Release Note

Release Date : **July, 2019**

Product Ver. : **nGen 2020 v1.1**

Next Generation Software

for Integrated Analysis, Design, Drawing of Building Systems

Contents

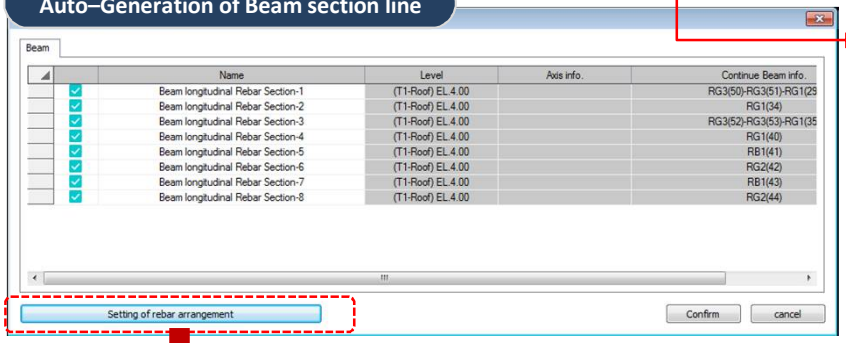
1. Improvement of Drawing Generation

Auto-generation of Rebar Arrangement for Longitudinal Section.

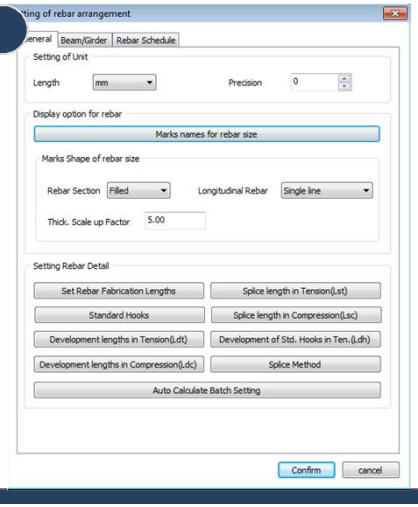
Midas Drawing > Drawing creation > Longitudinal section rebar arrangement…

- ***Supporting Scope***
  - Beam and Column
  - Non-Seismic detail as per EC2

Auto–Generation of Beam section line



Setting of rebar arrangement

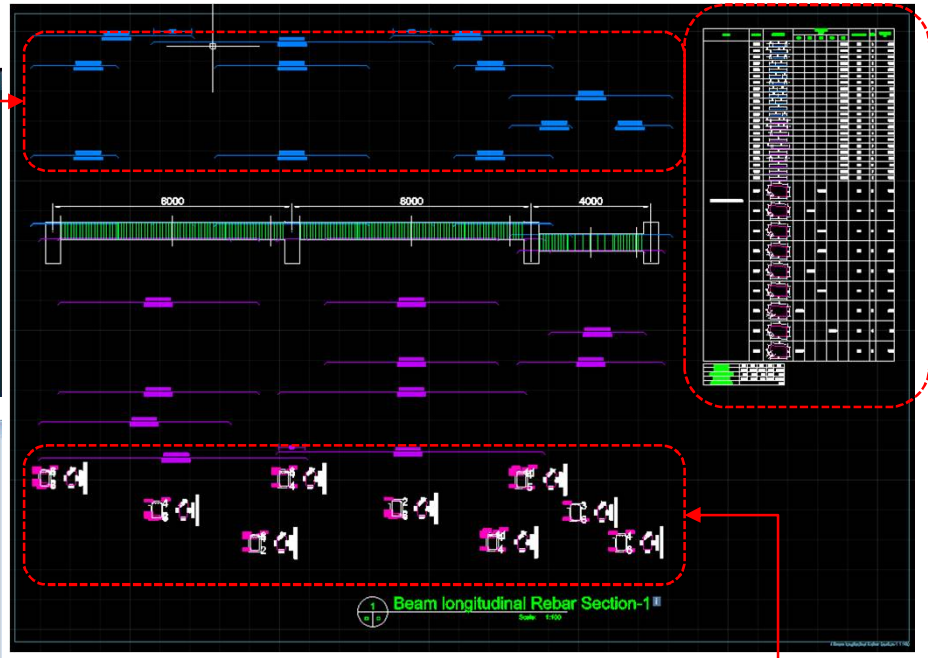


- *Setting Rebar Detail*
  - *Development type and length*
  - *Splice type and length*

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

- Length and weight of reinforcement

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

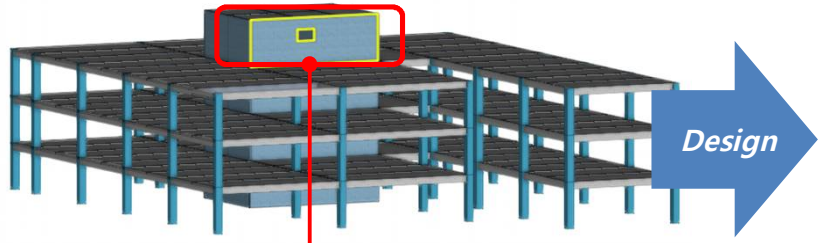


Rebar Arrangement for Longitudinal Section

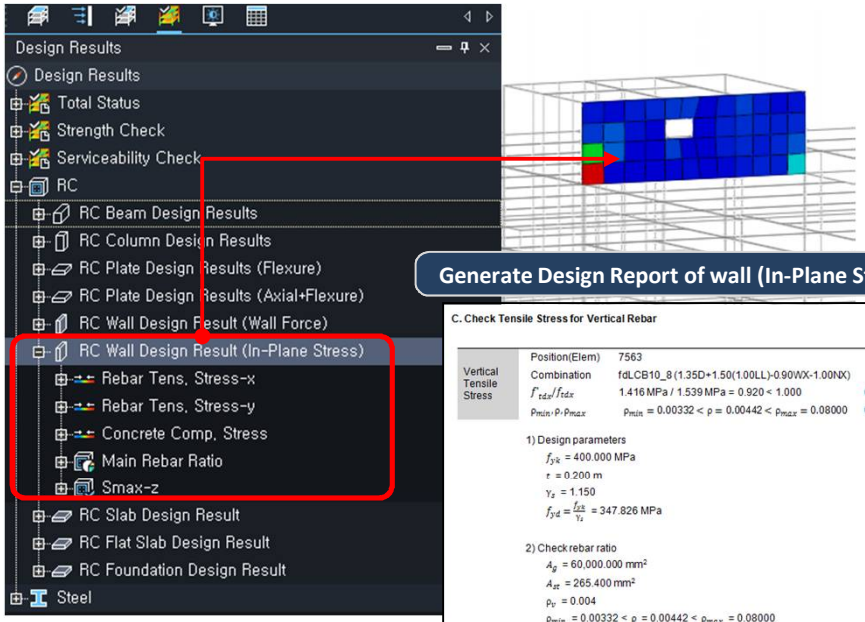
- Stirrup or Hoop Detail for Cross Section

2. Improvement for RC Design

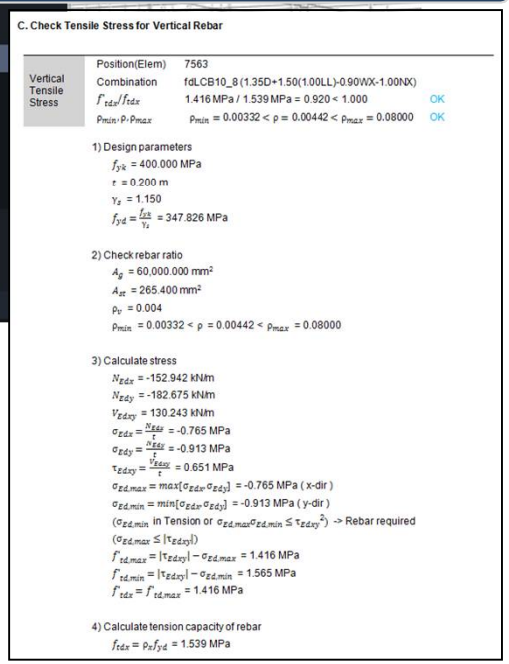
Addition of RC Design by elements in wall design (meshed plate)



