

Release Note

Release Date : July, 2019

Product Ver. : nGen 2020 v1.1

Next Generation Software
for Integrated Analysis, Design, Drawing of Building Systems

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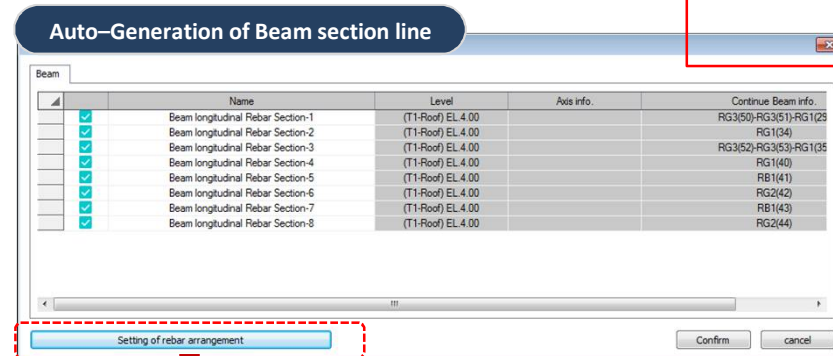
1. Improvement of Drawing Generation

Auto-generation of Rebar Arrangement for Longitudinal Section.

Midas Drawing > Drawing creation > Longitudinal section rebar arrangement...

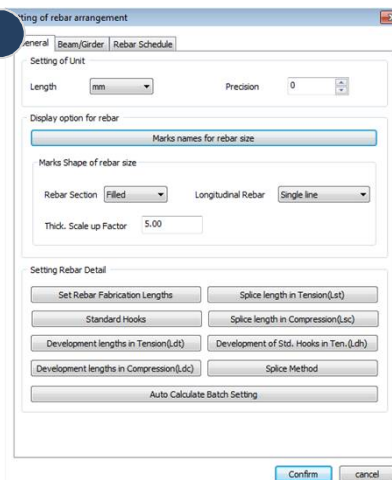
• Supporting Scope

- Beam and Column
- Non-Seismic detail as per EC2



Setting of rebar arrangement

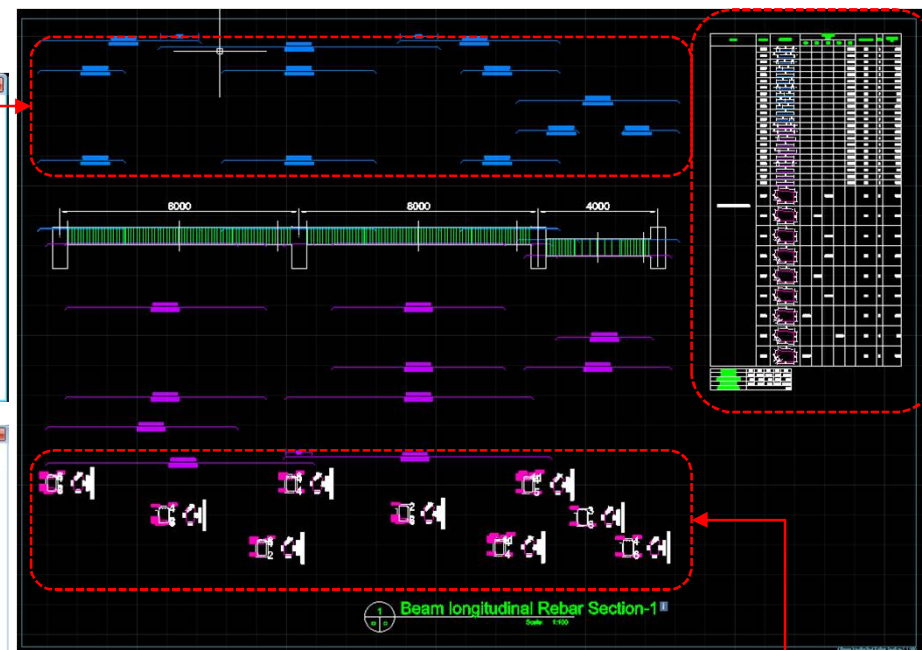
- Setting Rebar Detail
 - Development type and length
 - Splice type and length



- Length and weight of reinforcement

Bar Mark	Rebar Shape	Rebar Length (mm)					Diameter Name	QTY	Total Length (m)
		P10	P11	P12	P13	P25			
NO 01						5287.50	P25	2	10.58
NO 02						9265.00	P25	2	18.53

- Rebar Detail of Longitudinal section (Rebar Length & No.)

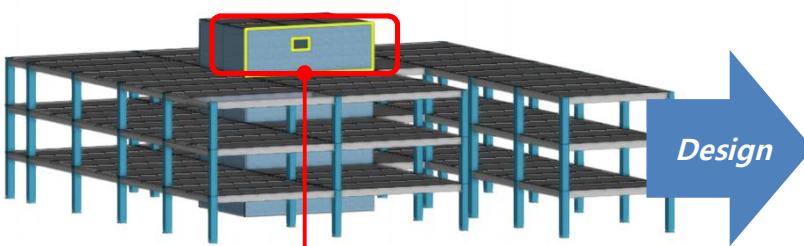


Rebar Arrangement for Longitudinal Section

- Stirrup or Hoop Detail for Cross Section

2. Improvement for RC Design

Addition of RC Design by elements in wall design (meshed plate)



Check Design Result of wall (In-Plane Stress)

Set Design Type of wall

Properties	
Member	
ID	475
Name	Wall-37
Member Set	Superstructure
Story Set	T1
Story	4F
Member Type	Wall
Analysis Type	Plate (Meshed)
Design Type	In-Plane Stress
Thickness	3: T200
Material	C30/37
Design Group	4W6
Direction	Forward

Generate Design Report of wall (In-Plane Stress)

C. Check Tensile Stress for Vertical Rebar

Vertical Tensile Stress	Position(Elem)	7563
Combination	fdL.CB10_8(1.35D+1.50(1.00LL)+0.90(WK+1.00NK))	
f_{tdx}/f_{tdx}	1.416 MPa / 1.539 MPa = 0.920 < 1.000 OK	
p_{min}/p_{max}	$p_{min} = 0.00332 < p = 0.00442 < p_{max} = 0.08000$ OK	

1) Design parameters
 $f_{yk} = 400.000$ MPa
 $t = 0.200$ m
 $\gamma_s = 1.150$
 $f_{yd} = \frac{f_{yk}}{\gamma_s} = 347.826$ MPa

2) Check rebar ratio
 $A_g = 60.000.000$ mm²
 $A_{st} = 265.400$ mm²
 $\rho_v = 0.004$
 $p_{min} = 0.00332 < p = 0.00442 < p_{max} = 0.08000$

3) Calculate stress
 $N_{edx} = -152.942$ kNm
 $N_{edy} = -182.675$ kNm
 $V_{edxy} = 130.243$ kNm
 $\sigma_{edx} = \frac{N_{edx}}{A_g} = -0.765$ MPa
 $\sigma_{edy} = \frac{N_{edy}}{A_g} = -0.913$ MPa
 $\tau_{edxy} = \frac{V_{edxy}}{A_g} = 0.651$ MPa
 $\sigma_{ed,max} = \max[\sigma_{edx}, \sigma_{edy}] = -0.765$ MPa (x-dir)
 $\sigma_{ed,min} = \min[\sigma_{edx}, \sigma_{edy}] = -0.913$ MPa (y-dir)
 $(\sigma_{ed,min} \text{ in Tension of } \sigma_{ed,max} \sigma_{ed,min} \leq \tau_{edxy}^2) \rightarrow \text{Rebar required}$
 $(\sigma_{ed,max} \leq \tau_{edxy}^2)$
 $f_{td,max} = |\tau_{edxy}| - \sigma_{ed,max} = 1.416$ MPa
 $f_{td,min} = |\tau_{edxy}| - \sigma_{ed,min} = 1.565$ MPa
 $f_{tdx} = f_{td,max} = 1.416$ MPa

