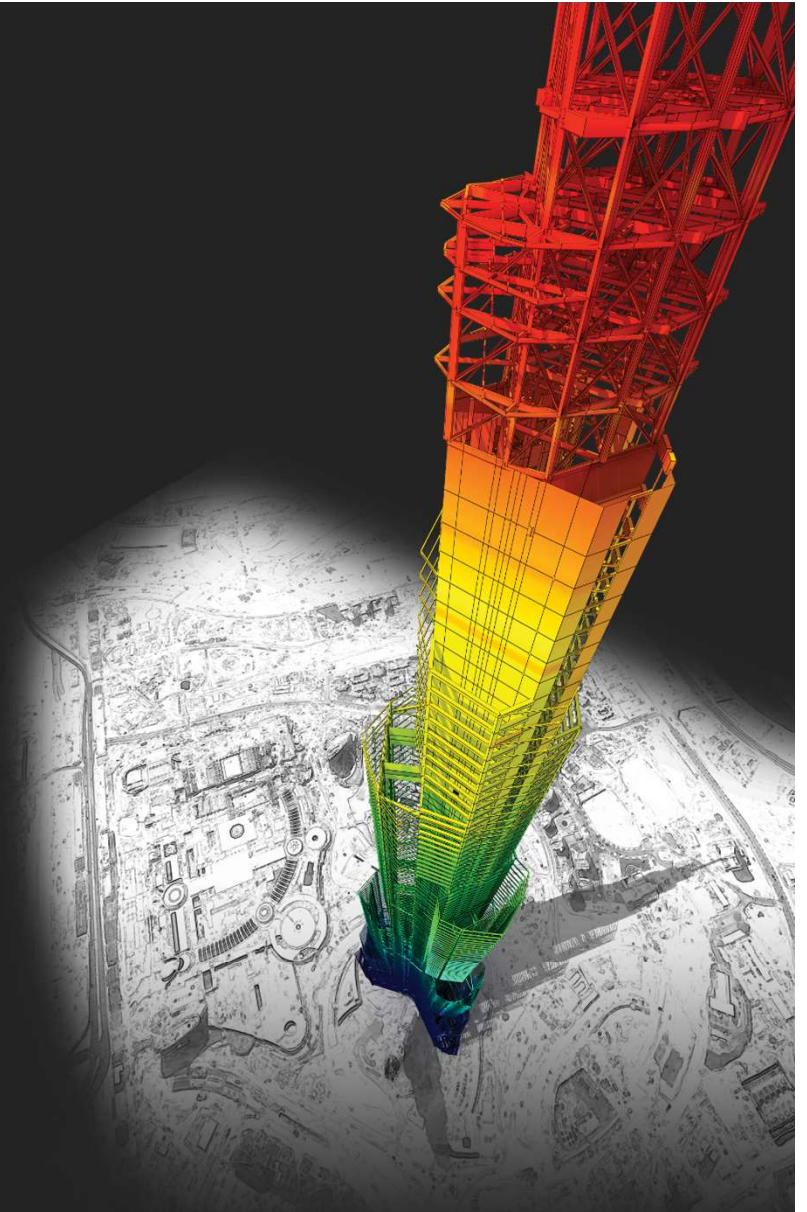


Release Note

Release Date : August. 2019

Product Ver. : midas Gen 2020 (v1.1) and Design+ 2020 (v1.1)



DESIGN OF General Structures

Integrated Design System for Building and General Structures

Enhancements

- **midas Gen**

1) Non-Dissipative Element Design as per NTC2018	4
2) Enhancement of Stability coefficient table as per NTC 2018	9
3) Added Spectrum as per NTC 2018 in Static seismic load & Response Spectrum	10
4) Added user input for "qo" in RC design setting as per EC2	11
5) Added "Update Rebar Option" in shell/slab/wall design	12
6) Improvement of graphic report for column design	13
7) Specify Moment-Rotation Hinge Properties with multi curve	14
8) Added name box in thickness properties.	15
9) Bilinear type spring stiffness for surface spring support	16
10) Force/Stress contouring based on center value of plate elements	17
11) Added "Node" icon in tool bar	18

- **midas Design+**

1) Added moment bolt connection as per AISC	20
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midas **Gen**

1. Non-dissipative element design as per NTC2018

In NTC 2018

NTC18 7.2.2. CRITERI GENERALI DI PROGETTAZIONE DEI SISTEMI STRUTTURALI

COMPORAMENTO STRUTTURALE

Le costruzioni soggette all'azione sismica, non dotate di appositi dispositivi d'isolamento e/o dissipativi, devono essere progettate in accordo con uno dei seguenti comportamenti strutturali:

- a) *comportamento strutturale non dissipativo,*
- oppure
- b) *comportamento strutturale dissipativo.*



NTC18 7.2.2.

Buildings subject to seismic action, not equipped with appropriate insulation and / or dissipative devices, must be designed in accordance with one of the following structural behaviors:

- a) non dissipative structural behavior,
- or
- b) dissipative structural behavior.

NTC18 7.4.1.

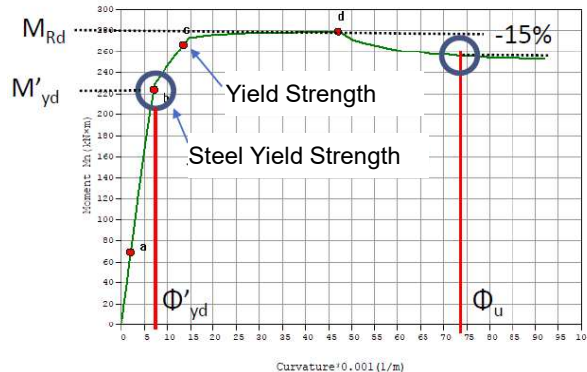
In the case of non-dissipative structural behavior, the capacity of the members must be evaluated in accordance with the rules set out in § 4.1, without any additional requirements, provided that in no section does the maximum moment of resistance in a substantially elastic field be exceeded, as defined in § 4.1.2.3.4.2. For beam-column Joint of structures with non-dissipative behavior, the design rules relating to CD "B" contained in § 7.4.4.3 must be applied. For prefabricated structures with non-dissipative behavior, the general rules contained in § 7.4.5 must also be applied.



