Release Note

Release Date : Mar. 2018

Product Ver. : Gen 2018 (v2.1) and Design+ 2018 (v2.1)



DESIGN OF General Structures

Integrated Design System for Building and General Structures

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• midas Gen

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• midas Design+

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- Shell design as per EC2 (BS EN 1992-1-1:2004) is supported.
- Design and Checking for axial force, bending and shear can be done.

Shell Design

Step 1. Define as a shell element

Define Sub Demain	Slah/Wall/Shell Rehar for Checking	
Verine Sub-Domain		MLC Serviceability Load Combination Type
Domain Name	Member Type Slab/Mat	ML: Slab/Wall/Shell Load Combinations
Element Type Plate	Element List : 78 91 127 142 174 176 180 200to233by11 207 216 218 242 243 245 247 2	Design Criteria for Rebars
Sub-Domain	Name Laver	Slab/Wall/Shell Rebars for Checking
Name	SL1 O Top-Dir,1 O Bot,-Dir,1 O Top-Dir,2 O Bot,-Dir,2	Slab Serviceability Parameters
Member Type None		Slab Flexural Design
Rebar Dir.(CCW) None	Basic Rebar P12 v @ 300.000000 v	📾 Slab Flexural Checking
Dir.1; Angle from GMat	Add Rebar 1 NONE @ 0.000000	Slab Shear Checking
Dir.2: Angle from Dishell	Add Rebar 2 NONE	Slah Sanisaahilitu Chasking
	Cover to Rebar Center : 0.026 m	1-1 Slab Serviceability Checking
Pagis Debes for Clob Mat/Chall	Parameter for Sandwich Model	😪 Cracked Section Analysis Control
Top - Dir 1: D12 - 0 300 -	Consider Iteration for Optimal Design	A Perform Cracked Section Analysis
Bot Dir. 1: P12 V @ 300 V	Top Layer Thickness 0.2 * h	Wall Design
Top - Dir 2: D12 = @ 300 =	Bottom Layer Thickness 0.2 * h	The Wall Chacking
	Number of Iterations 20	Wall Checking
Bot DIF.2: P12 - @ 300 -	Convergence Tolerance 0.001	Shell Flexural Design
Rebar Material for Nonlinear Analysis		🖶 Shell Flexural Checking
Material 0	Add/Replace Delete Close	🖶 Shell Shear Checking

Step 2. Define the layer of Rebar and Thickness

Step 3. Run Shell Design and Checking



Shell Design for Flexure

Result for Rebar

Results Table

Shell Flexural Design 🔹 📖
Load Cases/Combinations
ALL COMBINATION 🔻
Design Force
Element
Display Option
○ Top ○ Bottom
Rebar (Dir. 1)
Concrete

In Rebar option, the followings are supported.

- 1. Axial Force of Members
- 2. Shear Force of Members
- 3. Rebar Stress
- 4. As_req (mm²/m)
- (Required reinforcement)
- 5. Rho_req
- (Area ratio of Required reinforcement)
- 6. Rebar Arrangement
- 7. Design Ratio

Shell Flexural Design
Load Cases/Combinations
Design Force
element O Avg. Nodal
Display Option
○ Top ○ Bottom
 Rebar (Dir. 1) Rebar (Dir. 2) Concrete

Result for Concrete

In Concrete option, the followings are supported.

- 1. Axial Force of Members
- 2. Shear Force of Members
- 3. Principal Compressive Stress of Concrete

Ratio

0.01

1.46

0.00

1.46

0.76

0.01

0.79

4. Design Ratio

Dir-1 Dir-2 Conc Elem Node POS СНК ftd ftd ftd ftd sigcdlim Sig cd Ratio Ratio Lcom Lcom Lcom (kN/m²) (kN/m²) (kN/m²) (kN/m²) (kN/m²) (kN/m²) • 2 2 TOP LC3-st 5720.27 808.63 7.07 LC3-st 1155.22 743.06 1.55 LC3-st 28.70 4000.00 2 2 BOT NG LC3-st 139.52 771.16 0.18 LC3-st 28.18 721.21 0.04 LC3-st 5855.31 4000.00 3 TOP NG 1148.37 1.55 LC3-st 4000.00 2 LC3-st 5714.92 808.63 7.07 LC3-st 743.06 13.97 3 BOT NG 139.39 0.18 LC3-st 0.04 LC3-st 2 LC3-st 771.16 28.01 721.21 5856.79 4000.00 2 7 TOP NG LC3-st 2992.12 808.63 3.70 LC3-st 524.62 743.06 0.71 LC3-st 69.89 4000.00 2 7 BOT OK LC3-st 72.98 0.09 LC3-st 12.80 721.21 0.02 LC3-st 3040.47 4000.00 771.16 2 NG 743.06 0.85 LC3-st 4000.00 8 TOP LC3-st 3092.07 808.63 3.82 LC3-st 630.71 27.22 2 8 BOT OK LC3-st 75.42 771.16 0.10 LC3-st 15.38 721.21 0.02 LC3-st 3163.41 4000.00



