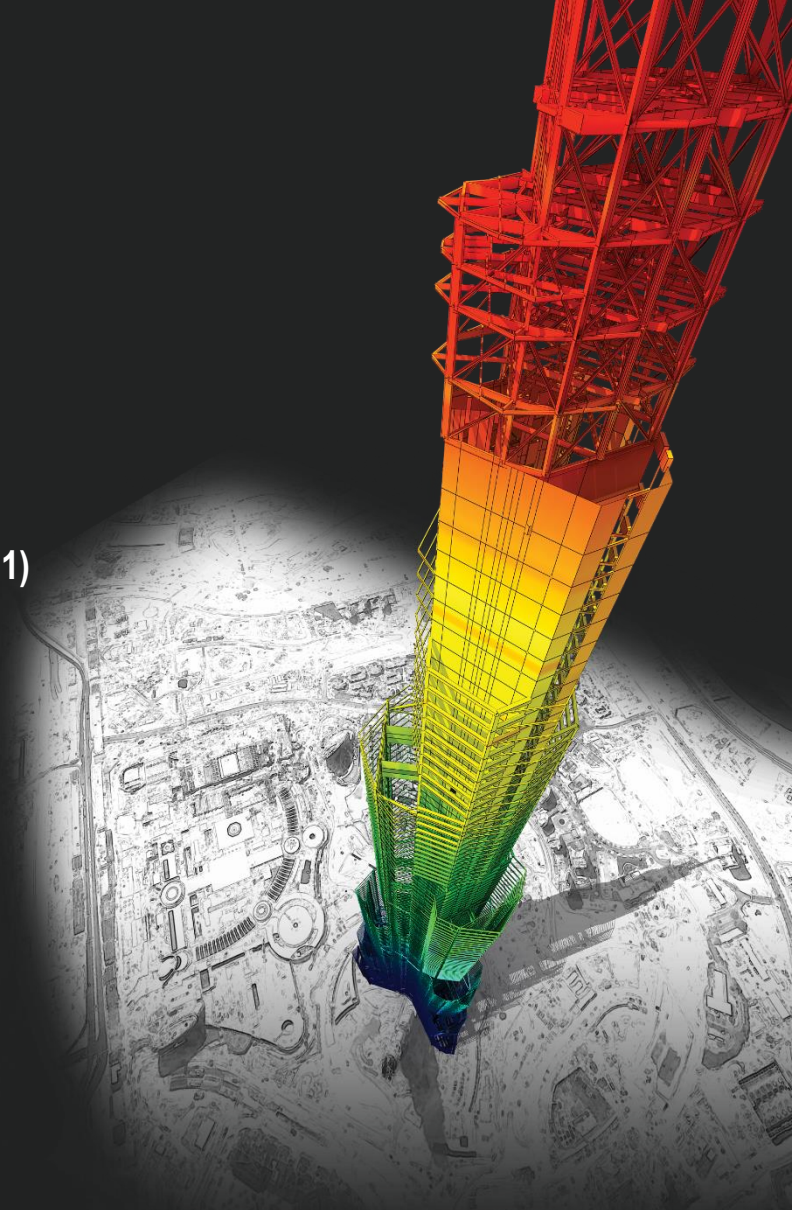


# Release Note

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Fecha de Lanzamiento: Enero, 2021

Versión de Producto: midas Gen 2021 (v1.1) y Design+2021(v1.1)



*DESIGN OF General Structures*

*Integrated Design System for Building and General Structures*

*midas* **Gen**

# Mejoras

## • *midas Gen*

1) Mejora en velocidad de Diseño no-disipativo	4
2) Mejora en elemento no-disipativo por NTC2018	5
3) Mejora en diseño a cortante por NTC2018	7
4) Combinación de carga para resultado de diseño de concreto por resistencia elástica	9
5) Adición de modelo de rótula por EC 8 :2004	10
6) Adición de coeficientes de reducción de la capacidad de disipación de energía por irregularidades según NSR-10	11
7) Mejoras en la función de presión de viento	12
8) Adición de material de barra de refuerzo a Base de Datos (Barra imperial U.S.)	13
9) Mejoras en el diseño a cortante de pórticos especiales de concreto según ACI318	14
10) Configuración asimétrica de Beam End Offset	15
11) Función de presión de suelo estática	16
12) Resultados gráficos de los link elásticos multi-lineales para análisis pushover	17
13) Longitud no adherida en viga pretensada	18
14) Conexión con Revit 2021	19

## • *midas Design+*

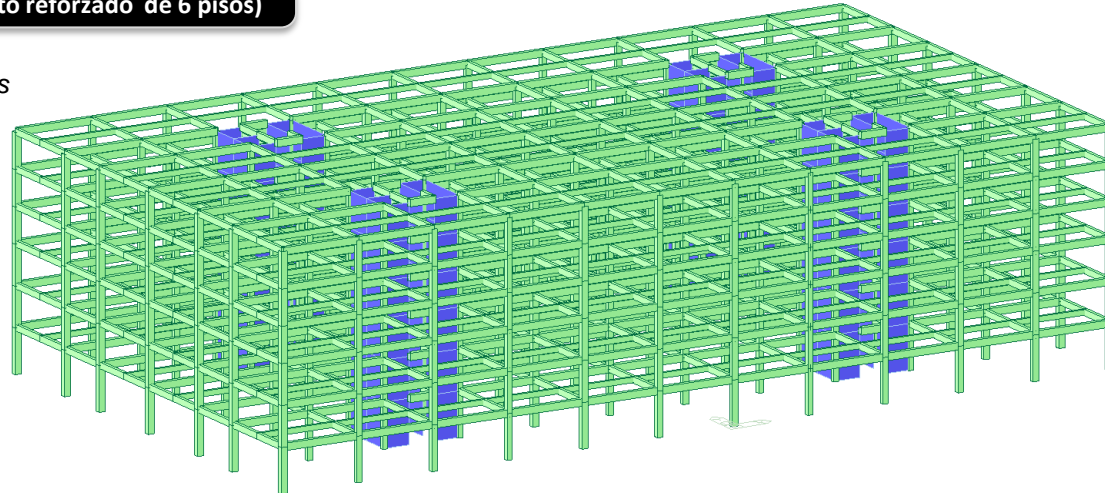
1) Generación de reportes en formato Excel	21
2) Módulo de columna SRC con adición de secciones metálicas (box/pipe)	23
3) Opción de Link Midas link	25
4) Adición de diseño de zapatas combinadas por Eurocode	28
5) Reducción de tiempo en la generación de reportes en formato Word	31

# 1. Mejora en velocidad de Diseño no-disipativo

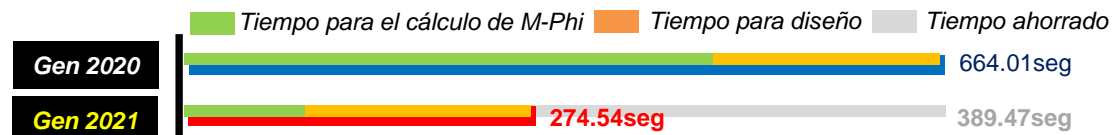
- Reducción del tiempo de diseño optimizando el cálculo de  $m$ - $\phi$  y mejorando el algoritmo de salida

**Modelo de ejemplo (estructura concreto reforzado de 6 pisos)**

- ✓ Vigas / columnas: 1,974 elementos
- ✓ Muros: 216 elementos
- ✓ Combinaciones de carga: 100



[Tiempo total de diseño de ND: Gen 2020 vs Gen 2021 (nueva versión)]



**Reducción del 60% en el tiempo de diseño**

## 2. Mejora en elemento no-disipativo por NTC2018

### Tabla de Diseño – Diseño a flexion y cortante no-disipativo

- Salida de resultados separados para ULS excepto acción sísmica y ELS con sísmica modificada por q para elementos no disipativos

