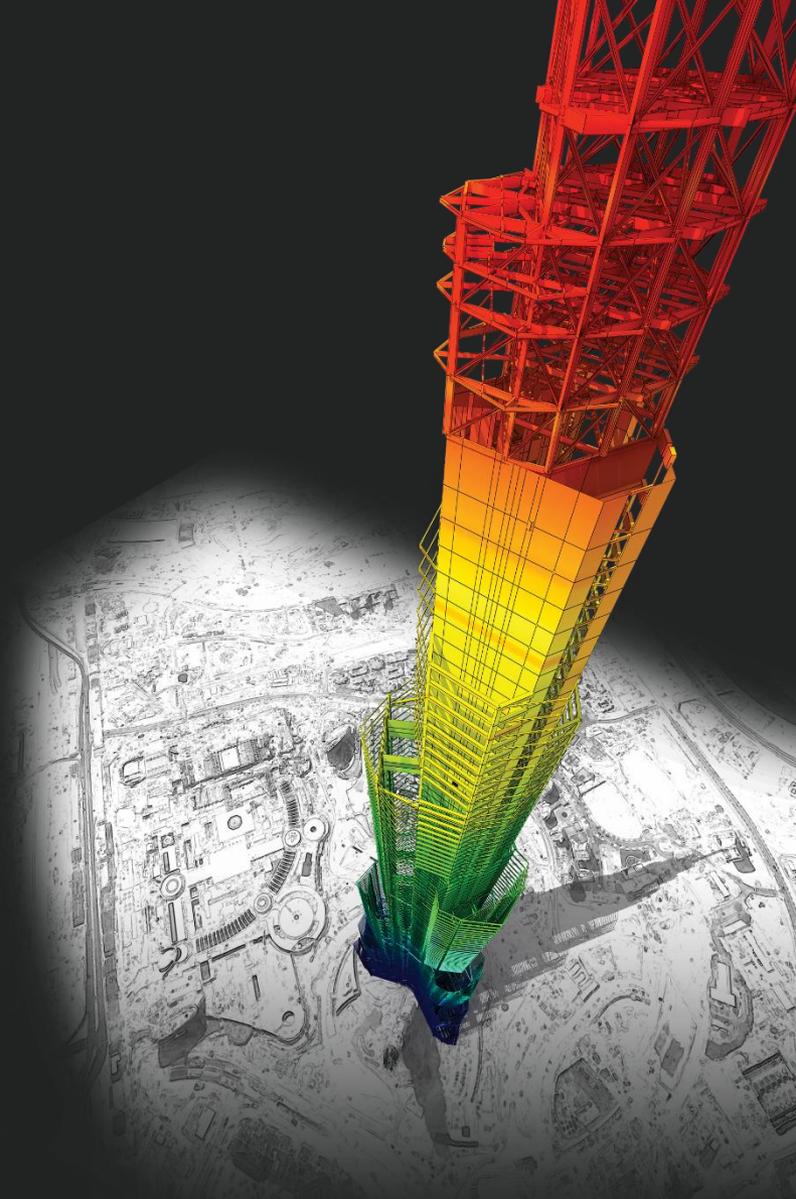


Release Note

Release Date : December. 2020

Product Ver. : midas Gen 2021 (v1.1) and Design+2021(v1.1)



DESIGN OF General Structures

Integrated Design System for Building and General Structures

midas **Gen**

Enhancements

• *midas Gen*

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• *midas Design+*

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1. 調整非圍束區之混凝土設計剪力強度判定

Reduction factor (R) for Vc is not used in mid-span of member.
 - 'Vc=0' is considered only both ends of the member.

Concrete Design Code

Design Code : ACI318M-14

Check Beam Deflection
 Apply Special Provisions for Seismic Design

Seismic Design Parameter

Select Frame Type

Special Moment Frames
 Intermediate Moment Frames
 Ordinary Moment Frames

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

$R \cdot V_c(a1 \cdot \sum(M_{pr})/L > \max(Ve1, Ve2)/2)$, R = 0

Method

MAX(Ve1, Ve2) MIN(Ve1, Ve2) Ve1 Ve2

Ve1, Vg + a1 * SUM(Mpr)/L, a1 = 1
 Ve2, Vg + a2 * Veq (Beam), a2 = 1
 Ve2, Vg + a2 * Veq (Column), a2 = 1

Gen 2020

3. Design for Shear

[END]	y : 8 (J)	z : 8 (J)
Applied Shear Force (Vu)	40.5826 tonf	20.4299 tonf
Design Shear Strength ($\phi V_c + \phi V_s$)	0.00000 + 62.4078 = 62.4078 tonf	0.00000 + 62.4078 = 62.4078 tonf
Shear Ratio	0.650 < 1.000 O.K	0.327 < 1.000 O.K
As-H_req	0.00330 m ² /m, 4-D13 @100	0.00166 m ² /m, 4-D13 @100

[MIDDLE]	y : 8 (1/2)	z : 8 (1/2)
Applied Shear Force (Vu)	40.5826 tonf	20.4299 tonf
Design Shear Strength ($\phi V_c + \phi V_s$)	0.00000 + 41.6052 = 41.6052 tonf	0.00000 + 41.6052 = 41.6052 tonf
Shear Ratio	0.976 < 1.000 O.K	0.491 < 1.000 O.K
As-H_req	0.00330 m ² /m, 4-D13 @150	0.00166 m ² /m, 4-D13 @150

Gen 2021 v1.1 (New version)

3. Design for Shear

[END]	y : 8 (J)	z : 8 (J)
Applied Shear Force (Vu)	40.5826 tonf	20.4299 tonf
Design Shear Strength ($\phi V_c + \phi V_s$)	0.00000 + 62.4078 = 62.4078 tonf	0.00000 + 62.4078 = 62.4078 tonf
Shear Ratio	0.650 < 1.000 O.K	0.327 < 1.000 O.K
As-H_req	0.00330 m ² /m, 4-D13 @100	0.00166 m ² /m, 4-D13 @100

[MIDDLE]	y : 10 (1/2)	z : 3 (1/2)
Applied Shear Force (Vu)	50.2696 tonf	36.5179 tonf
Design Shear Strength ($\phi V_c + \phi V_s$)	33.0322 + 41.6052 = 74.6374 tonf	32.0340 + 41.6052 = 73.6392 tonf
Shear Ratio	0.674 < 1.000 O.K	0.496 < 1.000 O.K
As-H_req	0.00140 m ² /m, 4-D13 @150	0.00083 m ² /m, 4-D13 @150

→ Vc in Design = R * Vc

✓ Note

Seismic provision in ACI 318M-19
 18.6.4 Transverse reinforcement

18.6.4.1 Hoops shall be provided in the following regions of a beam:

(a) Over a length equal to twice the beam depth measured from the face of the supporting column toward midspan, at both ends of the beam

(b) Over lengths equal to twice the beam depth on both sides of a section where flexural yielding is likely to occur as a result of lateral displacements beyond the elastic range of behavior.

18.6.5 Shear strength

18.6.5.1 Design forces—The design shear force V_e shall be calculated from consideration of the forces on the portion of the beam between faces of the joints. It shall be assumed that moments of opposite sign corresponding to probable flexural strength, M_{pr} , act at the joint faces and that the beam is loaded with the factored tributary gravity load along its span.

18.6.5.2 Transverse reinforcement—Transverse reinforcement over the lengths identified in 18.6.4.1 shall be designed to resist shear assuming $V_c = 0$ when both (a) and (b) occur:

- (a) The earthquake-induced shear force calculated in accordance with 18.6.5.1 represents at least one-half of the maximum required shear strength within those lengths.
- (b) The factored axial compressive force P_u including earthquake effects is less than $A_g f_c' / 20$.

2. 優化Beam End Offsets設定方式

Add element type (Asymmetric)

- Set a beam end offset by each direction.

Gen 2020

Type: Element

RGDi: 45 cm

RGDj: 60 cm

Gen 2021 v1.1 (New version)

Type: Element(ASYMI)

RGDyi: 45 cm

RGDzi: 60 cm

RGDyj: 45 cm

RGDzj: 60 cm

The screenshot shows the 'Boundary' tab in the software interface. The 'Beam Offsets' dialog is open, displaying a 3D coordinate system with nodes N1 and N2. The dialog includes a table of beam offset values for element 1.

Element	RGDxi (cm)	RGDyi(Mzi) (cm)	RGDzi(Myi) (cm)	RGDxj (cm)	RGDyj(Mzj) (cm)	RGDzj(Myj) (cm)	Group
1	0.00	45.00	60.00	0.00	45.00	60.00	Default

Below the table, the following values are listed:

RGDyi(Mzi)=45.000, RGDzi(Myi)=60.000
 RGDyj(Mzj)=45.000, RGDzj(Myj)=60.000

3. 新增靜土壓力設定功能

Add static earth pressure of function type.

- When editing the table values, earth pressure shape in the model is modified automatically.

Load > Static Loads > Lateral > Earth Pressure > Static Earth Pressure

Static Earth Pressure

Load Case Name : HsX(+)

Option
 Add/Replace Delete

Direction : X-Y
 Angle : 0 deg
 Inner Pt. : 0.0, 0.0 m
 Scale Factor : 1

Static Earth Pressure Type
 Earth Pressure at Rest
 Active Earth Pressure

Static Earth Pressure Parameters
 Surcharge Load : 0 kN/m²
 Water Level : 0 m

Parameters of Soil Properties :
 Soil-1

Selection : Group Element
 Loading Area Group Name : Default
 Element Type
 Frame Planar
 Elements Defining Loading Area :

Static Earth Pressure Profile...

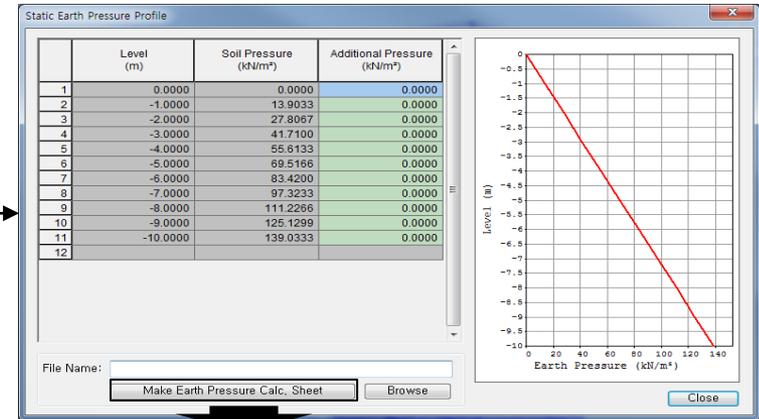
Set Load Case & Direction

Set Earth pressure type, Surcharge load, and water level

Select the function for Soil Properties

Set Loading Area

Check a loading curve by level



Calculating Sheet

Surcharge Load : s = 0.000 kN/m²
 Ground Level : GL = 0.000 m
 Water Level : WL = 0.000 m

Coefficient of Earth Pressure at Rest : KO = 1-sin(PHI)
 [Jaky's formula]
 Soil Stress Friction Angle : PHI = (12+N)*0.5+15 ([deg])
 [Dunham]

Soil Density : GAMMA = Density of Soil Property
 Water Density : GAMMA.w = 9.807 kN/m³
 Scale Factor : SF = 1.000

Earth Pressure at Level z : pz = KO*s + KO*(GAMMA*z-GAMMA.w+(WL-z)) + GAMMA.w*(WL-z)

(). STATIC EARTH PRESSURE PROFILE

LEVEL (m)	PHI ([deg])	KO	GAMMA (kN/m ³)	GAMMA.w (kN/m ³)	p(z) (kN/m ²)	ADD. p(z) (kN/m ²)
0.000	30.000	0.500	18.000	9.807	0.000	0.000
-1.000	30.000	0.500	18.000	9.807	13.903	0.000
-2.000	30.000	0.500	18.000	9.807	27.807	0.000
-3.000	30.000	0.500	18.000	9.807	41.710	0.000
-4.000	30.000	0.500	18.000	9.807	55.613	0.000
-5.000	30.000	0.500	18.000	9.807	69.517	0.000
-6.000	30.000	0.500	18.000	9.807	83.420	0.000
-7.000	30.000	0.500	18.000	9.807	97.323	0.000
-8.000	30.000	0.500	18.000	9.807	111.227	0.000
-9.000	30.000	0.500	18.000	9.807	125.130	0.000
-10.000	30.000	0.500	18.000	9.807	139.033	0.000

4. 優化自定義風壓函數功能

Input of wind pressure by table editing

- Wind Pressure generated by equation can be edited in table and updated to the model.

