

FEA NX INTRODUCTION

(English Course)

June 20, 2025

Google會議室 10:00~11:30 https://meet.google.com/sgo-hhbz-qiy 沈約翰 (John) support@midasuser.com.tw

FEA

CONTENTS

Engineering-Grade Simulation with MIDAS FEA NX

Applications and Capabilities of GTS NX

Enhanced the Design Workflow

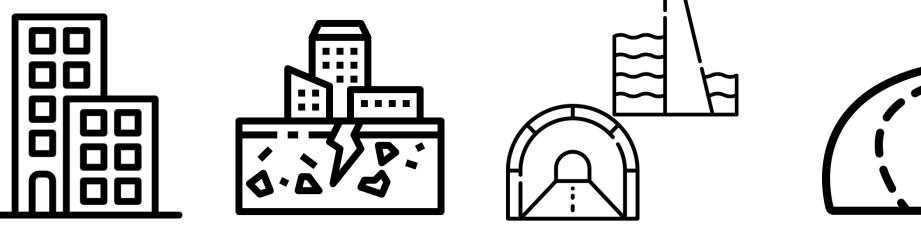
Real-World Implementation: Case Study

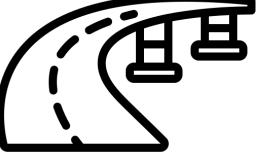
Fully integrated approach





MIDAS FEA NX is a **Finite Element Analysis software** developed by MIDAS IT, specifically designed for **advanced structural analysis in civil and geotechnical engineering**.





Concrete Behavior

Soil - Structure Interaction

Tunnels, dams, and underground structures

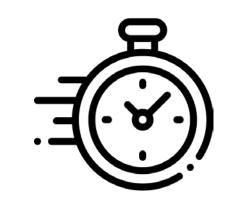
Bridges, large infracstructures and other complex geometries





FEA NX KEY FEATURES

elements for detailed modeling



Maximizing Efficiency with MIDAS FEA NX

Feature	Description
Advanced Material Models	Includes nonlinear concrete, steel, rock, and soil behaviors
3D solid modeling	Supports solid, shell, and beam elements for detailed modeling
Contact and interface elements	Models interactions between soil and structures, joints, and more
Automatic meshing & remeshing	Simplifies complex mesh generation and refinement
3D solid modeling	Supports solid, shell, and beam