7.4. COSTRUZIONI DI CALCESTRUZZO

7.4.1. GENERALITÀ

Nel caso di comportamento strutturale non dissipativo, la capacità delle membrature deve essere valutata in accordo con le regole di cui al § 4.1, senza nessun requisito aggiuntivo, a condizione che in nessuna sezione si superi il momento resistente massimo in campo sostanzialmente elastico, come definito al § 4.1.2.3.4.2. Per i nodi trave-pilastro di strutture a comportamento non dissipativo si devono applicare le regole di progetto relative alla CD "B" contenute nel § 7.4.4.3. Per le strutture prefabbricate a comportamento non dissipativo si devono applicare anche le regole generali contenute nel § 7.4.5.



Non-Dissipative Element Design (NDED)

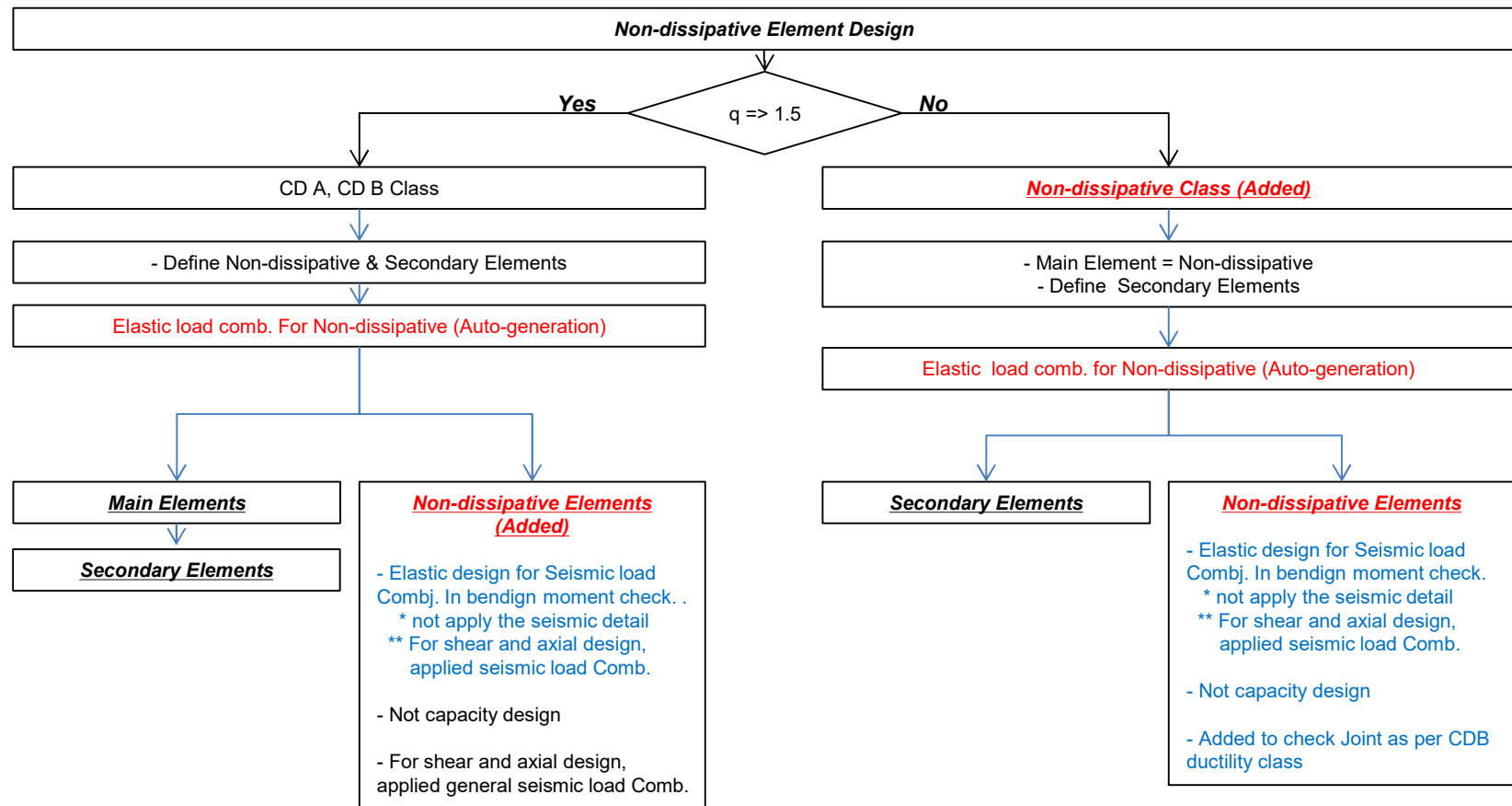
$$M'_{yd} > M_{Ed}$$

M'_{yd} : Bending resistance in elastic status

M_{Ed} : Design bending moment by elastic load combinations

1. Non-dissipative element design as per NTC2018

Flowchart of Non-dissipative Elements Design



**** This release version is supporting only a beam, column and wall member in code checking**

1. Non-dissipative element design as per NTC2018

Procedure of Non-Dissipative Element Design (NDED) – Response Spectrum

Define Inelastic material model

1 Input Inelastic Material Properties

Create seismic load for NDED

2 Create Seismic load for NDED

Generate load combination for NDED

3 Create load combination for NDED

Design Setting for NDED

4 Define Non-dissipative element

1. Non-dissipative element design as per NTC2018

Procedure of Non-Dissipative Element Design (NDED) – Static Seismic Load

Define Inelastic material model

1 Input Inelastic Material Properties

Create seismic load for NDED

2 Add Earthquake for Elastic (EE)

3 Create seismic load with EE

Generate load combination for NDED

4 Create load combination for NDED

Description	LoadCase	Factor
1.0D -1.0(0.3L) + 1.0E	Rx_elastic design(NRS)	0.3000
1.0D -1.0(0.3L) - 1.0E	DL(ST)	1.0000
1.0D -1.0(0.3L) + 1.0E	UL(CP)	1.0000
SERV -1.0D + (1.0LL)	Ry_elastic design(NRS)	1.0000
SERV -1.0D + (1.0LL) +	Ry_elastic design(NRS)	
SERV -1.0D + (1.0LL) -		
SERV -1.0D + (0.7LL) +		
SERV -1.0D + (0.7LL) -		
SERV -1.0D + (0.3LL) +		
SERV -1.0D + (0.3LL) -		
SERV -1.0D + (0.3LL)		

Design Setting for NDED

5 Define Non-dissipative element

Concrete

Rebar

1. Non-dissipative element design as per NTC2018

Design Result of Non-Dissipative Element Design (NDED) : Supporting only Design Checking