4) Calculate tension capacity of rebar
 $f_{tdx} = \rho_v f_{yk} = 1.539$ MPa

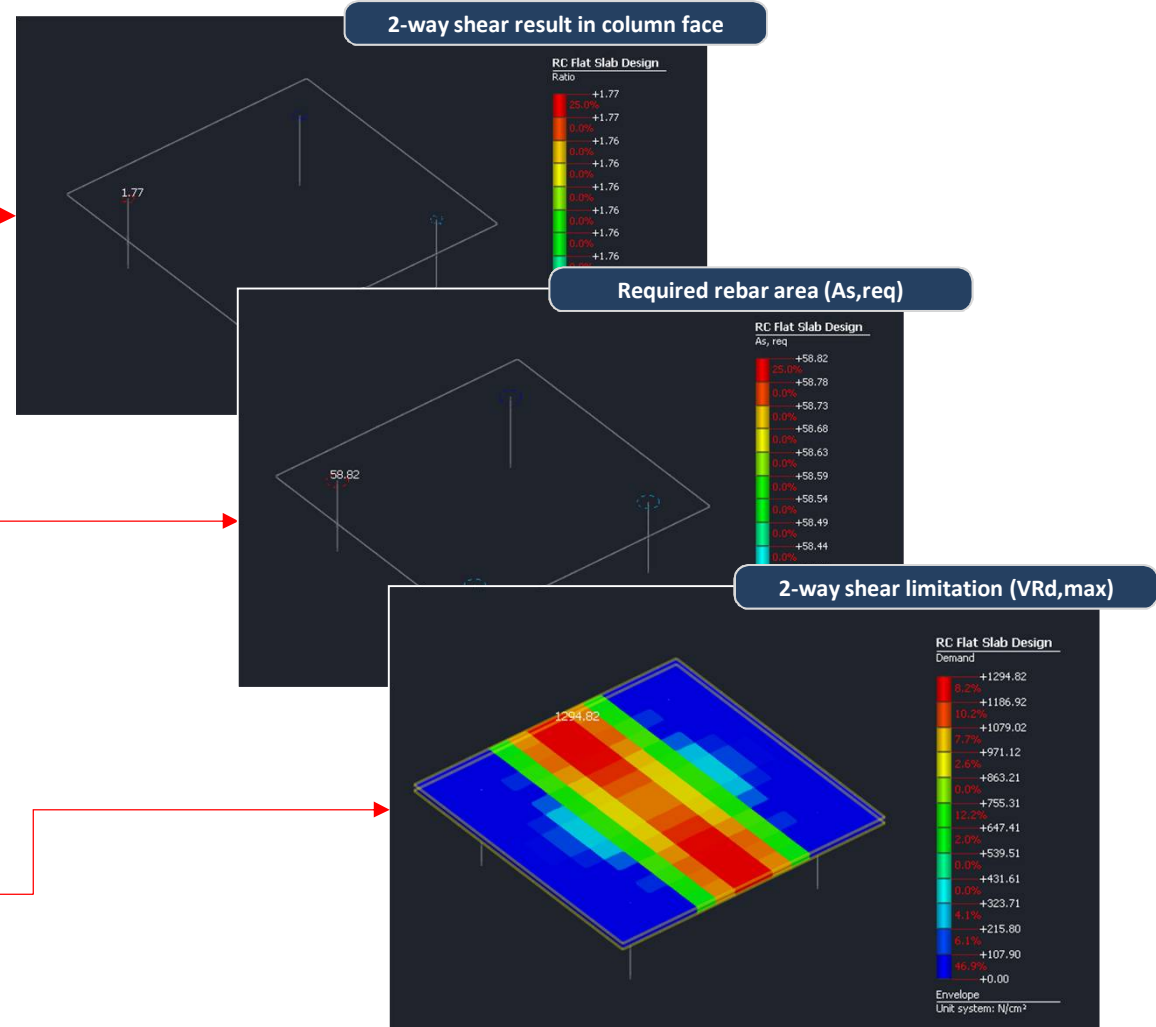
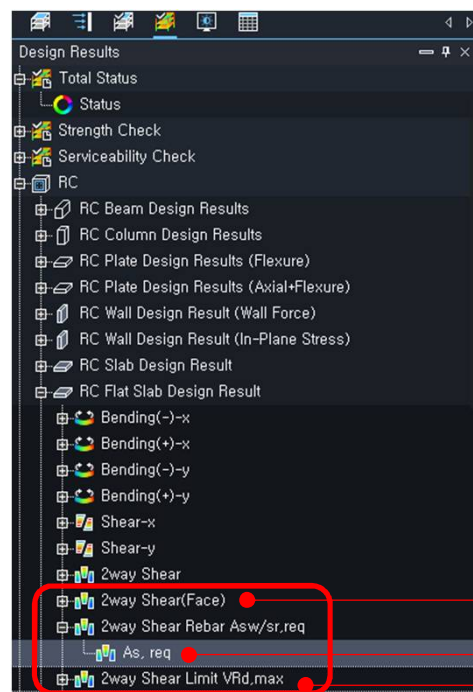
Design Type

- Wall Force : Design by member force
- In-Plane Stress : Design by element stress

2. Improvement for RC Design

Addition of 2-way Shear results for Flat Slab and Foundation

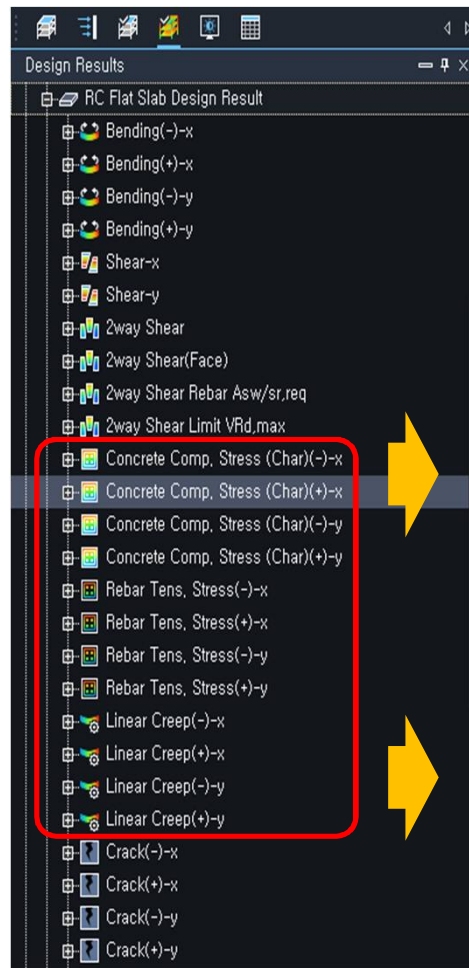
- The following items are added in design results tree.
 - 2-way shear result in column face
 - Required Rebar Area ($A_{s,req}$)
 - 2-way shear limitation ($V_{Rd,max}$)



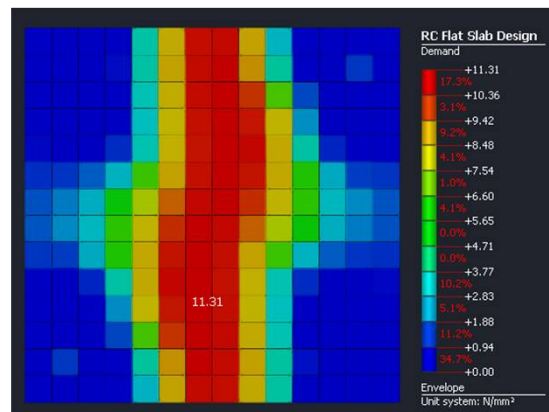
2. Improvement for RC Design

Addition of Serviceability design for Slab and Foundation

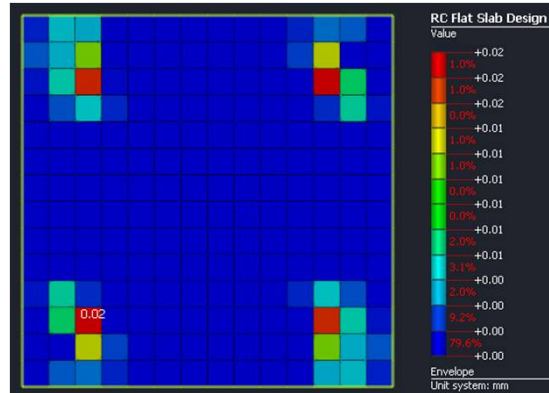
- Added Crack width check & Stress check.