Automated Meshing and Geometry Handling

Advanced Nonlinear Solvers

Integrated Modeling & Post-Processing

Template-Based Modeling & Reusability

Accurate Simulation Reduces Rework

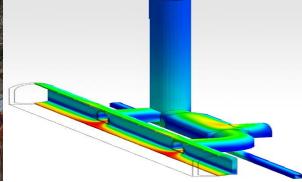


Reasons for 3D









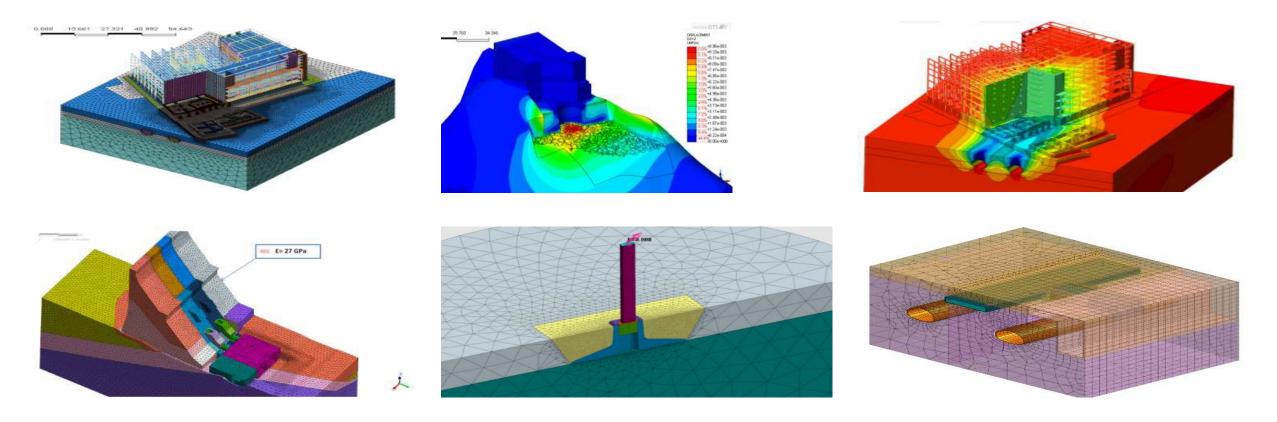


Our MIDAS commitment

• Experts in 3D/2D specialized engineering



• Constantly providing technical support, materials, and training





KEY APPLICATIONS

















MULTIPLE TYPE OF ANALYSES



- Linear static analysis
- Nonlinear static analysis

Construction Stage Analysis

- Stress (drained/undrained) analysis
- Seepage analysis for each stage
- Stress-seepage-slope coupled
- Consolidation analysis for each stage
- Fully coupled stress & seepage

Consolidation Analysis

• Consolidation analysis

Stress-Seepage Coupled Analysis

- Stress
- Steady-state
- Transient
- Stress seepage

Seepage Analysis

Steady state seepage analysisTransient seepage analysis

Dynamic Analysis

- Eigenvalue / Response Spectrum analysis
- Linear Time History (mode/direct methods)
- Nonlinear Time History analysis
- 1D/2D Equivalency Linear analysis
- Nonlinear time history + SRM Coupled

Slope Stability Analysis

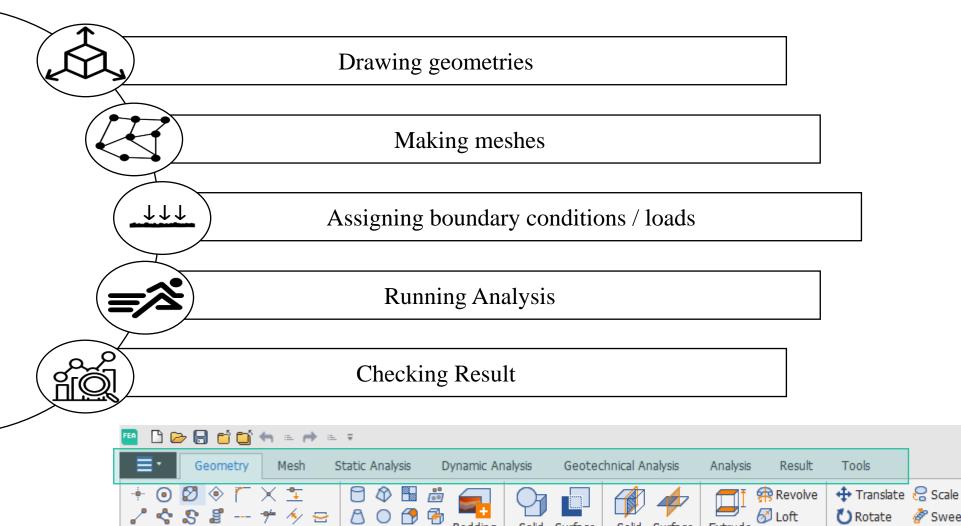
- Strength Reduction Method (SRM)
- Strength Analysis Method (SAM)
- Construction stages Slope stability (SRM/SAM)