Check Design Result of wall (In-Plane Stress)



Generate Design Report of wall (In-Plane Stress)



C. Check Tensile Stress for Vertical Rebar

Vertical Tensile Stress	Position(Elem)	7563
	Combination	fdLCB10_8 (1.35D+1.50(1.00LL)-0.90WX-1.00NX)
	f'_{tdx}/f_{tdx}	1.416 MPa / 1.539 MPa = 0.920 < 1.000 OK
	$\rho_{min}, \rho, \rho_{max}$	ρ_{min} = 0.00332 < ρ = 0.00442 < ρ_{max} = 0.08000 OK

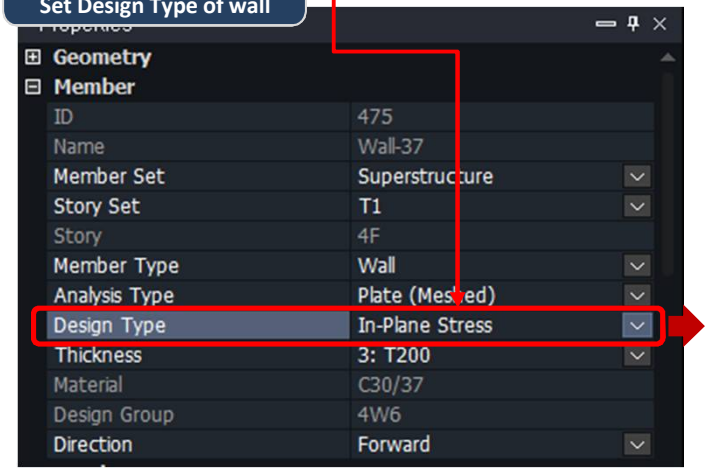
1) Design parameters
f_{yk} = 400.000 MPa
τ = 0.200 m
γ_s = 1.150
$f_{yd} = \frac{f_{yk}}{\gamma_s}$ = 347.826 MPa

2) Check rebar ratio
A_g = 60,000.000 mm²
A_{st} = 265.400 mm²
ρ_v = 0.004
ρ_{min} = 0.00332 < ρ = 0.00442 < ρ_{max} = 0.08000

3) Calculate stress
N_{Edx} = -152.942 kN/m
N_{Edy} = -182.675 kN/m
V_{Edxy} = 130.243 kN/m
$\sigma_{Edx} = \frac{N_{Edx}}{\tau}$ = -0.765 MPa
$\sigma_{Edy} = \frac{N_{Edx}}{\tau}$ = -0.913 MPa
$\tau_{Edxy} = \frac{V_{Edxy}}{\tau}$ = 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)
($\sigma_{Ed,min}$ in Tension or $\sigma_{Ed,max}\sigma_{Ed,min} \le \tau_{Edxy}^2$) -> Rebar required
($\sigma_{Ed,max} \le |\tau_{Edxy}|$)
$f'_{td,max} = |\tau_{Edxy}| - \sigma_{Ed,max}$ = 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
$f_{tdx} = \rho_x f_{yd}$ = 1.539 MPa

Set Design Type of wall



Geometry	
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

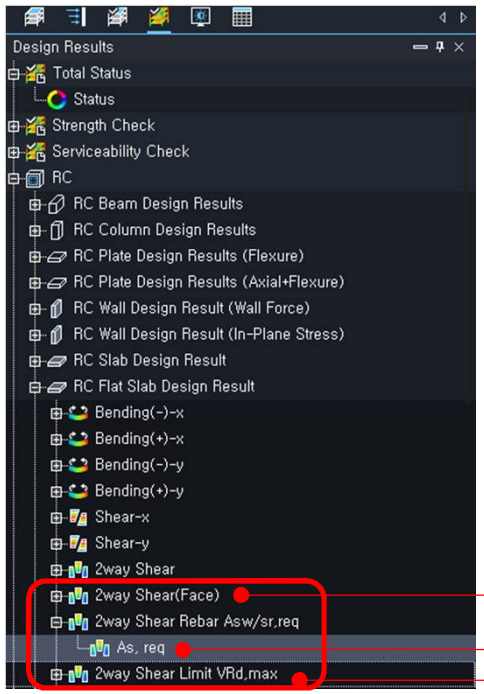
Design Type

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

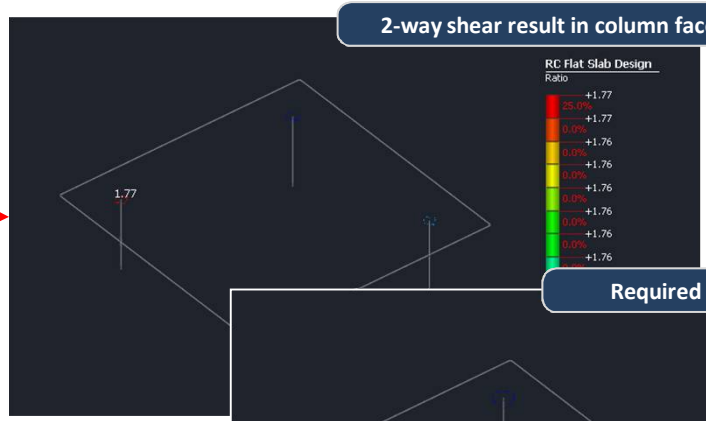
2. Improvement for RC Design

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 (As,req)
  - 2-way shear limitation (V_{Rd},max)

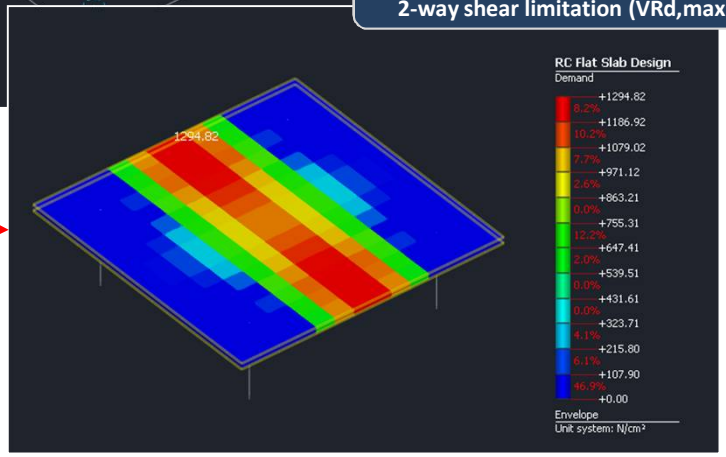


2-way shear result in column face



Required rebar area (As,req)

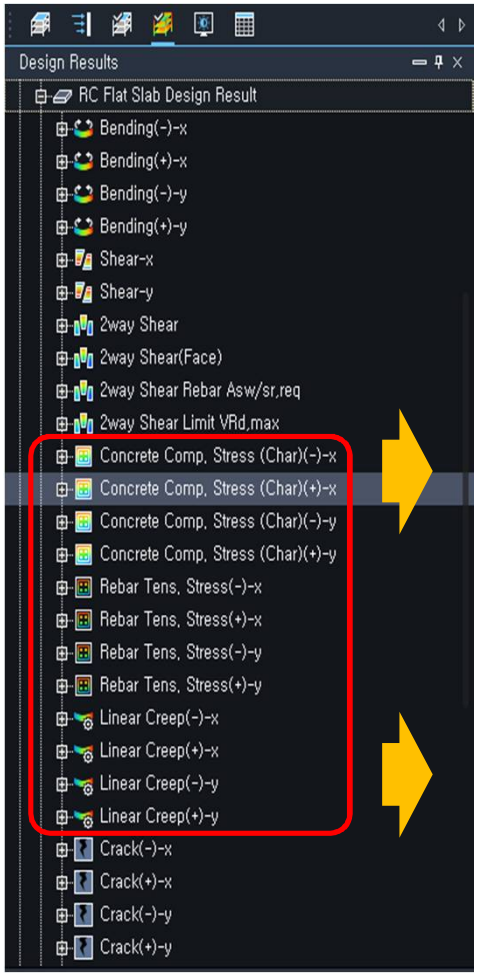
2-way shear limitation (VRd,max)