Shell Design for Shear

Result for One-Way Shear
Shell Shear Checking
Load Cases/Combinations
ALL COMBINATION 🔻 📖
Design Force
Element O Avg. Nodal
Element Width 1000 mm
Display Option
Type of Display
🔽 Contour 📖 🔽 Legend 📖
🔲 Values 📖
V_Edo
Shear Resistance
🔘 Resistance Ratio

In One-way shear, the followings are supported.

V_Ed for One-way shear
 Shear Resistance for Concrete
 Resistance Ratio

Text Output for design results



Shear Force Resistance CHK Elem Sub-Domain Node Lcom V_Edx V_Edy V_Edo V_Rdc V_Rds Asw/s phi_o (kN/m) (kN/m) (kN/m) (kN/m) (kN/m) (m^2/m) L-B LC2-ser 7 OK -44.70 2 1.76 44.73 -0.04 117.78 0.00 0.00 ► 2 8 OK L-B LC2-ser -43.10 1.76 43.14 -0.04 117.78 0.00 0.00 2 3 OK L-B LC2-ser -43.10 0.00 43.10 -0.00 126.37 0.00 0.00 2 2 OK L-B LC2-ser -44.700.00 44.70 -0.00 126.37 0.00 0.00



Results Table

Design Concept of Shell Design

- Shell or plate element subjected to membrane forces Nx,Ny,Nxy + flexural forces Mx,My,Mxy
- Resisted by resultant tensile forces of reinforcement + resultant compressive forces of concrete





Procedure of Shell Design





1. Shell Design as per Eurocode Establishing whether shell elements are cracked [EN1992-2 : 2005]

186 238 185

150

-18.198

-17.152

-17.152

-18.198

-0.873

-0.873

-1.860

-1.860

A Plate Force(G) A Plate Force(UL:Local) A Plate Force(UL:UCS) F

-0.319

-0.275

0.152

0.108

218 cLCB1

218 cLCB1

218 cLCB1

218 cLCB1

Plate Force(L)

Procedure of Shell Design

Crack Checking

$$\Phi = \alpha \frac{J_2}{f_{cm}^2} + \lambda \frac{\sqrt{J_2}}{f_{cm}} + \beta \frac{I_1}{f_{cm}} - 1 \le 0 \quad \Rightarrow Uncracked, \quad \text{If } \Phi > 0.0, Cracked$$
where:

$$J_2 = \frac{1}{6} [(\sigma_1 - \sigma_2)^2 + (\sigma_2 - \sigma_3)^2 + (\sigma_3 - \sigma_1)^2] \quad \lambda = c_1 \cos \left[\frac{1}{3} \operatorname{ar} \cos(C_2 \cos 3\theta)\right] \quad \text{for } \cos 3\theta \ge 0$$

$$J_3 = (\sigma_1 - \sigma_m) (\sigma_2 - \sigma_m) (\sigma_3 - \sigma_m) \quad \lambda = c_1 \cos \left[\frac{\pi}{3} - \frac{1}{3} \operatorname{ar} \cos(-C_2 \cos 3\theta)\right] \quad \text{for } \cos 3\theta < 0$$

$$I_1 = \sigma_1 + \sigma_2 + \sigma_3 \qquad \beta = \frac{1}{3,7k^{1/1}}$$

$$\sigma_m = (\sigma_1 + \sigma_2 + \sigma_3)/3 \qquad \cos 3\theta = \frac{3\sqrt{3}}{2} \frac{J_3}{J_2^{3/2}}$$

$$\sigma 1 = Max. [\sigma x, \sigma y] = Max. [Fxx, Fyy] \qquad c_1 = \frac{1}{0,7k^{0.9}}$$

$$\sigma 3 = 0 \qquad c_2 = 1 - 6,8 (k - 0,07)^2$$

$$k = \frac{f_{cm}}{2}$$

 $f_{\rm cm}$

τ_{vz}

σ_v

Fmin (kN/m)