DESIGN PROCESS

🕈 🖸 🕰 🛛 🗡 🛟 h

Point & Curve



Bedding

Plane

Solid Surface

Boolean

Solid Surface

Divide

8

đ

0

1

69

Surface & Solid

R



🔗 Sweep-Translate 🚦 Attach

>> Project

Transform

🕢 Loft

Protrude

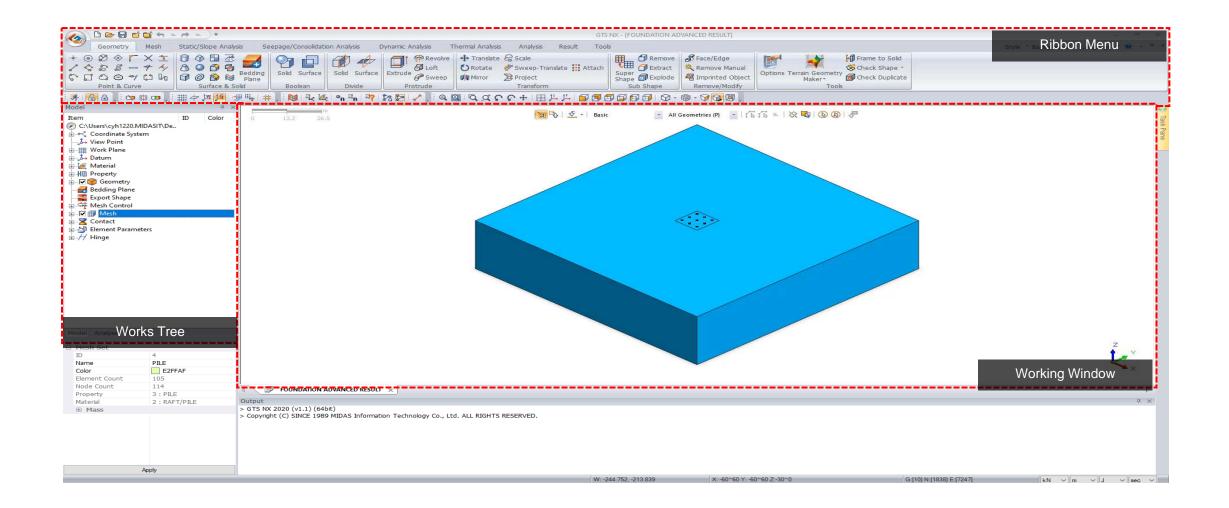
Sweep

Extrude

🕐 Rotate

Mirror

GRAPHICAL USER INTERFACE

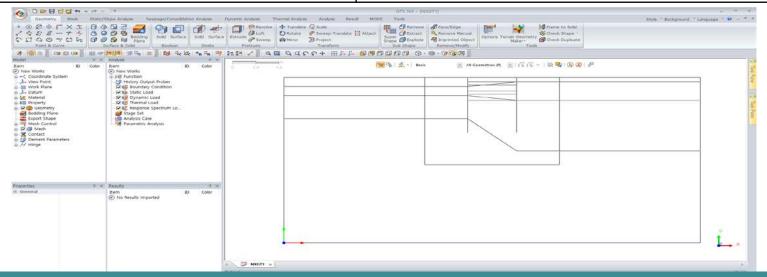




COMPATIBILITY

Works with most drawing files / CAD formats

File format	Description
*.dwg	AutoCAD drawing files
*.dxf	AutoCAD drawing interchange files
*.x_t; *.xmt_txt; *.x_b; *.xmt_bin	Parasolid (9 to 29) files
*.sat; *.sab; *.asat; *.asab	ACIS (R1 to 2018 1.0) files
*.stp; *.step	STEP (AP203, AP214) files
*.igs; *.iges	IGES (Up to 5.3) files

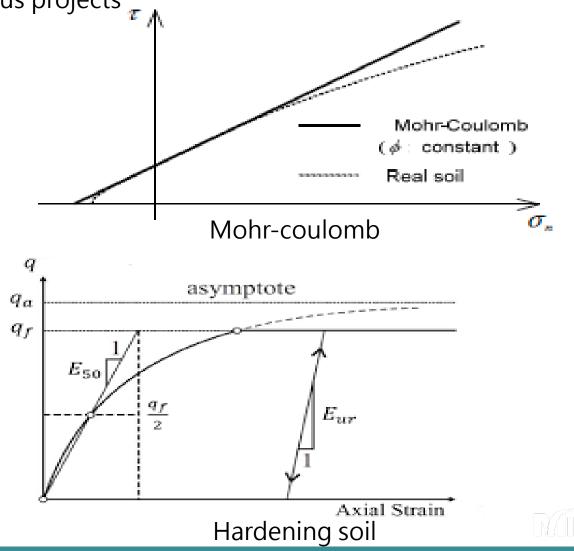




COMPREHENSIVE SOIL MODELS

Choose the appropriate soil model for your various projects τ

- GeneralMohr-CoulombHardening Soil (small strain stiffness)
 - Sand Modified UBCSAND PM4Sand
 - Clay Soft soil (Creep) Modified Cam Clay Sekiguchi-Ohta(Inviscid) Sekiguchi-Ohta(Viscid) Generalized SCLAY1S
 - Rock (Generalized) Hoek Brown Jointed Rock Mass CWFS