Gen 2020

Add/Modify/Show Wind Pressure Function

Function Name : Test

Coordinate System : Rectangular

Equation : $Z+0.1$

Description : (Example : $0.7+Z \cdot \cos(TH)+R$)

Table Show Option

Fixed Axis : X, Y Unit : m, [deg]

Z Start : 0 End : 6.01 Increment : 0.601

Fix Coordinates X 0 Y 0

Calculate

	X (m)	Y (m)	Z (m)	Wind Pressure (kN/m ²)
1	0	0	0	0
2	0	0	0.601	0.0601
3	0	0	1.202	0.1202
4	0	0	1.803	0.1803
5	0	0	2.404	0.2404
6	0	0	3.005	0.3005
7	0	0	3.606	0.3606
8	0	0	4.207	0.4207
9	0	0	4.808	0.4808
10	0	0	5.409	0.5409
11	0	0	6.01	0.601

Inactive

OK Cancel



Gen 2021 v1.1 (New version)

Add/Modify/Show Wind Pressure Function

Function Name : Test

Coordinate System : Rectangular

Equation : $Z+0.1$

Description : (Example : $0.7+Z \cdot \cos(TH)+R$)

Table Show Option

Fixed Axis : X, Y Unit : m, [deg]

Z Start : 0 End : 6.01 Increment : 0.601

Fix Coordinates X 0 Y 0

Calculate

	X (m)	Y (m)	Z (m)	Wind Pressure (kN/m ²)
1	0	0	0	0
2	0	0	0.601	0.1
3	0	0	1.202	0.3
4	0	0	1.803	0.6
5	0	0	2.404	0.4
6	0	0	3.005	0.3005
7	0	0	3.606	0.3606
8	0	0	4.207	0.4207
9	0	0	4.808	0.4808
10	0	0	5.409	0.5409
11	0	0	6.01	0.601

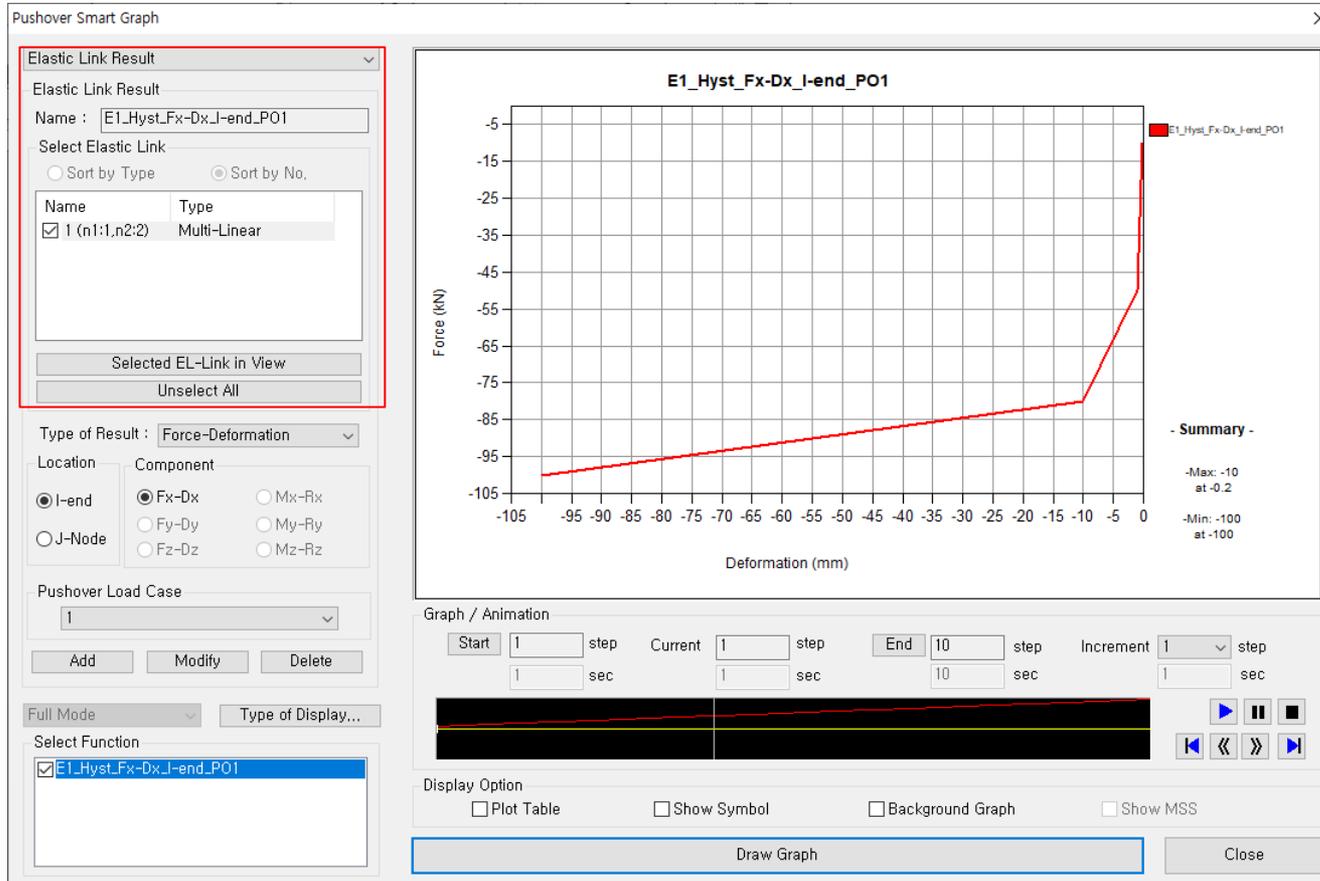
OK Cancel

When editing the table values, wind pressure is modified automatically.

5. 新增Elastic Link之側推分析結果圖表

Add graphic output of the elastic link (multi-linear type) in pushover analysis

Pushover > > Pushover Results > Pushover Smart Graph > **Elastic Link Graph**



Select Elastic Link

All elastic links assigned to the model are displayed in the list.
For same type, multiple selections are possible.

Type of Result

1. **[Force-Deformation]** : Force/Deform.
2. **[Force]** : Force / Time
3. **[Deformation]** : Deformation/Time

Location/Component

1. **Location** : Output position of elements
2. **Component**: Stress-Deform/ Moment-Rotation angle In element axis.

Graph/Animation

The animation function checks the results in a specific section.
It can be checked in conjunction with the table results

Display Option

After checking each item, click the [Graph] button to apply it to the graph.

6. 配置預力梁鋼腱可考慮Debonded Length

- Debonded length of pretensioned beam can be directly defined when creating strands from the 'Tendon Profile' dialog box.
- Define the actual whole length of strand including debonded parts at both ends and then enter the lengths for debonded parts.

Load > Temp./Prestress > Prestress Loads > **Tendon Profile**

Add/Modify Tendon Profile

Tendon Name : Group : Default

Tendon Property :

Assigned Elements :

Input Type: 2-D 3-D

Curve Type: Spline Round

Straight Length of Tendon: Begin: m End: m

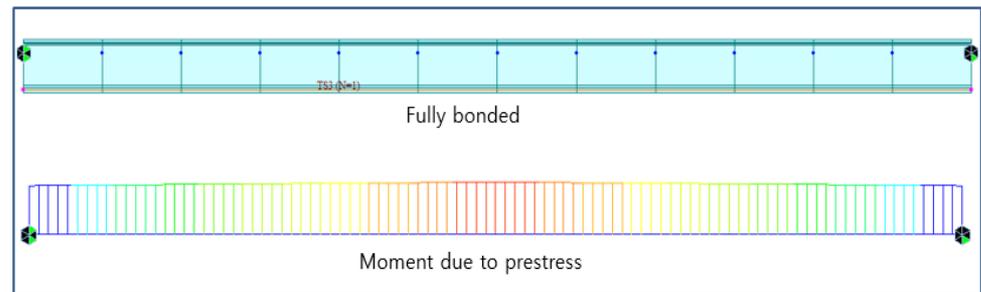
Transfer_Length: User defined Length Begin: m End: m

Debonded Length: Begin: 0 End: 0

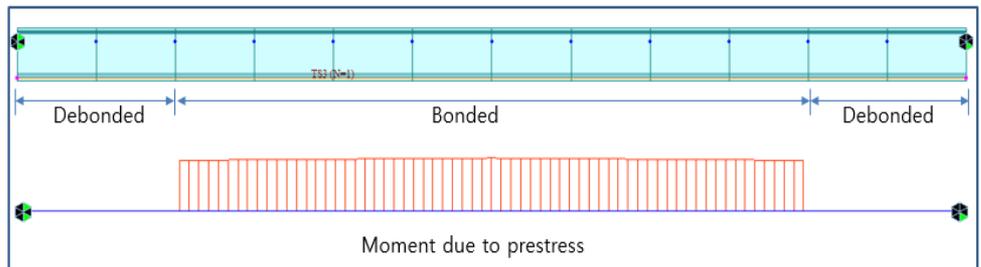
No. of Tendons : 1

Profile Reference Axis:

x(m)	y(m)
1	



When debonded length has 0, Tendon Primary Moment Diagram

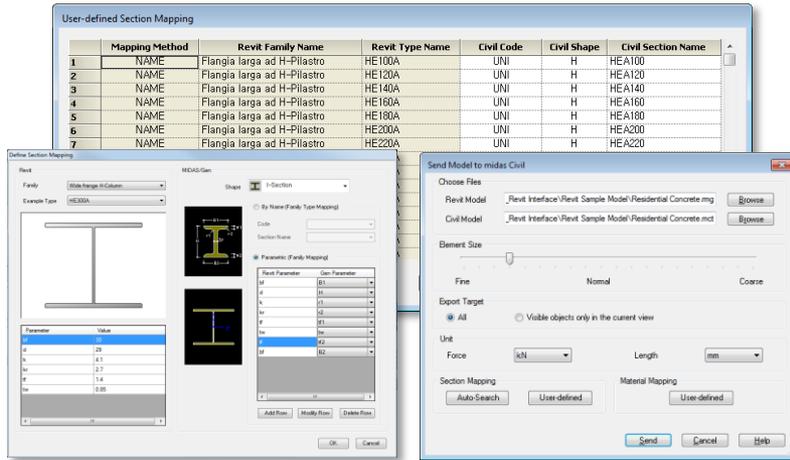


When debonded length has Non-Zero, Tendon Primary Moment Diagram

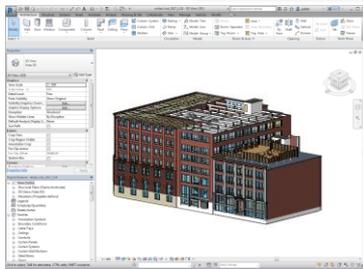
7. Gen-Revit 2021轉換介面

Gen-Revit Link

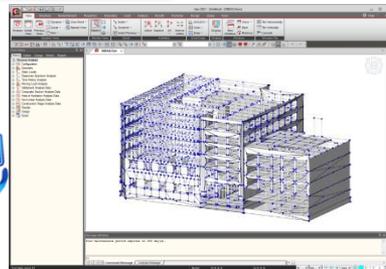
- **File > Import > midas Gen MGT File**
- **File > Export > midas Gen MGT File**



Send Model to midas Gen



Revit 2021

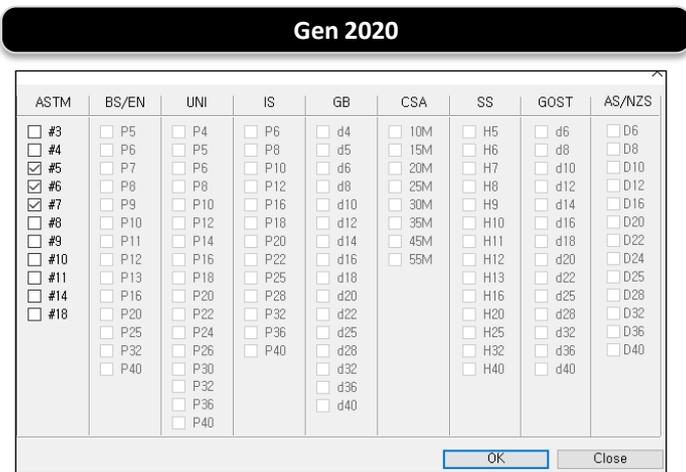


Gen 2021 v1.1 (New version)