Design Result Table

Eurocode2:04 RC-Beam Checking Result Dialog

Code : Eurocode2:04,NTC2018 Unit : kN , m Primary Sorting Option

Sorted by Member Strength SECT MEMB

Results Property Serviceability

MEMB	SECT	Section	fck	fyk	PO	CHK	Rebar		Negative Moment Strength				Positive Moment Strength				Shear Strength					Elastic Moment Capacity											
							AsTop	AsBot	N(-) M.Ed	LC B	x/d	N(-) M.Rd	Rat-N	P(+) M.Ed	LC B	x/d	P(+) M.Rd	Rat-P	V.Ed	LC B	V.Rdc	V.Rds	Rat-Vc	Rat-Vs	Rat-Vt	Seis. Class	N(-) M.Ed	LC B	N(-) M.Ed	Rat-N	P(+) M.Ed	LC B	P(+) M.Ed
0		travi in altezza	20000.0	I	OK	0.0006	0.0006	53.3142	10	0.09	108.928	0.49	26.6571	10	0.09	108.928	0.24	50.0967	2	57.9545	237.749	0.86	0.21	0.86	N.D.	21.849	19	98.401	0.22	10.925	19	98.401	0.11
2		0.300 0.500	450000	M	OK	0.0006	0.0006	17.2613	10	0.09	108.928	0.16	19.2975	6	0.09	108.928	0.18	64.6646	11	57.9545	87.1748	1.12	0.74	0.74	N.D.	21.849	19	98.401	0.22	10.925	19	98.401	0.11
3.6000		0.000 0.000	450000	J	OK	0.0006	0.0006	33.6289	10	0.09	108.928	0.31	19.8028	6	0.09	108.928	0.18	37.1465	2	57.9545	237.749	0.64	0.16	0.64	N.D.	21.849	19	98.401	0.22	10.925	19	98.401	0.11

Graphic Report

4. Shear Capacity

END-I	MEM	END-J
2	11	2
50.10	64.66	37.15
57.95	57.95	57.95
237.75	87.17	237.75
359.55	359.55	359.55
0.0014	0.0005	0.0014
2-P10 #110	2-P10 #300	2-P10 #110
0.8644	1.1159	0.6410
0.2107	0.7418	0.1562
0.8644	0.7418	0.6410

5. Elastic Bending Moment Capacity (for Non-Dissipative Element)

END-I	MEM	END-J
18	18	18
21.85	5.46	6.91
98.40	98.40	98.40
0.2220	0.0555	0.0703

(*) Load Combination No. 18

END-I	MEM	END-J
10	9.32	7.13
98.40	98.40	98.40
0.1110	0.0547	0.0724

6. Elastic Bending Moment Capacity (for Non-Dissipative Element)

END-I	MEM	END-J
18	18	18
21.85	5.46	6.91
98.40	98.40	98.40
0.2220	0.0555	0.0703

(*) Load Combination No. 18

END-I	MEM	END-J
10	9.32	7.13
98.40	98.40	98.40
0.1110	0.0547	0.0724

Detail Report

providing the data of Moment-Curvature Curve

No.	Conc.Strain	N.R.Depth	Bar.Strain	Curvature	Moment
1	0.00000	0.00000	0.00000	0.00000e+000	0.00
2	0.00010	0.11893	-0.00055	1.52820e-004	8.48
3	0.00074	0.11924	-0.00019	6.20219e-004	18.49
4	0.00164	0.11997	-0.00041	1.48248e-003	41.95
5	0.00301	0.12089	-0.00078	2.40516e-003	74.52
6	0.00454	0.11659	-0.00177	3.49527e-003	106.76
7	0.00651	0.06509	-0.00286	5.09527e-003	140.41
8	0.00829	0.02425	-0.00509	7.43527e-003	178.17
9	0.00875	0.02229	-0.00564	9.07527e-003	191.54
10	0.00816	0.06465	-0.00516	1.26216e-002	213.82
11	0.00916	0.06388	-0.00487	1.55820e-002	218.47
12	0.00102	0.06427	-0.00739	1.88548e-002	215.97
13	0.00195	0.06076	-0.00911	2.24261e-002	217.56
14	0.00156	0.06761	-0.01121	2.62810e-002	219.25
15	0.00183	0.06274	-0.01292	3.05413e-002	221.82
16	0.00152	0.06301	-0.01498	3.56837e-002	222.98
17	0.00167	0.06172	-0.01782	3.98988e-002	229.88
18	0.00182	0.06007	-0.01934	4.38239e-002	226.56
19	0.00199	0.05943	-0.02139	5.04844e-002	229.14
20	0.00200	0.06051	-0.02459	5.62527e-002	228.24
21	0.00253	0.06187	-0.02741	6.22919e-002	231.78
22	0.00280	0.06037	-0.02944	6.87190e-002	228.24
23	0.00153	0.06182	-0.03294	7.54182e-002	236.94
24	0.00288	0.06118	-0.03524	8.24265e-002	238.72
25	0.00171	0.06247	-0.03813	8.97530e-002	240.81
26	0.00303	0.06194	-0.04172	9.73893e-002	243.81
27	0.00380	0.06088	-0.04505	1.05260e-001	246.83
28	0.00420	0.06299	-0.04769	1.13594e-001	247.46
29	0.00181	0.06329	-0.05016	1.22162e-001	248.58
30	0.01956	0.01205	-0.04936	1.31847e-001	246.26
31	0.01409	0.13495	-0.05174	1.40240e-001	248.95
32	0.02480	0.13273	-0.05852	1.49749e-001	248.54
33	0.02794	0.13353	-0.06787	1.61811e-001	246.80
34	0.02470	0.137636	-0.06385	1.69917e-001	248.99
35	0.02198	0.13316	-0.06787	1.81811e-001	246.80
36	0.02180	0.10276	-0.06453	1.93831e-001	250.18
37	0.02594	0.12654	-0.06921	2.01946e-001	250.69
38	0.02593	0.13899	-0.06569	2.13237e-001	252.33
39	0.02774	0.10945	-0.06318	2.25888e-001	253.88
40	0.02674	0.06282	-0.10028	2.37867e-001	257.91

(*) Check ratio of elastic moment capacity.
 -. Rat_MEd = M_{Ed} / M_{gd} = 0.222 < 1.000 -> O.K.