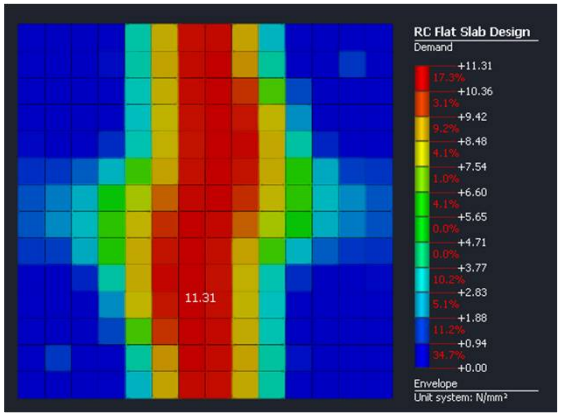
2. Improvement for RC Design

Addition of Serviceability design for Slab and Foundation

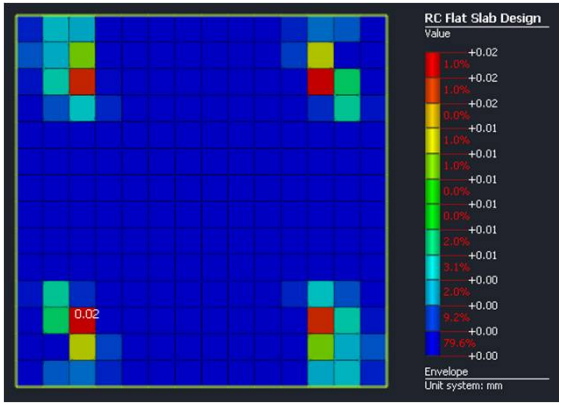
- Added Crack width check & Stress check.



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))	
	$\sigma_{c,comp}/k_1 f_{ck}$	-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))	
	$\sigma_{s,tens}/k_3 f_{yk}$	-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))	
	$\sigma_{c,comp}/k_1 f_{ck}$	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))	
	$\sigma_{s,tens}/k_3 f_{yk}$	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))	
	$\sigma_{c,comp}/k_1 f_{ck}$	-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))	
	$\sigma_{s,tens}/k_3 f_{yk}$	-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))	
	$\sigma_{c,comp}/k_1 f_{ck}$	12.760 MPa / 18.000 MPa = 0.709 < 1.000	OK
Pos. Stress	Position(Elem)	182	
	Combination	chLC	
	$\sigma_{s,tens}/k_3 f_{yk}$	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))	
	$\sigma_{c,comp}/k_2 f_{ck}$	-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))	
	$\sigma_{c,comp}/k_2 f_{ck}$	8.959 MPa / 13.500 MPa = 0.664 < 1.000	Linear Creep

b. Check y-Direction

Neg. Linear Creep	Position(Elem)	132	
	Combination	quLC	
	$\sigma_{c,comp}/k_2 f_{ck}$	-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

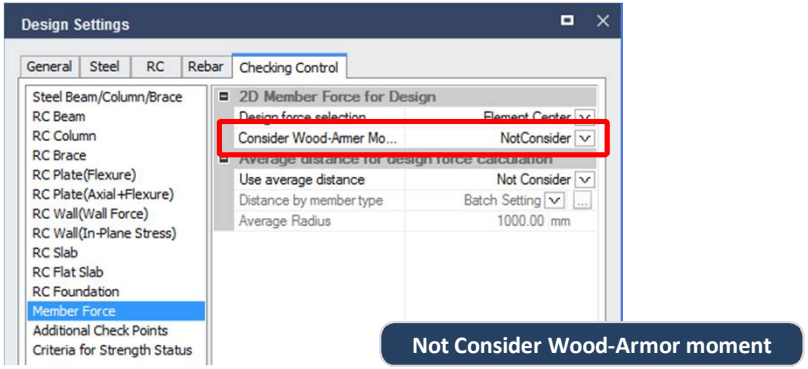
Neg. Crack	Position(Elem)	132	
	Combination	quLCB2 (1.00D+1.00(0.30Static Load Set-2))	
	w, w_{max}	0.030 mm < 0.300 mm	OK
Pos. Crack	Position(Elem)	182	
	Combination	quLC	
	w, w_{max}	0.020	

Check Crack width

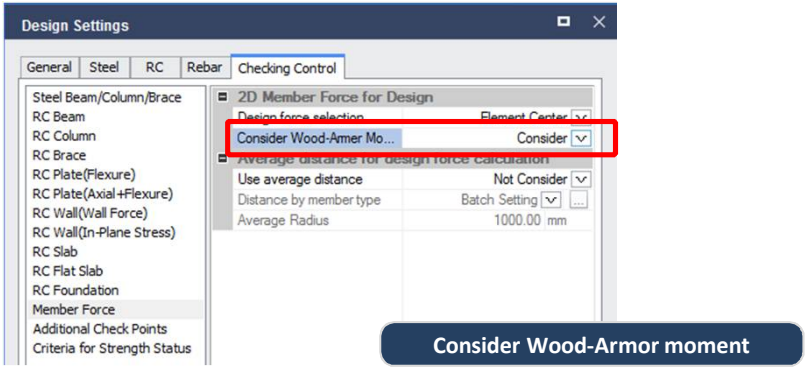
2. Improvement for RC Design

Slab and Foundation Design considering Wood-Armer moment

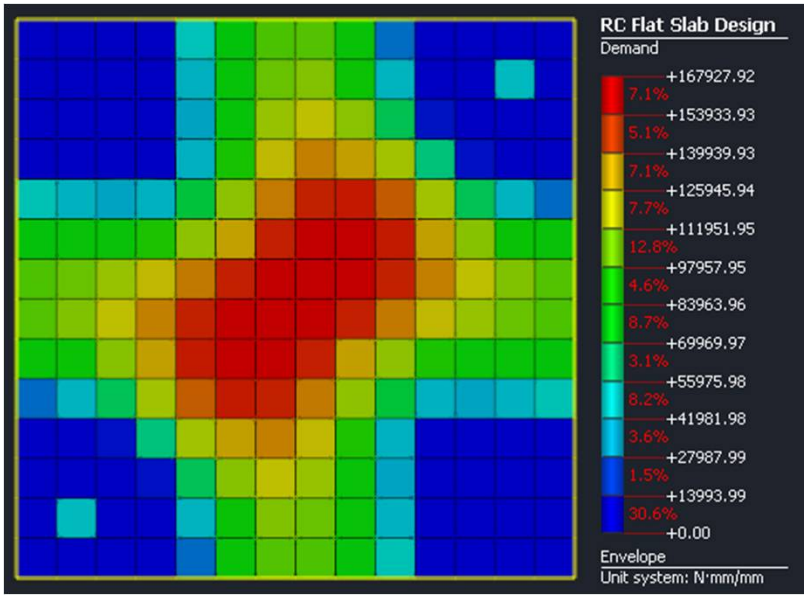
- Ultimate Limit State & Serviceability Limit State