-0.867

-0.869

-1.859

-1.859

-17.634

-18.203

-17.157

-17.154

-18.198

Procedure of Shell Design



Calculate Membrane Force

• The geometry of sandwich element has to be known to compute the membrane forces (Nxk, Nyk, Nxyk).

$$\begin{split} N_{xt} &= N_x \frac{a_b}{a} - \frac{M_x}{a} \qquad N_{xb} = N_x \frac{a_t}{a} + \frac{M_x}{a} \\ N_{yt} &= N_y \frac{a_b}{a} - \frac{M_y}{a} \qquad N_{yb} = N_y \frac{a_t}{a} + \frac{M_y}{a} \\ N_{xyt} &= N_{xy} \frac{a_b}{a} - \frac{M_{xy}}{a} \qquad N_{xyb} = N_{xy} \frac{a_t}{a} + \frac{M_{xy}}{a} \end{split}$$





Procedure of Shell Design

Calculation of Sandwich Thickness for Optimal Design - 1





Procedure of Shell Design

Calculation of Sandwich Thickness for Optimal Design - 2





Procedure of Shell Design

Calculation of Membrane Force in tension layer and Required Rebar Area





Procedure of Shell Design

Calculate Force of reinforcement(Tension Layer) and concrete(Compression Layer)



 N_{xak} , N_{yak} : tension forces in reinforcement placed in x and y direction in layer k

N_{ck} : Concrete compression force in layer k



Procedure of Shell Design

Modification of Tension force by considering the location of rebar

Distance from center section to center of outerRebar

$$z_{ya} = \frac{N_{ya}z_{yat} + N_{yab}z_{yab}}{\sum N_{ya}} = \frac{168.71 \cdot 67 + 229.47(-80)}{398.18} = -17.72 \text{ mm}$$

The actual positions of y reinforcement in top and bottom layer are $z_{yat}^* = 53 \text{ mm}$ and

 $z_{yab}^{*} = -23 \text{ mm}$, the corresponding tension forces at those levels, N_{yat}^{*} and N_{yab}^{*} can be

obtained from:

All the measurements in mm

$$N^{*}_{yat} = \sum N_{ya} \frac{z_{ya} - z^{*}_{yab}}{z^{*}_{yat} - z^{*}_{yab}} = 398.18 \frac{-17.72 + 23}{53 + 23} = 27.68 \ N/mm$$
$$N^{*}_{yab} = \sum N_{ya} \frac{z^{*}_{yat} - z_{ya}}{z^{*}_{yat} - z^{*}_{yab}} = 398.18 \frac{53 + 17.72}{53 + 23} = 370.50 \ N/mm$$





2. Modeling for Drop Panel and Column Capital

Drop Panel : Node/Element > Flat/Plate Structure > Drop Panel

Step 1 : Define Drop Panel	Step 2 : Assign Drop Panel	Step 3 : Apply Auto-mesh
Define Drop Panel Image: Add/Modify Drop Panel Add/Modify Drop Panel Description : Shape B1 B2 1.5 m H1 1.5 m H2 Thickness 0 Image: 0 Imag	Assign Drop Panel Assign Drop Panel Option Add / Replace Delete Drop Panel Name dp_01 Apply Close Select Columns and Click 'Apply'	Mesh Auto-mesh Planar Area Mesher Method Nodes 333, 315, 321, 327 Type Quadrilateral Mesh Inner Domain Include Interior Nodes Auto User Include Interior Lines Auto User Include Boundary Connectivity Mesh Size Length Div, Property Element Type Plate Material 1 1 10.2500 Domain Name Name 1
the defined drop panel generates automaticall	y.	Subdivide Boundary Line Elem,



2. Modeling for Drop Panel and Column Capital

Column Capital : Node/Element > Flat/Plate Structure > Column Capital

Step 1 : Define Drop Panel				
Define Colum	ın Capital			
Name Cap_01 Cap_02	Add Modify			
	Add/Modify Column Capital			
	Name : Cap_01			
	Description :			
	● Top of Column ◎ Bottom of Column ◎ Both Shape & Rigid Link			
	B1 0,25 m H B1 B2			
	B2 0.25 m H2			
	H1 0,25 m Node			
	H2 0.25 m			
	🖉 Auto Rigid Link 🗕			
	OK Cancel Apply			