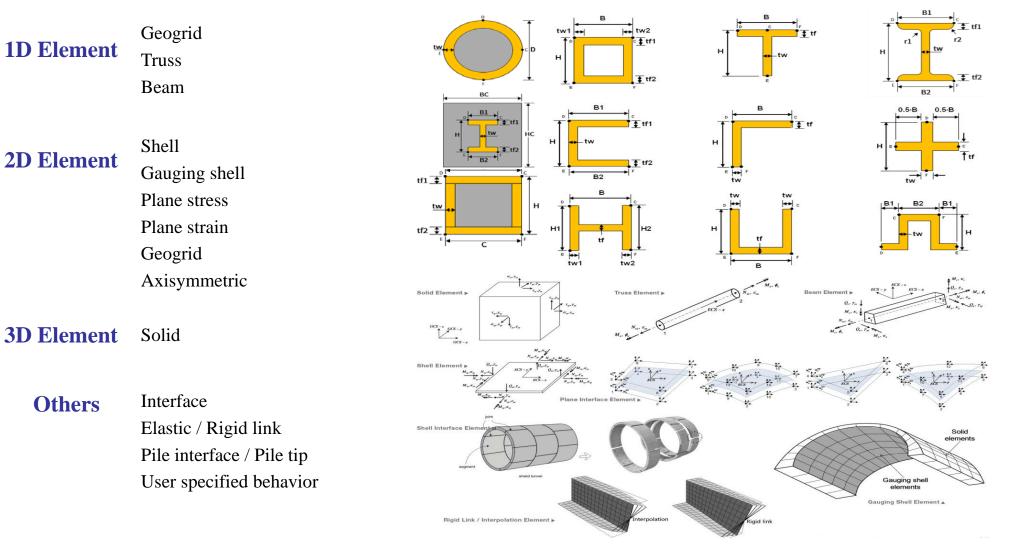




12

COMPREHENSIVE ELEMENT LIBRARY

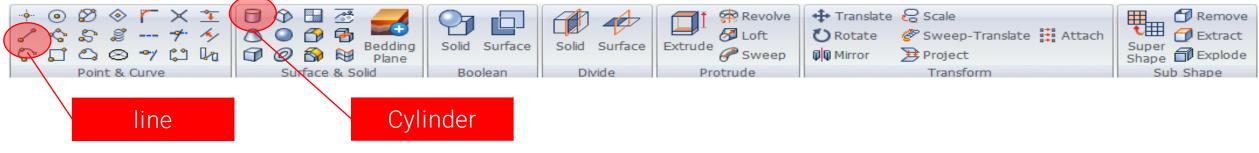
Saves time by just selecting the necessary elements from the database

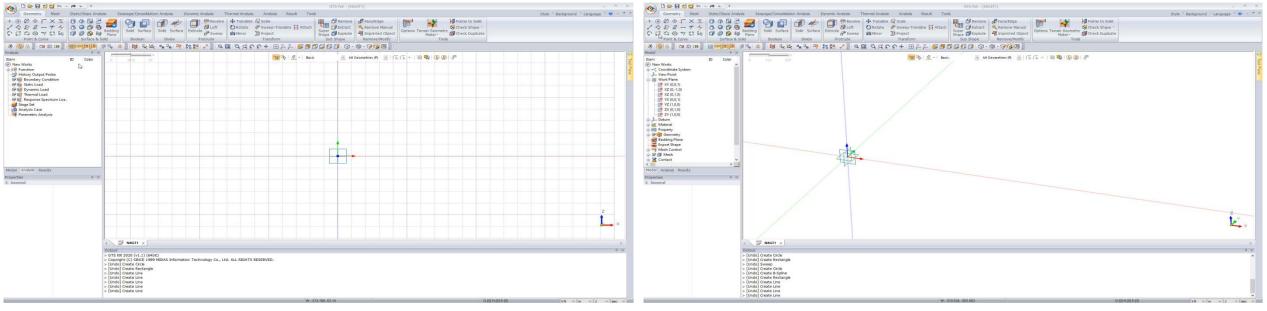




GEOMETRY

- From simple drawing modification to complex building up of geometries
- Intuitive and powerful geometry functions extrude, sweep, boolean and etc.











PARTIAL FACTORS

2D analysis can use the **partial factor** function which was developed based on Euro Code 7.