2. Enhancement of Stability coefficient table as per NTC 2018

About NTC18 chap. 7.3.1 – (this is to consider in wishlist)

Effetti delle non linearità geometriche

Le non linearità geometriche sono prese in conto attraverso il fattore θ che, in assenza di più accurate determinazioni, può essere definito come:

$$\theta = \frac{P \cdot d_{ER}}{V \cdot h} \quad [7.3.3]$$

dove:

P è il carico verticale totale dovuto all'orizzontamento in esame e alla struttura ad esso sovrastante;

d_{ER} è lo spostamento orizzontale medio d'interpiano allo *SLV*, ottenuto come differenza tra lo spostamento orizzontale dell'orizzontamento considerato e lo spostamento orizzontale dell'orizzontamento immediatamente sottostante, entrambi valutati come indicato al § 7.3.3.3;

V è la forza orizzontale totale in corrispondenza dell'orizzontamento in esame, derivante dall'analisi lineare con fattore di comportamento q ;

h è la distanza tra l'orizzontamento in esame e quello immediatamente sottostante.

Gli effetti delle non linearità geometriche:

- possono essere trascurati, quando θ è minore di 0,1;
- possono essere presi in conto incrementando gli effetti dell'azione sismica orizzontale di un fattore pari a $1/(1-\theta)$, quando θ è compreso tra 0,1 e 0,2;
- devono essere valutati attraverso un'analisi non lineare, quando θ è compreso tra 0,2 e 0,3.

Il fattore θ non può comunque superare il valore 0,3.

Load Case	Story	Story Height (m)	Vertical Load (kN)	Story Shear Force (kN)	Modified Story Drift (m)	Beta (Beta)	Stability Coefficient (Theta)	Allowable Limit	Remark	P-Delta Incremental Factor (ad)
Cd=1, Ie=1, Scale Factor=2.5										
SLVx(RS)	5F	3.2	26503.4572	646.7074	0.0186	1	0.2384	0.3	P-Delta Direct Analysis	
SLVx(RS)	4F	3.2	43667.3343	994.4165	0.0208	1	0.2859	0.3	P-Delta Direct Analysis	
SLVx(RS)	3F	3.2	60831.2115	1267.5691	0.0202	1	0.3257	0.3	Redesign	
SLVx(RS)	2F	13.2	88294.3753	1658.6257	0.0521	1	0.1802	0.3	P-Delta Increment	1.2662
SLVx(RS)	1F	3.2	105458.2525	1690.8036	0.003	1	0.0583	0.3	OK	1

- If "Theta" is less than 0.1, "O.K" is printed
- If "Theta" exceeds 0.1 and is less than 0.2, "P-Delta Increment" is printed
- If "Theta" exceeds 0.2 and is less than 0.3, "P-Delta Direct Analysis" is printed
- If "Theta" exceeds 0.3, "Redesign" is printed

3. Added spectrum as per NTC 2018 in static seismic Load & response spectrum

Static Seismic Load

Add/Modify Seismic Load Specification

Load Case Name : []
 Seismic Load Code : NTC2018

Description :

Seismic Load Parameters
 Ground Type : B

Spectrum Parameters
 T1 T2 T3 T4 User Defined

Soil Factor (S)	Tb	Tc	Td
1.20	0.14	0.42	1.63

Maximum Horizontal Acc. (ag) : 0.08 g
 Behavior Factor (q) : 1.5
 Amplification Factor (Fo) : 2.5
 Period of constant Hori.Acc. (Tc*) : 0.3

Structural Parameters
 Fundamental Period : X-Dir. 0.9787 Y-Dir. 0.9787

Seismic Load Direction Factor (Scale Factor)
 X-Direction : 1 Y-Direction : 0

Accidental Eccentricity
 X-Direction (Ex) : Positive Negative None
 Y-Direction (Ey) : Positive Negative None

Torsional Amplification
 Accidental Eccentricity Inherent Eccentricity

Additional Seismic Loads (Unit:N,mm)

Story	Add-X	Add-Y	Add-RZ

Seismic Load Profile... OK Cancel Apply

Response Spectrum

Generate Design Spectrum

Design Spectrum : NTC2018

Spectrum Type : Vertical Design Spectrum
 Horizontal Elastic Spectrum
 Vertical Elastic Spectrum
 Horizontal Design Spectrum
 Vertical Design Spectrum

Spectrum Parameter : T1 T4 User Defined

Soil Factor (S)	Tb	Tc	Td
1	0.05	0.15	1

Maximum Horizontal Acc. (ag) : 0.08 g
 Amplification Factor (Fo) : 2.5
 Period of constant Hor.Acc. (Tc*) : 0.3
 Behavior Factor (q) : 3

Max. Period : 2.5 (Sec)

OK Cancel

Add/Modify/Show Response Spectrum Functions

Function Name : NTC2018 H-DESIGN

Spectral Data Type : Normalized Accel.

Scaling : Scale Factor Maximum Value

	Period (sec)	Spectral Data (g)
1	0.0000	0.0960
2	0.0250	0.0931
3	0.0500	0.0903
4	0.0750	0.0874
5	0.1000	0.0846
6	0.1250	0.0817
7	0.1399	0.0800
8	0.1500	0.0800
9	0.1750	0.0800
10	0.2000	0.0800
11	0.2250	0.0800
12	0.2500	0.0800
13	0.2750	0.0800
14	0.3000	0.0800