Rigid Link is defined for nodes of column capital automatically

When modeling a slab by 'Auto-mesh' function, It is considering size of column capital and defining the rigid link for nodes in column capital

Step 2 : Assign Drop Panel and run "Auto mesh"	Step 3 : Apply Auto-mesh
Assign Drop Panel	Mesh
Assign Drop Panel 🗸	Auto-mesh Planar Area 🔹 🗸
Option Add / Replace Delete Drop Panel Name dp_01	Mesher Method Nodes - 333, 315, 321, 327 Type Quadrilateral - Mesh Inner Domain V Include Interior Nodes
Apply Close	Auto O User Include Interior Lines Auto O User Auto O User
Auto-Mesh considered size of column capital	Mesh Size • Length Div, .5 m
	Property Element Type Plate • Material 1 1: C21 • Thickness 1 1: 0,2500 •
cally	Domain Name 3
	Delete Boundary Line Elem, Subdivide Boundary Line Elem, Annly Close



x

3. Construction Stage Analysis considering Material Nonlinearity

- Construction stage analysis with material nonlinear is supported
- Plastic model for material can be defined in dialog box of 'Plastic Material' and 'Material Data'

Step 2. Define Material Nonlinear

Setting for Construction Stage Analysis with Material nonlinear

Add/Modify Plastic Material x × Construction Stage Analysis Control Data Nonlinear Analysis Control Final Stage Name Model Nonlinear Type Last Stage CDM V Material Nonlinear Concrete-Damage Geometry Nonlinear Analysis Option Iteration Method Plasticity Data Material Nonlinear Ar Analysis type Newton-Raphson Arc-Length O Displacement-Control 30 [deg] Diliation Angle Include Time Dependent Effect Eccentricity 0 Number of Load Steps : 1 -1,16 Maximum Number of Iterations/Load Step : 5 fbo/fco Cable-Pretension Force Control 0.667 Internal Force к x Material Data Visco Composite Section General Calculate Output of Each Part Compre Convergence Criteria Material ID 5 Conc(CMD) Name Tensile Load Cases to be Distinguished from Dead Load for C.S. Output 0.001 Energy Norm : Elasticity Data Load Case : Ldc1 Steel Displacement Norm : 0.001 Type of Design Conc Standard 0.001 Force Norm : DB Load Case Specific Nonlinear Analysis Control Data Initial Tangent Displacement for Erected Structures Concrete Add Load Case Iteration Method () All C Group KSCE-LSD15(RC) Standard Type of Material Code Isotropic Orthotropic Remove Construction St DB C30 Plasticity Data Plastic Material Name CDM -Inelastic Material Properties for Fiber Model OK Remove Nonlinear Analys None Rebar Concrete None -Thermal Transfer 0 kcal/N·[C] Specific Heat 0 Heat Conduction kcal/mm·hr·[C] 0.05 Damping Ratio OK Cancel Apply Linear Model (Max. for sig_eff =2.5N/mm²)

Step 1. Define Plastic Material Data

Step 3. Define Construction stage analysis Option

Other Stage

External Force

· ...

SG1

CS1

Add

Load Case

Matl. Nonlinear Anal. Control

Time Dependent Effect Control

Material nonlinear Model

(Max. for sig_eff =5.4N/mm²)

Replace

Add

Delete

ancel



midas **Gen**

4. Addition of artificial earthquake generation function of dynamic analysis

- Spectral load and time history load used for dynamic analysis (Response Spectrum Analysis and Time History Analysis) can be generated as artificial seismic waves.
- It is possible to apply dynamic load with various variables through artificial earthquake generation referring to Design Spectrum according to country code.

Add/Modify Artificial Earthquake

Data Type

Graph Option

Function Name



artificial earthquake : Tools > Data Generator > Artificial Earthquake

midas **Gen**

5. Reinforcement data interchange between Gen and GSD

- Addition of the function to link rebar input data to Gen column with GSD.
- Improvement of GSD design process (Interaction Curve and Moment Curvature Curve) through convenient reinforcement input function of Gen.