Partial Factor					×
Name					
Partial Factor Material	Loads				
Ground Material/Struc	tural Prop	perty			
	1	Material		^	
1		1: Sand			
+					
				~	
Partial Factor					
Parameter	C	Driginal	Factored		
Cohesion (c)		30	24	kN/m²	
Frictional Angle (Φ) Inc. of Cohesion		36 0	30.1666 0	[deg] kN/m³	

GTS NX is providing the database for this partial factor as below:

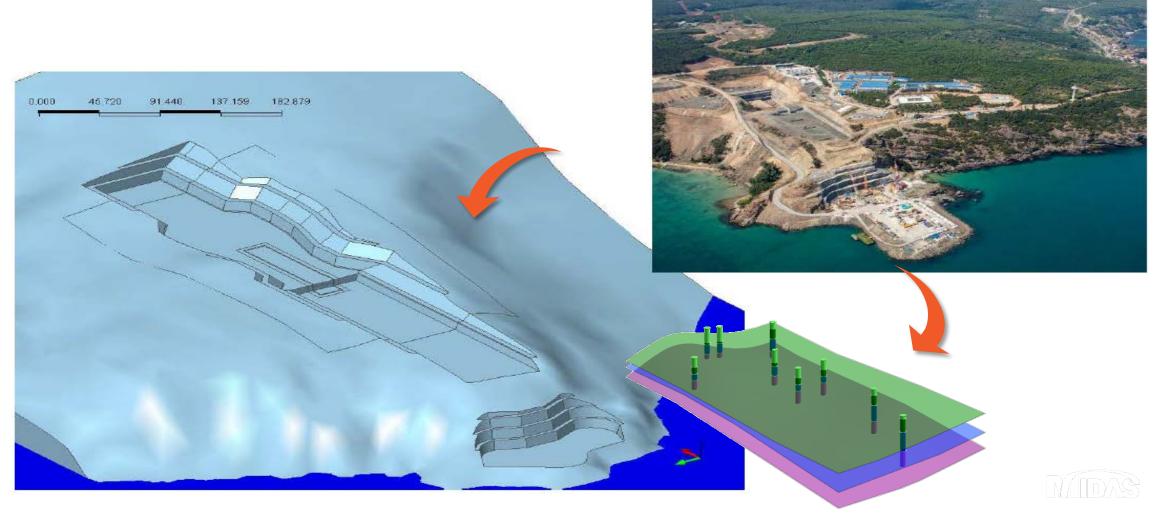
Design Approach 1 Combination 1 Design Approach 1 Combination 2 Design Approach 2 Design Approach 3...