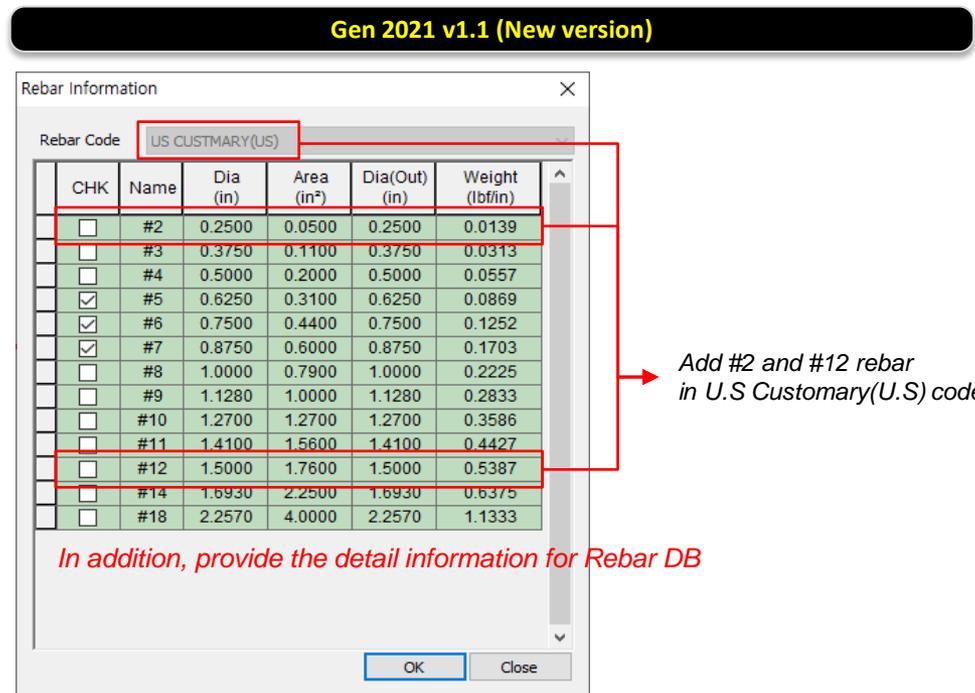
	Functions	Revit <> Gen
Linear Elements	Structural Column	<>
	Beam	<>
	Brace	<>
	Curved Beam	>
	Beam System	>
	Truss	>
Planar Elements	Foundation Slab	<>
	Structural Floor	<>
	Structural Wall	<>
	Wall Opening & Window	>
	Door	>
	Vertical or Shaft Opening	>
	Offset	>
	Rigid Link	>
Boundary	Cross-Section Rotation	>
	End Release	>
	Isolated Foundation Support	>
	Point Boundary Condition	>
	Line Boundary Condition	>
	Wall Foundation	>
	Area Boundary Condition	>
	Load Nature	>
	Load Case	>
	Load Combination	>
Load	Hosted Point Load	>
	Hosted Line Load	>
	Hosted Area Load	>
	Material	<>
Other Parameters	Level	>

8. 新增美規鋼筋規格

- Provide rebar information for diameter, area, and weight in dialog box
- Add #2 and #12 rebar in U.S Customary (U.S Imperial) DB



Provide only the feature to select rebar size.



Add #2 and #12 rebar in U.S Customary(U.S) code

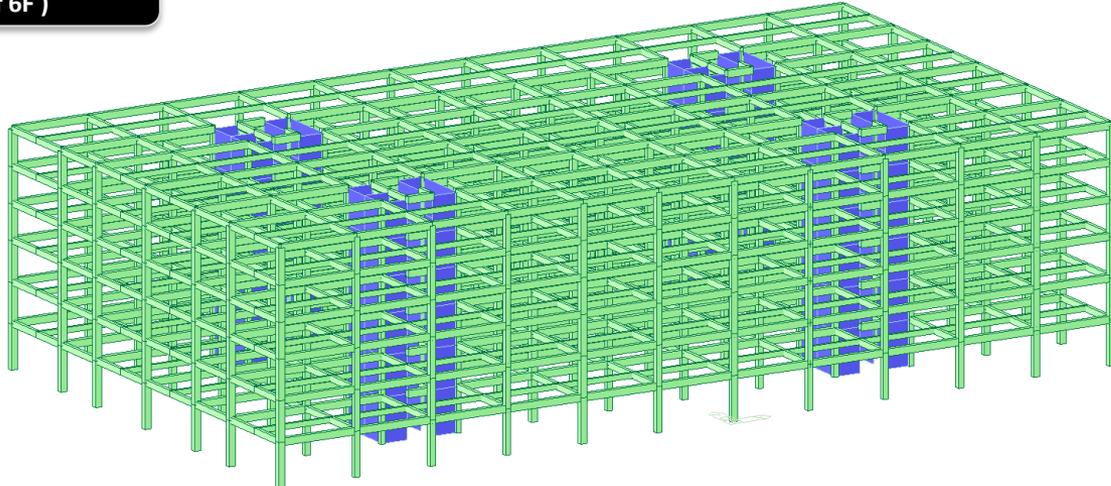
In addition, provide the detail information for Rebar DB

9. 優化Non-dissipative設計程序

- Reduction of design time by optimizing m-phi calculation and improving the output algorithm

Example Model (RC structure of 6F)

- ✓ Beam/Column : 1,974 Elements
- ✓ Wall : 216 Elements
- ✓ Load Combination : 100



[Total ND Design Time : Gen 2020 vs Gen 2021(New Version)]



60% reduction in design time

10. 優化NTC 2018規範之Non-dissipative設計

Non-dissipative in flexural & Shear design – Design Table

- Output of separated results for ULS (except seismic action) and ELS with seismic modified by q for non-dissipative elements

Ultimate Strength Check (LC_A) in graphic design

* LC_A : Load combination to check ULS(Ultimate Limit State) except seismic loads

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

Sorted by Member Results Strength Serviceability Elastic

SECT MEMB

MEMB	SECT	SE L	Section		fck	fyk	CHK	LC B	V-Rebar	N_Rdmax	Uc	N_Ed	M_Edy	M_Edz	V_Rdc.end	V_Rds.end	V_Rdc.mid	V_Rds.mid	LC B	V_Ed.end	Rat-V.end	Ash.req
			Bc	Hc							Height	fyw	Rat-Uc	Rat-N	Rat-My	Rat-Mz	Rat-Vc.end	Rat-Vs.end		Rat-Vc.mid	Rat-Vs.mid	V_Ed.mid
373		<input checked="" type="checkbox"/>	P30x60		25000.0	450000	MV	19	14-5-P16	3611.27	0.000	114.887	267.411	67.9358	115.741	131.478	116.749	131.478	35	135.439	1.030	0.00000
1			0.300	0.600	3.2000	450000					0.000	0.998	1.083	1.090	1.170	1.030	1.160	1.030	35	135.439	1.030	0.000

Elastic Strength Check (LC_E) in graphic design

* LC_E : Load combination to check ELS(Elastic Limit State)

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

Sorted by Member Results Strength Serviceability Elastic

SECT MEMB

MEMB	SECT	SE L	Section		fck	fyk	CHK	Seis. Class	LC B	M_Edy	M_Edz	Rat-My	Rat-Co	V_Rdc.end	V_Rds.end	V_Rdc.mid	V_Rds.mid	LC B	V_Ed.end	Rat-V.end	Ash.req
			Bc	Hc						Height	fyw	M'.ydy	M'.ydz	Rat-Mz	m	Rat-Vc.end	Rat-Vs.end		Rat-Vc.mid	Rat-Vs.mid	V_Ed.mid
373		<input checked="" type="checkbox"/>	P30x60		25000.0	450000	OK	N.D.	51	214.132	54.2597	0.849		106.276	131.478	105.268	131.478	43	105.100	0.989	0.00000
1			0.300	0.600	3.2000	450000				252.227	107.695	0.504	0.987	0.989	0.799	0.998	0.799	43	105.100	0.998	0.000

Serviceability Check (LC_S) in graphic design

* LC_S : Load combination to check SLS(Serviceability Limit State)

Sorted by Member Results Strength Serviceability Elastic

SECT MEMB

MEMB	SECT	SE L	Section		fck	fyk	CHK	Stress Control														
			Bc	Hc				Height	fyw	LC	sig-ct	sig-cta	LC	sig-cc	sig-cca	LC	sig-s	sig-sa				
373		<input checked="" type="checkbox"/>	P30x60		25000.0	450000	OK															
1			0.300	0.600	3.2000	450000				0.00000	2564.96	70	1134.84	15000.0	-	0.00000	0.00000					

10. 優化NTC 2018規範之Non-dissipative設計

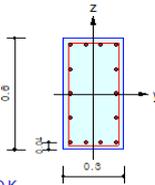
Non-dissipative in flexural & Shear design : Graphic report

- Output a design results for ULS, ELS and SLS separately in design reports.

Design result for ULS(Ultimate Limit State)

1. Design Condition

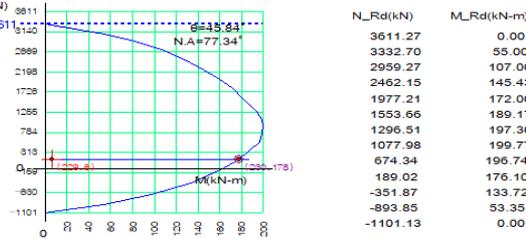
Design Code : Eurocode2:04 & NTC2018 UNIT SYSTEM : kN, m
 Member Number : 373
 Material Data : fck = 25000, fyk = 450000, fyw = 450000 KPa
 Column Height : 3.2 m
 Section Property : P30x60 (No : 1)
 Rebar Pattern : 14 - 5 - P16 Ast = 0.002814 m² (pst = 0.016)



2. Axial and Moments Capacity

Load Combination : 1 (I)
 Concentric Max. Axial Load N_Rdmax = 3611.27 kN
 Axial Load Ratio N_{Ed} / N_{Rd} = 229.268 / 229.761 = 0.998 < 1.000 O K
 Moment Ratio M_{Ed} / M_{Rd} = 6.48468 / 178.003 = 0.036 < 1.000 O K
 M_{Edy} / M_{Rdy} = 4.58536 / 124.006 = 0.037 < 1.000 O K
 M_{Edz} / M_{Rdz} = 4.58536 / 127.702 = 0.036 < 1.000 O K

M-N Interaction Diagram



3. Shear Capacity

[END] y : 1 (J) z : 1 (J)
 Applied Shear Force (V_{Ed}) 1.81597 kN 0.31087 kN
 V_{Ed} / V_{Rdc} 1.81597 / 126.642 = 0.014 0.31087 / 118.248 = 0.003
 V_{Ed} / V_{Rds} 1.81597 / 61.0435 = 0.030 0.31087 / 131.478 = 0.002
 V_{Ed} / V_{Rdmax} 1.81597 / 497.250 = 0.004 0.31087 / 535.500 = 0.001
 Shear Ratio 0.014 < 1.000 O K 0.003 < 1.000 O K
 Asw-H_{use} 0.00067 m²/m, 2-P8 @150 0.00067 m²/m, 2-P8 @150

[MIDDLE] y : 1 (1/2) z : 1 (1/2)
 Applied Shear Force (V_{Ed}) 1.81597 kN 0.31087 kN
 V_{Ed} / V_{Rdc} 1.81597 / 127.858 = 0.014 0.31087 / 119.558 = 0.003
 V_{Ed} / V_{Rds} 1.81597 / 61.0435 = 0.030 0.31087 / 131.478 = 0.002
 V_{Ed} / V_{Rdmax} 1.81597 / 497.250 = 0.004 0.31087 / 535.500 = 0.001
 Shear Ratio 0.014 < 1.000 O K 0.003 < 1.000 O K
 Asw-H_{use} 0.00067 m²/m, 2-P8 @150 0.00067 m²/m, 2-P8 @150

Design result for ELS(Elastic Limit State)