Spectral Data

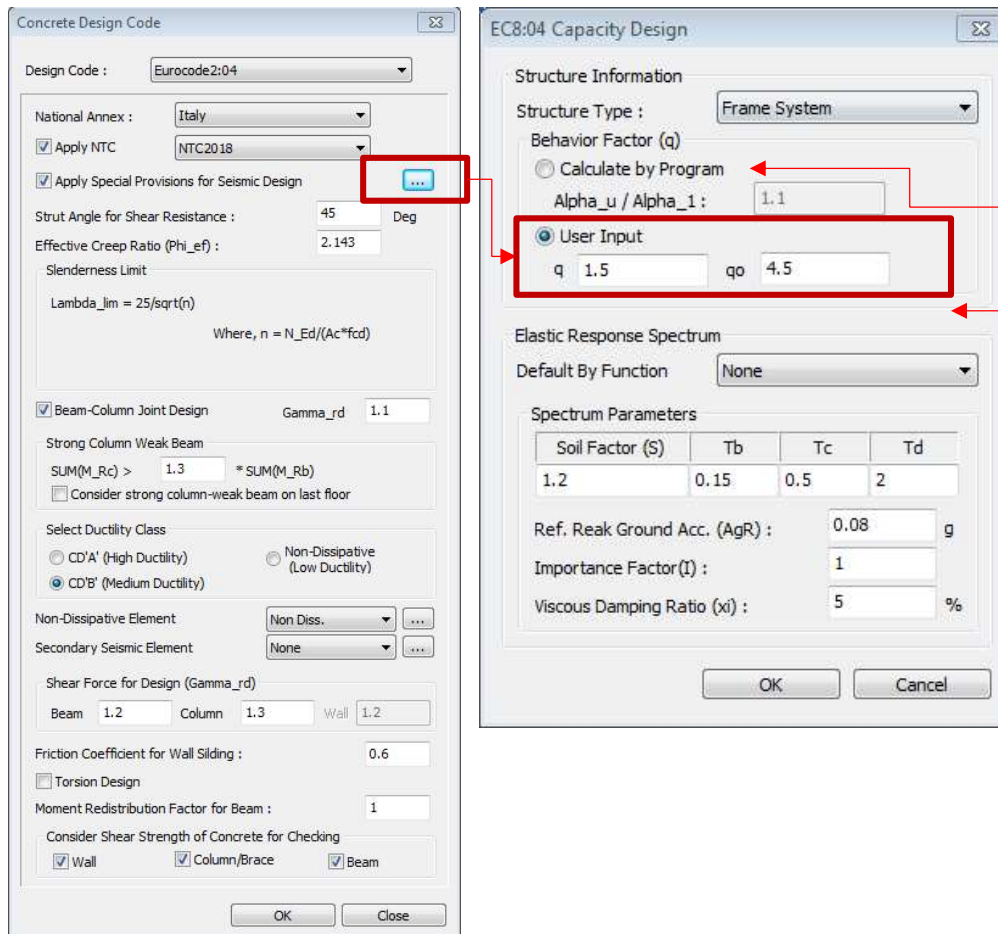
Import File Design Spectrum

Description : NTC2018 H-DGN: G=B,S=1.20,Tb=0.14,Tc=0.42,Td=1.63,ag=0.08g,Fo=2.5,Tc*=0.30,q=3.00

OK Cancel Apply

4. Added user input for "qo" in RC design setting as per EC2

- Definition of "qo" by user
- Design considering "qo" for irregular structures



Eurocod 08. Table 5.1

$$q = q_o k_w \geq 1,5$$

Table 5.1: Basic value of the behaviour factor, qo for systems regular in elevation

STRUCTURAL TYPE	DCM	DCH
Frame system, dual system, coupled wall system	3.0 α ₀ /α ₁	4.5 α ₀ /α ₁
Uncoupled wall system	3,0	4.0 α ₀ /α ₁
Torsionally flexible system	2,0	3,0
Inverted pendulum system	1,5	2,0

(3) For buildings which are not regular in elevation, the value of q_o should be reduced by 20% (see 4.2.3.1(7) and Table 4.1).

5. Added "Update Rebar Option" in shell/slab/wall design

- Update rebar arrangement by sub-domain & by elements

Added methods to input rebar information

Define Sub-domain

Update rebar by elements

Update rebar by Sub-domains (New)

Update Rebar Option

Element Sub-Domain

Update Rebar Option

Element Sub-Domain

6. Improvement of graphic report for column design

Printout shear design result for each direction in graphic report (RC column)

Midas Gen 2019 v2.2

5. Shear Force Capacity Check (End)

Applied Shear Force
Design Shear Strength
Shear Ratio
Joint Shear Ratio

Vu = 198.243 kN (Load Combination : 16)
 $\phi V_c + \phi V_s = 276.331 + 842.734 = 1119.06$ kN (As-H_req = 0.00053 m²/m, 2-P10 @30)
 Vu/ $\phi V_n = 0.177 < 1.000$ O.K
 Vhj/ $\phi V_{nj} = 0.00000 / 0.00000 = 0.000 < 1.000$ O.K

6. Shear Force Capacity Check (Middle)

Applied Shear Force
Design Shear Strength
Shear Ratio

Vu = 198.243 kN (Load Combination : 16)
 $\phi V_c + \phi V_s = 277.275 + 210.684 = 487.959$ kN (As-H_req = 0.00053 m²/m, 2-P10 @120)
 Vu/ $\phi V_n = 0.406 < 1.000$ O.K

Midas Gen 2020 v1.1

3. Design for Shear

[END]

Applied Shear Force (V_Ed)
Shear Ratio (V_Ed/V_Rdc)
Shear Ratio (V_Ed/V_Rds)
Shear Ratio (V_Ed/V_Rdmax)
Shear Ratio
Asw-H_req

y : 3 (l)
 39639.6 N
 39639.6 / 438445 = 0.090
 39639.6 / 837475 = 0.047
 39639.6 / 1716750 = 0.023
 0.090 < 1.000 O.K
 0.00393 mm²/m, 2-P10 @40

z : 9 (l)
 35434.7 N
 35434.7 / 437307 = 0.081
 35434.7 / 991141 = 0.036
 35434.7 / 1741500 = 0.020
 0.081 < 1.000 O.K
 0.00393 mm²/m, 2-P10 @40

[MIDDLE]

Applied Shear Force (V_Ed)
Shear Ratio (V_Ed/V_Rdc)
Shear Ratio (V_Ed/V_Rds)
Shear Ratio (V_Ed/V_Rdmax)
Shear Ratio
Asw-H_req

y : 10 (1/2)
 472545 N
 472545 / 414399 = 1.140
 472545 / 478557 = 0.987
 472545 / 1716750 = 0.275
 0.987 < 1.000 O.K
 0.00222 mm²/m, 2-P10 @70

z : 10 (1/2)
 559460 N
 559460 / 412915 = 1.355
 559460 / 566366 = 0.988
 559460 / 1741500 = 0.321
 0.988 < 1.000 O.K
 0.00222 mm²/m, 2-P10 @70

[JOINT]

Vjhd / Vjs
Joint Ratio
Ash.jnt

y : (l)
 0.00000 / 0.00000 = 0.000
 0.000 < 1.000 O.K
 0.00000 mm², Not Use

z : (l)
 0.00000 / 0.00000 = 0.000
 0.000 < 1.000 O.K
 0.00000 mm², Not Use



7. Specify Moment-Rotation hinge properties with multi curve

- Definition of hinge curve and yield strength depending on axial force in FEMA type

- **Pushover > Properties > Define Pushover Hinge Properties**

FEMA Multi-Curve

Add/Modify Pushover Hinge Properties

Name: BEAM Description: []