Check Stress for Concrete and Rebar



Check Crack width



Serviceability design Report

E. Check Stress Limitation

a. Check x-Direction

Neg. Stress	Position(Elem)	111	Combination	chLCB2 (1.00D+1.00(1.00Static Load Set-2))	
			$\sigma_{c,avg}/k_2f_{ck}$	-16.978 MPa / -18.000 MPa = 0.943 < 1.000	OK
Neg. Stress	Position(Elem)	111	Combination	chLCB2 (1.00D+1.00(1.00Static Load Set-2))	
			$\sigma_{c,tens}/k_2f_{ck}$	-546.495 MPa / -320.000 MPa = 1.708 > 1.000	NG
Pos. Stress	Position(Elem)	166	Combination	chLCB2 (1.00D+1.00(1.00Static Load Set-2))	
			$\sigma_{c,avg}/k_2f_{ck}$	11.306 MPa / 18.000 MPa = 0.628 < 1.000	OK
Pos. Stress	Position(Elem)	166	Combination	chLCB2 (1.00D+1.00(1.00Static Load Set-2))	
			$\sigma_{c,tens}/k_2f_{ck}$	363.915 MPa / 320.000 MPa = 1.137 > 1.000	NG

b. Check y-Direction

Neg. Stress	Position(Elem)	132	Combination	chLCB2 (1.00D+1.00(1.00Static Load Set-2))	
			$\sigma_{c,avg}/k_2f_{ck}$	-19.251 MPa / -18.000 MPa = 1.069 > 1.000	NG
Neg. Stress	Position(Elem)	132	Combination	chLCB2 (1.00D+1.00(1.00Static Load Set-2))	
			$\sigma_{c,tens}/k_2f_{ck}$	-585.396 MPa / -320.000 MPa = 1.829 > 1.000	NG
Pos. Stress	Position(Elem)	182	Combination	chLCB2 (1.00D+1.00(1.00Static Load Set-2))	
			$\sigma_{c,avg}/k_2f_{ck}$	12.760 MPa / 18.000 MPa = 0.709 < 1.000	OK
Pos. Stress	Position(Elem)	182	Combination	chLC	
			$\sigma_{c,tens}/k_2f_{ck}$	388.0	

Check Stress Limitation

F. Check linear creep

a. Check x-Direction

Neg. Linear Creep	Position(Elem)	111	Combination	quLCB2 (1.00D+1.00(0.30Static Load Set-2))	
			$\sigma_{c,avg}/k_2f_{ck}$	-13.454 MPa / -13.500 MPa = 0.997 > 1.000	Linear Creep
Pos. Linear Creep	Position(Elem)	166	Combination	quLCB2 (1.00D+1.00(0.30Static Load Set-2))	
			$\sigma_{c,avg}/k_2f_{ck}$	8.959 MPa / 13.500 MPa = 0.664 < 1.000	Linear Creep

b. Check y-Direction

Neg. Linear Creep	Position(Elem)	132	Combination	quLC	
			$\sigma_{c,avg}/k_2f_{ck}$	-15.3	

Check Linear Creep

G. Check Crack Width

a. Check x-Direction

Neg. Crack	Position(Elem)	111	Combination	quLCB2 (1.00D+1.00(0.30Static Load Set-2))	
			w, w_{max}	0.020 mm < 0.300 mm	OK
Pos. Crack	Position(Elem)	166	Combination	quLCB2 (1.00D+1.00(0.30Static Load Set-2))	
			w, w_{max}	0.013 mm < 0.300 mm	OK

b. Check y-Direction

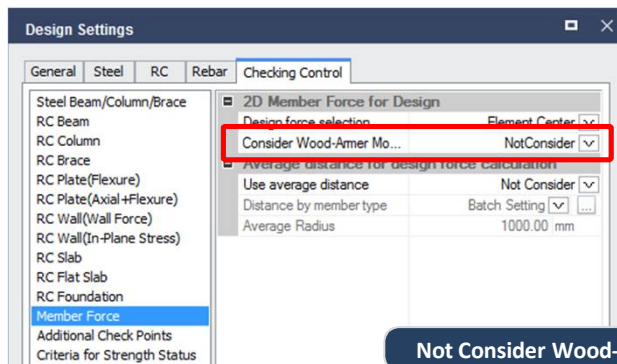
Neg. Crack	Position(Elem)	132	Combination	quLCB2 (1.00D+1.00(0.30Static Load Set-2))	
			w, w_{max}	0.030 mm < 0.300 mm	OK
Pos. Crack	Position(Elem)	182	Combination	quLC	
			w, w_{max}	0.020	

Check Crack width

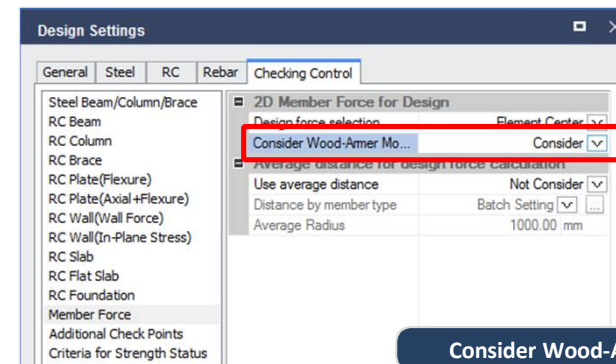
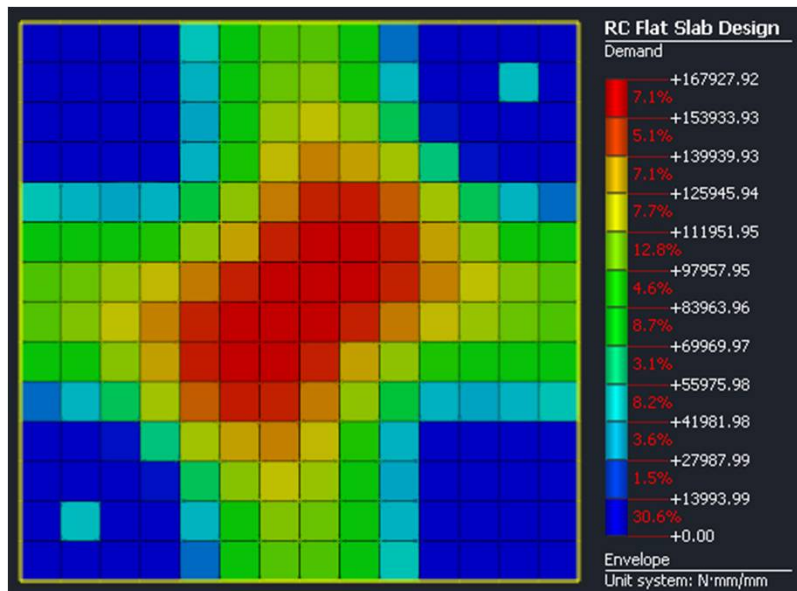
2. Improvement for RC Design

Slab and Foundation Design considering Wood-Armer moment

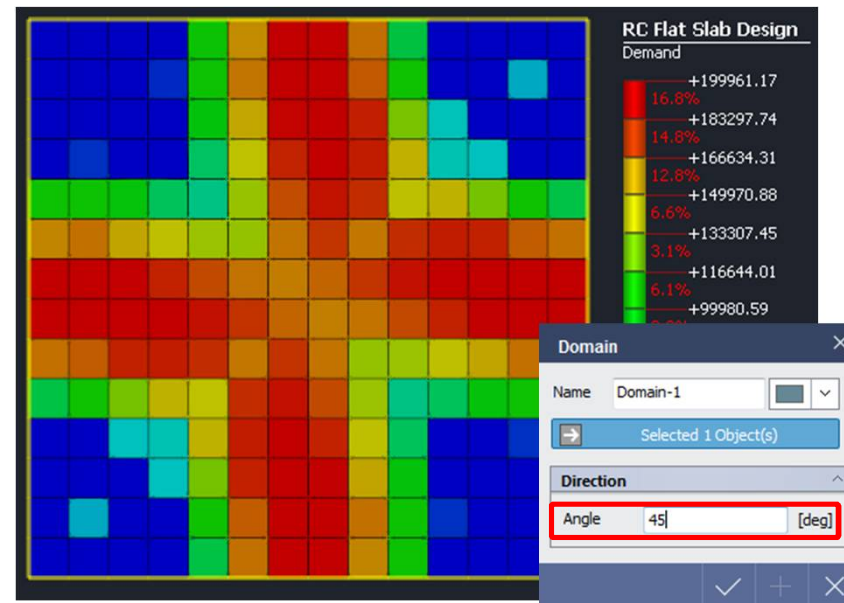
- Ultimate Limit State & Serviceability Limit State