4. Elastic Bending Moment Capacity

	y : 2 (I)	z : 2 (I)
Moment (MEd)	81.7143 kN-m	21.7915 kN-m
Elastic Strength (M _y d')	254.437 kN-m	118.530 kN-m
Check Ratio	0.321 < 1.000 O K	0.184 < 1.000 O K
Check Combined Ratio (sqrt((M _{Edy} /M _y d') ² + (M _{Edz} /M _y dz) ²))		0.370 < 1.000 O K

5. Elastic Shear Capacity

[END] y : 2 (J) z : 2 (J)
 Applied Shear Force (V_{Ed}) 12.1481 kN 40.1526 kN
 V_{Ed} / V_{Rdc} 12.1481 / 120.093 = 0.101 40.1526 / 111.195 = 0.361
 V_{Ed} / V_{Rds} 12.1481 / 61.0435 = 0.199 40.1526 / 131.478 = 0.305
 V_{Ed} / V_{Rdmax} 12.1481 / 497.250 = 0.024 40.1526 / 535.500 = 0.075
 Shear Ratio 0.101 < 1.000 O K 0.361 < 1.000 O K
 Asw-H_{use} 0.00067 m²/m, 2-P8 @150 0.00067 m²/m, 2-P8 @150

[MIDDLE] y : 2 (1/2) z : 2 (1/2)
 Applied Shear Force (V_{Ed}) 12.1481 kN 40.1526 kN
 V_{Ed} / V_{Rdc} 12.1481 / 121.029 = 0.100 40.1526 / 112.203 = 0.358
 V_{Ed} / V_{Rds} 12.1481 / 61.0435 = 0.199 40.1526 / 131.478 = 0.305
 V_{Ed} / V_{Rdmax} 12.1481 / 497.250 = 0.024 40.1526 / 535.500 = 0.075
 Shear Ratio 0.100 < 1.000 O K 0.358 < 1.000 O K
 Asw-H_{use} 0.00067 m²/m, 2-P8 @150 0.00067 m²/m, 2-P8 @150

Design result for SLS(Serviceability Limit State)

6. Serviceability : Stress Limit Check

	Load Combination	Stress(s)	Allowable Stress(sa)	Stress Ratio(s/sa)
Concrete (Tensile)	-	0.00	2564.96	0.0000
Concrete (Compression)	3(C)	1095.15	15000.00	0.0730
	-	0.00	0.00	*****
Rebar	-	0.00	0.00	*****
Check Linear Creep	*****	*****	*****	*****

11. 優化NTC 2018規範之剪力設計

Design Shear force of primary elements according to NTC 2018

- When calculating a design shear force for primary elements, member force can be limited by a resistance demand for ELS load combinations.

7.2.2. CRITERI GENERALI DI PROGETTAZIONE DEI SISTEMI STRUTTURALI

PROGETTAZIONE IN CAPACITÀ E FATTORI DI SOVRARESISTENZA

La domanda di resistenza valutata con i criteri della progettazione in capacità può essere assunta non superiore alla domanda di resistenza valutata per il caso di comportamento strutturale non dissipativo.

Le strutture di fondazione e i relativi elementi strutturali devono essere progettati sulla base della domanda ad essi trasmessa dalla struttura sovrastante (si veda § 7.2.5) attribuendo loro comportamento strutturale non dissipativo, indipendentemente dal comportamento attribuito alla struttura su di essi gravante.

The resistance demand evaluated with the capacity design criteria can be assumed not higher than the resistance demand evaluated for the case of non dissipative structural behavior.

Design report (Detail)

[[[+]]] CALCULATE DATA OF SPECIAL PROVISIONS FOR SEISMIC DESIGN.

```
( ). Design parameters.
- . fyk = 450000.00000 KPa.
- . phi = 1.0

( ). Bending strength for design shear force.
- . MeI+ = 66.455 kN-m.({I, Clockwise})
- . MeJ- = 96.206 kN-m.({J, Clockwise})
- . MeI- = 96.206 kN-m.({I, Counter-Clockwise})
- . MeJ+ = 66.455 kN-m.({J, Counter-Clockwise})

( ). Calculate design shear force according to special provisions for seismic design.
- . Alpha1 = 1.0000
- . Span = 4.3000 m.
- . VzG = -10.004 kN. (by Gravity-Direction Load).
- . Clockwise
  VeI1_CW= VzG + Alpha1*(MeI+ + MeJ-)/Span = 27.824 kN.
  VeI2_CW= VzG - Alpha1*(MeI+ + MeJ-)/Span = -47.832 kN.
  VeI_CW = MAX[ |VeI1_CW|, |VeI2_CW| ] = 47.832 kN.
- . Counter-Clockwise
  VeI1_CCW= VzG + Alpha1*(MeI- + MeJ+)/Span = 27.824 kN.
  VeI2_CCW= VzG - Alpha1*(MeI- + MeJ+)/Span = -47.832 kN.
  VeI_CCW = MAX[ |VeI1_CCW|, |VeI2_CCW| ] = 47.832 kN.
- . VeI(M) = MAX[ |VeI_CW|, |VeI_CCW| ] = 47.832 kN. (by Moment Strength).
- . VeI(E) = 17.186 kN. (by Elastic Load Combination).
- . VeI = MIN[ VeI(M), VeI(E) ] = 17.186 kN.
- . VzOrg = -18.902 kN. (by Strength Load Combination).
- . V_Ed = MAX[ |VzOrg|, VeI ] = 18.902 kN.
```

VzOrig = Design shear force by ULS load combination

Ve1(M) = Design shear force by flexural strength of member.

Ve1(E) = Design shear force by ELS load combination.

V_Ed = Max [VzOrig, Min[Ve1(M), Ve1(E)]]

11. 優化NTC 2018規範之剪力設計

Design Shear force of primary elements according to NTC 2018

- When calculating a design shear force for primary elements, member force can be limited by a resistance demand for ELS load combinations.



Design Setting

Seismic Design Parameter

Beam-Column Joint Design Gamma_{rd} 1.1

Confined Joint Not Confined Joint

Strong Column Weak Beam

SUM(M_{Rc}) > 1.3 * SUM(M_{Rb})

Consider strong column-weak beam on last floor

Select Ductility Class

CD'A' (High Ductility) Non-Dissipative (Low Ductility)

CD'B' (Medium Ductility)

Design Method of Non-Dissipative Member

M-C curve Approximate Method : 0.8 * M_{Rd}

Non-Dissipative Member: Non diss 1

Secondary Seismic Member: Secondary

Shear Force for Design

Gamma_{rd}

Beam 1 Column 1.1 Wall 1.2

Consider for Shear Wall alpha_s max

Consider V_{ed} of elastic strength Load combination for primary members

Friction Coefficient for Wall Sliding : 0.6

Option is added.

```

=====
[[[+]]] CALCULATE DATA OF SPECIAL PROVISIONS FOR SEISMIC DESIGN.
=====
( ). Design parameters.
-. fyk = 450000.00000 KPa.
-. phi = 1.0

( ). Bending strength for design shear force.
-. MeI+ = 66.455 kN-m.({I, Clockwise})
-. MeJ- = 96.206 kN-m.({J, Clockwise})
-. MeI- = 96.206 kN-m.({I, Counter-Clockwise})
-. MeJ+ = 66.455 kN-m.({J, Counter-Clockwise})

( ). Calculate design shear force according to special provisions for seismic design.
-. Alpha1 = 1.0000
-. Span = 4.3000 m.
-. VzG = -10.004 kN. (by Gravity-Direction Load).
-. Clockwise
VeI1_CW = VzG + Alpha1*(MeI+ + MeJ-)/Span = 27.824 kN.
VeI2_CW = VzG - Alpha1*(MeI+ + MeJ-)/Span = -47.832 kN.
VeI_CW = MAX[ |VeI1_CW|, |VeI2_CW| ] = 47.832 kN.
-. Counter-Clockwise
VeI1_CCW = VzG + Alpha1*(MeI- + MeJ+)/Span = 27.824 kN.
VeI2_CCW = VzG - Alpha1*(MeI- + MeJ+)/Span = -47.832 kN.
VeI_CCW = MAX[ |VeI1_CCW|, |VeI2_CCW| ] = 47.832 kN.

-. VeI = MAX[ |VeI_CW|, |VeI_CCW| ] = 47.832 kN.
-. VzOrg = -18.902 kN. (by Strength Load Combination).
-. V_Ed = MAX[ |VzOrg|, VeI ] = 47.832 kN.
    
```

--> $V_{Ed} = \text{Max} [VzOrig, Ve1(M)]$

VzG = Design shear force by load combination with only gravity loads.
 $Ve1(M)$ = Design shear force by flexural strength of member.
 $Ve1(E)$ = Design shear force by ELS load combination.

```

=====
[[[+]]] CALCULATE DATA OF SPECIAL PROVISIONS FOR SEISMIC DESIGN.
=====
( ). Design parameters.
-. fyk = 450000.00000 KPa.
-. phi = 1.0

( ). Bending strength for design shear force.
-. MeI+ = 66.455 kN-m.({I, Clockwise})
-. MeJ- = 96.206 kN-m.({J, Clockwise})
-. MeI- = 96.206 kN-m.({I, Counter-Clockwise})
-. MeJ+ = 66.455 kN-m.({J, Counter-Clockwise})

( ). Calculate design shear force according to special provisions for seismic design.
-. Alpha1 = 1.0000
-. Span = 4.3000 m.
-. VzG = -10.004 kN. (by Gravity-Direction Load).
-. Clockwise
VeI1_CW = VzG + Alpha1*(MeI+ + MeJ-)/Span = 27.824 kN.
VeI2_CW = VzG - Alpha1*(MeI+ + MeJ-)/Span = -47.832 kN.
VeI_CW = MAX[ |VeI1_CW|, |VeI2_CW| ] = 47.832 kN.
-. Counter-Clockwise
VeI1_CCW = VzG + Alpha1*(MeI- + MeJ+)/Span = 27.824 kN.
VeI2_CCW = VzG - Alpha1*(MeI- + MeJ+)/Span = -47.832 kN.
VeI_CCW = MAX[ |VeI1_CCW|, |VeI2_CCW| ] = 47.832 kN.

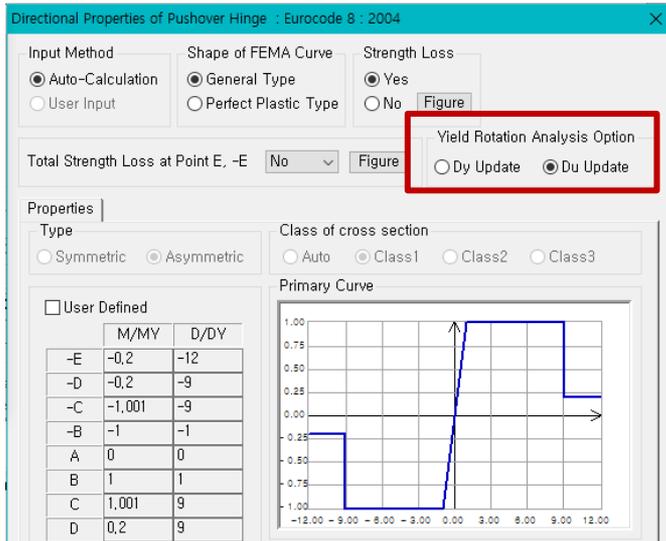
-. VeI(M) = MAX[ |VeI_CW|, |VeI_CCW| ] = 47.832 kN. (by Moment Strength).
-. VeI(E) = 17.186 kN. (by Elastic Load Combination).
-. VeI = MIN[ VeI(M), VeI(E) ] = 17.186 kN.
-. VzOrg = -18.902 kN. (by Strength Load Combination).
-. V_Ed = MAX[ |VzOrg|, VeI ] = 18.902 kN.
    
```

--> $V_{Ed} = \text{Max} [VzOrig, \text{Min}[Ve1(M), Ve1(E)]]$

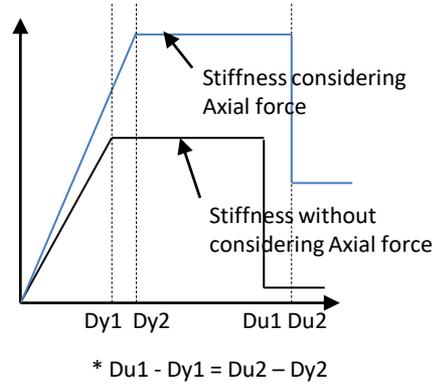
12. 優化EC8: 2004側推塑鉸設定參數

New hinge curve model as per Eurocode 8 :2004

- Add a hinge curve with "Du update" type

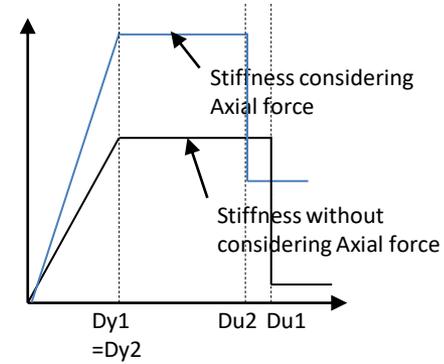


Dy Update (supporting in old version)



Stiffness and Dy are changed by axial force Under PMM or PM type.