Element Type: Beam/Column Wall

Material Type: RC / SRC (encased) Steel / SRC (filled) Masonry

Definition: Moment - Rotation (M-θ) Moment - Curvature (M-φ Lumped) Moment - Curvature (M-φ Distributed)

Interaction Type: None P-M Interaction

Skeleton Curve: FEMA

Yield Surface Properties... Masonry Proper

Directional Properties of Pushover Hinge : GSD Import Type

Input Method: Auto-Calculation User Input

Shape of FEMA Curve: General Type Perfect Plastic Type

Strength Loss: Yes No

Properties of I-end | Properties of J-end

Multi-Curve Define Axial Force

Axial Force (P) 0,000 kN

	M/MY	D/DY
-E	-0,2	-E -15
-D	-0,2	-D -10,5
-C	-1	-C -10
-B	-1	-B -1
A	0	A 0
B	1	B 1
C	1	C 10
D	0,2	D 10,5
E	0,2	E 15

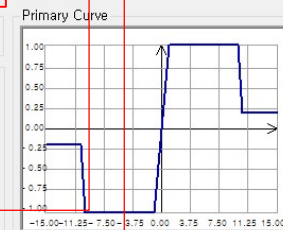
Yield Strength (MY) (+) (-) 0,001 0,001 kN-m

Yield Curvature (DY) (+) (-) 0 0 rad/m

User Defined Auto-Definition depending on a selected force

Initial Stiffness: Elastic Stiffness : EI

Multiple inputs depending on a selected axial force



Acceptance Criteria (Current Deform./ Yield Deform.)

	(+)	(-)
Immediate Occupancy (IO)	2	6
Life Safety (LS)	6	6
Collapse Prevention (CP)	6	6

Auto-Definition depending on a selected force

8. Added name box in thickness properties.

Usage classification for the same thickness

- Properties > Section > Thickness

The screenshot shows the 'Thickness Data' dialog box for ID 1. The 'In-plane & Out-of-plane' radio button is selected with a value of 0 m. The 'Plate Offset' section has 'Thickness Ratio' selected with a local z value of 0. A 3D diagram illustrates the offset distance. Below the dialog is the 'Properties' table:

ID	Type	Thickness(m)	Offset
1	Value	150.000000	No
2	Value	150.000000	No
3	Value	150.000000	No
4	Value	200.000000	No
5	Value	200.000000	No

A callout box shows a tree view for 'Thickness : 5' with entries: 1 : 150, 2 : 150, 3 : 150, 4 : 200, 5 : 200.

Midas Gen 2019 v2.2

The screenshot shows the 'Thickness Data' dialog box for ID 5. A red box highlights the 'Name' field containing 'Slab_01'. The 'In-plane & Out-of-plane' radio button is selected with a value of 200 mm. The 'Plate Offset' section has 'Thickness Ratio' selected with a local z value of 0. A 3D diagram illustrates the offset distance. Below the dialog is the 'Properties' table:

ID	Name	Thickness(...)	Offset
1	Slab_1F	Value	150.000000
2	Slab_2F	Value	150.000000
3	Slab_roof	Value	150.000000
4	Wall_01	Value	200.000000
5	Slab_01	Value	200.000000

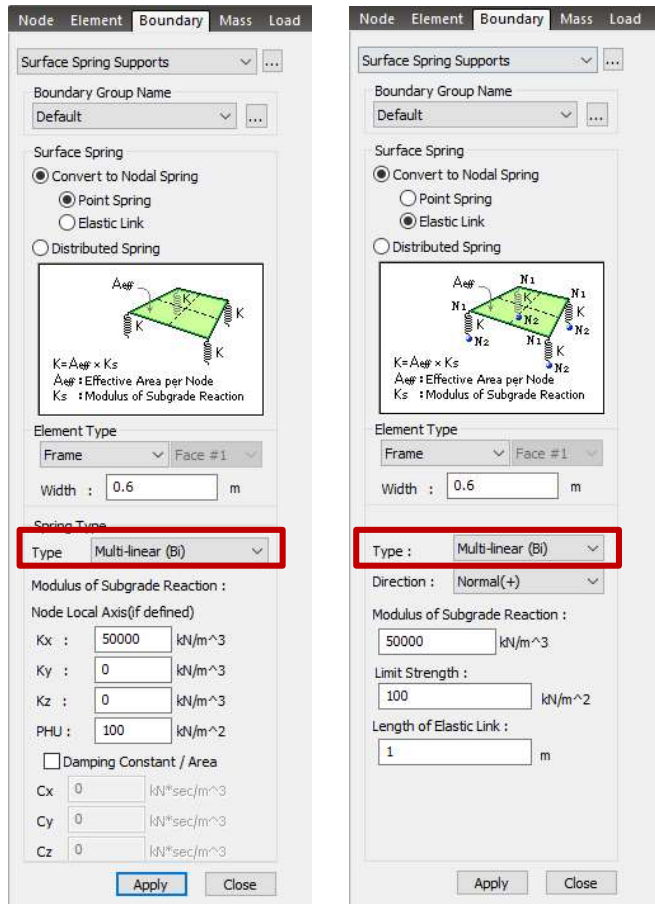
A callout box shows a tree view for 'Thickness : 5' with entries: 1 : 150 (Slab_1F), 2 : 150 (Slab_2F), 3 : 150 (Slab_roof), 4 : 200 (Wall_01), 5 : 200 (Slab_01). Red arrows indicate the mapping from the 'Name' field in the dialog to the 'Name' column in the table and the corresponding entries in the tree view.

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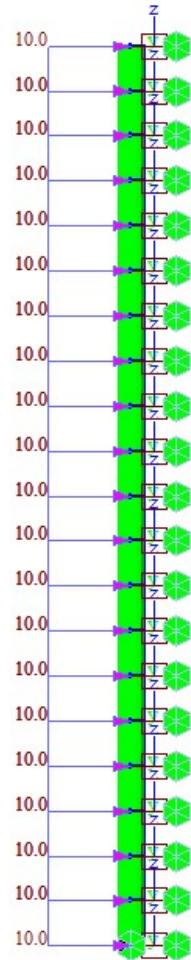
9. Bilinear type spring stiffness for surface spring support

- Bilinear spring type is added in the Surface Spring Support to simulate the strength limit of the soil. The strength limit should be defined by the user.
- Both Point Spring Support and Elastic Link are supported.