Design > RC Design > Beam Section Data for Checking Design > RC Design > Column Section Data for Checking



6. Revit 2018 Interface

 Using Midas Link for Revit Structure, direct data transfer between midas Gen and Revit 2018 is available for Building Information Modeling (BIM) workflow. Midas Link for Revit Structure enables us to directly transfer a Revit model data to midas Gen, and deliver it back to the Revit model file. This feature is provided as an Add-In module in Revit Structure and midas Gen text file (*.mgt) is used for the roundtrip

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

	Mapping Method	Revit Family Name	Revit Type Name	Civil Code	Civil Shape	Civil Section Name	A
1	NAME	Flangia larga ad H-Pilastro	HE100A	UNI	н	HEA100	
2	NAME	Flangia larga ad H-Pilastro	HE120A	UNI	Н	HEA120	
3	NAME	Flangia larga ad H-Pilastro	HE140A	UNI	Н	HEA140	
4	NAME	Flangia larga ad H-Pilastro	HE160A	UNI	Н	HEA160	
5	NAME	Flangia larga ad H-Pilastro	HE180A	UNI	Н	HEA180	
6	NAME	Flangia larga ad H-Pilastro	HE200A	UNI	Н	HEA200	
7	NAME	Flangia larga ad H-Pilastro	HE220A	UNI	Н	HEA220	
2244221		A Carlo Market (Market (M	Cold Cold	Model , Pevit Int tt Size 	Interdece (Revit Sample Norm ible objects only in th User-defined	Moder-Residential Concrete inct al he cutrent view Length m Material Mapping User-defin	Bjowse Coarse m •
		Send Mode	l to midas G	ien	Name and Annual And		1
Compared to the second se							

Gen2018

Revit 2018

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

Concrete Design Code

Concrete Design Co	ode		x	
Design Code :	Eurocode2:04	•		
National Annex :	Italy	-		
Apply NTC	NTC2018	-		
Apply Special Pro	ovisions for Seismic De	sign		
Strut Angle for Shea	ar Resistance :	45	Deg	
Effective Creep Rat	io (Phi_ef) :	2.14		
Slenderness Limit				
Lambda_lim = 25	/sqrt(n)			
Where, n = N_Ed/(Ac*fcd)				
Beam-Column Jo	int Design	Gamma_rd 1	.2	
Torsion Design				
Moment Redistributi	on Factor for Beam :	1		
Consider Shear St	rength of Concrete for Column/Brace	r Checking V Beam		
	ОК	Clo	se	

Seismic Load Specification

Add/Modify Sei	ismic Lo	oad Specifi	cation		— ×
Load Case Nam	e :	Perm		•	
Seismic Load Co	de :	NTC2018	3	-	
Description :					
-Seismic Load	Paramet	ers			
Ground Type	2:		в		•
Spectrum Pa	aramete	rs			
🖲 T1 🖉) T2	🔘 T3 🛛 🔘) T4 🛛 🤇) User De	fined
Soil Fact	or(S)	Tb	Tc		Td
1.20		0.14	0.42	1.92	2
Maximum Hor	izontal /	Acc. (ag)		0.08	g
Structure Fac	tor (q)			1.5	
Amplification	Factor (Fo)		2.5	
Period of con	stant Ho	ori.Acc. (Tc*)	0.3	
-Structural Par	ameters	s .			
Fundamenta	Period	· 1	-Dir.	Y-Dir	
i di damenta	in choa				
- Seismic Load I	Direction	Eactor (Sca	e Facto	r)	
V-Direction :	1		-Directio		
A Direction.	-		-Direcue		
Accidental Eco	centricit	y			
X-Direction (E	x):	Positive	Ne	gative	None
Y-Direction (E	y):	Positive	© Ne	gative	None
Torsional Amp	lification	ı			
Accidental	Eccentr	icity	Inher	ent Eccer	ntricity
Additional Sei	smic Loa	ds (Unit:N,c	m)		
Story	AddX	AddY	Add	RZ 🔺	Add
				-	
,					
Seismic Load	Profile.	(OK (Cancel	Apply