Du Update (Add to Gen2021 newly)



Stiffness and Du are changed by axial force Under PMM or PM type

✓ Note

[Calculation of Du (= θu, Ultimate Rotation)]

$$\theta_{um} = \frac{1}{\gamma_{el}} 0,016 \cdot (0,3^v) \left[\frac{\max(0,0; \omega)}{\max(0,0; \omega)} f_c \right]^{0,225} \left(\min \left(9; \frac{L_V}{h} \right) \right)^{0,35} \left(\frac{\sigma_{ps} f_{yw}}{f_c} \right) (1,25^{100 \rho_d})$$

[Calculation of Dy (= θy, Yielding Rotation)]

$\theta_y = k \times \epsilon_y \div \text{Depth of element}$
 * ϵ_y : Yielding strain at tensile face

hinge type	k			k	
	rectangular section			circular section	
	column	beam	wall	column	beam
none	2.1	1.7	2	2.25	-
PM ePMM	2.1	1.7	2	2.25	-

Displacement based Seismic Design of Structures- pg 165
 Priestley; Calvi; Kowalsky

13. 新增NSR-10規範之不規則結構折減因子

- Results > Results Tables > Story > Stiffness Irregularity Check, Capacity Irregularity Check, and Mass Irregularity Check

Output reduction factors (Phi_p) ←

Stiffness Irregularity Check

	Story	Story Stiffness				Upper Story Stiffness				Upper 3 Story Stiffness(Avg.)				Remark	Phi_p
		(kN)	(kN)	(kN)	(kN)	0.6K (Upper)	0.7K (Upper)	0.7K (3 Stories)	0.8K (3 Stories)	0.6K (Upper)	0.7K (Upper)	0.7K (3 Stories)	0.8K (3 Stories)		
Ey	12F	46.00	4.00	-0.0000	0.00	-	0.00	0.00	0.00	0.00	Regular	1.0			
Ey	11F	42.00	4.00	-0.0000	0.00	-	-199998.58	-	-116665.84	-133332.39	Extreme Irregular	0.8			
Ey	10F	38.00	4.00	-0.0000	0.00	-	-264205.86	-	-270785.92	-309469.62	Extreme Irregular	0.8			
Ey	9F	34.00	4.00	-0.0000	0.00	-	-339744.86	-	-312646.87	-357310.71	Extreme Irregular	0.8			
Ey	8F	30.00	4.00	-0.0000	0.00	-	-406558.07	-	-392975.56	-449114.93	Extreme Irregular	0.8			
Ey	7F	26.00	4.00	-0.0000	0.00	-	-776743.33	-	-592295.69	-676909.36	Extreme Irregular	0.8			
Ey	6F	22.00	4.00	0.0000	0.00	1830963.85	-4291921.05	-	-2129253.18	-2433432.20	Regular	1.0			
Ey	5F	18.00	4.00	0.0000	0.00	1511336.03	1098578.31	-	-1543922.36	-176442.70	Regular	1.0			
Ey	4F	14.00	4.00	0.0000	0.00	1154767.03	906801.62	-	-889210.44	-1016240.50	Regular	1.0			
Ey	3F	9.50	4.50	0.0000	0.00	3028926.91	692860.22	808336.92	1049315.61	1199217.84	Regular	1.0			
Ey	2F	5.00	4.50	-0.0000	0.00	-	1817356.15	2120248.84	1328840.33	1518674.66	Extreme Irregular	0.8			
Ey	1F	0.00	5.00	-0.0000	0.00	-	-688215.48	-	708555.90	809778.17	Extreme Irregular	0.8			

✓ Note

According to Table A.3-7 in NSR-10, Gen is reporting Reduction factor, ϕ in seismic design forces to account for Irregularity check

1. Stiffness Irregularity (Soft Story) Check

- Regular Structures $\phi_a = 1.0$
- Irregular Structures $\phi_a = 0.9$
- Extreme Irregular Structures $\phi_a = 0.8$

<p>Tipo 1aA — Piso flexible $\phi_a = 0.9$ $0.60 \text{ Rigidex } K_D \leq \text{Rigidex } K_C < 0.70 \text{ Rigidex } K_D$ $0.70 (K_D + K_C + K_B) / 3 \leq \text{Rigidex } K_C < 0.80 (K_D + K_C + K_B) / 3$</p>	
<p>Tipo 1bA — Piso flexible extremo $\phi_a = 0.8$ $\text{Rigidex } K_C < 0.60 \text{ Rigidex } K_D$ $\text{Rigidex } K_C < 0.70 (K_D + K_C + K_B) / 3$</p>	

Capacity Irregularity Check

	Story	Story Shear Strength Ratio				Remark1	Phi_p1	Angle2 (Deg)	Story Shear Strength2 (kN)	Upper Story Shear Strength2 (kN)	Story Shear Strength Ratio2	Remark2	Phi_p2
		(kN)	(kN)	(kN)	(kN)								
12F	46.00	4.00	0.00	8786.5611	0.0000	Regular	1.0	90.00	8552.2528	0.0000	Regular	1.0	
11F	42.00	4.00	0.00	8786.5611	1.0000	Regular	1.0	90.00	8552.2528	8552.2528	1.0000	Regular	1.0
10F	38.00	4.00	0.00	8786.5611	1.0000	Regular	1.0	90.00	8552.2528	8552.2528	1.0000	Regular	1.0
9F	34.00	4.00	0.00	10218.4451	8786.5611	1.1630	Regular	1.0	9984.1368	8552.2528	1.1674	Regular	1.0
8F	30.00	4.00	0.00	10218.4451	10218.4451	1.0000	Regular	1.0	9984.1368	9984.1368	1.0000	Regular	1.0
7F	26.00	4.00	0.00	10478.7878	10218.4451	1.0255	Regular	1.0	9024.4793	9984.1368	1.0261	Regular	1.0
6F	22.00	4.00	0.00	10478.7878	10478.7878	1.0000	Regular	1.0	10244.4793	10244.4793	1.0000	Regular	1.0
5F	18.00	4.00	0.00	12821.8706	10478.7878	1.2236	Regular	1.0	12587.5623	10244.4793	1.2287	Regular	1.0
4F	14.00	4.00	0.00	12821.8706	12821.8706	1.0000	Regular	1.0	12587.5623	12587.5623	1.0000	Regular	1.0
3F	9.50	4.50	0.00	15392.7533	12821.8706	1.2005	Regular	1.0	15158.4450	12587.5623	1.2042	Regular	1.0
2F	5.00	4.50	0.00	15392.7533	15392.7533	1.0000	Regular	1.0	15158.4450	15158.4450	1.0000	Regular	1.0
1F	0.00	5.00	0.00	17484.7772	15392.7533	1.1359	Regular	1.0	17841.7063	15158.4450	1.1770	Regular	1.0

2. Capacity Irregularity (Weak Story) check

- Regular Structures $\phi_a = 1.0$
- Irregular Structures $\phi_a = 0.9$
- Extreme Irregular Structures $\phi_a = 0.8$

<p>Tipo 5aA — Piso débil $\phi_a = 0.9$ $0.65 \text{ Resist. Piso C} \leq \text{Resist. Piso B} < 0.80 \text{ Resist. Piso C}$</p>	
<p>Tipo 5bA — Piso débil extremo $\phi_a = 0.8$ $\text{Resistencia Piso B} < 0.65 \text{ Resistencia Piso C}$</p>	

Mass Irregularity Check

	Story	Adjacent Story Mass				Story Mass Ratio	Remark	Phi_p	
		1.5M(Upper) (kN/g)	1.5M(Lower) (kN/g)	Story Mass Ratio	Remark				
Ex	Roof	50.00	0.00	333.843	0.000	612.228	0.545	Regular	1.0
Ex	12F	46.00	4.00	408.152	500.764	612.228	0.815	Regular	1.0
Ex	11F	42.00	4.00	408.152	612.228	624.901	0.667	Regular	1.0
Ex	10F	38.00	4.00	416.600	612.228	637.573	0.680	Regular	1.0
Ex	9F	34.00	4.00	425.049	624.901	639.878	0.680	Regular	1.0
Ex	8F	30.00	4.00	426.585	637.573	642.182	0.669	Regular	1.0
Ex	7F	26.00	4.00	428.121	639.878	662.919	0.669	Regular	1.0
Ex	6F	22.00	4.00	441.946	642.182	683.657	0.688	Regular	1.0
Ex	5F	18.00	4.00	455.771	662.919	727.651	0.688	Regular	1.0
Ex	4F	14.00	4.00	485.101	683.657	771.646	0.710	Regular	1.0
Ex	3F	9.50	4.50	514.431	727.651	802.248	0.707	Regular	1.0
Ex	2F	5.00	4.50	534.832	771.646	0.000	0.693	Regular	1.0
Ex	1F	0.00	5.00	147.850	802.248	0.000	0.184	Regular	1.0

3. Mass irregularity Check

- Regular Structures $\phi_a = 1.0$
- Irregular Structures $\phi_a = 1.0$

<p>Tipo 2A — Distribución masa — $\phi_a = 0.9$ $m_D > 1.50 m_E$ $m_D > 1.50 m_C$</p>	

14. Concrete design result for ELS load combination

Add Graphic result for ELS Load combination.

No	Name	Active	Type	Dr
1	cLCB1	Strength(Elastic)	Add	1.3D +
2	cLCB2	Inactive	Add	1.3D +
3	cLCB3	Strength/Stress	Add	1.3D +
4	cLCB4	Serviceability Special	Add	1.3D +
5	cLCB5	Vertical	Add	1.3D +
6	cLCB6	Strength(Elastic)	Add	1.3D +
7	cLCB7	Strength/Stress	Add	1.3D +