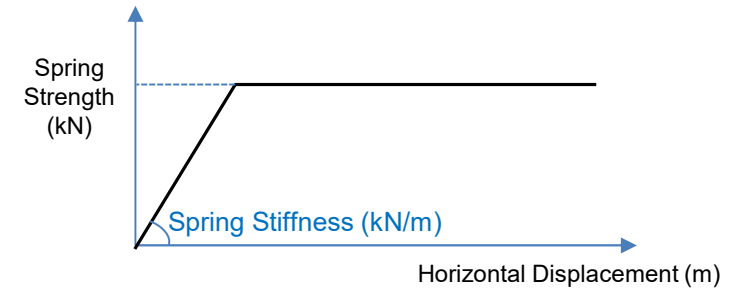
▪ Boundary > Spring Supports > Surface Spring



Surface Spring Support



Horizontal Soil Stiffness(kN)

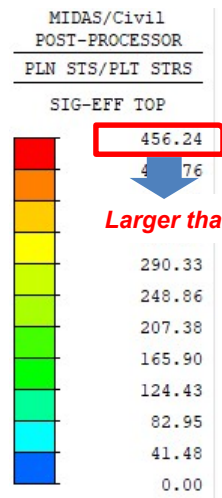
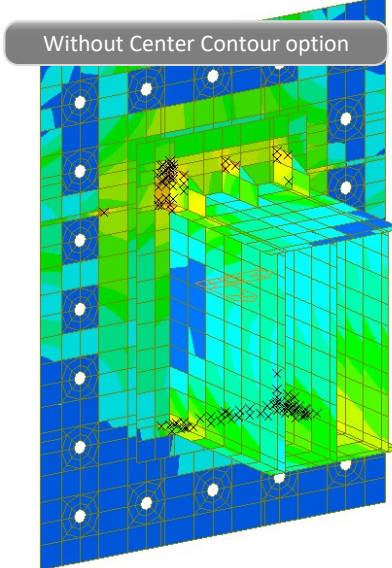
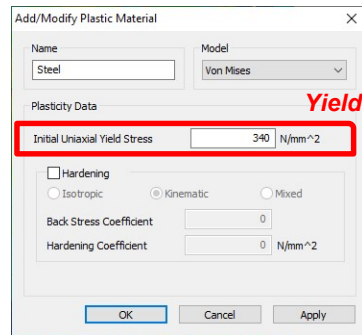


$$\text{Spring Strength [kN]} = \text{Section Width [m]} \times \text{Element Length [m]} \times \text{PHU [kN/m}^2\text{]}$$

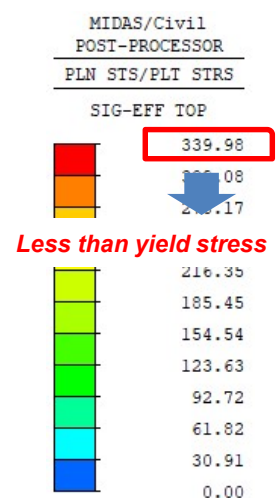
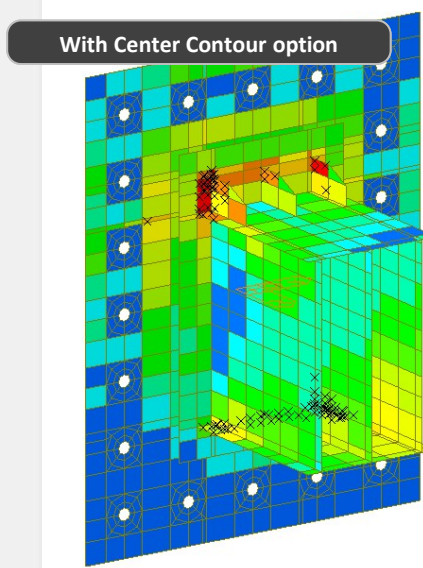
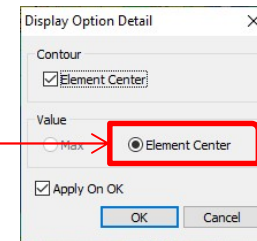
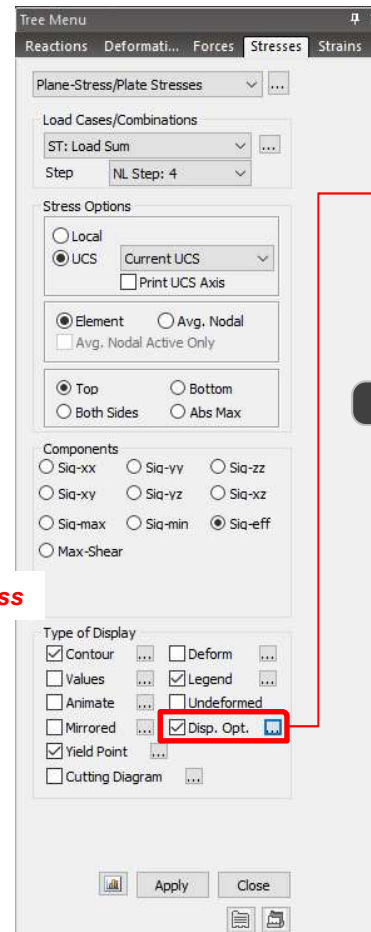
10. Force/Stress contouring based on center value of plate elements

- Stresses at the node are determined by the linear interpolation of Gauss points, which often leads to stress exceeding yield stress in the material nonlinear analysis.
- Plate stress contour can now be displayed using the value at the element center instead of element nodes. The center values will not exceed the yield stress.