User input for Strut angle for concrete shear resistance

Euro	ocode2:04 × SSRC79	*	Eur	G	eneral	Steel	Concrete	SRC	Cold Fo					
P	RC Design 👻 🖳 SRC Design	•	6	adific Ma	mbar C	tout Apple								
	Design Code		Ľ	(Hoany Hender Statt Angle										
\mathbf{X}	Partial Safety Factors for Material Prop	perties		Option										
×	Modify Concrete Material			Add	l/Repla	ce 🔘	Delete							
	Limiting Rebar Ratio			Strut Angle for Shear Resistance										
	Limiting Minimum Section Size		\rightarrow	SuurAn	igie ioi	onear resi	starice							
	Design Criteria for Rebar		Ļ	Angle	: (+5)eg						
	Design Criteria for Rebars by Member					(Analy		Class						
	Same Beam Rebar at Joints					Apply		Close						
	Moment Redistribution Factor			(Only f	or B	eam &	Colu	ımn					
	Torsion Reduction Factor													
	Serviceability Parameters													
	Uncertainly Load Combination Factor													
	Modify Member Strut Angle													
	Modify Beam Rebar Data													
:::	Modify Column Rebar Data													
:::	Modify Brace Rebar Data													
(##	Modify Wall Rebar Data													
(##	Modify Wall Mark Data													
	Boundary element Method by Wall ID													
	Concrete Design Tables		Þ											
	Concrete Code Design		•											
	Concrete Code Check		•											
	RC Strong Column-Weak Beam		Þ											
	Footing Design	Ctr	1+9											



• Add serviceability stress checks for 'Quasi Permanent' load combination

	Detail report
Calculate	stress and check linear creep.
LCB	= 30 (Quasi-permanent)
k2	= 0.45000
(Assumed	Uncracked Section)
Mu	= 176.57 kN-m.
n	= 12.18154(Long Term).
fctm	= 0.30 * fck^(2/3) = 2896.46815 KPa.
fr1	= (1.6 - H/1000) * fctm = 2317.17452 KPa.
fr	= MAX[fctm, fr1] = 2896.46815 KPa.
z_bar	= 0.40207 m.
Iyy	= 0.03279 m ² 4.
Ss_con	(Tens.) = Mu*(H-z_bar)/Iyy = 2142.66645 KPa.
Ss_con	(Tens.) < fr> UnCracked Section !
Ss_con	(Comp.) = Mu*(z_bar)/Iyy = 2164.99199 KPa.
Ss_con	(Comp.) < k2*fck = 13500.00000 KPa> 0.K! and Linear Creep

Graphic report

Stress Check

	ENI	D-I	MI	D	END-J					
	Concrete	Rebar	Concrete	Rebar	Concrete	Rebar				
(-) Load Combination No.	17(C)	17(C)	30(Q)	30(Q)	15(C)	15(C)				
Stress(s)	2664.06	27678.56	0.00	0.00	1708.79	17953.55				
Allowable Stress(sa)	18000.00	400000.00	0.00	0.00	18000.00	400000.00				
Stress Ratio(s/sa)	0.1480	0.0692	****	****	0.0949	0.0449				
(+) Load Combination No.	19(C)	19(C)	15(C)	15(C)	17(C)	17(C)				
Stress(s)	354.06	3761.79	1418.04	14898.72	767.72	8066.08				
Allowable Stress(sa)	18000.00	400000.00	18000.00	400000.00	18000.00	400000.00				
Stress Ratio(s/sa)	0.0197	0.0094	0.0788	0.0372	0.0427	0.0202				

• Add plot of VRd,max, VRd,s when VRd,c <1





END-J

Shear Capacity

	END-I	MID	END-J
Load Combination No.	6	6	2
Factored Shear Force (V_Ed)	174.35	109.51	150.13
Shear Strength by Conc.(V_Rdc)	187.00	187.00	187.00
Shear Strength by Rebar.(V_Rds)	183.17	183.17	183.17
Shear Strength by Rebar.(V_Rdmax)	2478.17	2478.17	2478.17
Required Shear Reinf. (Asw)	0.0008	0.0008	0.0008
Required Stirrups Spacing	2-P10 @200	2-P10 @200	2-P10 @200
Shear Ratio by Conc	0.9323	0.5856	0.8028
Shear Ratio by (V_Rds ; V_Rdmax)	0.9518	0.5979	0.8196
Check Ratio	0.9323	0.5856	0.8028

Classification of load combinations

(C: Characteristic Q: Quasi-permanent)