#### Ultimate Strength Check (LC\_A) en diseño gráfico

\* 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  SECT  MEMB  
 Property  Serviceability  
 Elastic

MEMB	SE	Section		fck	fyk	CHK	LC	V-Rebar	N_Rdmax	Uc	N_Ed	M_Edy	M_Edz	V_Rdc.end	V_Rds.end	V_Rdc.mid	V_Rds.mid	LC	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	
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) en diseño gráfico

\* 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  SECT  MEMB  
 Property  Serviceability  
 Elastic

MEMB	SE	Section		fck	fyk	CHK	Seis. Class	LC	M_Edy	M_Edz	Rat-My	Rat-Co	V_Rdc.end	V_Rds.end	V_Rdc.mid	V_Rds.mid	LC	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	
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) en diseño gráfico

\* LC\_S : Load combination to check SLS(Serviceability Limit State)

Sorted by  Member Results  Strength  SECT  MEMB  
 Property  Serviceability  
 Elastic

MEMB	SE	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					

# 2. Mejora en elemento no-disipativo por NTC2018

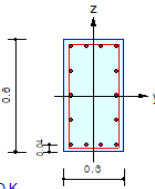
## Reporte gráfico – Diseño a flexion y cortante no-disipativo

- Genere resultados de diseño para ULS, ELS y SLS por separado en informes de diseño.

### Resultado de diseño para ULS(Ultimate Limit State)

#### 1. Design Condition

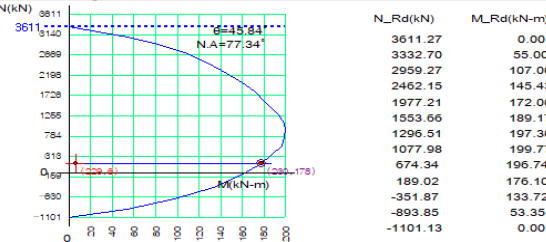
Design Code : Eurocode2.04 & NTC2018      UNIT SYSTEM : kN, m  
 Member Number : 373  
 Material Data : fck = 25000, fyk = 450000, fyw = 450000 KPa  
 Column Height : 3.2 m  
 Section Property : P30x60 (No : 1)  
 Rebar Pattern : 14 - 5 - P16      Ast = 0.002814 m² (pst = 0.016)



#### 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

### Resultado de diseño para 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_yd)	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_yd)² + (M_Edz/M_ydz)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

### Resultado de diseño para 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	*****	*****	*****	*****

## 3. Mejora en diseño a cortante por NTC2018

### Diseño Fuerza cortante de elementos primarios según NTC 2018

- Al calcular una fuerza cortante de diseño para elementos primarios, la fuerza del miembro puede limitarse por una demanda de resistencia para combinaciones de carga ELS.

#### 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.

#### 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  
 $Ve11\_CW = VzG + Alpha1 * (MeI+ + MeJ-) / Span = 27.824 \text{ kN.}$   
 $Ve12\_CW = VzG - Alpha1 * (MeI+ + MeJ-) / Span = -47.832 \text{ kN.}$   
 $Ve1\_CW = \text{MAX}[ |Ve11\_CW|, |Ve12\_CW| ] = 47.832 \text{ kN.}$   
 - . Counter-Clockwise  
 $Ve11\_CCW = VzG + Alpha1 * (MeI- + MeJ+) / Span = 27.824 \text{ kN.}$   
 $Ve12\_CCW = VzG - Alpha1 * (MeI- + MeJ+) / Span = -47.832 \text{ kN.}$   
 $Ve1\_CCW = \text{MAX}[ |Ve11\_CCW|, |Ve12\_CCW| ] = 47.832 \text{ kN.}$   
 - . Ve1(M) = MAX[ |Ve1\\_CW|, |Ve1\\_CCW| ] = 47.832 kN. (by Moment Strength).  
 - . Ve1(E) = 17.186 kN. (by Elastic Load Combination).  
 - . Ve1 = MIN[ Ve1(M), Ve1(E) ] = 17.186 kN.  
 - . VzOrg = -18.902 kN. (by Strength Load Combination).  
 - . V\_Ed = MAX[ |VzOrg|, Ve1 ] = 18.902 kN.

$VzOrig = \text{Design shear force by ULS load combination}$

$Ve1(M) = \text{Design shear force by flexural strength of member.}$

$Ve1(E) = \text{Design shear force by ELS load combination.}$

$V\_Ed = \text{Max}[ VzOrg, \text{Min}[Ve1(M), Ve1(M)] ]$

La demanda de resistencia evaluada con los criterios de diseño de capacidad se puede asumir no mayor que la demanda de resistencia evaluada para el caso de comportamiento estructural no dissipativo.



### 3. Mejora en diseño a cortante por NTC2018

#### Diseño Fuerza cortante de elementos primarios según NTC 2018

- Al calcular una fuerza cortante de diseño para elementos primarios, la fuerza del miembro puede limitarse por una demanda de resistencia para combinaciones de carga ELS.



**Design Setting**

Seismic Design Parameter

Beam-Column Joint Design Gamma<sub>rd</sub> 1.1

Confined Joint  Not Confined Joint

Strong Column Weak Beam

SUM(M<sub>Rc</sub>) > 1.3 + SUM(M<sub>Rb</sub>)

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<sub>rd</sub>

Beam 1 Column 1.1 Wall 1.2

Consider for Shear Wall alpha<sub>s,max</sub>

Consider V<sub>ed</sub> of elastic strength Load combination for primary members

Friction Coefficient for Wall Sliding : 0.6

Opción agregada.

```

=====
[[[+]]] 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.
    
```

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



## 4. Combinación de carga para resultado de diseño de concreto por resistencia elástica

*Se agregaron resultados gráficos para la combinación de carga ELS.*

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 +

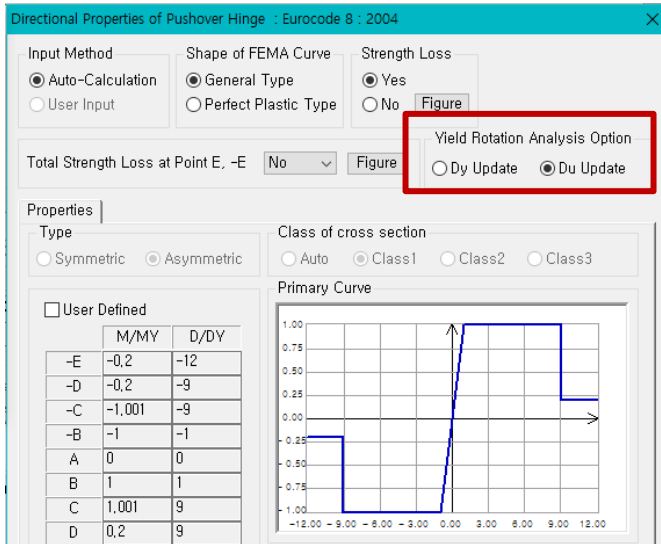
midas Gen  
POST-PROCESSOR  
CONCRETE DESIGN  
COMBINED  
1.77481e+000  
1.62032e+000  
1.46583e+000  
1.31133e+000  
1.15684e+000  
1.00235e+000  
8.47858e-001  
6.93365e-001  
5.38879e-001  
3.84381e-001  
2.29889e-001  
7.53967e-002  
ALL COMBINATION  
MAX : 508  
MIN : 1050  
FILE: NON-DIS\_C-  
UNIT:  
DATE: 10/12/2020  
VIEW-DIRECTION  
X1=0.000  
Y2=-0.759  
Z1=0.000