Not Consider Wood-Armer moment



Consider Wood-Armer moment



2. Improvement for RC Design

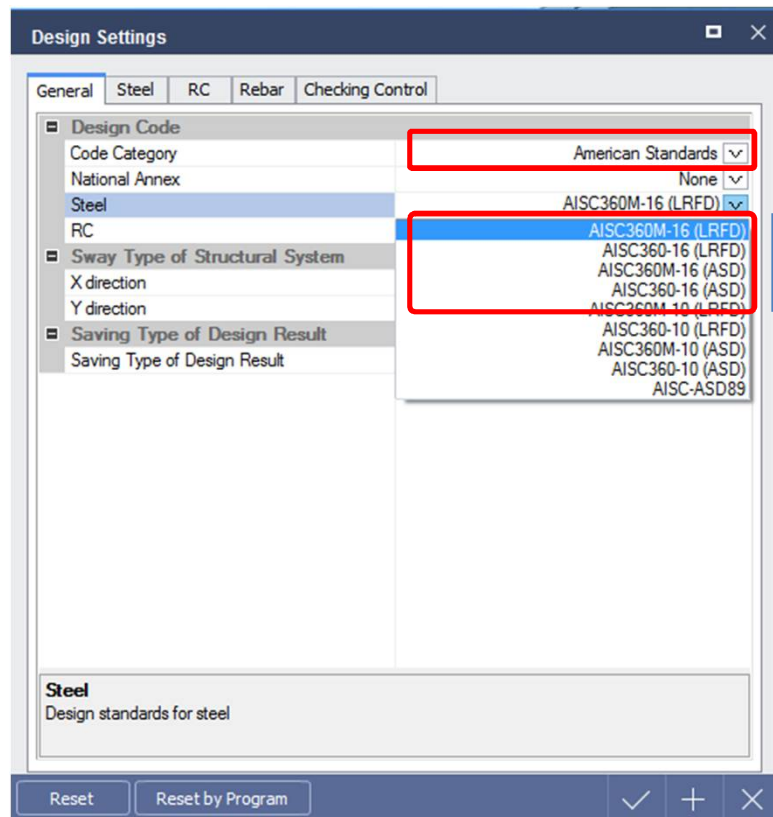
Enhancement of RC design as per NTC 2018

No	Design Item	Description
1	Addition of seismic load	• Static Seismic Load, Response Spectrum
2	Improvement of shear design	• User's control for strut angle in column and beam shear design
3	Improvement of stress check	• Added serviceability stress checks for 'Quasi Permanent' load combination
4	Improvement of punching check	• Added punching check as per 6.4.5 and 6.4.5 of UNI EN1992-1-1
5	Improvement of foundation design	• Changed Min. rebar ratio for foundation (0.2% → 0.1% (NTC 2018 7.2.5))
6	Improvement of wall design	• In Wall Design, it is not supported to apply $\pm 50\%N$ for design of wall (NTC 2018 7.4.4.5.1)
7		• Changed Min. Rebar Ratio for Wall Element and Plate Type Wall (ASWD) ($A_s/A_c = 0.002$ (Vertical & Horizontal) (NTC 2018 7.4.6.2.4))
8	Improvement of seismic design	• Updated a formula for Ductility check (NTC 2018 7.4.4.1.2)

3. Improvement for Steel Design

Addition of Steel Design as per AISC360-16

- AISC360-16 (LRFD)
- AISC360M-16 (LRFD)
- AISC360-16 (ASD)
- AISC360M-16 (ASD)



Design Result Table

Steel Design Modification

Beam: AISC360M-16 (LRFD)

Status	Ratio	Story	Design Group	Member	Section	Material	Combined	Combi...	Axial (kN)	Bending-y (kN)
			Set	Group			LCB1	LCB1	LCB1	LCB1
OK	Deflection	0.04	-	-	Beam-1	UB 610x229x113	S275	0.056	0.056	0.107
OK	Deflection	0.04	-	-	Beam-2	UB 610x229x113	S275	0.052	0.052	0.107
OK	Deflection	0.04	-	-	Beam-4	UB 610x229x113	S275	0.052	0.052	0.107
OK	Deflection	0.04	-	-	Beam-3	UB 610x229x113	S275	0.056	0.056	0.107

Re-Design for Checked List

Design Report (Summary)

Steel Member Design Summary Report: AISC360M-16 (LRFD) (N, mm)

A. Member Information

Member Name: Column-4 (4)

Material: S275 (EN10025-2)

Section: UC 305x305x118 (R)

Member Length: L = 6.000 m

Effective Length Factor: K = 0.700, K_y = 0.666

Member Parameters: B_y = 1.000, B_x = 1.000, C_y = 2.188, C_x = 1.000

Seismic Provision Considered: Seismic Load Resisting System: SMF

B. Check Slenderness Ratio

λ_r = 50.312 < 200.000 (Need Check)

C. Check Combined Ratio

Member Name: Column-4 (at 1.00L, 6.00 m)

Combination: LCB1 (1.400)

Ratio	Value	Limit	Status
Axial	79.553 kN / 3,178,554 kN = 0.025	< 1.000	Need Check
Moment	14,728 kN·m / 475,558 kN·m = 0.031	< 1.000	Need Check
Combined	0.071	< 1.000	Need Check

D. Check Shear Capacity

Shear: Position: Column-4 (0.50L)

Combination: LCB1 (1.400)

V_{Ed} / V_{Rd} = 3,624 kN / 617,821 kN = 0.006 < 1.000 (Need Check)

E. Check Deflection

Deflection: Position: Column-4 (0.50L)

Combination: v_{LCB1} (1.000)

Δ / Δ_{Ed} = 0.001 mm / 16,667 mm (L/250) = 0.000 < 1.000 (OK)

F. Check Fatigue

Do not check because checked off Fatigue check option.

Design Report (Detail)

Steel Member Design Detail Report: AISC360M-16 (LRFD) (N, mm)

A. Design Case: Design 1

Member Information

Member Name: Column-4 (4)

Material: S275 (EN10025-2)

Section: UC 305x305x118 (R)

Member Length: L = 6.000 m

Effective Length Factor: K = 0.700, K_y = 0.666

Member Parameters: B_y = 1.000, B_x = 1.000, C_y = 2.188, C_x = 1.000

Seismic Provision Considered: Seismic Load Resisting System: SMF

C. Design Results

A. Design Results: Check Results

Ratio	Value	Limit	Status
Axial	79.553 kN / 3,178,554 kN = 0.025	< 1.000	Need Check
Moment	14,728 kN·m / 475,558 kN·m = 0.031	< 1.000	Need Check
Combined	0.071	< 1.000	Need Check