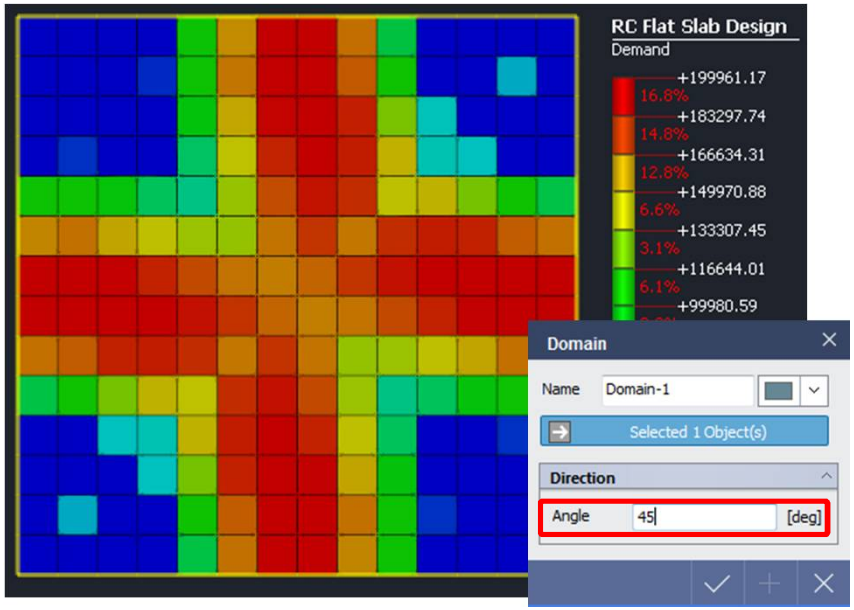


Not Consider Wood-Armor moment



Consider Wood-Armor moment





2. Improvement for RC Design

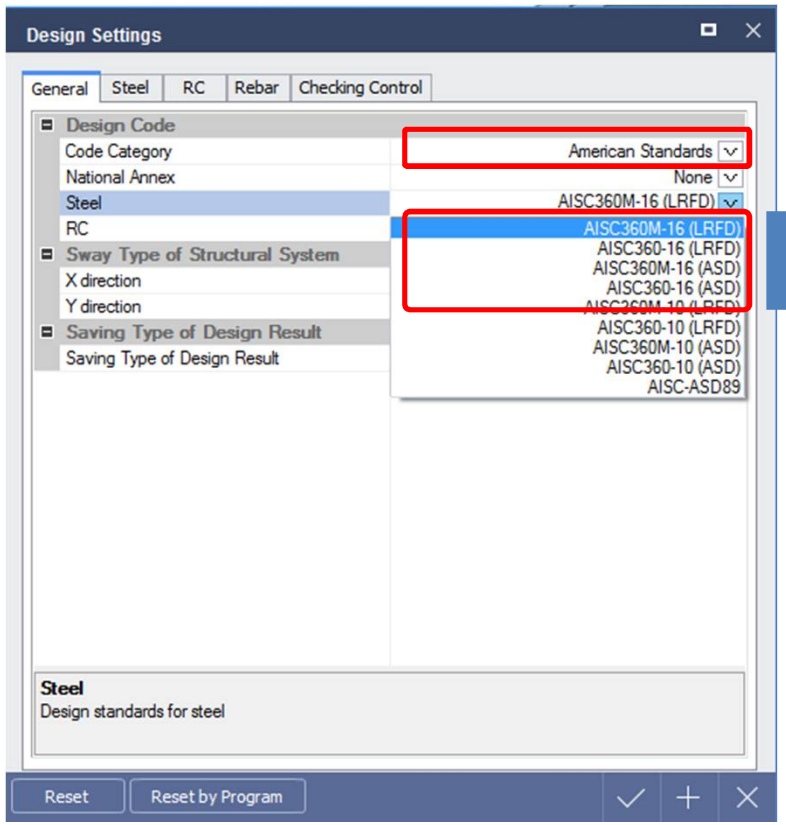
Enhancement of RC design as per NTC 2018

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 ±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) (As/Ac = 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)

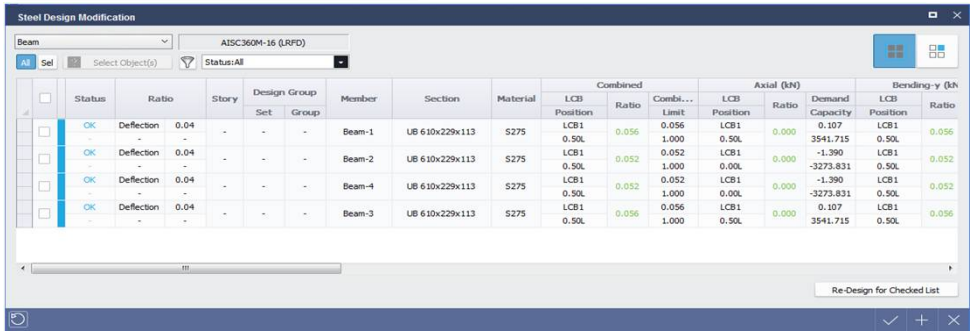
3. Improvement for Steel Design

Addition of Steel Design as per AISC360-16

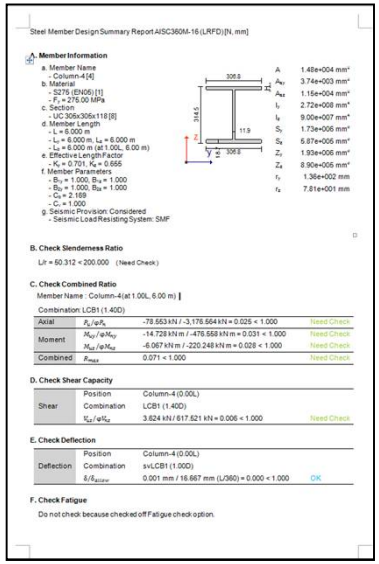
- AISC360-16 (LRFD)
- AISC360M-16 (LRFD)
- AISC360-16 (ASD)
- AISC360M-16 (ASD)



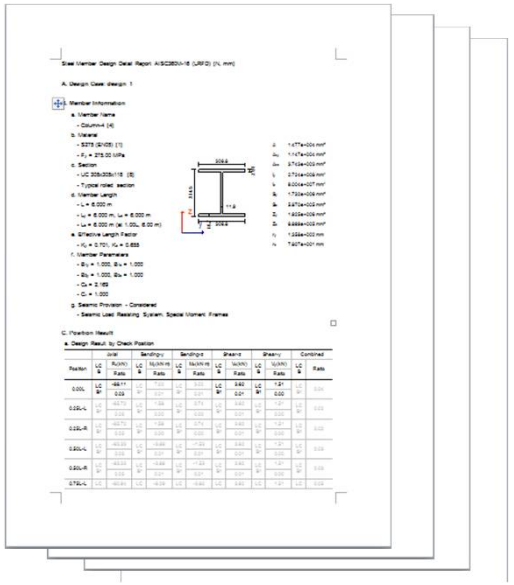
Design Result Table



Design Report (Summary)



Design Report (Detail)