- ✓ 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

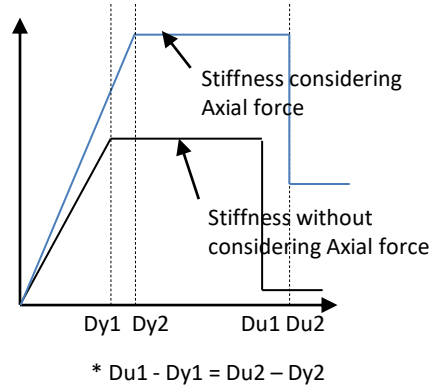
# 5. Adición de modelo de rótula por EC 8 :2004

## Nuevo modelo de rotula por Eurocode 8 :2004

- Adición de curva de rotula con tipo "Du update"

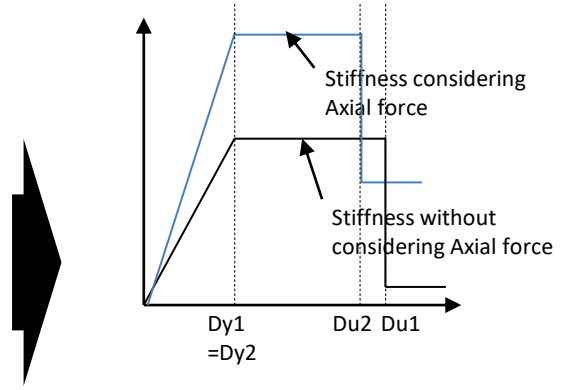


### Actualización de Dy (compatible con la versión antigua)



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

### Du Update (Agregada a Gen2021 nueva)



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

✓ Note

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

$$\theta_{um} = \frac{1}{\gamma_{el}} 0,016 \cdot (0,3^v) \left[ \frac{\max(0,01; \omega)}{\max(0,01; \omega)} f_c \right]^{0,225} \left( \min \left( 9; \frac{L_V}{h} \right) \right)^{0,35} \left( \frac{\sigma_{ps} f_{yw}}{f_c} \right) (1,25^{100 p_d})$$

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

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

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

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

# 6. Adición de coeficientes de reducción de capacidad de disipación de energía por irregularidades según NSR-10

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

Factores de reducción (Phi\_p) ←

## Chequeo Irregularidad de rigidez

	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 (3 Stories)	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	0.00	0.00	Regular	1.0	
Ey	11F	42.00	4.00	-0.0000	0.00	-	-199998.58	-	-116665.84	-133332.39	-133332.39	-133332.39	Extreme Irregular	0.8	
Ey	10F	38.00	4.00	-0.0000	0.00	-	-264205.86	-	-270785.92	-309469.62	-309469.62	-309469.62	Extreme Irregular	0.8	
Ey	9F	34.00	4.00	-0.0000	0.00	-	-339744.86	-	-312646.87	-357310.71	-357310.71	-357310.71	Extreme Irregular	0.8	
Ey	8F	30.00	4.00	-0.0000	0.00	-	-406558.07	-	-392975.56	-449114.93	-449114.93	-449114.93	Extreme Irregular	0.8	
Ey	7F	26.00	4.00	-0.0000	0.00	-	-776743.33	-	-592295.69	-678909.36	-678909.36	-678909.36	Extreme Irregular	0.8	
Ey	6F	22.00	4.00	0.0000	0.00	1830963.85	-4291921.05	-	-2129253.18	-2433432.20	-2433432.20	-2433432.20	Regular	1.0	
Ey	5F	18.00	4.00	0.0000	0.00	1511336.03	1098578.31	-	-1543922.36	-1764482.70	-1764482.70	-1764482.70	Regular	1.0	
Ey	4F	14.00	4.00	0.0000	0.00	1154767.03	906801.62	-	-889210.44	-1016240.50	-1016240.50	-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	1199217.84	1199217.84	Regular	1.0	
Ey	2F	5.00	4.50	-0.0000	0.00	-	1817356.15	2120248.84	1328840.33	1518674.66	1518674.66	1518674.66	Extreme Irregular	0.8	
Ey	1F	0.00	5.00	-0.0000	0.00	-	-688215.48	-	708555.90	809778.17	809778.17	809778.17	Extreme Irregular	0.8	

Stiffness Irregularity(X) / Stiffness Irregularity(Y) /

## Chequeo Irregularidad de capacidad

	Story	Story Shear				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	8796.5611	0.0000	Regular	1.0	90.00	8552.2528	0.0000	Regular	1.0	
11F	42.00	4.00	0.00	8796.5611	1.0000	Regular	1.0	90.00	8552.2528	1.0000	Regular	1.0	
10F	38.00	4.00	0.00	8796.5611	1.0000	Regular	1.0	90.00	8552.2528	1.0000	Regular	1.0	
9F	34.00	4.00	0.00	10218.4451	1.1630	Regular	1.0	90.00	9984.1368	8552.2528	1.1674	Regular	1.0
8F	30.00	4.00	0.00	10218.4451	1.0000	Regular	1.0	90.00	9984.1368	9984.1368	1.0000	Regular	1.0
7F	26.00	4.00	0.00	10478.7878	1.0255	Regular	1.0	90.00	10244.4793	9984.1368	1.0261	Regular	1.0
6F	22.00	4.00	0.00	10478.7878	1.0000	Regular	1.0	90.00	10244.4793	10244.4793	1.0000	Regular	1.0
5F	18.00	4.00	0.00	12821.8706	1.2236	Regular	1.0	90.00	12587.5623	10244.4793	1.2287	Regular	1.0
4F	14.00	4.00	0.00	12821.8706	1.0000	Regular	1.0	90.00	12587.5623	12587.5623	1.0000	Regular	1.0
3F	9.50	4.50	0.00	15392.7533	1.2005	Regular	1.0	90.00	15158.4450	12587.5623	1.2042	Regular	1.0
2F	5.00	4.50	0.00	15392.7533	1.0000	Regular	1.0	90.00	15158.4450	15158.4450	1.0000	Regular	1.0
1F	0.00	5.00	0.00	17484.7772	1.1359	Regular	1.0	90.00	17841.7063	15158.4450	1.1770	Regular	1.0

Capacity Irregularity /

## Chequeo Irregularidad Masa

	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	4.00	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

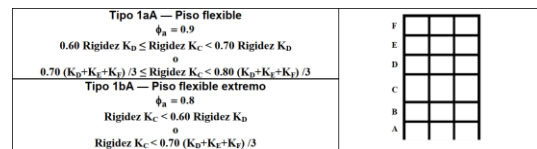
Mass Irregularity(X) / Mass Irregularity(Y) /

### Nota

De acuerdo con la Tabla A.3-7 en NSR-10, Gen informa el factor de reducción,  $\phi$  en las fuerzas de diseño sísmico para tener en cuenta la verificación de irregularidades

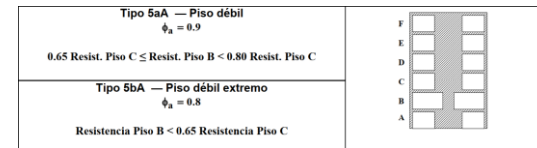
### 1. Chequeo Irregularidad de rigidez (piso flexible)

- Estructuras Regulares  $\phi_o = 1.0$
- Irregulares Estructuras  $\phi_o = 0.9$
- Estructuras Irregulares Extremas  $\phi_o = 0.8$



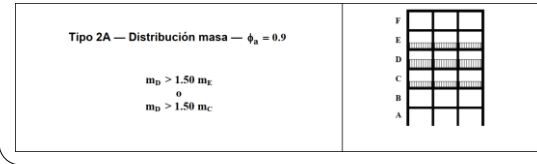
### 2. Chequeo Irregularidad de capacidad (Piso débil)