Results > Results > Stresses > Plane-Stress/Plate Stresses



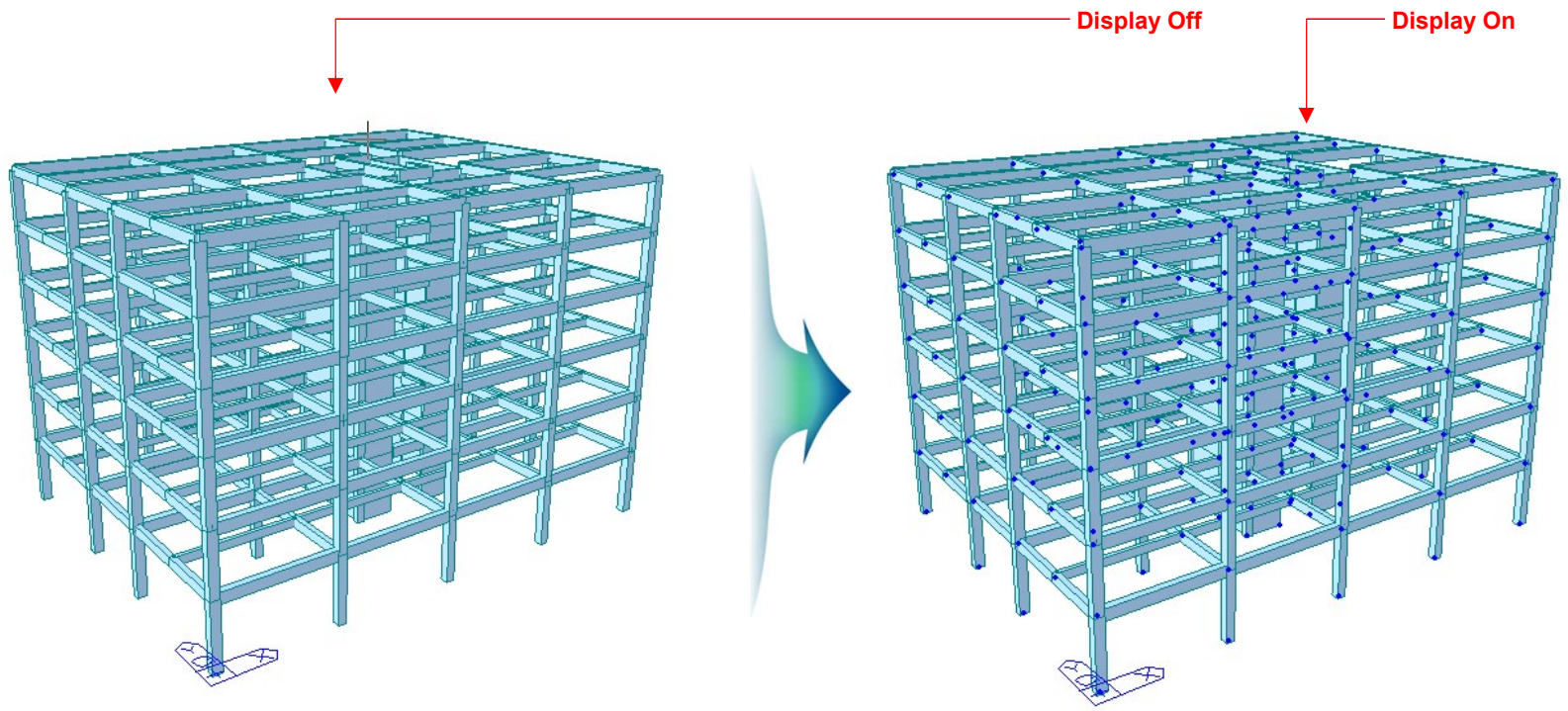
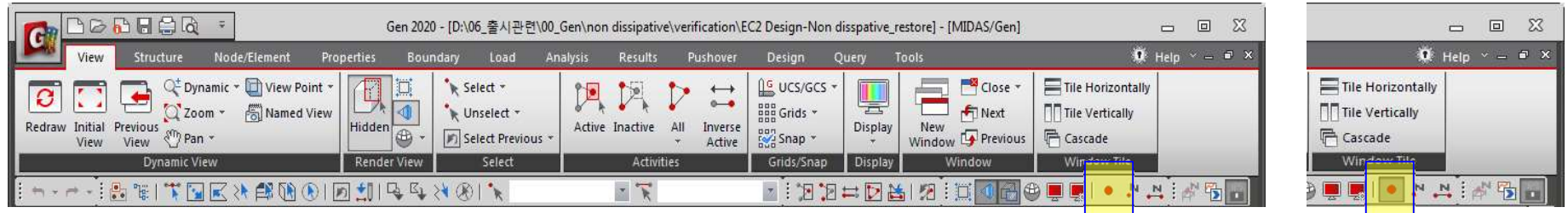
Larger than yield stress



Less than yield stress

11. Added "Node" icon in tool bar

Quick display on/off for Node



midas **Design+**

1. Added moment bolt connection as per AISC

Supporting AISC-URFD05(M) / AISC-URFD10(M) / AISC-URFD16(M)

The screenshot displays the midas DESIGN+ software interface. The 'STEEL' menu is open, showing 'Bolt Connection' and 'Moment Bolt Connection' options highlighted with red boxes. A red arrow points from these options to two panels on the right: 'Auto-Generation of Detail/Summary Report' and 'Auto-Generation of Drawing'.

Auto-Generation of Detail/Summary Report

1. Calculation Summary

(1) General requirement

Category	Value	Criteria	Ratio	Note
Required girder stiffener thickness (mm)	-	-	-	-
Required girder stiffener length (mm)	-	-	-	-
Width - thickness ratio of Girder stiffener	-	-	-	-
No prying bolt moment strength (kN-m)	0.000	420	0.000	

(2) End Plate

Category	Value	Criteria	Ratio	Note
Required end plate thickness (mm)	18.28	6.000	3.048	
Shear yielding strength of end plate (kN)	0.000	161	0.000	
Shear rupture strength of end plate (kN)	0.000	171	0.000	

(3) High Tension Bolt

Category	Value	Criteria	Ratio	Note
Shear rupture strength of compression bolts (kN)	0.000	283	0.000	
Bolt bearing / tear out failure of end plate (kN)	0.000	329	0.000	
Bolt bearing / tear out failure of column flange (kN)	0.000	1,825	0.000	

(4) Column Flange

Category	Value	Criteria	Ratio	Note
Required thickness of column flange for flexural yielding (mm)	33.27	11.62	0.355	

(5) Stiffener

Category	Value	Criteria	Ratio	Note
Strength of unstiffened column flange (kN)	0.000	4,721	0.000	
Local web yielding strength (kN)	0.000	1,569	0.000	
Web buckling strength (kN)	0.000	4,041	0.000	
Web crippling strength (kN)	0.000	2,996	0.000	

2. Calculate Design Forces

(1) Calculate the expected yield stress

- $F_y = 248\text{MPa}$
- $Z_x = 2,195,867\text{mm}^3$
- $M_{ux} = 1.1 R_f Z_x = 899\text{kN-m}$

(2) Calculate the distance from the face of the column to the plastic hinge

- $d = 599\text{mm}$
- $b_w = 12.83\text{mm}$
- $L_p = \min (d/2, 3b_w) = 38.48\text{mm}$

Auto-Generation of Drawing

MC01 (w24X55)

END PLATE	8 x 31 (A36)
BOLT (TOP)	4 - 3/4 (A325M)
BOLT (BOT.)	4 - 3/4 (A325M)
STIF. (TOP)	-
STIF. (BOT.)	-