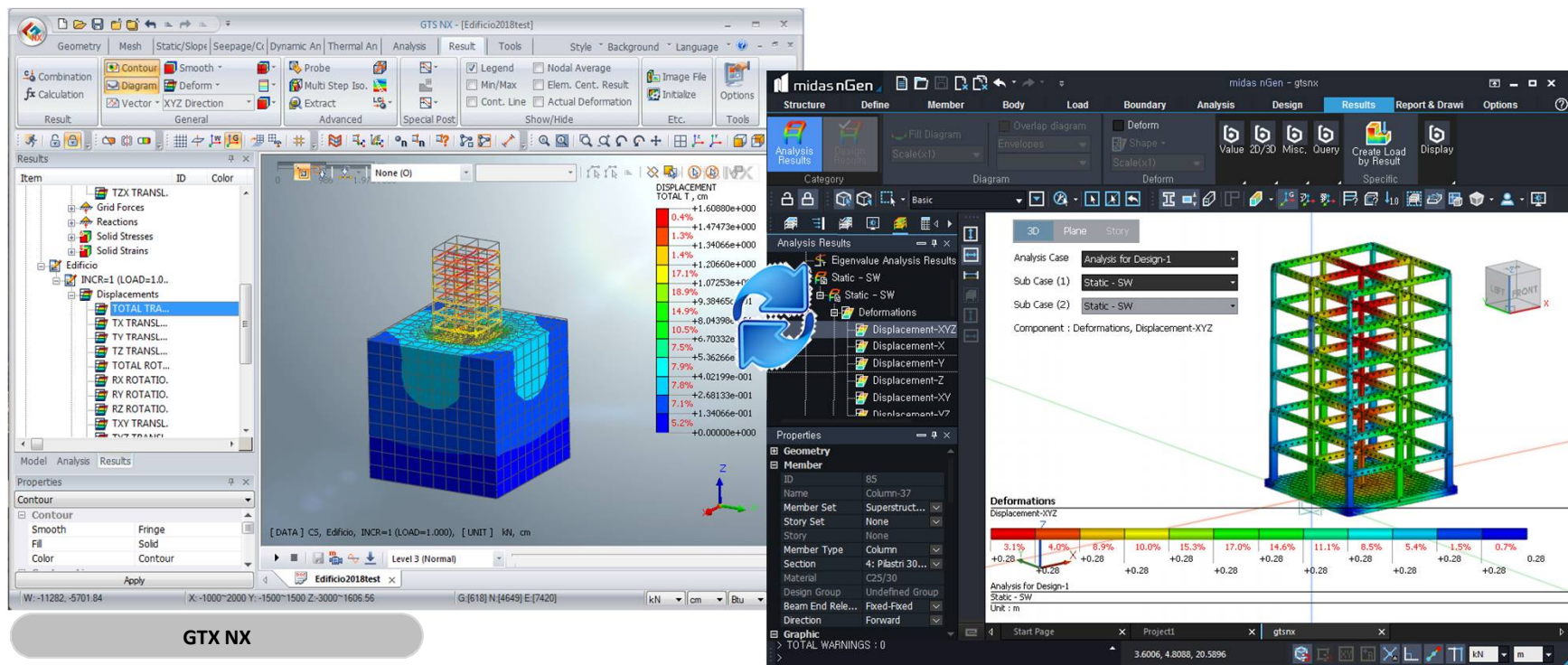
4. nGen - GTS NX Interface

nGen > import > midas GTS Nodal Results file : Import a nodal result such as forces and spring properties for GTS NX

nGen > export > midas GTS MXT file : Export a model information to GTS NX

nGen > export > midas GTS Nodal Results : Export a reaction data of each nodes to GTS NX

- Gen-GTS NX interface supports that the nodal results and nonlinear spring data can be imported or exported in Gen

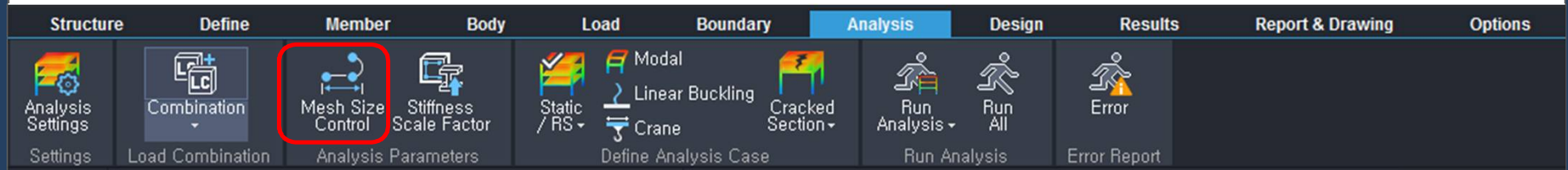


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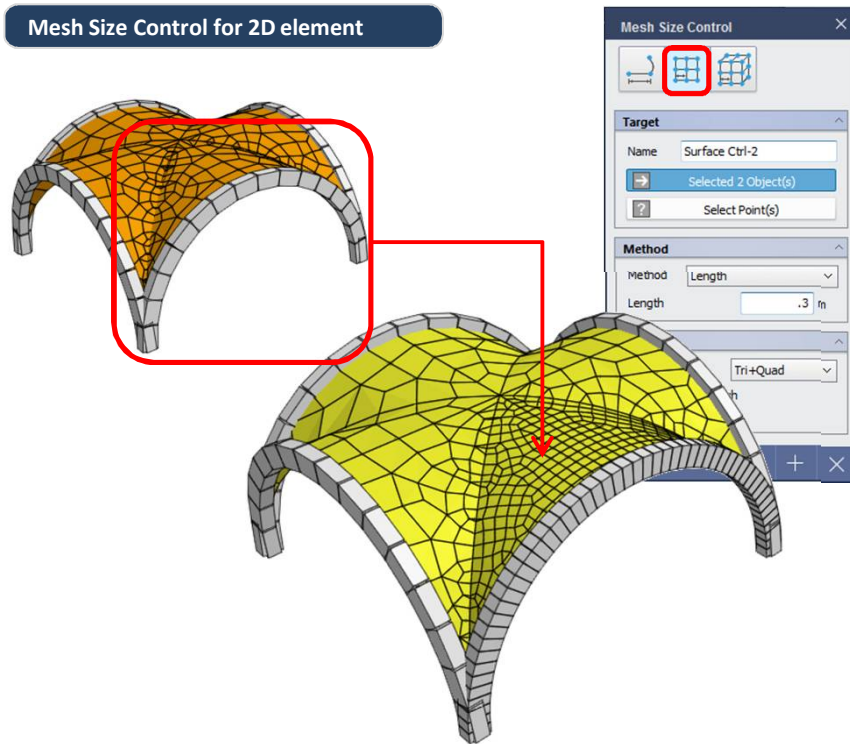
5. Improvement for Auto-mesh

Control a mesh size for specific elements

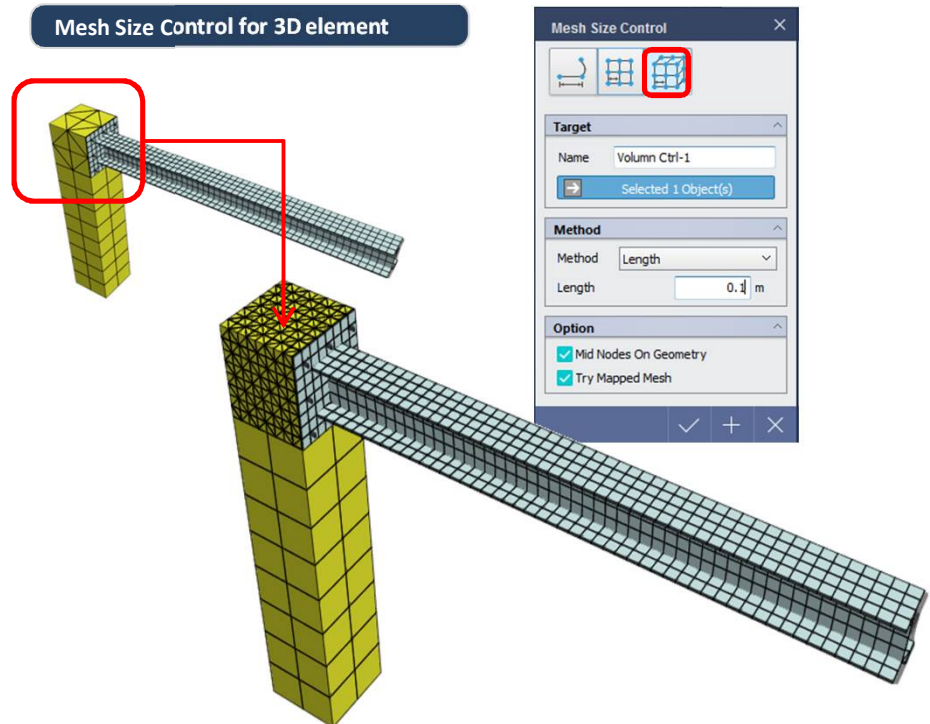
Analysis > Analysis Parameter > **Mesh Size Control**