- Estructuras Regulares  $\phi_o = 1.0$
- Irregulares Estructuras  $\phi_o = 0.9$
- Estructuras Irregulares Extremas  $\phi_o = 0.8$



### 3. Chequeo Irregularidad Masa

- Estructuras Regulares  $\phi_o = 1.0$
- Estructuras Irregulares  $\phi_o = 0.9$



## 7. Mejora en función de presión de viento

### Inserción de presión de suelo con edición de tabla

- La presión de viento generada por ecuación en tabla puede ser editada y actualizada en el modelo

**Gen 2020**

Add/Modify/Show Wind Pressure Function

Function Name : Test

Coordinate System : Rectangular

Equation :  $Z+0,1$

Description : ( Example :  $0,7+Z+Z, \cos(TH)+R$  )

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 <sup>2</sup> )
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

Inactivo

OK Cancel

**Gen 2021 v1.1 (Nueva versión)**

Add/Modify/Show Wind Pressure Function

Function Name : Test

Coordinate System : Rectangular

Equation :  $Z+0,1$

Description : ( Example :  $0,7+Z+Z, \cos(TH)+R$  )

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

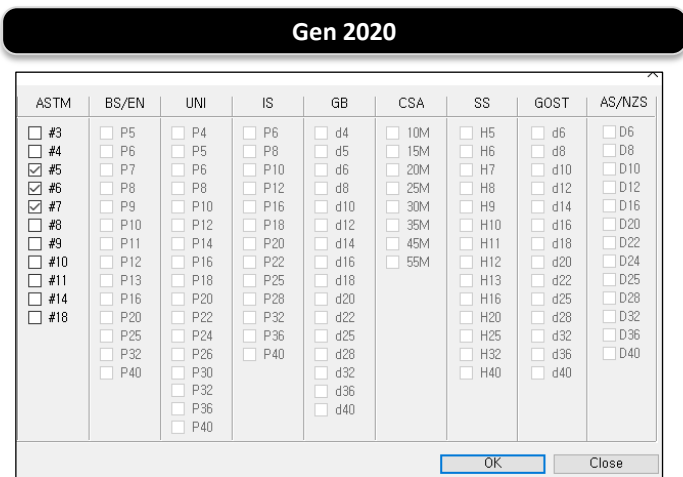
	X (m)	Y (m)	Z (m)	Wind Pressure (kN/m <sup>2</sup> )
1	0	0	0	0
2	0	0	0,601	0,1
3	0	0	1,202	0,3
4	0	0	1,803	0,6
5	0	0	2,404	0,4
6	0	0	3,005	0,3005
7	0	0	3,606	0,3606
8	0	0	4,207	0,4207
9	0	0	4,808	0,4808
10	0	0	5,409	0,5409
11	0	0	6,01	0,601

OK Cancel

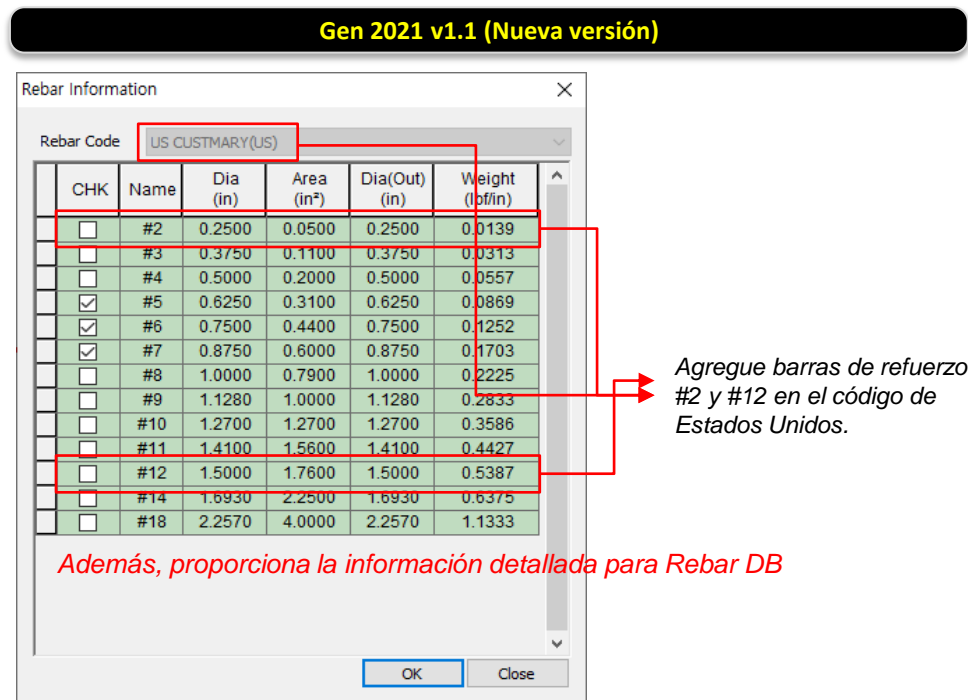
Al editar los valores de la tabla, la presión del viento se modifica automáticamente.

## 8. Adición de base de datos de materiale (Barra imperial U.S.)

- Proporcionar información de barras para el diámetro, el área y el peso en el cuadro de diálogo
- Adición de barras de refuerzo #2 y #12 en la base de datos estándar de EE. UU. (Imperial de EE. UU.)



Proporciona solo la función para seleccionar el tamaño de las barras.



Agregue barras de refuerzo #2 y #12 en el código de Estados Unidos.

# 9. Mejoras en el diseño a cortante de pórticos especiales de concreto según ACI

**El factor de reducción (R) para  $V_c$  no se usa en la mitad del tramo del miembro.**  
 - ' $V_c=0$ ' se considera solo en ambos extremos del miembro.

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

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

Method

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

Ve1 ,  $V_g + a1 \cdot \text{SUM}(M_{pr}) / L$  , a1 = 1  
 Ve2 ,  $V_g + a2 \cdot V_{eq}$  (Beam) , a2 = 1  
 Ve2 ,  $V_g + a2 \cdot V_{eq}$  (Column) , a2 = 1

## Gen 2020

3. Design for Shear

[ END ]	y : 8 (J)	z : 8 (J)
Applied Shear Force (Vu)	40.5926 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 <sup>2</sup> /m, 4-D13 @100	0.00166 m <sup>2</sup> /m, 4-D13 @100

[ MIDDLE ]	y : 8 (1/2)	z : 8 (1/2)
Applied Shear Force (Vu)	40.5926 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 <sup>2</sup> /m, 4-D13 @150	0.00166 m <sup>2</sup> /m, 4-D13 @150

## Gen 2021 v1.1 (Nueva versión)

3. Design for Shear

[ END ]	y : 8 (J)	z : 8 (J)
Applied Shear Force (Vu)	40.5926 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 <sup>2</sup> /m, 4-D13 @100	0.00166 m <sup>2</sup> /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 <sup>2</sup> /m, 4-D13 @150	0.00083 m <sup>2</sup> /m, 4-D13 @150

$V_c$  en Diseño =  $R \cdot V_c$

✓ Nota

Provisiones sísmicas en 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  $A_g f_c' / 20$ .

# 10. Configuración asimétrica de Beam End Offset

## Adición tipo de elemento (Asymmetric)

- Establezca un beam end offset para cada dirección

**Gen 2020**

Type: Element

RGDi: 45 cm

RGDj: 60 cm

**Gen 2021 v1.1 (Nueva versión)**

Type: Element(ASYMI)

RGDyi: 45 cm

RGDzi: 60 cm

RGDyj: 45 cm

RGDzj: 60 cm

Boundary Group Name: Default

Options: Add/Replace (selected), Delete

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

Beam Offset Type: Element(ASYMI)

RGDyi(Mzi): 45 cm

RGDzi(Myi): 60 cm

RGDyj(Mzj): 45 cm

RGDzj(Myj): 60 cm

Beam Offset Values: RGDyi(Mzi)=45.000, RGDzi(Myi)=60.000, RGDyj(Mzj)=45.000, RGDzj(Myj)=60.000



# 11. Función de presión de suelo estática

## Adición de presión de suelo estática tipo función.

- Al editar los valores de la tabla, la forma de la presión del suelo en el modelo se modifica automáticamente.