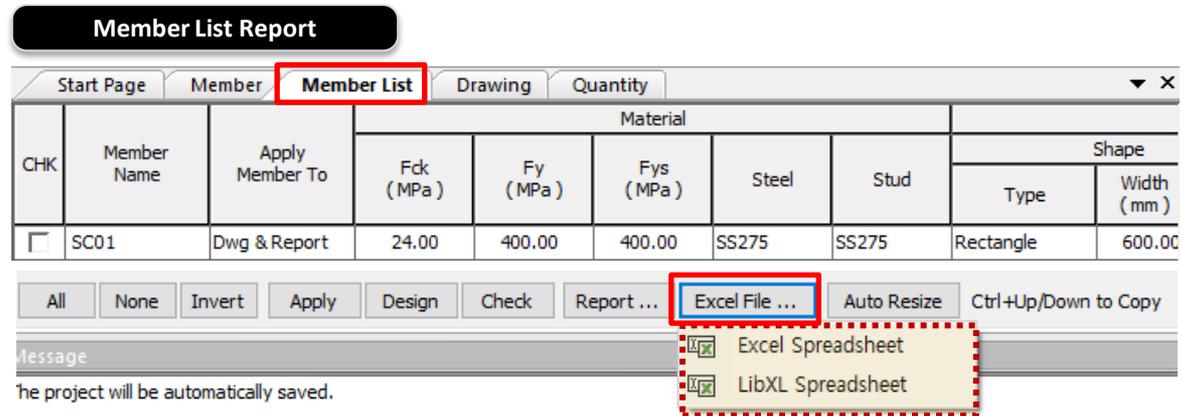
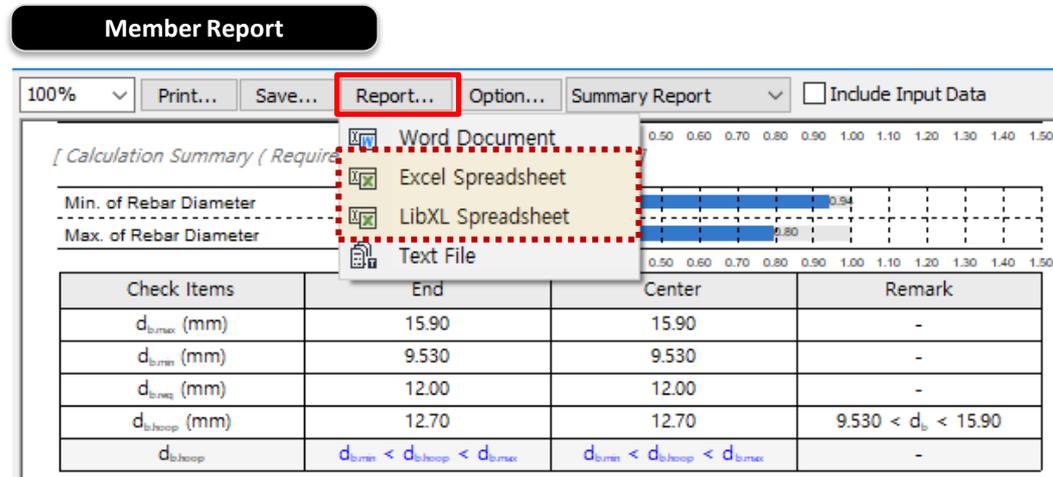
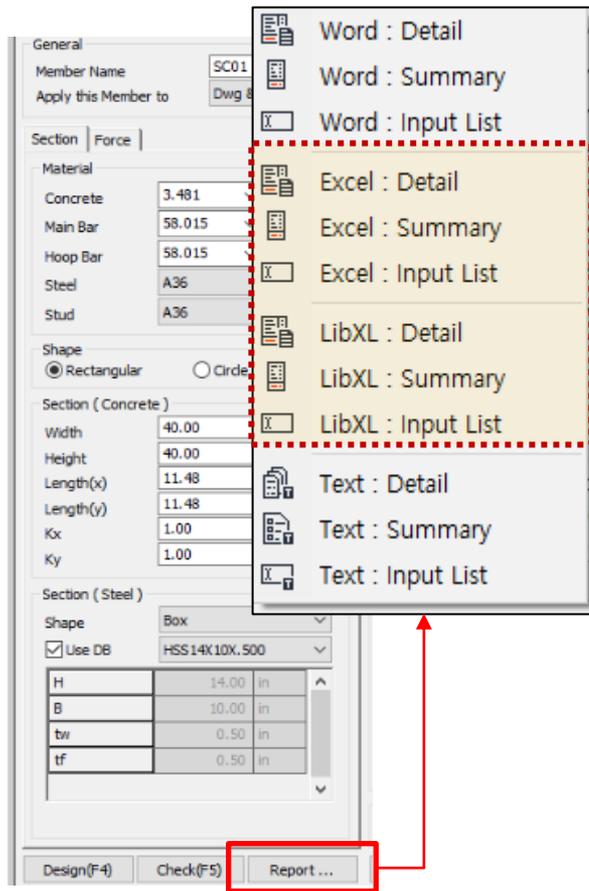
midas Gen
POST-PROCESSOR
CONCRETE DESIGN
COMBINED
1.77481e+000
1.62032e+000
1.46583e+000
1.31133e+000
1.15684e+000
1.00235e+000
8.47858e-001
6.93365e-001
5.38873e-001
3.84381e-001
2.29889e-001
7.53967e-002
ALL COMBINATION
MAX : 508
MIN : 1050
FILE: NON-DIS_C-
UNIT:
DATE: 10/12/2020
VIEW-DIRECTION
X1: 0.000
Y2: -0.759
Z3: 0.492

- ✓ ULS : Load combinations assigned to "Strength/Stress" type in Load combination dialog box
- ✓ ELS : Load combinations assigned to "Strength(Elastic)" type in Load combination dialog box

midas **Design+**

1. 支援匯出Excel格式計算報表

Generate a report of excel format.



1. 支援匯出Excel格式計算報表

Excel Report

- Provides high-quality output
- All functions of Excel can be used.

(5) Calculate the Horizontal Ground Reaction Force Coefficient ($\frac{KH}{Layer-2}$)

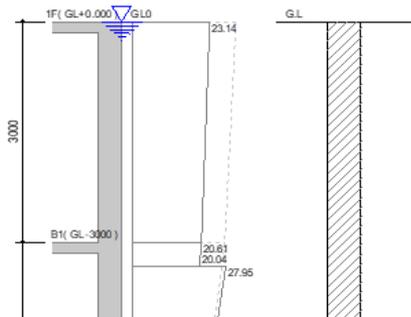
$$K_{H1} = \frac{4,082kN}{m^2}$$

$$K_{H2} = \frac{5,695kN}{m^2}$$

$$K_{H3} = \frac{8,770kN}{m^2}$$

(6) Calculate Displacement of Ground (Load Combination Factor is applied)

H (m)	u(z) (mm)	u(z)-u(z)B (mm)	KH (kN/m ² /m)	p(z) (kN/m ²)	p(z) /R (kN/m ²)
0.000	14.17	14.17	4,082	57.84	23.14
3.000	12.62	12.62	4,082	51.54	20.61
3.333	12.27	12.27	4,082	50.09	20.04
3.333	12.27	12.27	5,695	69.88	27.95
6.000	8.329	8.329	5,695	47.43	18.97
6.667	7.085	7.085	5,695	40.35	16.14
6.667	7.085	7.085	8,770	62.13	24.85
9.000	2.217	2.217	8,770	19.44	7.776
10.00	0.000	0.000	8,770	0.000	0.000



LibXL Report

- Very fast output generation speed
- Expression in the same format as Text Report

(2) Calculate the Acceleration Response Spectrum (Sa)

- Fa = 1.120
- Fv = 0.840
- SDS = 2.5 S Fa x 2 / 3 = 0.373
- SD1 = S Fv x 2 / 3 = 0.112
- T0 = 0.2 SD1 / SDS = 0.0600 sec.
- TS = SD1 / SDS = 0.300 sec.
- TL = 5.000 sec.
- Sa = 2.746m/s²

(3) Calculate the Acceleration Response Spectrum of Base Rock (Sv)

- Sv = Sa / ω0 = 0.175m/s

(4) Calculate the Horizontal Ground Reaction Force Coefficient (KH / Layer 1)

- KH1 = 4,082kN/m²/m
- KH2 = 5,695kN/m²/m
- KH3 = 8,770kN/m²/m

(5) Calculate the Horizontal Ground Reaction Force Coefficient (KH / Layer 2)

- KH1 = 4,082kN/m²/m
- KH2 = 5,695kN/m²/m
- KH3 = 8,770kN/m²/m

(6) Calculate Displacement of Ground (Load Combination Factor is applied)

H (m)	u(z) (mm)	u(z)-u(z)B (mm)	KH (kN/m ² /m)	p(z) (kN/m ²)	p(z) / R (kN/m ²)
0.000	14.17	14.17	4,082	57.84	23.14
3.000	12.62	12.62	4,082	51.54	20.61
3.333	12.27	12.27	4,082	50.09	20.04
3.333	12.27	12.27	5,695	69.88	27.95
6.000	8.329	8.329	5,695	47.43	18.97
6.667	7.085	7.085	5,695	40.35	16.14
6.667	7.085	7.085	8,770	62.13	24.85
9.000	2.217	2.217	8,770	19.44	7.776
10.00	0.000	0.000	8,770	0.000	0.000



2. 新增SRC柱斷面類型

- Applied Design Code : AISC-LRFD16(M),10(M)
- Applied Steel Shape : H section, **Box**, **Pipe**

The screenshot displays the 'SRC Column' design configuration in midas Gen. The 'Shape' dropdown is set to 'Box' and the 'Section (Steel)' dropdown is set to 'H Section'. A diagram shows a 40x40 inch square column with a 14x10 inch inner section. A table on the right shows calculation results for material requirements, moment magnification factors, design parameters, and moment capacity.

1. Calculation Summary

(1) Requirement for Material

Category	Value	Criteria	Ratio
Min. of Concrete Strength (MPa)	24.00	21.00	0.875
Max. of Concrete Strength (MPa)	24.00	69.00	0.348
Max. of Steel Strength (MPa)	248	525	0.473
Max. of Rebar Strength (MPa)	400	550	0.727

(2) Moment Magnification Factor

Category	Value	Criteria	Ratio
Moment Magnification Factor (X)	1.000	1.400	0.714
Moment Magnification Factor (Y)	1.000	1.400	0.714

(3) Design Parameter

Category	Value	Criteria	Ratio
Min. of Rebar Area	0.00593	0.00400	0.675
Max. of Rebar Area	0.00593	0.0400	0.148
Min. of Steel Area	0.0131	0.0100	0.766
Space of Main Rebar (mm)	52.70	40.00	0.759

(4) Moment Capacity

Category	Value	Criteria	Ratio
Axial Capacity (kN)	222	25,956	0.0114
Moment Capacity (X) (kN-m)	2.260	264	0.0114
Moment Capacity (Y) (kN-m)	2.260	256	0.0114
Moment Capacity (kN-m)	3.196	368	0.0114

(5) Shear Capacity (End)

Category	Value	Criteria	Ratio
Rebar Spacing (X) (mm)	150	400	0.375
Rebar Spacing (Y) (mm)	150	400	0.375
Shear Capacity (X) (kN)	0.000	856	0.000
Shear Capacity (Y) (kN)	0.000	1,109	0.000

Added Box and Pipe shape

2. 新增SRC柱斷面類型

Example

Section | Force

Material

Concrete: 24 MPa

Main Bar: 400 MPa

Hoop Bar: 400 MPa

Steel: SS275

Stud: SS275

Shape: Rectangular Circle

Section (Concrete)

Width: 600.00 mm

Height: 600.00 mm

Length(x): 3.50 m

Length(y): 3.50 m

Kx: 1.00

Ky: 1.00

Section (Steel)

Shape: Box

Use DB

H	250.00	mm
B	250.00	mm
tw	12.00	mm
tf	12.00	mm

Click to Zoom

M19@300

Click to Zoom

Box

- B 200x200x12
- B 200x200x12
- B 250x250x5
- B 250x250x6
- B 250x250x8
- B 250x250x9
- B 250x250x12
- B 300x300x4.5
- B 300x300x6
- B 300x300x9
- B 300x300x12
- B 350x350x9
- B 350x350x12
- B 50x20x1.6

SRC column with **Box** section

Click to Zoom

M19@300

Click to Zoom

Pipe

- P 139.8x4
- P 139.8x4
- P 139.8x4.5
- P 139.8x6
- P 165.2x4.5
- P 165.2x5
- P 165.2x6
- P 165.2x7
- P 190.7x4.5
- P 190.7x5
- P 190.7x6
- P 190.7x7
- P 216.3x4.5
- P 216.3x6

SRC column with **Pipe** section

Click to Zoom

M19@300

Click to Zoom

H Section

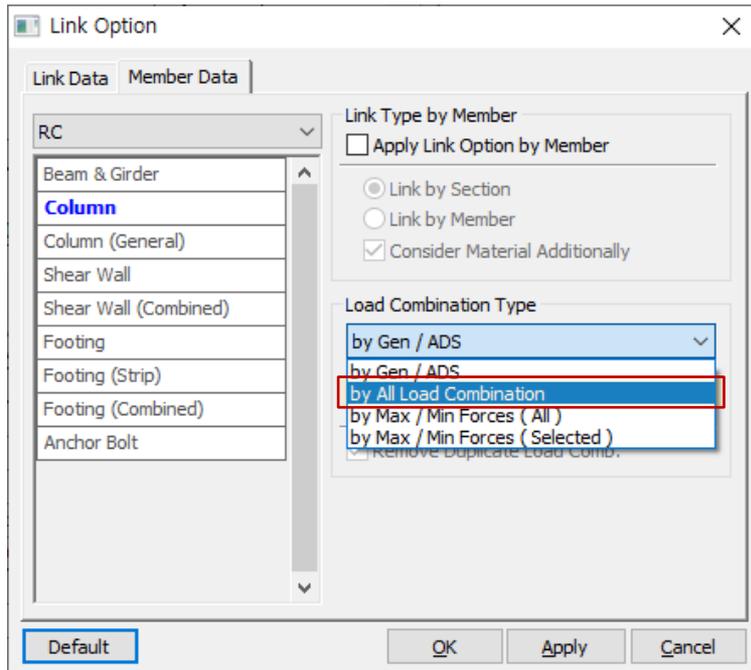
- H 200x200x8/12
- H 200x200x8/12
- H 200x204x12/12
- H 208x202x10/16
- H 244x252x11/11
- H 248x249x8/13
- H 250x250x9/14
- H 250x255x14/14
- H 294x302x12/12
- H 298x299x9/14
- H 300x300x10/15
- H 300x305x15/15
- H 304x301x11/17

SRC column with **H-section**

3. 優化連結選項

- Add “by all combination” type in load combination type.