Directly checking the original and factored parameters



TGM & Bedding plane wizard

Easily create the surface of the site by simple topography import

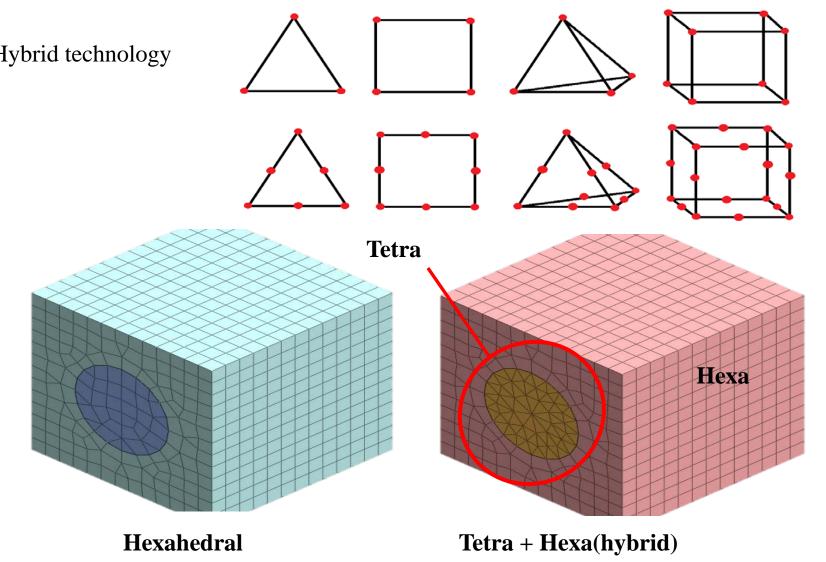




MESH

Tetrahedral

Powerful meshing algorithm with Hybrid technology





BOUNDARY CONDITION AND LOADS

Boundary

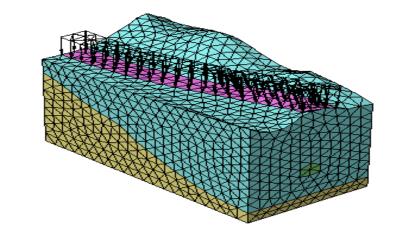
Constraint

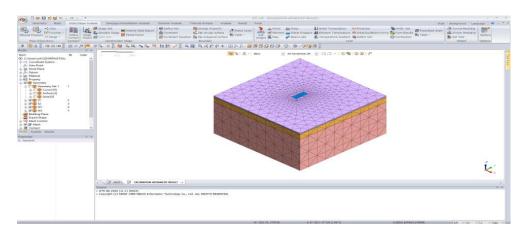
Change Properties Review Water level Nodal Head Surface Flux Slip Circle/Polygonal Surface **Draining Condition** Non Consolidation Transmitting



Self Weight Force Moment Displacement Pressure(Surcharge / Water) Line Beam Load Element Beam Load Temperature Pre-stress

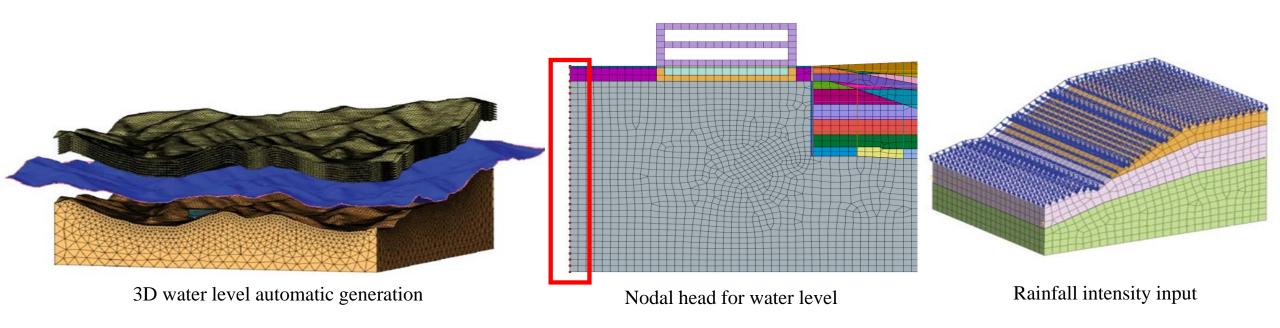
Contraction Initial Equilibrium Force **Combined Load Response Spectrum** Ground Acceleration Time Varying Static Dynamic Nodal / Surface Load to Mass Train Dynamic Load Table







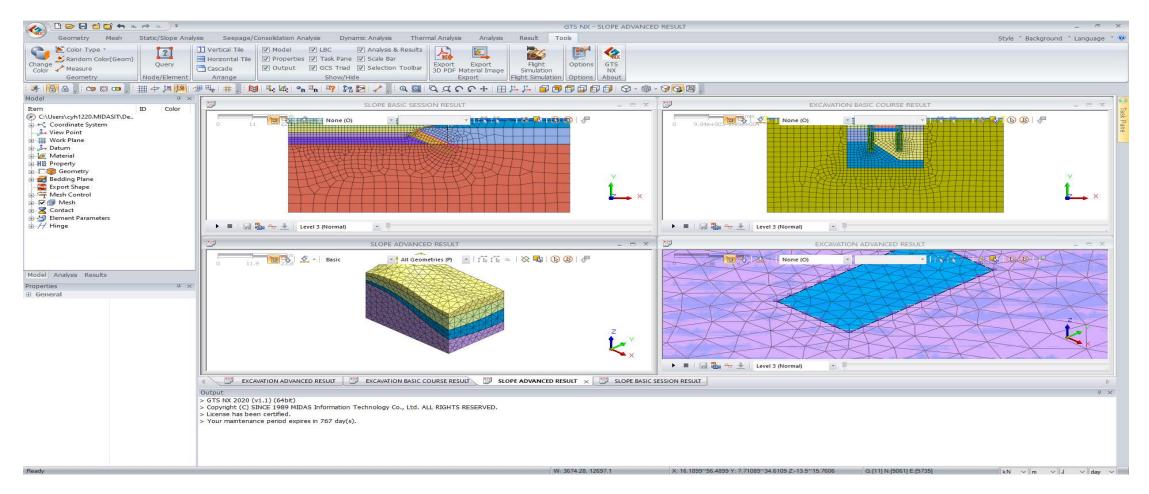
WATER CONDITION nodal head, line & surface flux, water level