Mesh Size Control for 2D element



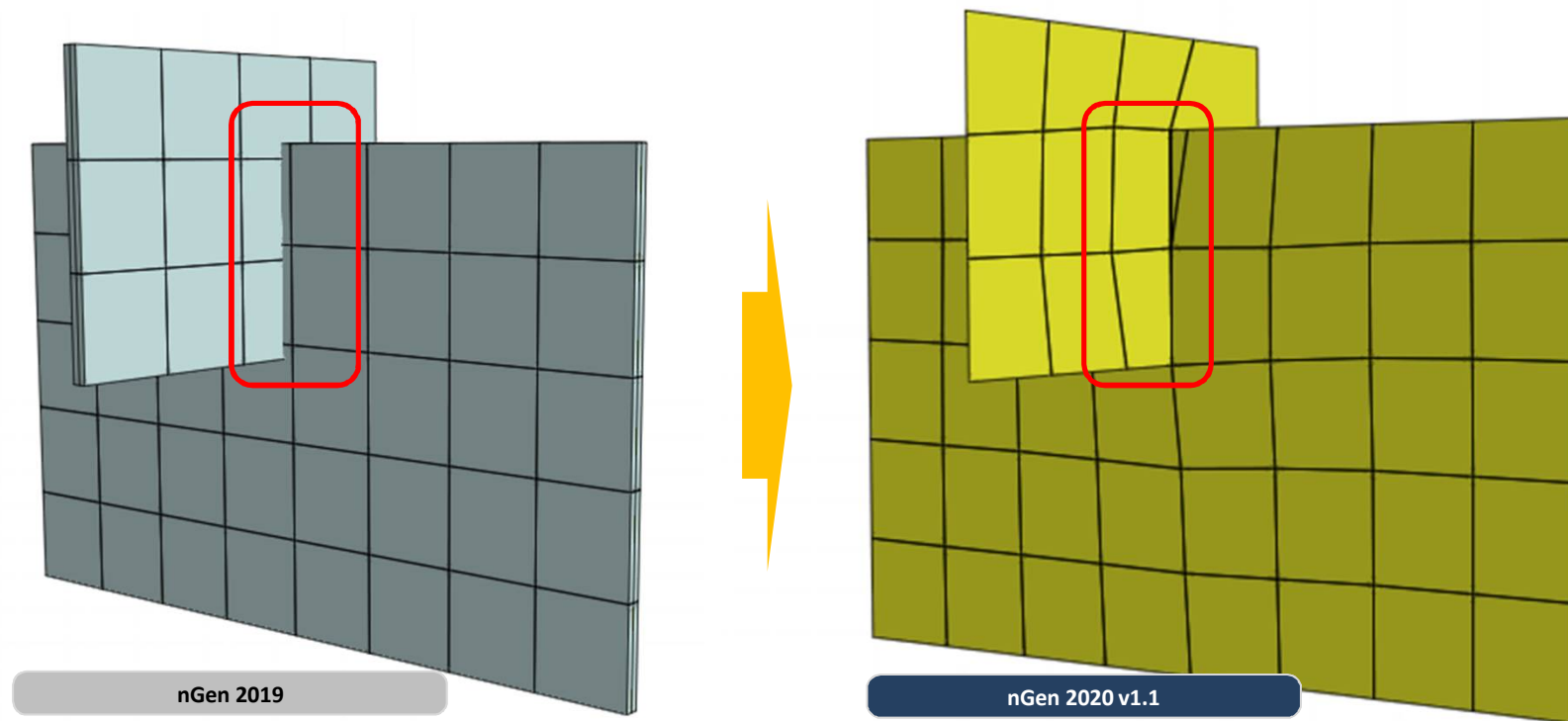
Mesh Size Control for 3D element



5. Improvement for Auto-mesh

Generation of Mesh according to 2D interference

- Improvement of automatic mesh shape generation according to the intersection of 2D-2D



6. Improvement for Wind Load

Addition of Wind Load as per Poland national annex

Tab NA.1 – Basic values of the base wind speed and wind speed pressure in zones

Zone	V_{bo} (m/s)	V_{bo} (m/s)	q_{bo} (kN/m ²)	q_{bo} (kN/m ²)
	$A \leq 300$ m	$A > 300$ m	$A \leq 300$ m	$A > 300$ m
1	22	$22 [1 + 0.0006(A - 300)]$	0.30	$0.30 [1 + 0.0006(A - 300)]^2$
2	26	26	0.42	0.42
3	22	$22 [1 + 0.0006(A - 300)]$	0.30	$0.30 [1 + 0.0006(A - 300)]^2$

NOTE: A – height above sea level (m)

Tab NA.2 – Values of the directional coefficient

Zone	Wind direction (sector)											
	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
	1	2	3	4	5	6	7	8	9	10	11	12
1	0.8			0.7				0.8	0.9	1.0		0.9
2	1.0	0.9	0.8		0.7			0.8	0.9	1.0		
3	0.8			0.7		0.9				1.0		

NOTE: Sector 1 indicates the north direction 0° (360°)

NA.6 Provisions regarding 4.3.2 (1)

The coefficient of roughness can be calculated from the formulas given in the Table NA.3.

Tab NA.3 – Coefficient of roughness and exposure coefficient and Z_{min} and Z_{max}

Terrain category	$c_r(z)$	$c_e(z)$	Z_{min} m	Z_{max} m
0	$1.3 \cdot \left(\frac{z}{10}\right)^{0.11}$	$3.0 \cdot \left(\frac{z}{10}\right)^{0.17}$	1	200
I	$1.2 \cdot \left(\frac{z}{10}\right)^{0.13}$	$2.8 \cdot \left(\frac{z}{10}\right)^{0.19}$	1	200
II	$1.0 \cdot \left(\frac{z}{10}\right)^{0.17}$	$2.3 \cdot \left(\frac{z}{10}\right)^{0.24}$	2	300
III	$0.8 \cdot \left(\frac{z}{10}\right)^{0.19}$	$1.9 \cdot \left(\frac{z}{10}\right)^{0.26}$	5	400
IV	$0.6 \cdot \left(\frac{z}{10}\right)^{0.24}$	$1.5 \cdot \left(\frac{z}{10}\right)^{0.29}$	10	500

NOTE: $c_r(z)$ i $c_e(z)$ for height $z > Z_{max}$ should be taken as for Z_{max} .

Define Design Wind Load

Design Wind Load (General)

Name: EN1991:2005(General)-1

Code: EN1991:2005

National Annex: **Poland**

Range (Z): 0 cm ~ 10 cm

Average Roof Height (H): 10 cm

☒ Consider wind load when the height above sea level (A) exceeds 300m.

Common Parameters

Terrain Category: II

Wind Zone Factor: Zone 1

☒ Fund Basic Wind Velocity: 22 m/s

☐ Fund Basic Wind Press...: 0.3 kN/m²

Directional Factor: 1

Seasonal Factor: 1

Turbulence Factor: 1

Orographic Effects

Effects of Neighbouring High-rise Structures

Raising of Displacement Height

Structural Factor

Pressure and Force Coefficients

Structure Type: (Partial) Enclosed

Considered: ☒ Internal ☐ Roof ☐ Friction

☐ Auto Calculation of Pressure Coefficient

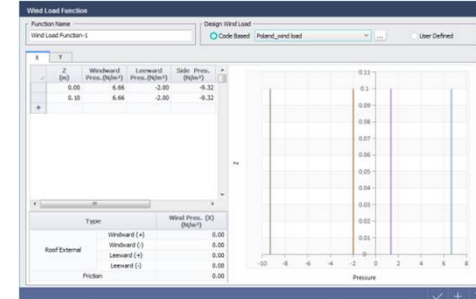
☒ Apply ABS Max ☐ Apply Average

Coefficient

	X	Y
Windward	1.00	1.00
Leeward	-0.30	-0.30
A	-1.40	-1.40
B	-1.10	-1.10
C	-0.50	-0.50
ABS ...	-1.40	-1.40

Report

Wind Load Function



Generation of Wind Load Report

9. Equation for Wind Load

Wind Force: $F_w = P_f \cdot A_{ref}$

Pressure: $P_f = C_p \cdot C_{pe} \cdot q_p$

Exposure Factor: $C_{pe} = 2.3 \cdot (z/10)^{0.24}$

Peak Velocity Pressure: $q_p = C_p(2) \cdot q_b$

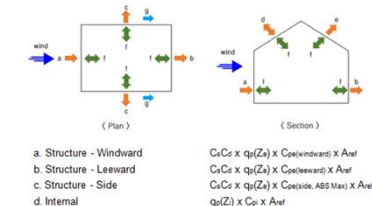
Basic Velocity Pressure: $q_b = 1/2 \cdot \rho \cdot V_b^2$