Link Option > **Member Data**



- Supporting linkage feature for all combinations created in Gen

[by All Load Combination] Support List

- ✓ **RC**
 - Column / General Section Column
 - Shear Wall / Combined Wall
 - Footing (Isolated/Combined/Strip)
 - Anchor Bolt
- ✓ **Steel**
 - Beam / Column
 - Bolt Connection (EC3)
 - Moment Connection(KSSC, AISC, EC3)
 - Baseplate / Embedded Plate
 - Web Opening
 - Welding
- ✓ **SRC**
 - Column
 - CFT Column
- ✓ **Aluminum**
 - Beam / Column
 - General Section Beam / Column
- ✓ **Reinforce**
 - Reinforced Beam
 - Reinforced Column

3. 優化連結選項

Example for "by All Combination" Type

No	Name	Active	Type	Description
1	WINDC	Inactive	Add	WX
2	WINDC	Inactive	Add	WY
3	cLCB3	Strengt	Add	1.4(D)
4	cLCB4	Strengt	Add	1.2(D) + 1.6(L)
5	cLCB5	Strengt	Add	1.2(D) + 1.3WINDCOM
6	cLCB6	Strengt	Add	1.2(D) + 1.3WINDCOM
7	cLCB7	Strengt	Add	1.2(D) - 1.3WINDCOMB
8	cLCB8	Strengt	Add	1.2(D) - 1.3WINDCOMB
9	cLCB9	Strengt	Add	1.2(D) + 1.0(1.0(1.13)R
10	cLCB10	Strengt	Add	1.2(D) + 1.0(1.0(1.13)R
11	cLCB11	Strengt	Add	1.2(D) + 1.0(1.0(1.13)R
12	cLCB12	Strengt	Add	1.2(D) + 1.0(1.0(1.13)R
13	cLCB13	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
14	cLCB14	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
15	cLCB15	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
16	cLCB16	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
17	cLCB17	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
18	cLCB18	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
19	cLCB19	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
20	cLCB20	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
21	cLCB21	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R
22	cLCB22	Strengt	Add	1.2(D) + 1.0(1.0(1.54)R

Link Option

Link Data | Member Data

RC

Beam & Girder

Column

Column (General)

Shear Wall

Shear Wall (Combined)

Footing

Footing (Strip)

Footing (Combined)

Anchor Bolt

Link Type by Member

Apply Link Option by Member

Link by Section

Link by Member

Consider Material Additionally

Load Combination Type

by All Load Combination

P Mx My

Vx Vy

Remove Duplicate Load Comb.

Default OK Apply Cancel

WorkBar

Add new member

System RC

Type Column

Member 600 601 678 679

Option... Import

Keep Sect. & Bar Data

RC | Steel | SRC | Aluminum | Reinforce

RC Design Procedure

Option

RC : KDS 41 30 : 2018

Live Load : KDS2018

Rebar Code : KS/JIS

Design Option (Member)

Drawing Option (Member)

Report Option

Preference

Slab

Beam

Column (1)

5~6C1(600)

Column (General)

Shear Wall

Shear Wall (Combined)

Footing

Footing (Combined)

Footing (Strip)

Basement Wall (1)

RW01

Buttress

Stair

Corbel/Bracket

Retaining Wall

Anchor Bolt

Beam Table

Slab Table

Batch Wall

1. Generate a load combinations and select a column.
2. Set Load Combination Type to by All Load Combination in Link Option > Member Data > Column tab.
3. Check Member No. and import Design information of members.
4. Check Member List in RC tree menu.

3. 優化連結選項

Example for "by All Combination" Type

1. Calculation Summary
(1) Check Magnified Moment

SN	CHK	NAME	Pu (kN)	Mux (kN.m)	Muy (kN.m)	Vux (kN)	Vuy (kN)	Cmx	Cmy	βdns	Description
PM	✓	d.CB4(601-I)	4597.39	67.72	121.24	62.03	34.96	0.850	0.850	0.709	1.2(D) + 1.6(L)
Vux	✓	d.CB13(679-J)	3097.68	55.56	-18.87	148.31	108.95	0.850	0.850	0.794	1.2(D) + 1.0(1.0(1.54)(RX(RS)+RY(ES))+1.3(WINDCOMB1)+1.0(L)
Vuy	✓	d.CB25(678-J)	2251.17	-26.17	29.29	-66.82	-269.08	0.850	0.850	0.806	1.2(D) - 1.0(1.0(1.13)(RX(RS)+RY(ES))+1.3(WINDCOMB1)+1.0(L)
1	✓	d.CB3(600-I)	2618.42	-146.31	-46.49	-22.71	-78.36	0.850	0.850	1.000	1.4(D)
2	✓	d.CB3(600-J)	2534.06	167.13	44.36	-22.71	-78.36	0.850	0.850	1.000	1.4(D)
3	✓	d.CB4(600-I)	3083.45	-189.37	-66.44	-32.39	-101.31	0.850	0.850	0.728	1.2(D) + 1.6(L)
4	✓	d.CB4(600-J)	3011.15	215.88	63.13	-32.39	-101.31	0.850	0.850	0.721	1.2(D) + 1.6(L)
5	✓	d.CB5(600-I)	2828.00	-96.99	-59.83	-29.78	-52.45	0.850	0.850	0.811	1.2(D) + 1.3(WINDCOMB1) + 1.0(L)
6	✓	d.CB5(600-J)	2755.70	112.83	59.29	-29.78	-52.45	0.850	0.850	0.806	1.2(D) + 1.3(WINDCOMB1) + 1.0(L)
7	✓	d.CB6(600-I)	2723.82	-154.22	-107.49	-54.50	-82.79	0.850	0.850	0.811	1.2(D) + 1.3(WINDCOMB2) + 1.0(L)
8	✓	d.CB6(600-J)	2651.51	176.94	110.49	-54.50	-82.79	0.850	0.850	0.806	1.2(D) + 1.3(WINDCOMB2) + 1.0(L)
9	✓	d.CB7(600-I)	2709.58	-233.77	-53.10	-25.31	-124.56	0.850	0.850	0.811	1.2(D) - 1.3(WINDCOMB1) + 1.0(L)
10	✓	d.CB7(600-J)	2637.28	264.47	48.14	-25.31	-124.56	0.850	0.850	0.806	1.2(D) - 1.3(WINDCOMB1) + 1.0(L)
11	✓	d.CB8(600-I)	2813.77	-176.54	-5.44	-0.60	-94.22	0.850	0.850	0.811	1.2(D) - 1.3(WINDCOMB2) + 1.0(L)
12	✓	d.CB8(600-J)	2741.46	200.35	-3.06	-0.60	-94.22	0.850	0.850	0.806	1.2(D) - 1.3(WINDCOMB2) + 1.0(L)
13	✓	d.CB9(600-I)	2480.41	70.59	-3.62	0.68	34.75	0.850	0.850	0.811	1.2(D) + 1.0(1.0(1.13)(RX(RS)+RX(ES))+1.3(WINDCOMB1)+1.0(L)
14	✓	d.CB9(600-J)	2408.10	428.32	85.61	0.68	34.75	0.850	0.850	0.806	1.2(D) + 1.0(1.0(1.13)(RX(RS)+RX(ES))+1.3(WINDCOMB1)+1.0(L)
15	✓	d.CB10(600-I)	2458.49	55.38	-22.95	-11.56	26.57	0.850	0.850	0.811	1.2(D) + 1.0(1.0(1.13)(RX(RS)-RX(ES))+1.3(WINDCOMB1)+1.0(L)
16	✓	d.CB10(600-J)	2386.19	445.83	115.20	-11.56	26.57	0.850	0.850	0.806	1.2(D) + 1.0(1.0(1.13)(RX(RS)-RX(ES))+1.3(WINDCOMB1)+1.0(L)
17	✓	d.CB11(600-I)	2558.56	47.81	-73.87	-37.26	23.09	0.850	0.850	0.811	1.2(D) + 1.0(1.0(1.13)(RX(RS)+RX(ES))-1.0(L)

5. Click "Load Combinations" button.

6. Check a load combination name and end position of member before design/check.

* In the case of RC columns, member forces of I and J-end per load combination are imported.
Recommended to check the design position.

4. 新增Eurocode之聯合基礎設計模組

Support combined footing design as per Eurocode 2: 04

The screenshot displays the midas Gen software interface for designing a combined footing. The 'Footing' menu is active, showing options for 'Isolated Footing' and 'Combined Footing'. The 'Combined Footing' option is selected, and the 'Strip Footing' sub-option is also visible. The property panel on the left shows the member name 'F01' and various design parameters such as concrete strength (25 MPa), main bar diameter (400 MPa), footing depth (500.00 mm), width (3.00 m), and soil bearing capacity (100.00 kPa). The central design view shows a plan view of a 3000 mm wide footing with two columns (C01 and C02) spaced 3000 mm apart. The footing is 500 mm deep. Reinforcement details show #7 bars at 150 mm spacing. The report window on the right provides a summary of design checks and capacity tables.

1. Calculation Summary

(1) Soil Capacity

Category	Value	Criteria	Ratio	Note
Soil Capacity* (kPa)	27.77	100.00	0.278	$q_{s,max} / \gamma$

* The value is based on service load

(2) Shear Capacity

Category	Value	Criteria	Ratio	Note
One Way Shear-X (kN)	72.59	1,046	0.0694	$V_{Ed} / V_{Rd,s}$
Two Way Shear (MPa)	0.127	0.431	0.296	$V_{Ed} / V_{Rd,s}$

(3) Moment Capacity

Category	Value	Criteria	Ratio	Note
Moment-X Direction (kN-m)	-17.98	359	0.0500	$M_{Ed} / M_{Rd,s}$
Moment-Y Direction (kN-m)	6.573	112	0.0589	$M_{Ed} / M_{Rd,s}$

(4) Rebar

Category	Value	Criteria	Ratio	Note
Check Space-X (mm)	150	400	0.375	$s_{x,iso} \leq s_{x,max}$
Check Space-Y (mm)	150	400	0.375	$s_{y,iso} \leq s_{y,max}$
Check Area-X($A_{s,iso} \leq A_{s,min}$) (mm ²)	2,581	20,000	0.129	$A_{s,iso} \leq A_{s,min}$
Check Area-X($A_{s,iso} > A_{s,min}$) (mm ²)	2,581	645	0.250	$A_{s,iso} > A_{s,min}$
Check Area-X($A_{s,iso} > A_{s,min}$) (mm ²)	2,581	129	0.0500	$A_{s,iso} > A_{s,min}$
Check Area-Y($A_{s,iso} < A_{s,min}$) (mm ²)	860	20,000	0.0430	$A_{s,iso} < A_{s,min}$
Check Area-Y($A_{s,iso} > A_{s,min}$) (mm ²)	860	645	0.749	$A_{s,iso} > A_{s,min}$
Check Area-Y($A_{s,iso} > A_{s,min}$) (mm ²)	860	50.63	0.0589	$A_{s,iso} > A_{s,min}$

** Values will not be displayed, if overturning occurs

2. Check Soil Capacity (Unit: kPa)

Check Items	Calculated	Criteria	Ratio
Soil Capacity	27.77	100.00	0.278
$Q_{s,max}$	28.77	-	-
$Q_{s,min}$	28.77	-	-

3. Check 1Way Shear Capacity (Unit: kN)

Check Items	Calculated	Criteria	Ratio
One Way Shear-X	72.59	1,046	0.0694

4. Check 2Way Shear Capacity (Unit: MPa)

Check Items	Calculated	Criteria	Ratio

4. 新增Eurocode之聯合基礎設計模組

Procedure of Combined Footing Design

Define Section

Section	Load	Column
Material		
Concrete	<input type="text" value="25"/> MPa	
Main Bar	<input type="text" value="400"/> MPa	
Footing		
Depth	<input type="text" value="500.00"/> mm	
Width	<input type="text" value="3.00"/> m	
Cover	<input type="text" value="80.00"/> mm	
Ext. (Left)	<input type="text" value="1.00"/> m	
Ext. (Right)	<input type="text" value="1.00"/> m	
Soil Bearing	<input type="text" value="100.00"/> kPa	

Step 1.
Define concrete, rebar material,
soil bearing
and footing element information.