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/m<sup>2</sup>  
 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...

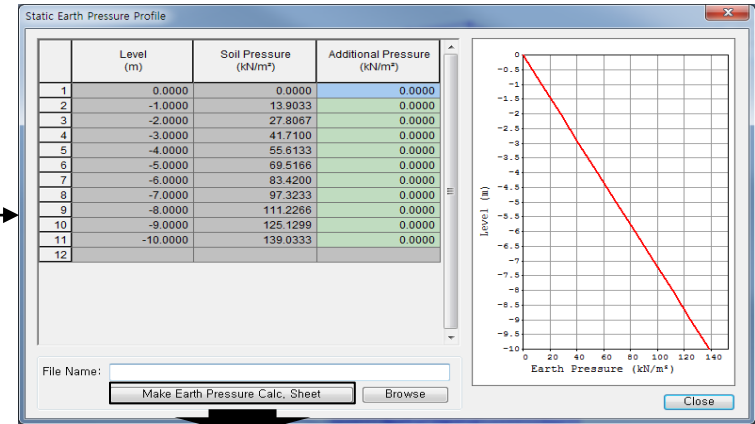
Establezca caso de carga y dirección

Configure el tipo de presión de la tierra, la sobrecarga y el nivel del agua

Seleccione la función de Propiedades del suelo

Establezca área de carga

Revise curva de carga por nivel



Hoja de Cálculo

Surcharge Load : s = 0.000 kN/m<sup>2</sup>  
 Ground Level : BL = 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/m<sup>3</sup>  
 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 <sup>3</sup> )	GAMMA.w (kN/m <sup>3</sup> )	p(z) (kN/m <sup>2</sup> )	ADD. p(z) (kN/m <sup>2</sup> )
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

## 12. Resultados gráficos de links elásticos en análisis pushover

### Adición de salida gráfica del enlace elástico (tipo multilineal) en el análisis pushover

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

The screenshot displays the 'Pushover Smart Graph' window. On the left, the 'Elastic Link Result' panel is highlighted with a red box. It shows the 'Name' as 'E1\_Hyst\_Fx-Dx\_J-end\_PO1' and 'Type' as 'Multi-Linear'. Below this, there are options to 'Sort by Type' or 'Sort by No.', and a table with one entry: '1 (n1:1,n2:2)' of type 'Multi-Linear'. There are buttons for 'Selected EL-Link in View' and 'Unselect All'. Below the table, the 'Type of Result' is set to 'Force-Deformation'. The 'Location' is 'I-end' and the 'Component' is 'Fx-Dx'. The 'Pushover Load Case' is set to '1'. At the bottom, the 'Select Function' list includes 'E1\_Hyst\_Fx-Dx\_J-end\_PO1'. The main graph area shows a hysteresis loop for 'E1\_Hyst\_Fx-Dx\_J-end\_PO1' with Force (kN) on the y-axis and Deformation (mm) on the x-axis. The graph shows a linear elastic region followed by a non-linear region. A summary box indicates: '- Summary -', '-Max: -10 at -0.2', and '-Min: -100 at -100'. Below the graph, there are controls for 'Graph / Animation' including Start, Current, End, and Increment values in steps and seconds, along with play, pause, and navigation buttons. At the bottom, there are 'Display Option' checkboxes for 'Plot Table', 'Show Symbol', 'Background Graph', and 'Show MSS', and a 'Draw Graph' button.

#### Seleccione Elastic Link

Todos los enlaces elásticos asignados al modelo se muestran en la lista. Para el mismo tipo, son posibles varias selecciones.

#### Tipo de Resultado

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

#### Ubicación/Componente

1. **Ubicación** : Posición de salida de elementos
2. **Componente** : Stress-Deform/ ángulo Momento-Rotación en eje de elemento

#### Gráfica / Animación

La función de animación comprueba los resultados en una sección específica. Puede comprobarse junto con los resultados de la tabla

#### Opciones de Display

Después de comprobar cada elemento, haga clic en el botón [Gráfico] para aplicarlo al gráfico.

# 13. Longitud no adherida en vigas pretensadas

- La longitud no adherida de la viga pretensada se puede definir directamente al crear torones desde el cuadro de diálogo "Perfil de tendón".
- Defina la longitud total real del torón, incluidas las partes no adheridas en ambos extremos y luego ingrese las longitudes de las partes no adheridas.

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

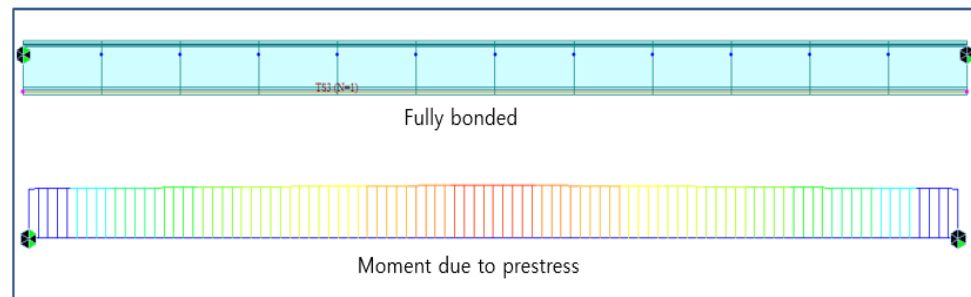
Straight Length of Tendon: Begin: 0 m End: 0 m

Transfer Length: User defined Length Begin: 0 m End: 0 m

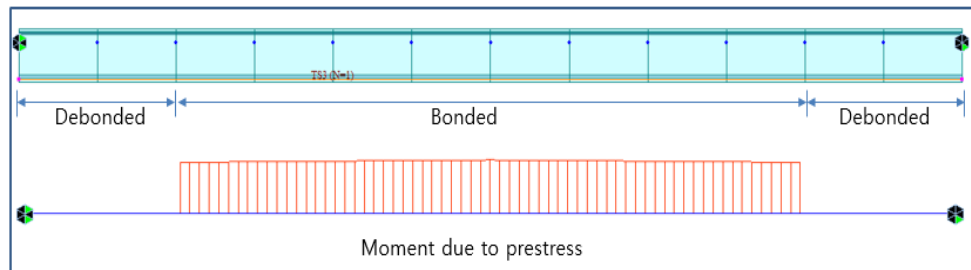
Debonded Length: Begin: 0 m End: 0 m

Profile Reference Axis:

x(m)	y(m)
1	



Cuando la longitud no adherida tiene 0, diagrama del momento primario del tendón

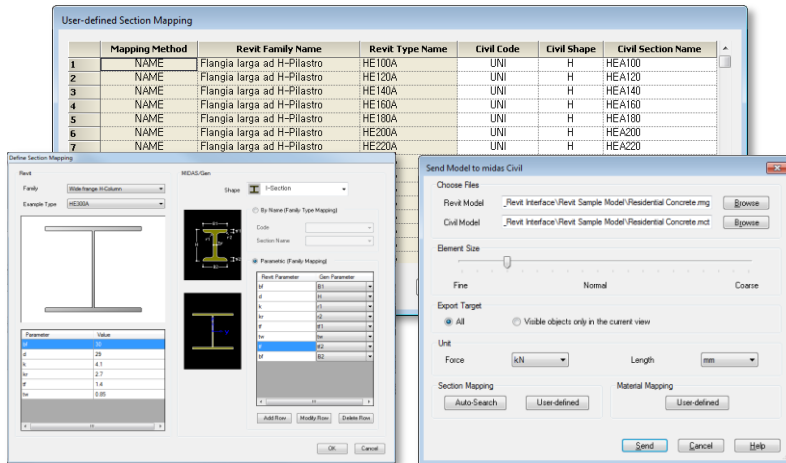


Cuando la longitud no adherida no es cero, diagrama de momento primario del tendón