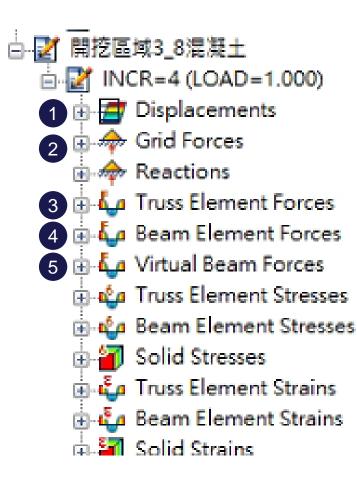
MULTI WINDOWS

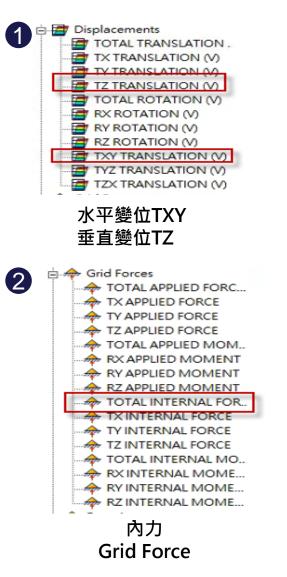
Compare various sections or different analyses in one program window

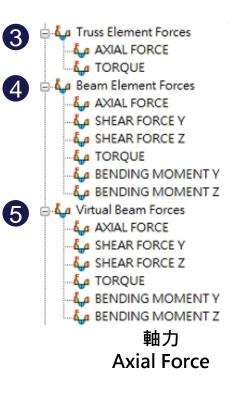




COMPREHENSIVE BREAKDOWN OF RESULTS

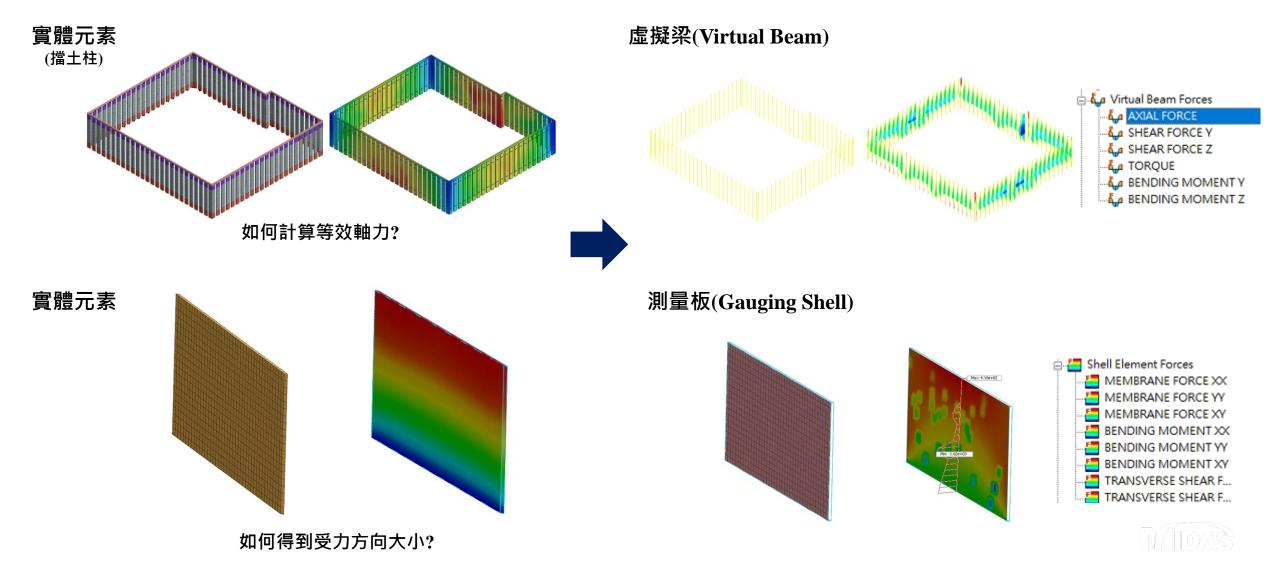