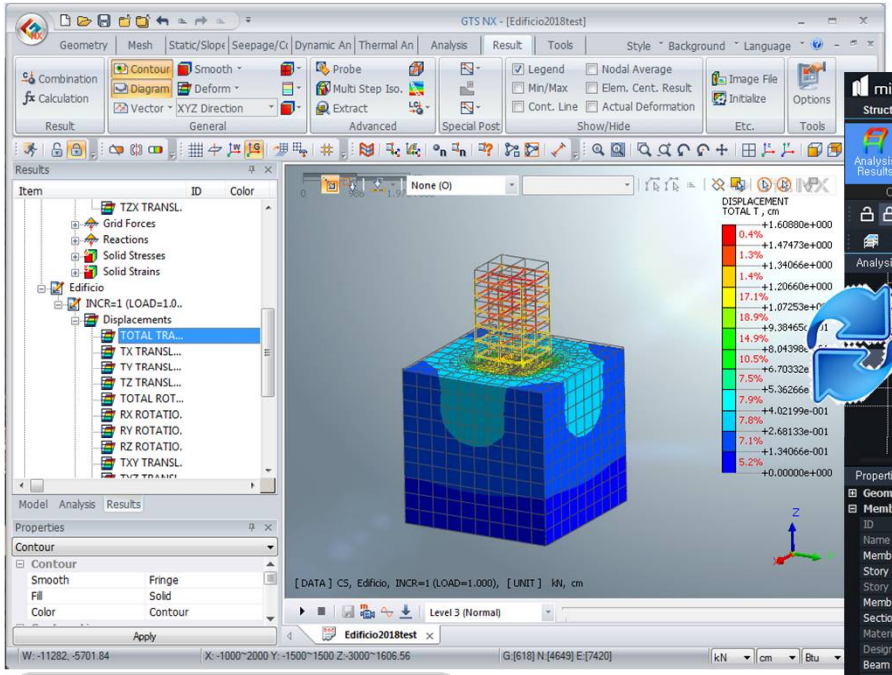
4. nGen - GTS NX Interface

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

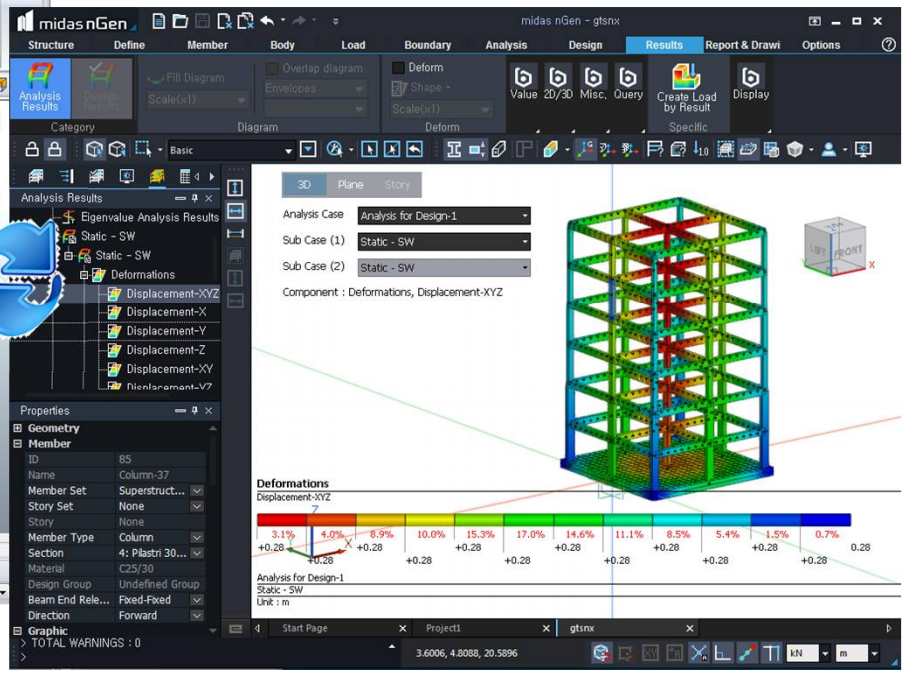
nGen > export > midas GTS MXT file ***: Export a model information to GTS NX***

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



GTX NX



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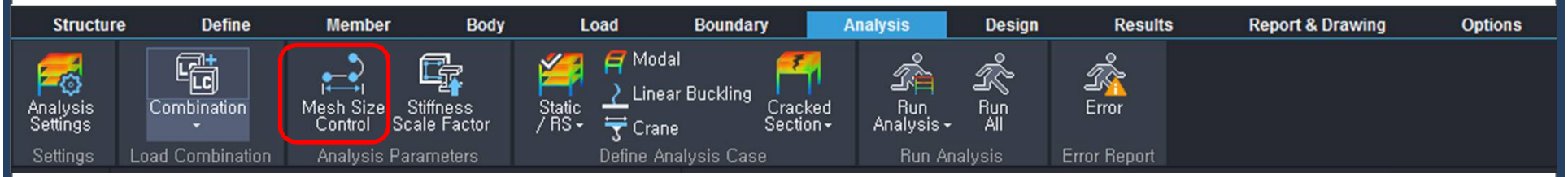
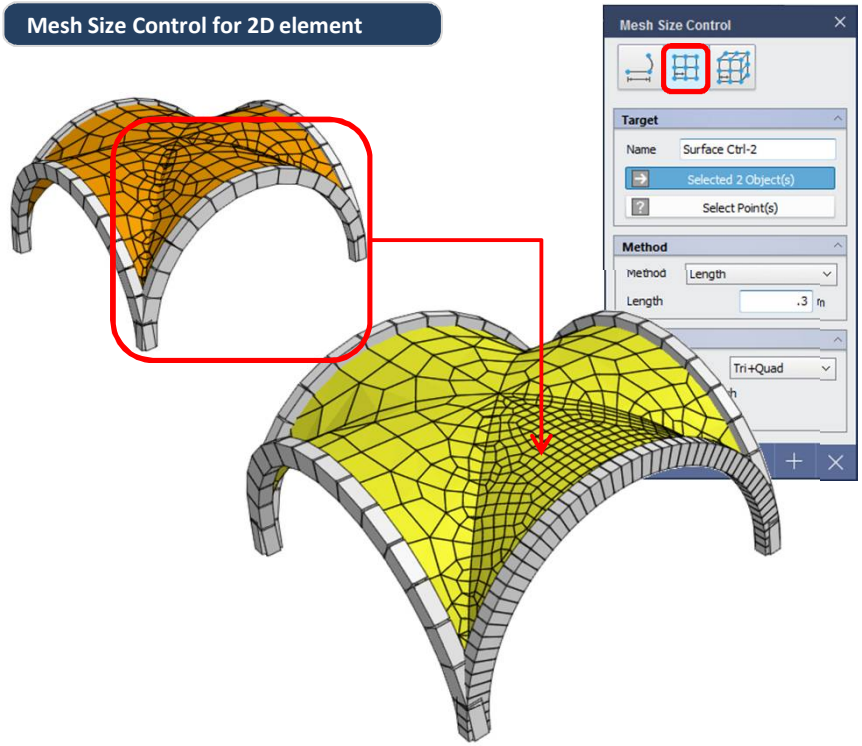
5. Improvement for Auto-mesh

Control a mesh size for specific elements

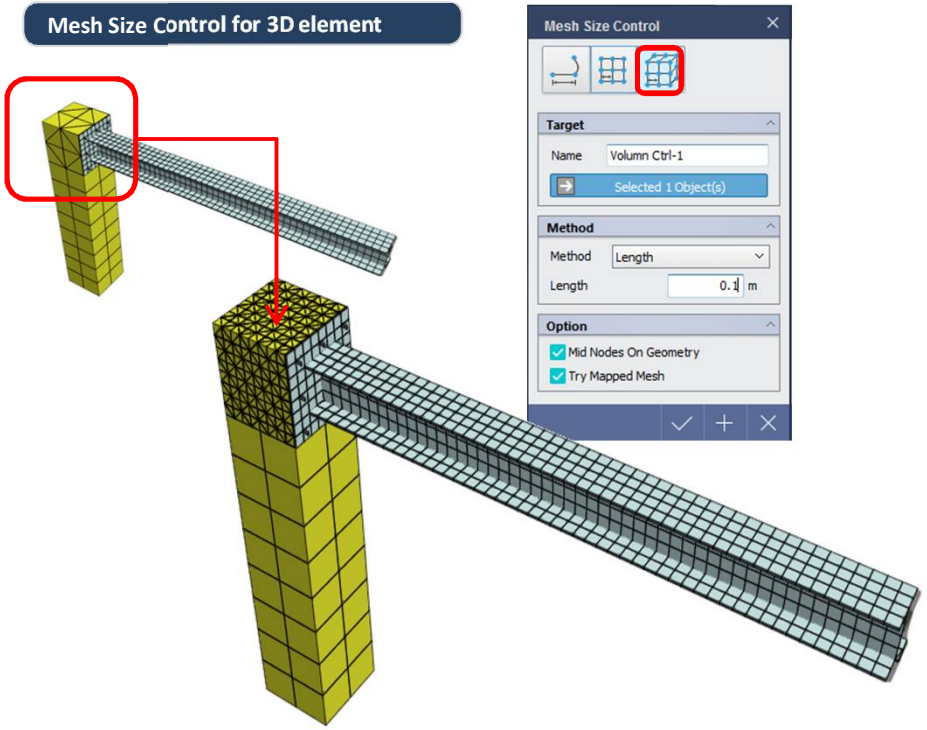
Analysis > Analysis Parameter > Mesh Size Control