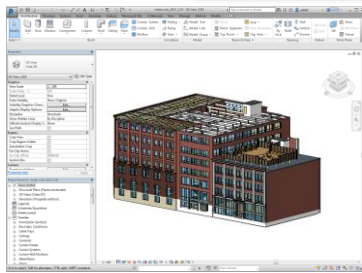
# 14. Interfaz con Revit 2021

## Gen-Revit Link

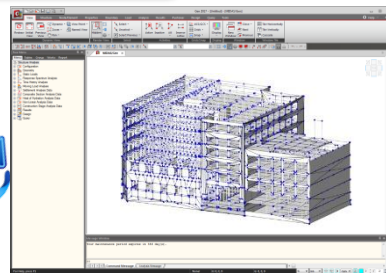
- **File > Import > midas Gen MGT File**
- **File > Export > midas Gen MGT File**



**Send Model to midas Gen**



**Revit 2021**



**Gen 2021 v1.1 (Nueva versión)**

	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	>
Boundary	Offset	>
	Rigid Link	>
	Cross-Section Rotation	>
	End Release	>
	Isolated Foundation Support	>
	Point Boundary Condition	>
	Line Boundary Condition	>
	Wall Foundation	>
	Area Boundary Condition	>
	Load	Load Nature
Load Case		>
Load Combination		>
Hosted Point Load		>
Hosted Line Load		>
Hosted Area Load		>
Other Parameters	Material	<>
	Level	>

*midas* **Design+**

# 1. Reporte en formato Excel

**Generate a report of excel format.**

The screenshot shows the 'Report ...' menu with the following options:

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

The 'Excel : Summary' option is highlighted with a red dashed box. A red arrow points from the 'Report ...' button in the bottom toolbar to this menu.

### Reporte Miembros

100% | Print... | Save... | **Report...** | Option... | Summary Report |  Include Input Data

[ Calculation Summary ( Required ) ]

Min. of Rebar Diameter	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
Max. of Rebar Diameter	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50

Check Items	End	Center	Remark
$d_{b,max}$ (mm)	15.90	15.90	-
$d_{b,min}$ (mm)	9.530	9.530	-
$d_{b,max}$ (mm)	12.00	12.00	-
$d_{b,hoop}$ (mm)	12.70	12.70	9.530 < $d_b$ < 15.90
$d_{b,hoop}$	$d_{b,min} < d_{b,hoop} < d_{b,max}$	$d_{b,min} < d_{b,hoop} < d_{b,max}$	-

### Reporte Lista de Miembros

Start Page | Member | **Member List** | Drawing | Quantity

CHK	Member Name	Apply Member To	Material				Shape		
			Fck (MPa)	Fy (MPa)	Fys (MPa)	Steel	Stud	Type	Width (mm)
<input type="checkbox"/>	SC01	Dwg & Report	24.00	400.00	400.00	SS275	SS275	Rectangle	600.00

All | None | Invert | Apply | Design | Check | Report ... | **Excel File ...** | Auto Resize | Ctrl+Up/Down to Copy

Message

the project will be automatically saved.

# 1. Reporte en formato Excel

## Reporte Excel

- Proporciona resultados de alta calidad
- Se pueden utilizar todas las funciones de Excel.

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

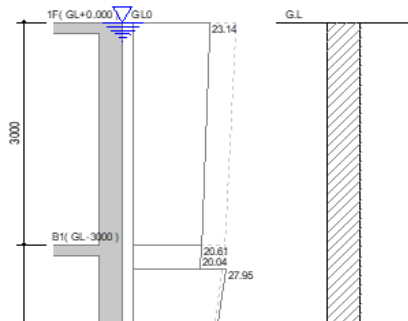
$$K_{H1} = \frac{4,082kN}{m^2}$$

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

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

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

H (m)	u(z) (mm)	u(z)-u(z)B (mm)	KH (kN/m <sup>2</sup> /m)	p(z) (kN/m <sup>2</sup> )	p(z) l/R (kN/m <sup>2</sup> )
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



## Reporte LibXL

- Velocidad de generación de salida muy rápida
- Expresión en el mismo formato que Informe de texto

(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/s<sup>2</sup>

(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/m<sup>2</sup>/m
- KH2 = 5,695kN/m<sup>2</sup>/m
- KH3 = 8,770kN/m<sup>2</sup>/m

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

- KH1 = 4,082kN/m<sup>2</sup>/m
- KH2 = 5,695kN/m<sup>2</sup>/m
- KH3 = 8,770kN/m<sup>2</sup>/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 <sup>2</sup> /m)	p(z) (kN/m <sup>2</sup> )	p(z) l/R (kN/m <sup>2</sup> )
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. Módulo de columna SRC con secciones cajón y tubulares

- Código de diseño aplicado: AISC-LRFD16 (M), 10 (M)
- Forma de acero aplicada: sección H, cajón, tubería

**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

Adición secciones Box y Pipe

## 2. Módulo de columna SRC con secciones cajón y tubulares

Ejemplo

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

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

Pipe

- 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

Columna SRC con sección **Box**

Columna SRC con sección **Pipe**

Click to Zoom

M19@300

Click to Zoom

H Section

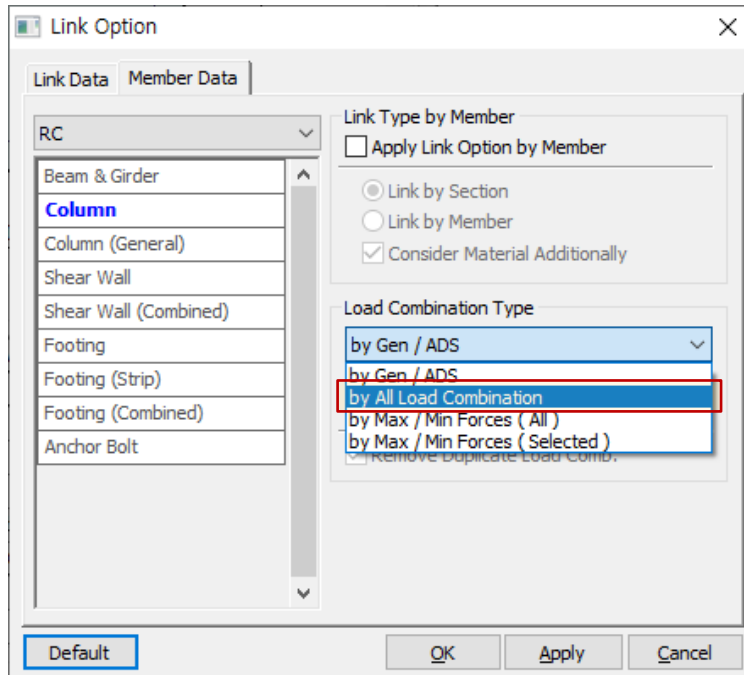
- H 250x250x9/14**
- H 200x200x8/12
- H 200x204x12/12
- H 208x202x10/16
- H 244x252x11/11
- H 248x249x8/13
- H 250x250x9/14
- H 250x255x14/14
- H 294x302x12/12
- H 298x299x9/14
- H 300x300x10/15
- H 300x305x15/15
- H 304x301x11/17

Columna SRC con sección **H**

### 3. Opción de Midas link

- Adición de tipo "by all combination" en el tipo de combinación de carga.

