowable Limit	Remark
R=3, Allowable Limit=0.2 Press right mouse button and click 'Set Stability Coefficient Parameters...' menu to change R/Allowable limit!										
▶	EXP	12F	3.15	12137.9445	588.8395	0.0012	3.0000	0.0026	0.2000	OK
	EXP	11F	3.15	25409.8890	1170.5164	0.0018	3.0000	0.0042	0.2000	OK
	EXP	10F	3.15	38681.8335	1653.5459	0.0025	3.0000	0.0063	0.2000	OK
	EXP	9F	3.15	51953.7780	2047.0877	0.0031	3.0000	0.0084	0.2000	OK
	EXP	8F	3.15	65225.7225	2360.3013	0.0036	3.0000	0.0105	0.2000	OK
	EXP	7F	3.15	78497.6670	2602.3463	0.0040	3.0000	0.0127	0.2000	OK
	EXP	6F	3.15	91769.6115	2782.3822	0.0042	3.0000	0.0148	0.2000	OK
	EXP	5F	3.15	105041.5560	2909.5688	0.0044	3.0000	0.0169	0.2000	OK
	EXP	4F	3.15	118313.5005	2993.0656	0.0045	3.0000	0.0189	0.2000	OK
	EXP	3F	3.15	131585.4450	3042.0322	0.0045	3.0000	0.0206	0.2000	OK
	EXP	2F	3.15	144857.3895	3065.6281	0.0042	3.0000	0.0210	0.2000	OK
	EXP	1F	4.00	158531.0355	3073.1202	0.0033	3.0000	0.0144	0.2000	OK

1. Stability Coefficient check

According to Clause 7.3.10 of IS : 16700-2023

Stability coefficient is by :-

$$\theta = \frac{P_i \Delta_i}{V_i h_{i-r} R} \leq 0.2$$

Where,

- θ= Inter-Storey Drift stability coefficient
- P_i= Total design vertical load at level i
- Δ_i= Design storey drift at level i
- V_i= Design shear force at level i;
- h_{i-r}= Story height below level i
- R= Response reduction factor