Define Load

Section	Load	Column
Design Load		
Surface Load	<input type="text" value="5.00"/> kPa	
Weight Density	<input type="text" value="18.00"/> kN/m ³	
Height	<input type="text" value="0.50"/> m	
<input checked="" type="checkbox"/> Include Self-Weight <input checked="" type="checkbox"/> Include Surcharge Load		
Load Factor		
Dead Load	<input type="text" value="1.000"/>	
Live Load	<input type="text" value="1.000"/>	
Shear Offset Information		
SN	Offset Factor	
1	0.25	
2	0.50	
3	0.75	
4	1.00	
5	1.25	
6	1.50	
7	1.75	
8	2.00	
		<input type="button" value="Sort"/> <input type="button" value="Add"/> <input type="button" value="Insert"/> <input type="button" value="Delete"/>

Step 2.
Define Load Data.
(Design load, factor, shear offset
information)

Define column information

Section	Load	Column
Load Combinations		
<input type="checkbox"/> Apply SLS Load Combination <input type="checkbox"/> Apply ULS Load Combination		
Select Column		
C01	<input type="button" value="Add"/>	
C01	<input type="button" value="Insert"/>	
C02	<input type="button" value="Delete"/>	
<input type="button" value="Column Data..."/>		
Column Section		
<input checked="" type="radio"/> Rectangle <input type="radio"/> Circle		
Cx	<input type="text" value="500.00"/> mm	
Cy	<input type="text" value="500.00"/> mm	
Span	<input type="text" value="-"/> m	
Position	<input type="text" value="Internal"/>	
Service Load		
N.Ed,s	<input type="text" value="15.00"/> kN	
<input type="button" value="Load Combinations (1) ..."/>		
Factored Load		
N.Ed	<input type="text" value="22.50"/> kN	
<input type="button" value="Load Combinations (1) ..."/>		
<input type="button" value="Check Load Combinations"/>		

Step 3.
Define column element
and applied load information.

Define Rebar Arrangement

Bar Arrangement (X-Dir.)			
Rebar Position : <input type="text" value="C01"/>			
	Items		
Bottom (mm)	#7	@	150.00
Max. Spacing(mm)	#7	@	400
Moment (kN.m/m)	14.38		
Eff. Width(mm)	3000		

Step 4.
Define Bar arrangement layout & spacing

4. 新增Eurocode之聯合基礎設計模組

Summary design report

3. Check 1Way Shear Capacity (Unit : kN)

Check Items	Calculated	Criteria	Ratio
One Way Shear-X	72.59	1,046	0.0694

4. Check 2Way Shear Capacity (Unit : MPa)

Check Items	Calculated	Criteria	Ratio
Two Way Shear-Column Face	0.184	3.825	0.0480
Two Way Shear-UserD	0.107	0.431	0.248
Two Way Shear-2D	0.0193	0.431	0.0447
Two Way Shear	0.107	0.431	0.248

5. Check Moment Capacity (Unit : kN-m/m)

Check Items	Calculated	Criteria	Ratio
Moment-X Direction(Cantilever)	0.0140	359	0.0000391
Moment-X Direction(Column)	14.38	359	0.0400
Moment-X Direction(Span)	-17.98	359	0.0500
Moment-X Direction	-17.98	359	0.0500
Moment-Y Direction	6.573	112	0.0589

Detail design report

3. Check One-Way Shear (Direction X)

(1) Calculate ratio of shear capacity

Column	D _{eff} (mm)	k	ρ	V _{Res.1} (kN)	V _{Res.2} (kN)	V _{Ed} (kN)	V _{Res,max} (kN)	Ratio	Remark
C01	409	1.699	0.00631	1,046	793	72.59	1,046	0.0694	OK
C02	409	1.699	0.00631	1,046	793	72.59	1,046	0.0694	OK

- $k = \min [1 + \sqrt{200/d}, 2.0] = 1.699$
- $\rho = \min [A_{st} / b_w d, 0.02] = 0.00631$
- $C_{Res,C} = 0.18 / \gamma_c = 0.120$
- $V_{Res,1} = [C_{Res,C} k (100 \rho f_{tk})^{1/3} + k_1 \sigma_{cp}] b_w d = 1,046kN$
- $V_{Res,2} = [0.035 k^{3/2} f_{tk}^{1/2} + k_1 \sigma_{cp}] b_w d = 793kN$
- $V_{Res} = V_{Res,C} = 1,046kN$
- $V_{Ed} = 72.59kN$
- $V_{Ed} / V_{Res} = 0.0694 \rightarrow O.K$

4. Check Two-Way Shear

(1) Calculate Shear at Face of Column

Column	Position	Offset (mm)	U (mm)	β	k	V _{Ed} (MPa)	V _{Res,max} (MPa)	Ratio	Remark
C01	Interior	0.000	2,000	6.497	0.000	0.184	3.825	0.0480	OK
C02	Interior	0.000	2,000	6.497	0.000	0.183	3.825	0.0478	OK

- $U = 2,000mm$
- $a = (\frac{e_x}{b_c})^2, \quad b = (\frac{e_y}{b_c})^2$
- $\beta = 1 + 1.0\sqrt{a+b} = 6.497$
- $V_{Ed} = \frac{\beta N_{Ed}}{U d} = 0.184MPa$
- $f_{ctd} = \alpha_{ct} f_{ctk} / \gamma_c = 0.000MPa$

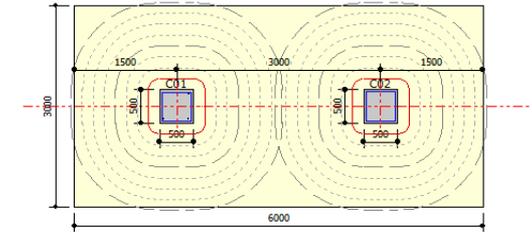
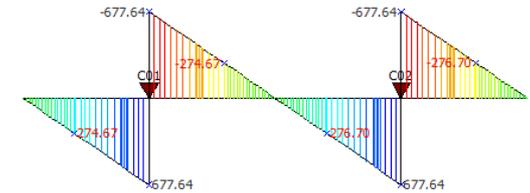
5. Calculate moment capacity

(1) Calculate moment capacity (Direction X)

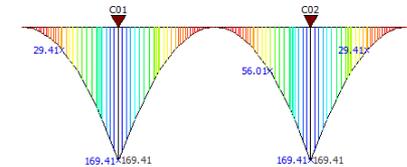
Position	Top/Bottom	f _{cd} (MPa)	z (mm)	A _s (mm ²)	M _{Ed} (kN-m/m)	M _{Res} (kN-m/m)	Ratio	Remark
Cantilever(L)	Bottom	348	400	2,581	0.0140	359	0.0000391	OK
Colm (C01)	Bottom	348	400	2,581	14.38	359	0.0400	OK
Span (C01-C02)	Top	348	400	2,581	-17.98	359	0.0500	OK
Colm (C02)	Bottom	348	400	2,581	14.38	359	0.0400	OK
Cantilever(R)	Bottom	348	400	2,581	0.00746	359	0.0000208	OK

- $M_{Res} = f_{cd} A_s z$

Diagram



(2) Bending Moment Diagram (Direction X)



5. 優化匯出Word計算報表程序

- Reporting time for MS word format has been reduced by improving algorithm.

Example Model (RC structure of 6F)

- National Code : Eurocode2:04
- Module: Combined Footing Design
- Report Page : 13 EA

Word : Detail
Word : Summary
 Word : Input List
Excel : Detail
Excel : Summary
 Excel : Input List
LibXL : Detail
LibXL : Summary



(7) Calculate shear at distance x from d (Coefficient: 1.500)

Column	Position	Offset (mm)	U (mm)	β	k	V_{Ed} (kN)	$V_{Rd,c}$ (kN)	Ratio	Remark
CS1	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK
CS2	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK

(8) Check d_{min}

(9) Calculate moment capacity (Direction X)

Column	Position	Offset (mm)	U (mm)	β	k	V_{Ed} (kN)	$V_{Rd,c}$ (kN)	Ratio	Remark
CS1	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK
CS2	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK

(10) Calculate shear at distance x from d (Coefficient: 1.500)

Column	Position	Offset (mm)	U (mm)	β	k	V_{Ed} (kN)	$V_{Rd,c}$ (kN)	Ratio	Remark
CS1	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK
CS2	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK

(11) Calculate moment capacity (Direction Y)

Column	Position	Offset (mm)	U (mm)	β	k	V_{Ed} (kN)	$V_{Rd,c}$ (kN)	Ratio	Remark
CS1	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK
CS2	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK

(12) Calculate moment capacity (Direction X)

Column	Position	Offset (mm)	U (mm)	β	k	V_{Ed} (kN)	$V_{Rd,c}$ (kN)	Ratio	Remark
CS1	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK
CS2	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK

(13) Calculate moment capacity (Direction Y)

Column	Position	Offset (mm)	U (mm)	β	k	V_{Ed} (kN)	$V_{Rd,c}$ (kN)	Ratio	Remark
CS1	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK
CS2	interior	1,431	11,021	1.150	1,421	0.0270	1.125	0.0221	OK

(1) Calculate moment capacity (Direction X)

Position	Top/Bottom	f_{td} (MPa)	z (mm)	A_s (mm ²)	M_{Ed} (kN·m)	M_{Rd} (kN·m)	Ratio	Remark
Centerline (L)	Bottom	400	1,095	17,735	28.37	11,649	0.00244	OK
CS1 (CS)	Bottom	400	1,095	17,735	148	11,649	0.0027	OK
Span (CS1-CS2)	Top	400	1,095	17,735	84.31	11,649	0.00724	OK
CS1 (CS)	Bottom	400	1,095	17,735	148	11,649	0.0027	OK
Centerline (R)	Bottom	400	1,095	17,735	28.37	11,649	0.00244	OK

(2) Bending Moment Diagram (Direction X)

(3) Calculate moment capacity (Direction Y)

Position	Top/Bottom	f_{td} (MPa)	z (mm)	A_s (mm ²)	M_{Ed} (kN·m)	M_{Rd} (kN·m)	Ratio	Remark
Centerline (L)	Bottom	400	1,078	17,735	125	11,447	0.0029	OK
CS1 (CS)	Bottom	400	1,078	17,735	135	11,447	0.0029	OK

(4) Check Rebar

Criteria	Value	Criteria	Ratio	Note
Maximum Space - X (mm)	17.72	137	0.129	$s_x \leq 4d_{max}$
Maximum Space - Y (mm)	17.72	137	0.129	$s_y \leq 4d_{max}$

(5) Calculate minimum rebar space required (X Direction)

Position	Top/Bottom	Rebar	S_x (mm)	S_y (mm)	Remark
Centerline (L)	Bottom	F20@17.72	400	137	OK
CS1 (CS)	Bottom	F20@17.72	400	137	OK
Span (CS1-CS2)	Top	F20@17.72	400	137	OK
CS1 (CS)	Bottom	F20@17.72	400	137	OK
Centerline (R)	Bottom	F20@17.72	400	137	OK

(6) Calculate minimum rebar space required (Y Direction)

Position	Top/Bottom	Rebar	S_x (mm)	S_y (mm)	Remark
CS1 (CS)	Bottom	F20@17.72	400	137	OK
Centerline (L)	Bottom	F20@17.72	400	137	OK

[Reporting Time : Design+ 2020 vs Design+ 2021 (New Version)]

Design+ 2020	28.66 sec
Design+ 2021	0.41sec

99% reduction in reporting time