Link Option > **Member Data**



- Función de enlace de apoyo para todas las combinaciones creadas en Gen

#### Lista modulos con [ by All Load Combination ]

- ✓ **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. Opción de Midas link

Ejemplo para tipo "by All Combination"

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

1. Genere una combinación de carga y seleccione una columna.
2. Establezca el tipo de combinación by All Load Combination en Link Option> Member Data> Column tab.
3. Verifique el número de miembro e importe la información de diseño de los miembros.
4. Verifique la Lista de miembros en el menú del árbol de RC.

# 3. Opción de Midas link

## Ejemplo para tipo "by All Combination"

1. Calculation Summary  
(1) Check Magnified Moment

SN	CHK	NAME	Pu (kN)	Mux (kN.m)	Muy (kN.m)	Vux (kN)	Vuy (kN)	Cmx	Cmy	Bdns	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))+1.3WINDCOMB1 + 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))+1.3WINDCOMB2 + 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) + 1.3WINDCOMB1 + 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) + 1.3WINDCOMB1 + 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) + 1.3WINDCOMB2 + 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) + 1.3WINDCOMB2 + 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) - 1.3WINDCOMB1 + 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) - 1.3WINDCOMB1 + 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) - 1.3WINDCOMB2 + 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) - 1.3WINDCOMB2 + 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))+1.3WINDCOMB1 + 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))+1.3WINDCOMB1 + 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))+1.3WINDCOMB2 + 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))+1.3WINDCOMB2 + 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))-1.3WINDCOMB1 + 1.0(L)

5. Haga clic en el botón "Load Combinations".

6. Verifique el nombre de la combinación de carga y la posición final del miembro antes de diseñar / verificar.

\* En el caso de las columnas RC, se importan las fuerzas de los miembros de los extremos I y J por combinación de carga.

Recomendado para comprobar la posición del diseño.

# 4. Diseño de zapatas combinadas por Eurocode

## Adición de diseño de zapata combinada según Eurocódigo 2: 04

The screenshot displays the Midas Gen software interface for designing a combined footing. The 'Footing' menu is open, showing options like 'Isolated Footing' and 'Combined Footing'. The 'Combined Footing' option is selected, and its properties are shown in the left panel. The central view shows a plan and section of the footing with dimensions: total width 5000mm, depth 3000mm, and two columns (C01 and C02) spaced 3000mm apart. The soil bearing capacity is set to 100.00 kPa. The report window on the right provides a detailed calculation summary and check results.

**1. Calculation Summary**

(1) Soil Capacity

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

\* 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	$M_{Ed} / M_{Rd}$
Moment-Y Direction ( kN-m )	6.573	112	0.0589	$M_{Ed} / M_{Rd}$

(4) Rebar

Category	Value	Criteria	Ratio	Note
Check Space-X ( mm )	150	400	0.375	$S_{d,Ed} < S_{d,max}$
Check Space-Y ( mm )	150	400	0.375	$S_{d,Ed} < S_{d,max}$
Check Area-X( $A_{s,Ed} < A_{s,max}$ ) ( mm <sup>2</sup> )	2,581	20,000	0.129	$A_{s,Ed} < A_{s,max}$
Check Area-X( $A_{s,Ed} > A_{s,min}$ ) ( mm <sup>2</sup> )	2,581	645	0.250	$A_{s,Ed} > A_{s,min}$
Check Area-X( $A_{s,Ed} > A_{s,req}$ ) ( mm <sup>2</sup> )	2,581	129	0.0500	$A_{s,Ed} > A_{s,req}$
Check Area-Y( $A_{s,Ed} < A_{s,max}$ ) ( mm <sup>2</sup> )	860	20,000	0.0430	$A_{s,Ed} < A_{s,max}$
Check Area-Y( $A_{s,Ed} > A_{s,min}$ ) ( mm <sup>2</sup> )	860	645	0.749	$A_{s,Ed} > A_{s,min}$
Check Area-Y( $A_{s,Ed} > A_{s,req}$ ) ( mm <sup>2</sup> )	860	50.63	0.0589	$A_{s,Ed} > A_{s,req}$

\*\* 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
Two Way Shear	0.127	0.431	0.296

## 4. Diseño de zapatas combinadas por Eurocode

### Procedimiento de diseño de zapatas combinadas

#### Defina Sección

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	

**Paso 1.**  
Definir hormigón, material de armadura, capacidad del suelo e información del elemento de la zapata.

#### Defina Carga

Section	Load	Column
Design Load		
Surface Load	<input type="text" value="5.00"/> kPa	
Weight Density	<input type="text" value="18.00"/> kN/m <sup>3</sup>	
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"/>		

**Paso 2.**  
Definir datos de carga. (Carga de diseño, factor, información de corte (Shear offset))

#### Defina información de columna

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"/>		

**Paso 3.**  
Defina el elemento de columna e información de carga aplicada.

#### Defina arreglo de barras

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		

**Paso 4.**  
Defina arreglo de barras y espaciamiento



# 4. Diseño de zapatas combinadas por Eurocode

## Reporte de Diseño resumido

### 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

## Reporte de Diseño detallado

### 3. Check One-Way Shear ( Direction X )

(1) Calculate ratio of shear capacity

Column	D <sub>eff</sub> (mm)	k	ρ	V <sub>Res,1</sub> (kN)	V <sub>Res,2</sub> (kN)	V <sub>Ed</sub> (kN)	V <sub>Res,max</sub> (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

- $k = \min [ 1 + \sqrt{200/d} , 2.0 ] = 1.699$
- $\rho_1 = \min [ A_{st} / b_w d , 0.02 ] = 0.00631$
- $C_{Rd,c} = 0.18 / \gamma_c = 0.120$
- $V_{Rd,1} = [ C_{Rd,c} k ( 100 \rho_1 f_{ctk} )^{1/3} + k_1 \sigma_{cp} ] b_w d = 1,046 \text{ kN}$
- $V_{Rd,2} = [ 0.035 k^{3/2} f_{ctk}^{1/2} + k_1 \sigma_{cp} ] b_w d = 793 \text{ kN}$
- $V_{Rd} = V_{Rd,c} = 1,046 \text{ kN}$
- $V_{Ed} = 72.59 \text{ kN}$
- $V_{Ed} / V_{Rd} = 0.0694 \rightarrow \text{O.K}$

### 4. Check Two-Way Shear

(1) Calculate Shear at Face of Column

Column	Position	Offset (mm)	U (mm)	β	k	V <sub>Ed</sub> (MPa)	V <sub>Rd,c,max</sub> (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

- $U = 2,000 \text{ mm}$
- $a = ( \frac{e_x}{b_y} )^2 , \quad b = ( \frac{e_y}{b_x} )^2$
- $\beta = 1 + 1.8 \sqrt{a+b} = 6.497$
- $V_{Ed} = \frac{\beta N_{Ed}}{U d} = 0.184 \text{ MPa}$
- $f_{ctd} = \alpha_{cc} f_{ctk} / \gamma_c = 0.000 \text{ MPa}$

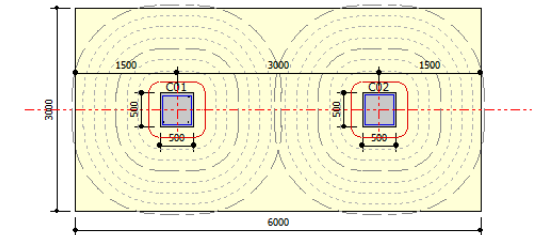
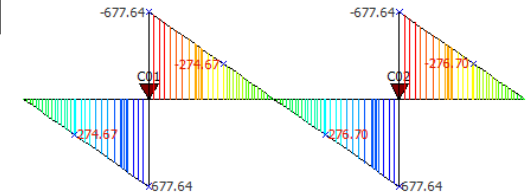
### 5. Calculate moment capacity