Improvement of IS code in Design+

- *Added Design Module for IS :456-2000.*

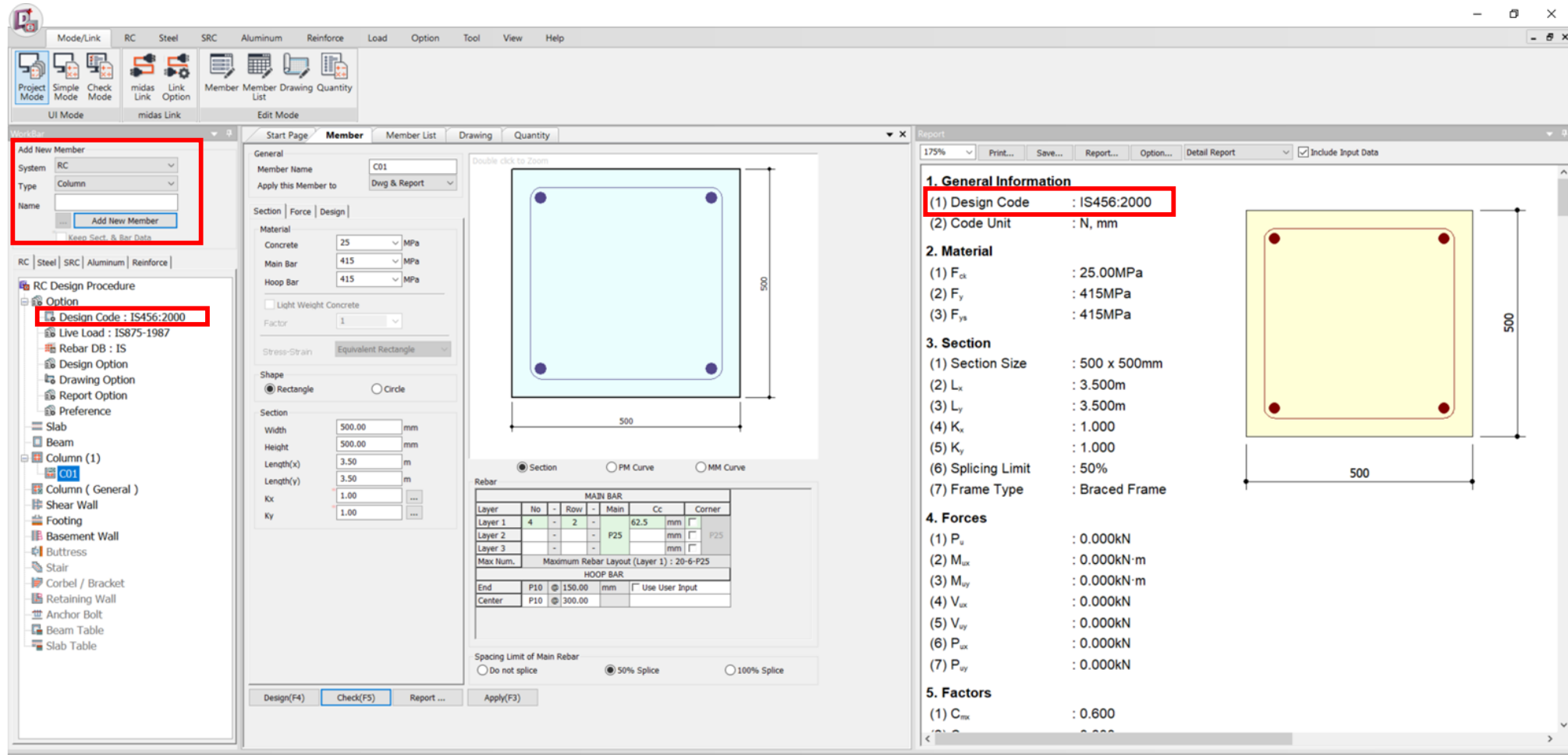
1. Column Module

2. Basement Wall Module

3. Shear Wall Module

Added Design Module for IS :456-2000

- Added Column module



Added Design Module for IS :456-2000

- Added Basement wall module

Add New Member

System: RC
Type: Basement Wall
Name:

Option

Design Code : IS456:2000

Member Properties

Member Name: BW01
Apply this Member to: Dwg & Report

Material

Concrete: 25 MPa
Main Bar: 415 MPa
Sub Bar: 415 MPa

Section

Type: 1 Way
Cover: 40.00 mm
Width: 5.00 m

Boundary Condition

Top: Pin (Factor = 0.00)
Bottom: Fix (Factor = 1.00)
Left: Fix (Factor = 1.00)
Right: Fix (Factor = 1.00)

Rebar Arrangement

Story to display: B1

Rebar	Ratio
(1) P16 @ 450.00	Mu = 0.000
(2) P16 @ 450.00	Mu = 16.88
(3) P16 @ 450.00	Mu = -37.28
(4) P16 @ 450.00	Mu = 1.011
(5) P16 @ 450.00	Mu = 0.000
(6) P16 @ 450.00	Mu = 0.000
(7) P16 @ 450.00	Mu = 0.000
(8) P16 @ 450.00	Mu = 0.000
(9) P16 @ 450.00	Mu = 0.000
(10) P16 @ 450.00	Mu = 0.000

Report

175% Print... Save... Report... Option... Detail Report Include Input Data

1. General Information

(1) Design Code : IS456:2000
(2) Code Unit : N, mm

2. Material

(1) F_{ck} : 25.00MPa
(2) F_y : 415MPa
(3) F_{ys} : 415MPa

3. Section

(1) Basewall Type : 1 Way
(2) Cover : 40.00mm
(3) Story Information
• Story(B1) : H=3.000m, THK.=300mm

4. Boundary Condition

(1) Top : Pin (Factor = 0.000)
(2) Bottom : Fix (Factor = 1.000)

5. Soil Load

(1) Surcharge Load : 0.000KPa
(2) 1st Floor Level : GL+0.000m
(3) Water Level : GL+0.000m
(4) Live Factor : 1.500
(5) Soil Factor : 1.500
(6) Water Factor : 1.500
(7) Soil Property
• Use Active Soil Pressure : No

No.	H(m)	Angle

Added Design Module for IS :456-2000

- Added Shear wall module

The screenshot displays the Design+ software interface for the Shear Wall design module. The interface is divided into several sections:

- Left Sidebar:** Contains a tree view with categories like RC, Steel, SRC, Aluminum, and Reinforce. Under RC, there is a sub-category 'RC Design Procedure' with options like 'Design Code : IS456:2000' (highlighted), 'Live Load : IS875-1987', 'Rebar DB : IS', 'Design Option', 'Drawing Option', 'Report Option', and 'Preference'. Below this, there are various structural elements like Slab, Beam, Column, and Shear Wall (1).
- Central Area:**
 - General:** Member Name: W01, Apply this Member to: Dwg & Report.
 - Section | Force:** Material (Basic): Concrete: 25 MPa, Ver. Bar: 415 MPa, Hor. Bar: 415 MPa. Stress-Strain: Equivalent Rectangle.
 - Material (Factor):** Light Weight Concrete: Factor: 1.
 - Section:** Thickness: 200.00 mm, Length: 1.00 m, Cover: 40.00 mm, Height(x): 3.50 m, Height(y): 3.50 m, Kx: 1.00, Ky: 1.00.
 - Rebar:** Ver. Bar: P10 @ 450, Hor. Bar: P10 @ 450, End Bar: 2 - P12, BE. Hor.: P10 @ 450.
 - Seismic Design:** Apply Special Provisions: Special Structural Wall, Intermediate Structural Wall.
 - Design Parameters...**
 - PM Curve:** A graph showing the relationship between Moment (M) and Plastic Moment (P). The curve is labeled with values like $P = 2447$ and $M = 832$.
- Right Sidebar:**
 - 1. General Information:** (1) Design Code : IS456:2000, (2) Code Unit : N, mm.
 - 2. Material:** (1) F_{ck} : 25.00MPa, (2) F_y : 415MPa, (3) F_{ys} : 415MPa.
 - 3. Section:** (1) Thickness : 200mm, (2) Length : 1.000m, (3) Cover : 40.00mm, (4) Height(X) : 3.500m, (5) Height(Y) : 3.500m, (6) K_x : 1.000, (7) K_y : 1.000, (8) Frame Type : Braced Frame.
- Bottom Section:**
 - 4. Force:** (1) Axial & Moment.
 - Diagram:** A cross-section diagram of the shear wall showing dimensions: Thickness: 200mm, Length: 1000mm, Cover: 40mm.