Mesh Size Control for 2D element



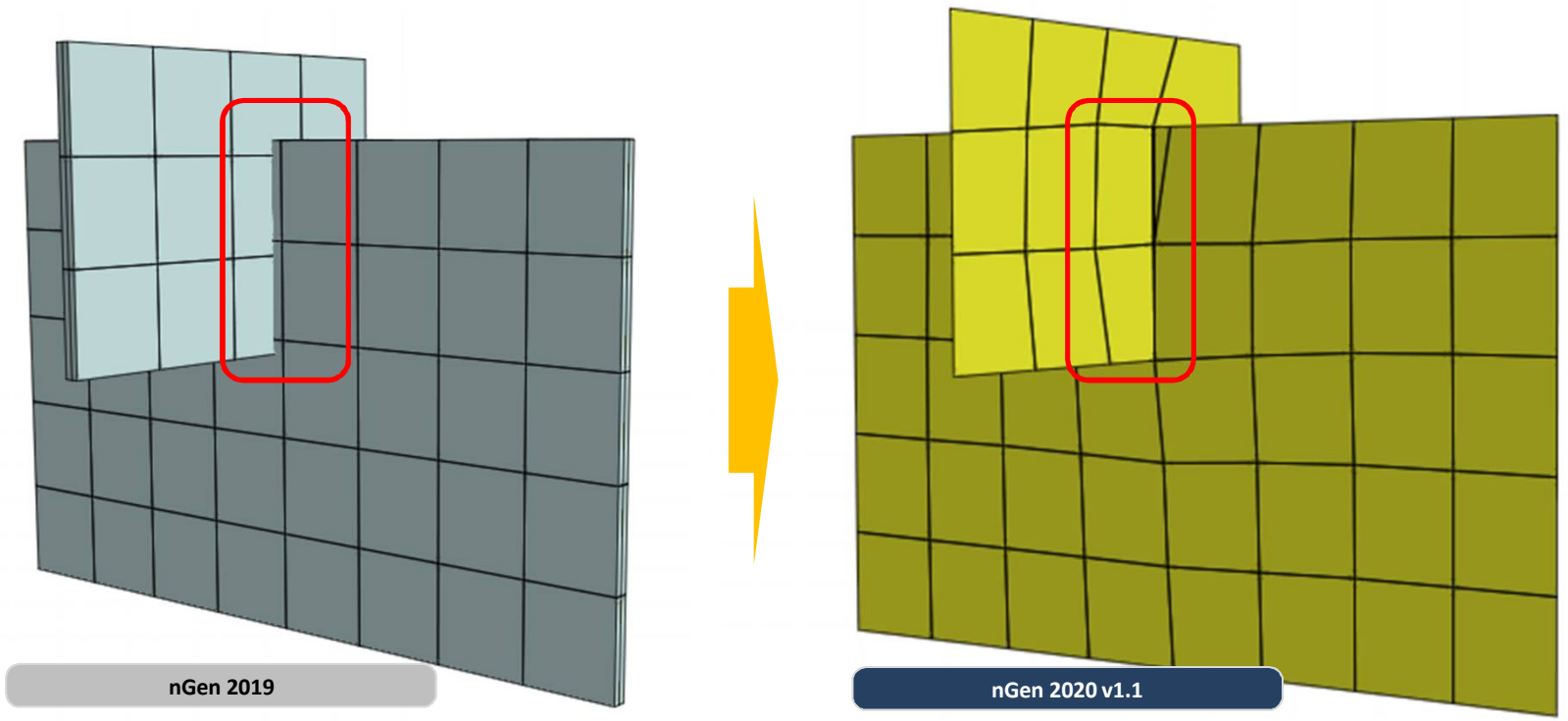
Mesh Size Control for 3D element



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	$v_{b,0}$ (m/s)	$v_{b,0}$ (m/s)	$q_{b,0}$ (kN/m²)	$q_{b,0}$ (kN/m²)
	$A \le$ 300 m	$A >$ 300 m	$A \le$ 300 m	$A >$ 300 m
1	22	$22 \cdot [1 + 0{,}0006\ (A - 300)]$	0,30	$0{,}30 \cdot [1 + 0{,}0006(A - 300)]^2$
2	26	26	0,42	0,42
3	22	$22 \cdot [1 + 0{,}0006\ (A - 300)]$	0,30	$0{,}30 \cdot [1 + 0{,}0006(A - 300)]^2 \cdot \frac{20000 - A}{20000 + A}$
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 °)												

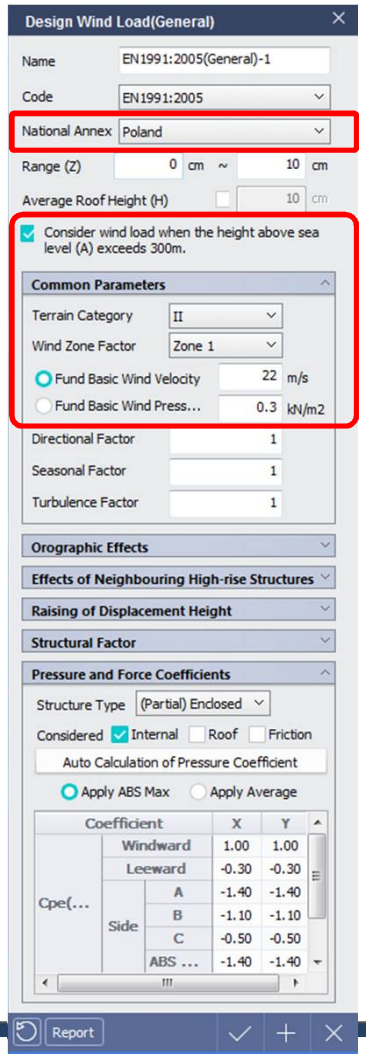
NA.6 Provisions regarding 4.3.2 (1)

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

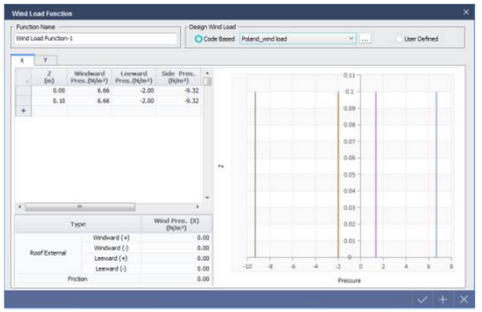
Tab NA.3 – Coefficient of roughness and exposure coefficient and z_{min} and z_{max}

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}.				