(1) Calculate moment capacity (Direction X)

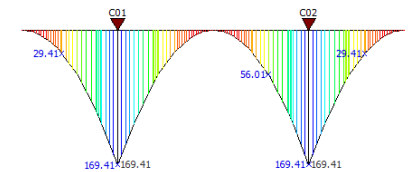
Position	Top/Bottom	f <sub>td</sub> (MPa)	z (mm)	A <sub>s</sub> (mm <sup>2</sup> )	M <sub>Ed</sub> (kN-m/m)	M <sub>Res</sub> (kN-m/m)	Ratio	Remark
Cantilever(L)	Bottom	348	400	2,581	0.0140	359	0.0000391	OK
Colm (C01)	Bottom	348	400	2,581	14.38	359	0.0400	OK
Span (C01-C02)	Top	348	400	2,581	-17.98	359	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

- $M_{Ed} = f_{td} A_s z$

Diagram



(2) Bending Moment Diagram ( Direction X )

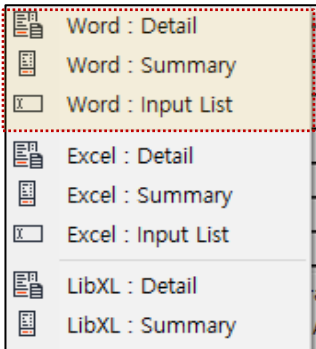


# 5. Velocidad de informes para formato MS Word

- El tiempo de presentación de informes para el formato MS Word se ha reducido mejorando el algoritmo.

## Ejemplo Modelo ( Estructura RC de 6 pisos )

- ✓ Código Nacional : Eurocode2:04
- ✓ Módulo: Combined Footing Design
- ✓ Páginas de Reporte: 13 cada una



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(7) Calculate shear at distance  $x$  from column face (Offset Factor: 1.200)

Column	Position	Offset (mm)	U (mm)	d	h	V <sub>Ed</sub> (kN)	V <sub>Ed</sub> (MPa)	Ratio	Remark
CO1	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK
CO2	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK

(8) Calculate shear at distance  $x$  from column face (Offset Factor: 1.500)

Column	Position	Offset (mm)	U (mm)	d	h	V <sub>Ed</sub> (kN)	V <sub>Ed</sub> (MPa)	Ratio	Remark
CO1	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK
CO2	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK

(9) Calculate shear at distance  $x$  from column face (Offset Factor: 1.200)

Column	Position	Offset (mm)	U (mm)	d	h	V <sub>Ed</sub> (kN)	V <sub>Ed</sub> (MPa)	Ratio	Remark
CO1	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK
CO2	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK

(10) Calculate shear at distance  $x$  from column face (Offset Factor: 1.500)

Column	Position	Offset (mm)	U (mm)	d	h	V <sub>Ed</sub> (kN)	V <sub>Ed</sub> (MPa)	Ratio	Remark
CO1	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK
CO2	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK

(11) Calculate shear at distance  $x$  from column face (Offset Factor: 1.200)

Column	Position	Offset (mm)	U (mm)	d	h	V <sub>Ed</sub> (kN)	V <sub>Ed</sub> (MPa)	Ratio	Remark
CO1	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK
CO2	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK

(12) Calculate shear at distance  $x$  from column face (Offset Factor: 1.500)

Column	Position	Offset (mm)	U (mm)	d	h	V <sub>Ed</sub> (kN)	V <sub>Ed</sub> (MPa)	Ratio	Remark
CO1	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK
CO2	Interior	1431	1102	1150	1421	0.0170	1.225	0.0221	OK

(13) Check Rebar

Calculation Summary (Factor Shear //)	Value	Criteria	Ratio	Note
Maximum Space - X (mm)	17.72	137	0.129	S <sub>x</sub> < S <sub>min</sub>
Maximum Space - Y (mm)	17.72	137	0.129	S <sub>y</sub> < S <sub>min</sub>

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

Position	Top/Bottom	Rebar	S <sub>x</sub> (mm)	S <sub>y</sub> (mm)	Remark
Center (L)	Bottom	F20@17.72	400	137	OK
Com (CO1)	Bottom	F20@17.72	400	137	OK
Com (CO2)	Bottom	F20@17.72	400	137	OK
Center (R)	Bottom	F20@17.72	400	137	OK

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

Position	Top/Bottom	Rebar	S <sub>x</sub> (mm)	S <sub>y</sub> (mm)	Remark
Center (L)	Bottom	F20@17.72	400	137	OK
Com (CO1)	Bottom	F20@17.72	400	137	OK
Com (CO2)	Bottom	F20@17.72	400	137	OK
Center (R)	Bottom	F20@17.72	400	137	OK

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(1) Calculate moment capacity (Direction X)

Position	Top/Bottom	f <sub>yk</sub> (MPa)	z (mm)	A <sub>s</sub> (mm <sup>2</sup> )	M <sub>u,Ed</sub> (kN.m)	M <sub>u,Rd</sub> (kN.m)	Ratio	Remark
Center (L)	Bottom	400	1095	17733	28.37	11.449	0.0014	OK
Com (CO1)	Bottom	400	1095	17733	148	11.449	0.0137	OK
Com (CO2)	Top	400	1095	17733	84.31	11.449	0.0074	OK
Center (R)	Bottom	400	1095	17733	148	11.449	0.0137	OK
Center (R)	Bottom	400	1095	17733	28.37	11.449	0.0014	OK

(2) Bending Moment Diagram (Direction X)

(3) Calculate moment capacity (Direction Y)

Position	Top/Bottom	f <sub>yk</sub> (MPa)	z (mm)	A <sub>s</sub> (mm <sup>2</sup> )	M <sub>u,Ed</sub> (kN.m)	M <sub>u,Rd</sub> (kN.m)	Ratio	Remark
Com (CO1)	Bottom	400	1076	17733	125	11.447	0.0159	OK
Com (CO2)	Bottom	400	1076	17733	125	11.447	0.0159	OK

(13) Check Rebar

Calculation Summary (Factor Shear //)	Value	Criteria	Ratio	Note
Maximum Space - X (mm)	17.72	137	0.129	S <sub>x</sub> < S <sub>min</sub>
Maximum Space - Y (mm)	17.72	137	0.129	S <sub>y</sub> < S <sub>min</sub>

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Com (CO1)	Bottom	F20@17.72	400	137	OK
Com (CO2)	Top	F20@17.72	400	137	OK
Center (R)	Bottom	F20@17.72	400	137	OK

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

Position	Top/Bottom	Rebar	S <sub>x</sub> (mm)	S <sub>y</sub> (mm)	Remark
Center (L)	Bottom	F20@17.72	400	137	OK
Com (CO1)	Bottom	F20@17.72	400	137	OK
Com (CO2)	Bottom	F20@17.72	400	137	OK
Center (R)	Bottom	F20@17.72	400	137	OK

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Com (CO1)	Bottom	400	1095	17733	148	11.449	0.0137	OK
Com (CO2)	Top	400	1095	17733	84.31	11.449	0.0074	OK
Center (R)	Bottom	400	1095	17733	148	11.449	0.0137	OK
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Center (L)	Bottom	F20@17.72	400	137	OK
Com (CO1)	Bottom	F20@17.72	400	137	OK
Com (CO2)	Bottom	F20@17.72	400	137	OK
Center (R)	Bottom	F20@17.72	400	137	OK

[Tiempo de Reporte : Design+ 2020 vs Design+ 2021 (Nueva Versión)]



99% reducción en tiempo de reporte