• Detail Report for Punching Shear Checking as per 6.4.4 and 6.4.5 of UNI EN1992-1-1 (Scheduled for June)

	asic control perimeter
	noly = 0.0000
	nolz = 0.0000
	nol = min[sqrt(rholy*rholz), 0.02] = 0.0000
	= min[1+(200/d) 0.5, 2.0] = 2.000 (d in mm)
	JMWはし ビー 1.200 D c = mayf 6 805×2/1 5×50×1/502) /8 19/0amma c)×2/2/188×2/68×2/61×502/1/2 1×11×4
	$a_{1} = b_{2} + 132$ kN
	atV = Beta*V_Ed / V_Rd,c = 1.747 > 1.0> Not Acceptable !!!
	(Need Vertical Reinforcements.)
	уюd = 347826.0870 КРа.
Г	μμη_ef = min[258+8, 25*4, fund] = 203588.8888 KPa_
	5W/SY = Beta*U_Ed / (1.5*0*FyWa_eF) = 0.8099 m 2/m. (0.8099 m 2/m.)
L	(Galculating the outermost perimeter of shear reinfortement.)
	Calculating "Area(Asw)/space(Sr)" of shear reinforcement.
	as per SS-EN 1992-1-1:2005/A1:2014
	"(1) Where shear reinforcement is required it should be calculated in accordance with Expression (6.52):
	$v_{\rm Rd,cs} = 0.75 v_{\rm Rd,c} + 1.5 (d / s_{\rm f}) A_{\rm sw} f_{\rm ywd,ef} \left[1 / (u_1 d) \right] \sin d \le k_{\rm max} \cdot v_{\rm Rd,c} $ (6.52)
	where
	A_{sw} is the area of one perimeter of shear reinforcement around the column [mm ²];

- sr is the radial spacing of perimeters of shear reinforcement [mm];
- $f_{ywd,ef}$ is the effective design strength of the punching shear reinforcement according to $f_{ywd,ef} = 250 + 0.25 d \le f_{ywd}$ [MPa];
- d is the mean of the effective depths in the orthogonal directions [mm];
- a is the angle between the shear reinforcement and the plane of the slab;
- v_{Rd,c} according to 6.4.4;
- k_{\max} is the factor, limiting the maximum capacity that can be achieved by application of shear reinforcement.

NOTE The value of kmax for use in a country may be found in its National Annex. The recommended value is 1,5.

• Remove the default "flag" for Beam-Column Joint Design

Concrete Design Code														
Design Code :	E	4	•											
National Anne	x: []	taly		•										
Apply NTC NTC2018														
Apply Special Provisions for Seismic Design														
Strut Angle for Shear Resistance : 45 Deg														
Effective Cree	p Ratio (Phi_ef) :		2.143										
Slenderness	Limit													
Lambda_lim	= 25/sq	rt(n)												
	Lamoud_im = $25/sqrt(n)$ Where, n = N_Ed/(Ac*fcd)													
Been Column Jaint Design														
Beam-Column Joint Design Gamma_rd 1.2														
Strong Column Weak Beam														
SUM(M_Rc)	> 1	.3 *	SUM(M_Rb)											
Select Ductil	ity Class													
CD'A' (Hi	gh Ductil	ity)												
CD'B' (Me	edium Du	ctility)												
Shear Force	for Desig	gn (Gamma_	rd)											
Beam 1.3	2	Column	1.3	Wall 1	2									
Secondary Sei	smic Elen	nent	None		▼									
Friction Coeffi	cient for	Wall Silding	:		0.6									
Torsion De	sign													
Moment Redis	tribution	Factor for B	eam :		1									
Consider She	ear Stren	igth of Conc	rete for Che	tking										
Vall		Column,	Brace	🔽 Bear	m									
		_												
			OK	C	lose									



Location in NTC 2018	Details											
7.2.5	Minimum rebar ratio for mat foundation modifies the limit from 0.2% to 0.1%											
7.4.4.5.1	When checking Wall element, it is not supported to apply $\pm 50\%$ N for design of wall.											
7.4.6.2.4	Minimum Rebar Ratio for Wall Element and Plate Type Wall (ASWD) will be modified as As/Ac = 0.002 (Vertical and Horizontal)											
7.4.6.2.2	Construction details for Ductility for column											
7.4.6.2.4	Construction details for Ductility for wall											
7.4.4.1.2	Update formula for Check of Ductility: $\mu_{\phi} = \begin{cases} 1, 2 \cdot (2q_0 - 1) & \text{per } T_1 \ge T_C \\ 1, 2 \cdot \left(1 + 2(q_0 - 1) \frac{T_C}{T_1}\right) & \text{per } T_1 < T_C \end{cases} $ [7.4.3]											





Design+

1. Steel Design as per Eurocode

- Supports steel beam and column design as per per EC3 (BS EN 1993-1-1:2005)
- Steel design supports only H-shape.