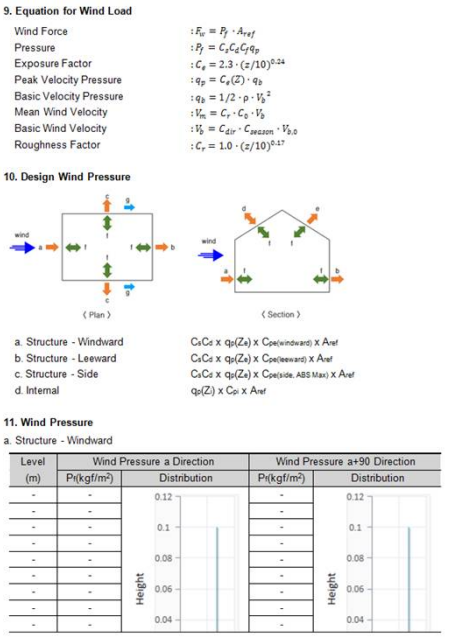
Define Design Wind Load



Wind Load Function



Generation of Wind Load Report

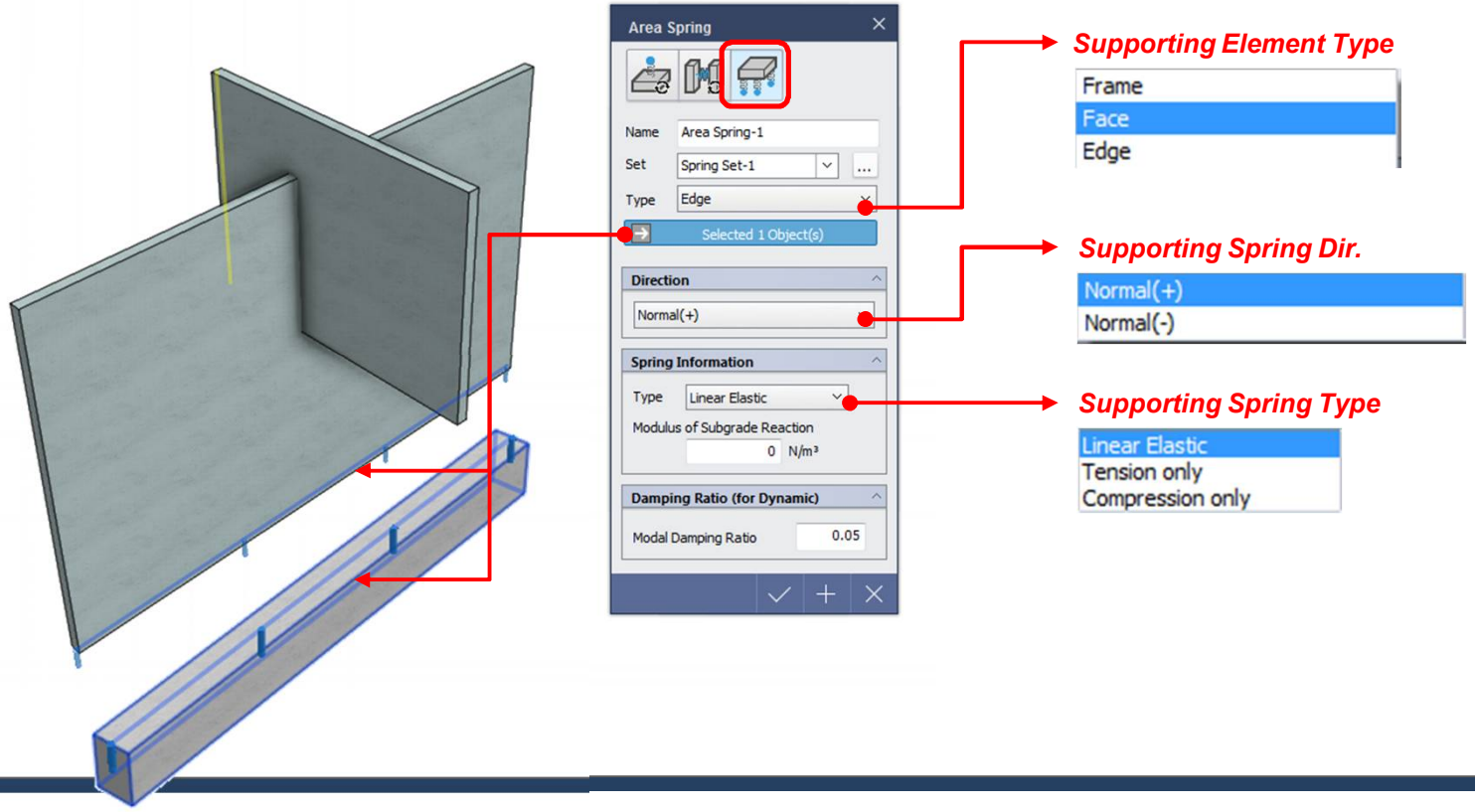


7. Improvement for Spring Support

Addition of Distribute Spring Type in Area Spring

Boundary > Spring > Area

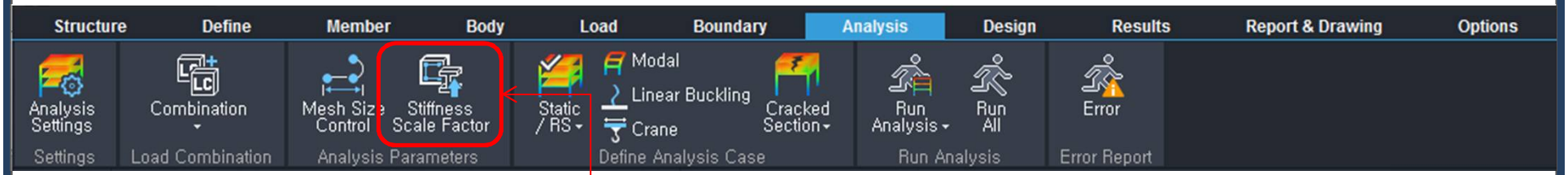
- Spring input for 2D Edge, 2D Face, and 1D Fame member.



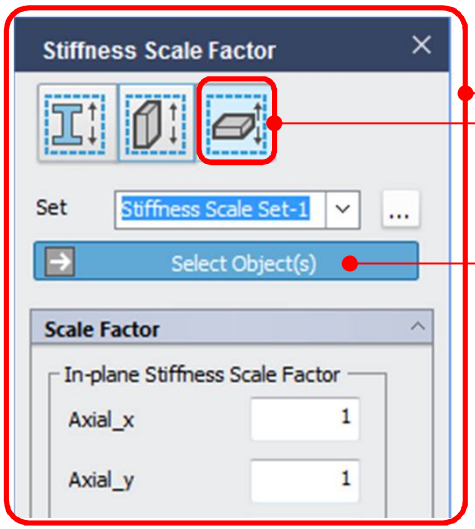
8. Improvement of Stiffness scale factor

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

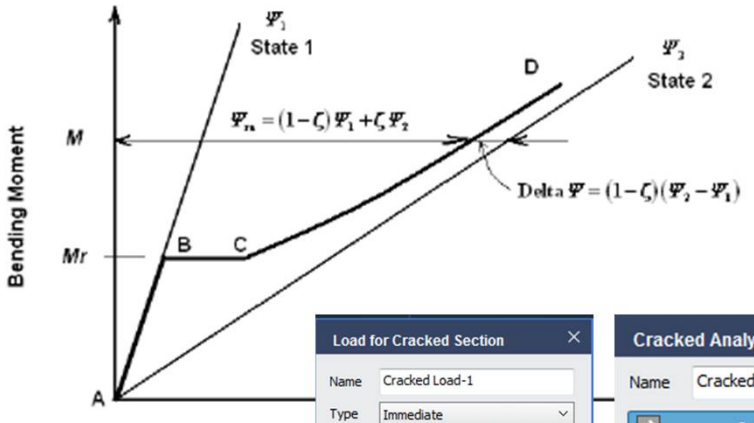
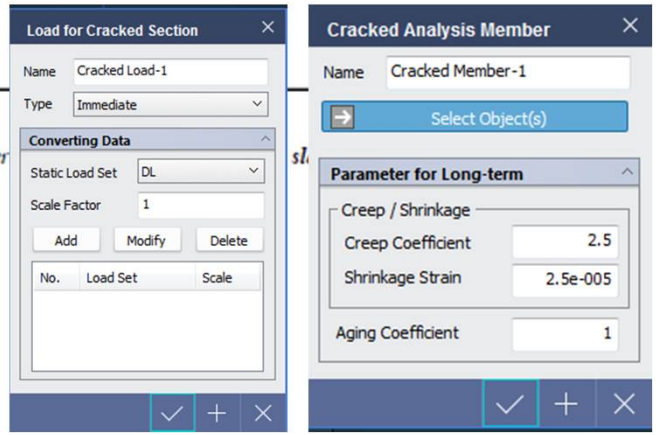
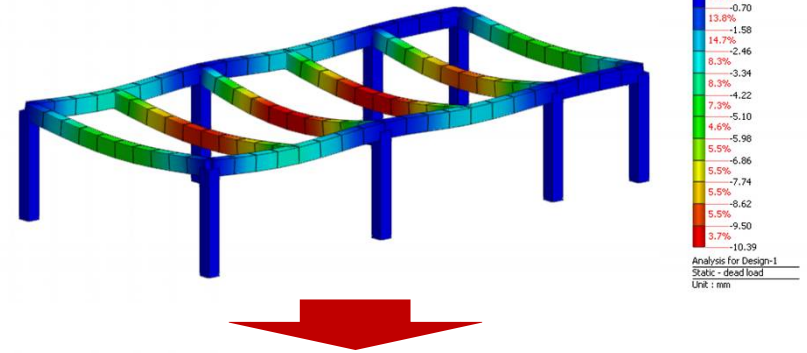