Mean Wind Velocity: $V_m = C_r \cdot C_e \cdot V_b$

Basic Wind Velocity: $V_b = C_{dir} \cdot C_{season} \cdot V_{b,0}$

Roughness Factor: $C_r = 1.0 \cdot (z/10)^{0.17}$

10. Design Wind Pressure



11. Wind Pressure

a. Structure - Windward

Level (m)	Wind Pressure a Direction		Wind Pressure a+90 Direction	
	P(kg/m ²)	Distribution	P(kg/m ²)	Distribution
-	-	0.12	-	0.12
-	-	0.1	-	0.1
-	-	0.08	-	0.08
-	-	0.06	-	0.06
-	-	0.04	-	0.04

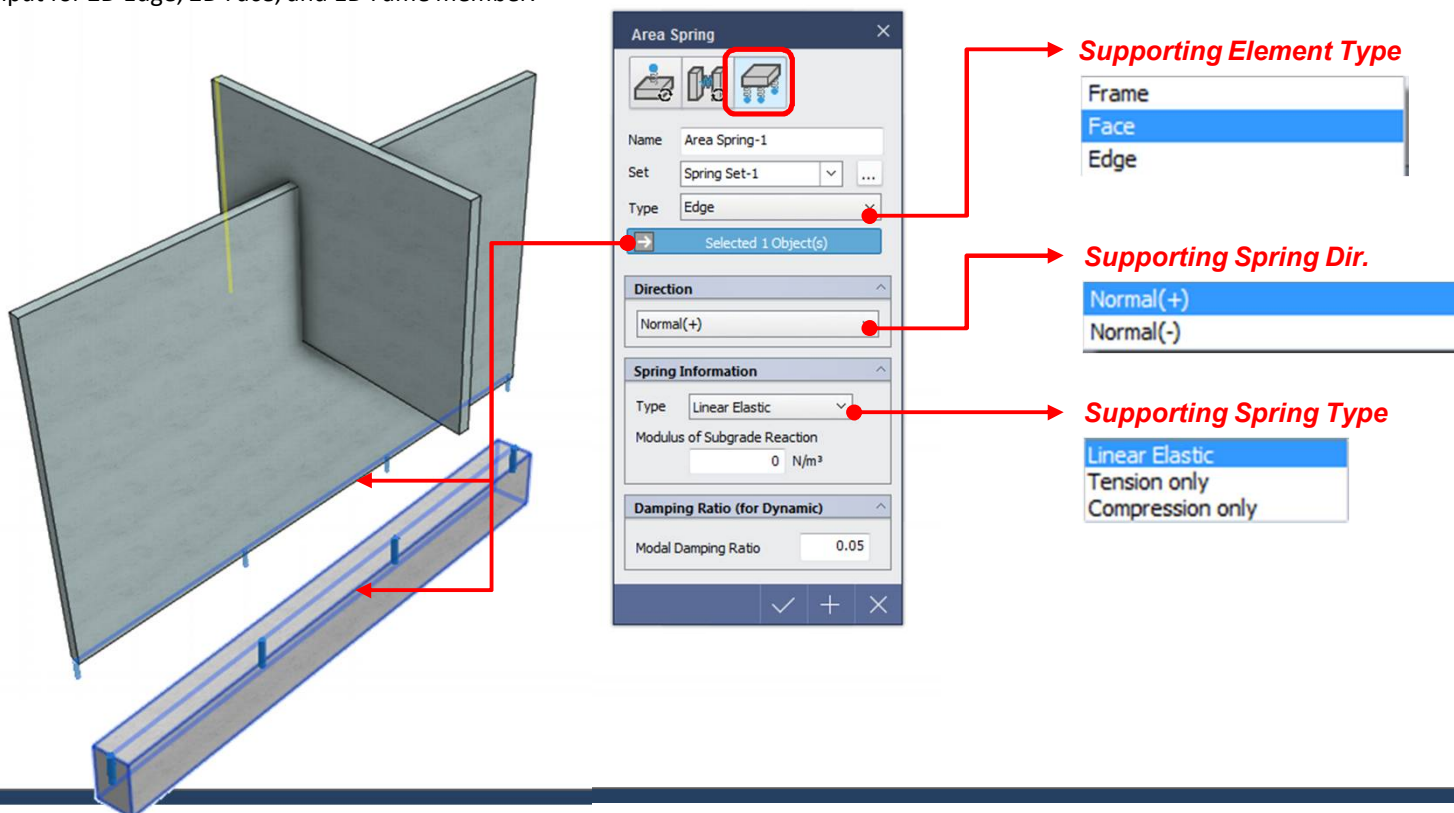
7. Improvement for Spring Support

Addition of Distribute Spring Type in Area Spring

Boundary > Spring > Area



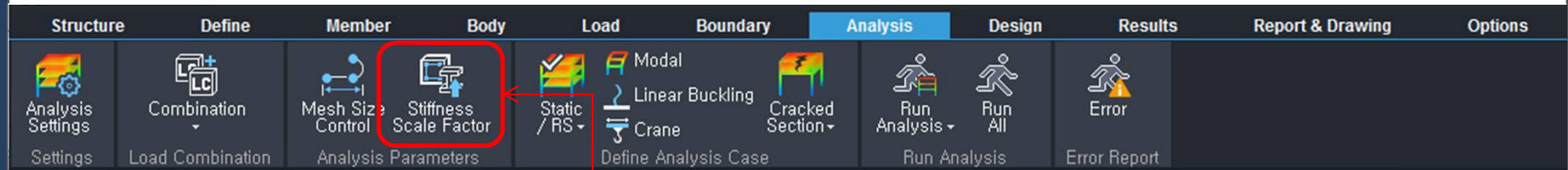
- Spring input for 2D Edge, 2D Face, and 1D Famed member.



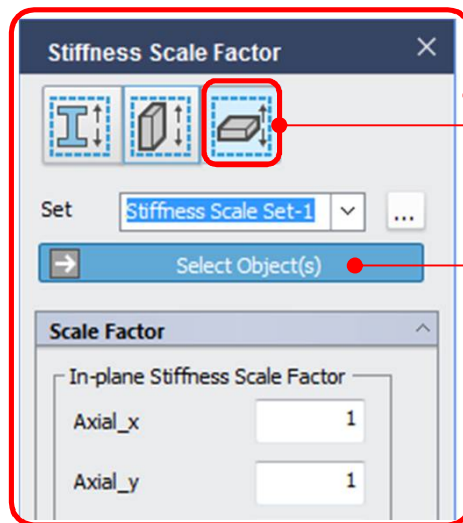
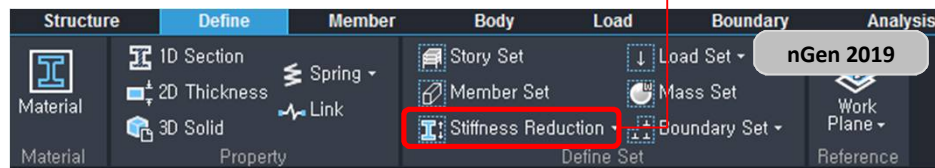
8. Improvement of Stiffness scale factor

Improvement of Dialog box, Defining method and Target member type

Analysis > Analysis Parameters > Stiffness Scale Factor



- Position of "Stiffness Scale Factor" menu is changed to analysis tap



- Integrated a separated menu by member type into one dialog box
- Added to define all 2D members except wall(Membrane type) member
- Assignment by member

9. Improvement of Cracked Analysis

Addition of Cracked Analysis for 1D element

- Deflection Calculation considering stiffness reduction by crack

Analysis of element with crack section

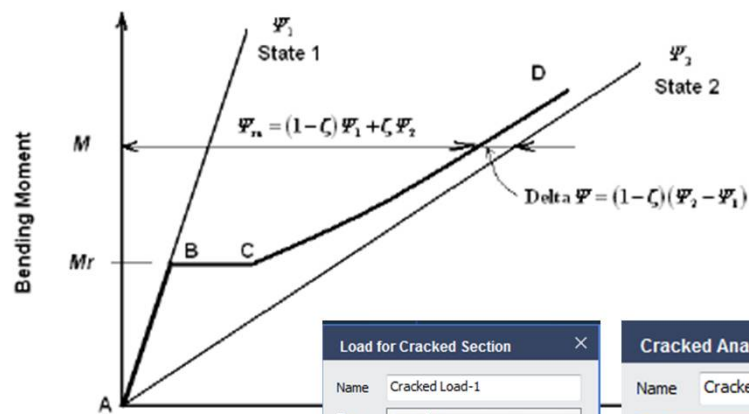


Figure 16-1 Moment vs. Rotation

Load for Cracked Section

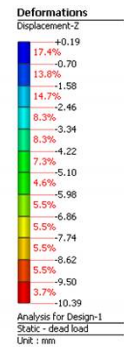
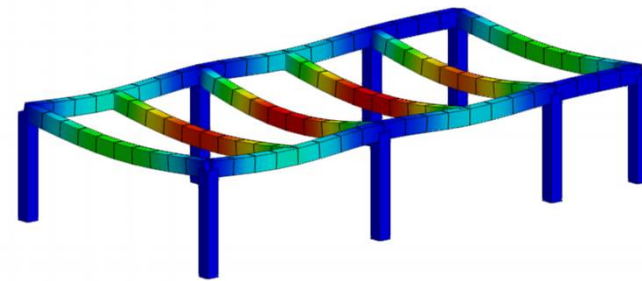
Name: Cracked Load-1
Type: Immediate
Converting Data
Static Load Set: DL
Scale Factor: 1
Add Modify Delete