Steel Design as per Eurocode



2. Addition of EC N.A. for RC Design

• National Annex of Singapore and Sweden is added



- If click "Code Table", You can see a comparison table for each NA.



▼ X

Design+

3. Copy & Paste function in Member List table

• We can copy the value of the member list table to SW such as Excel, and simply edit the model data by pasting the modified value into the Member list table.

Design+ : Member List

Start Page Member Verber List Drawing Quantity

		Apply Member To		Design Type	Section									Force								Length			
CUK	Member		Material					Size						Load C	Load Comb.										
CIIK	Name		material		Shape	DB	Name	Size1 (mm)	Size2 (mm)	Size3 (mm)	Size4 (mm)	Size5 (mm)	Size6 (mm)	СНК	:	(kN)	(kN.m)	(kN.m)	(kN)	(kN)	(kN.m)	(m)	(m)	(m)	(m)
Г	1_1	Dwg & Report	S275	Column	H Section		UC 305x305x283	365.30	321.80	26.90	44.10	0.00	-	Г		142.50	260.67	266.32	195.76	194.63	0.00	5.000	5.000	5.000	5.000
Π	1_2	Dwg & Report	S275	Column	H Section	Π	BH-315x307x12/16	315.00	307.00	12.00	16.00	2.00	-			142.50	261.96	266.40	195.78	194.89	0.00	5.000	5.000	5.000	5.000
Γ	1_3	Dwg & Report	S275	Column	H Section	Π	BH-315x307x8/12	315.00	307.00	8.00	12.00	2.00	-			142.50	261.96	266.40	195.78	194.89	0.00	5.000	5.000	5.000	5.000
Γ	1_4	Dwg & Report	S275	Column	H Section	Π	BH-315x307x8/8	315.00	307.00	8.00	8.00	2.00	-			142.50	262.84	266.40	195.78	195.07	0.00	5.000	5.000	5.000	5.000
Γ	2_1	Dwg & Report	S275	Column	H Section	V	UC 305x305x283	365.30	321.80	26.90	44.10	0.00	-			142.50	260.67	266.32	195.76	194.63	0.00	10.000	10.000	10.000	10.000
	2_2	Dwg & Report	S275	Column	H Section	Π	BH-500x500x5/8	500.00	500.00	5.00	8.00	0.00	-			142.50	260.67	266.32	195.76	194.63	0.00	10.000	10.000	10.000	10.000
	2_3	Dwg & Report	S275	Column	H Section	Π	BH-300x300x12/15	300.00	300.00	12.00	15.00	0.00	-			142.50	158.98	645.28	2267.00	566.17	0.00	5.000	5.000	5.000	5.000
	2_4	Dwg & Report	S275	Column	H Section	Π	BH-300x300x15/30	300.00	300.00	15.00	30.00	30.00	-			2850.00	157.87	645.28	2267.00	566.00	0.00	5.000	5.000	5.000	5.000
	2_5	Dwg & Report	S460	Column	H Section	Π	BH-300x300x12/15	300.00	300.00	12.00	15.00	0.00	-			2850.00	1271.56	1299.34	927.84	922.28	0.00	5.000	5.000	5.000	5.000
Π	SG01	Dwg & Report	S275	Beam	H Section	V	UB 406x140x39	397.30	141.80	6.30		0.00	-			11.00	111.00	111.00	111.00	61.00	0.00	3.000	3.000	3.000	3.000

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4 1_4	Dwg & Rej S	275 Column	H Section	0	BH-315x30	315	307	8	8	2 -		0	142.5	262.84	266.4	195.78	195.07) 5	5	5	5	
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7 2_3	Dwg & Rej S	275 Column	H Section	0	BH-300x30	300	300	12	15	0 -		0	142.5	158.98	645.28	2267	566.17	· () 5	5	5	5	
8 2_4	Dwg & Rej S	275 Column	H Section	0	BH-300x30	300	300	15	30	30 -		0	2850	157.87	645.28	2267	566	i () 5	5	5	5	
9 2_5	Dwg & Rej S	460 Column	H Section	0	BH-300x30	300	300	12	15	0 -		0	2850	1271.56	1299.34	927.84	922.28	() 5	5	5	5	
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