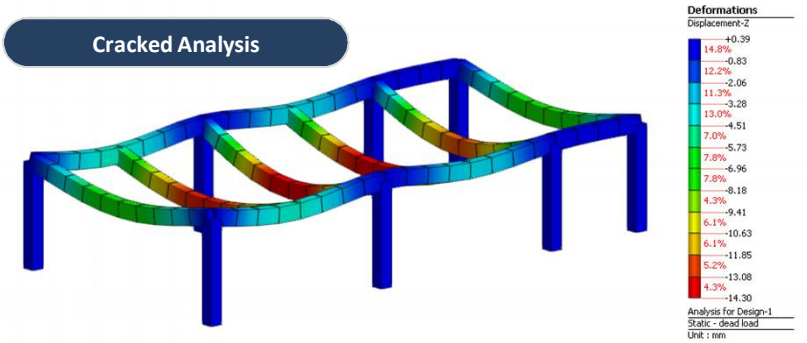
Figure 16-1 Moment ver



Non-cracked Analysis



Cracked Analysis

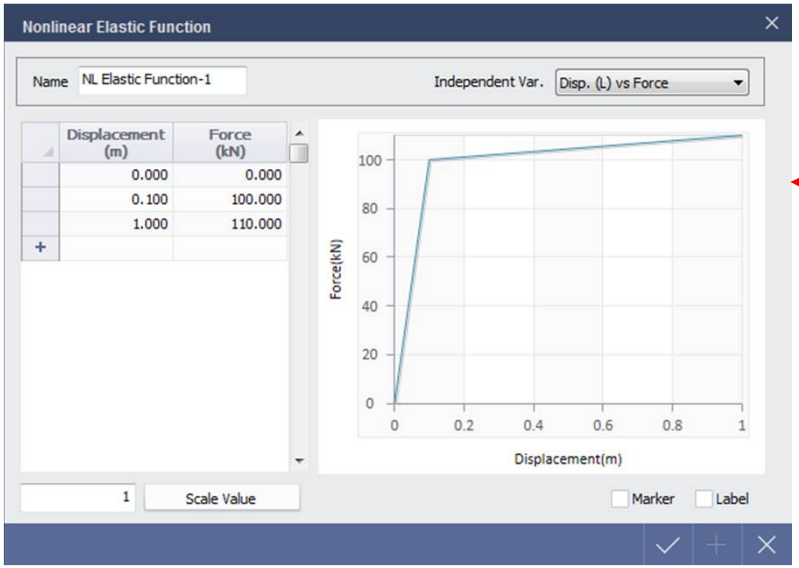


10. Improvement of Boundary conditions

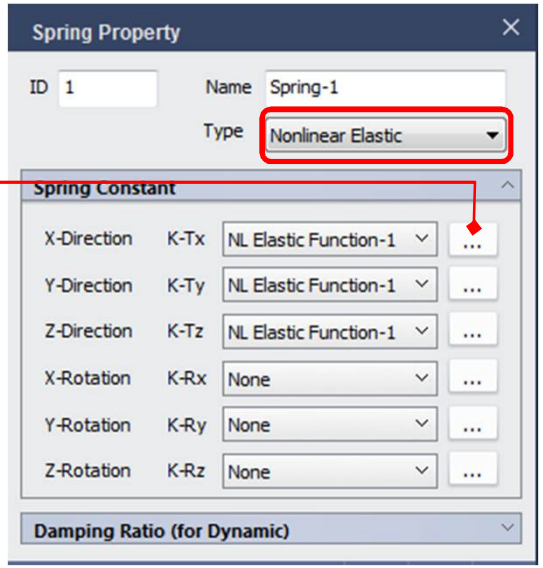
Addition of Nonlinear Spring Properties

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



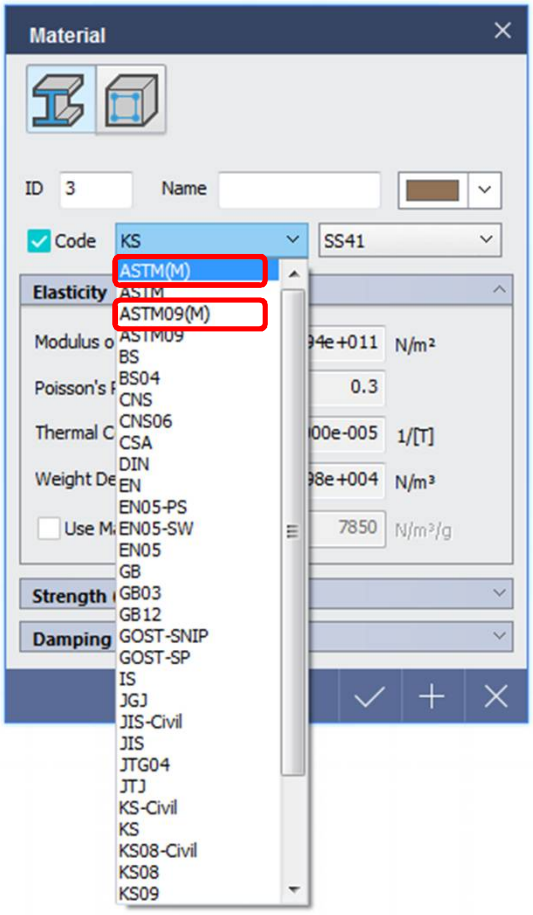
Generation of Nonlinear Curve



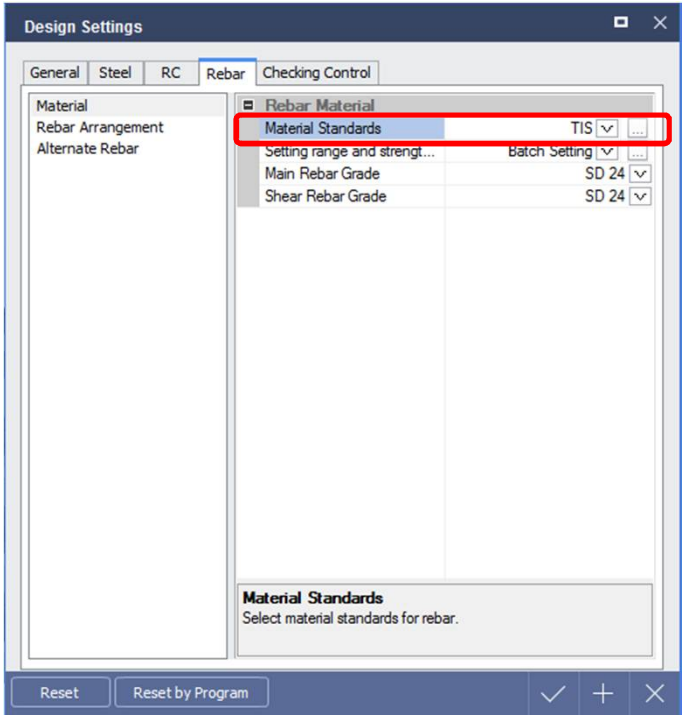
Define of Nonlinear Curve

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