No.	Load Set	Scale
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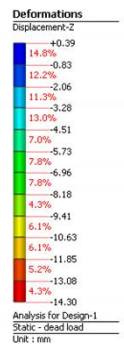
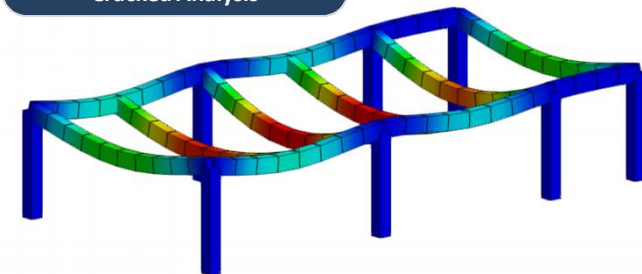
Cracked Analysis Member

Name: Cracked Member-1
Select Object(s)
Parameter for Long-term
Creep / Shrinkage
Creep Coefficient: 2.5
Shrinkage Strain: 2.5e-005
Aging Coefficient: 1

Non-cracked Analysis



Cracked Analysis



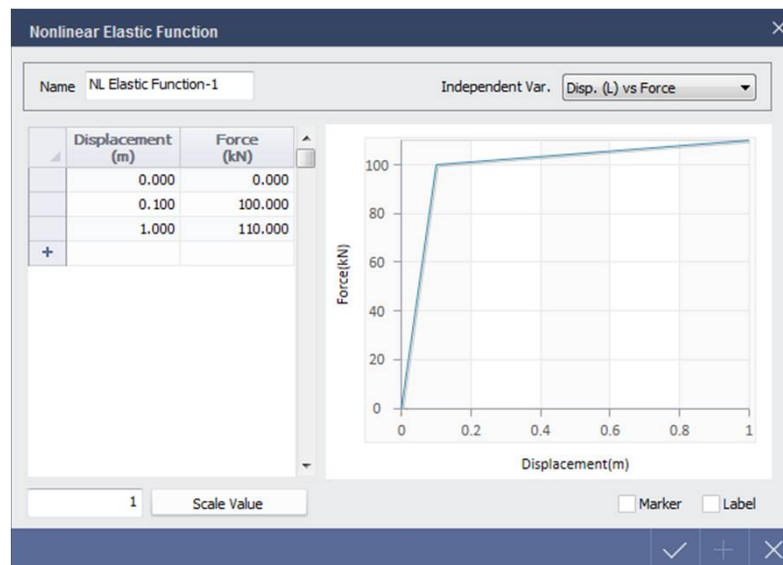
10. Improvement of Boundary conditions

Addition of Nonlinear Spring Properties

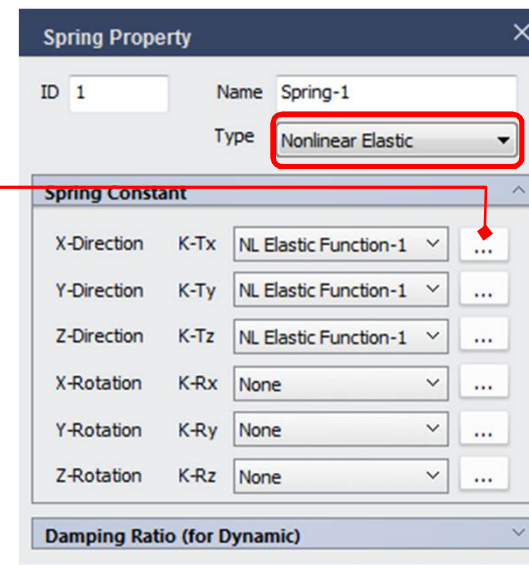
nGen > Member > Flat/Plate Structure > **Drop Panel**



- Analysis results reflecting the nonlinear characteristics of soil
- Definition of Pile spring by importing the analysis result of GTS NX



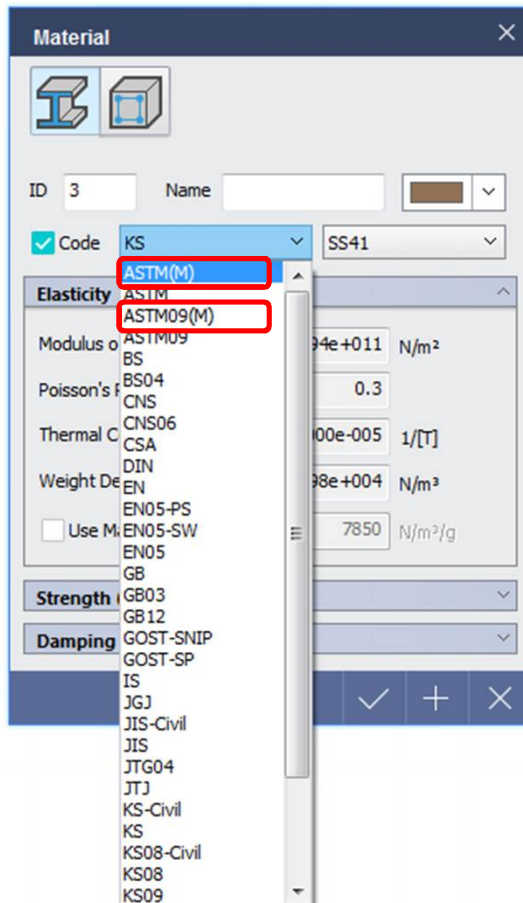
Generation of Nonlinear Curve



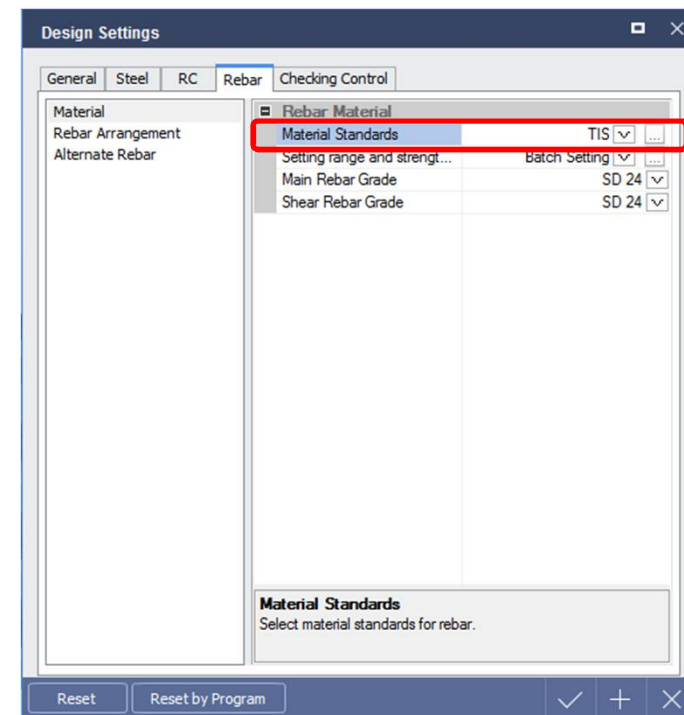
Define of Nonlinear Curve

11. Addition of Material DB

- Addition of Metric material DB as per ASTM / ASTM09



- Addition of rebar DB for Thailand



12. Improvement for Usability

Selection of member using member number

Results > Query > Node / Element