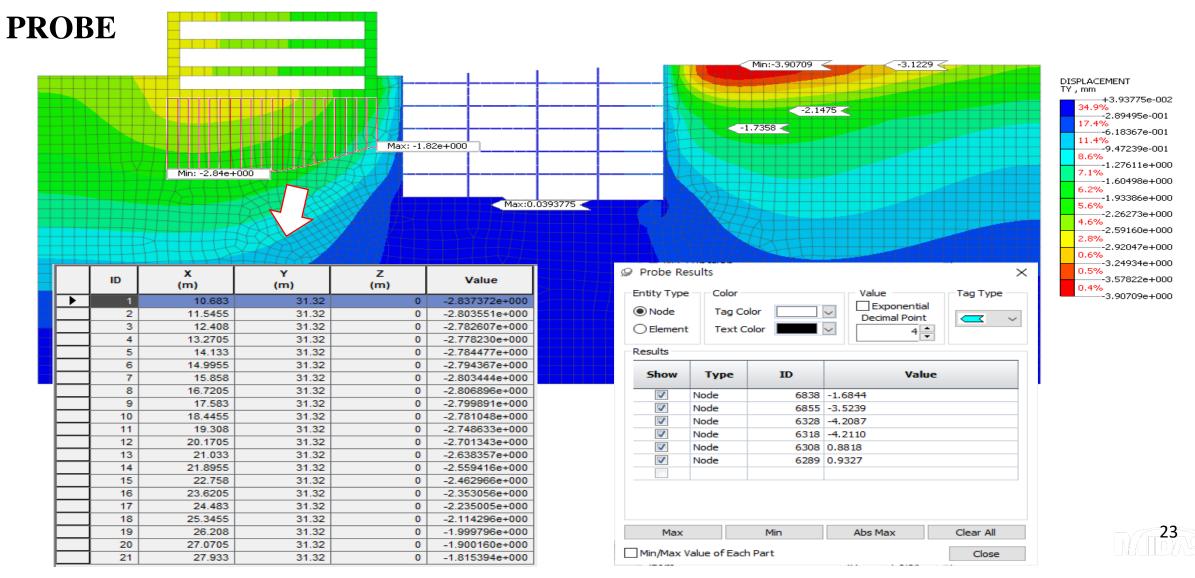


RESULT - VISUALIZATION



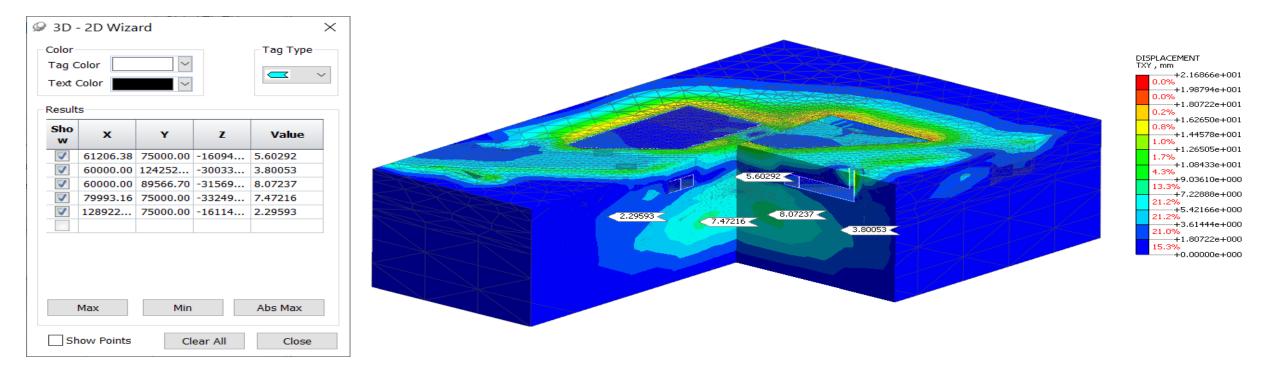


RESULT - MULTIPLE METHODS FOR VERIFICATION





RESULT - MULTIPLE METHODS FOR VERIFICATION PLANE CLIPPING and PROBING





RESULT - ANALYSIS REPORT and EXPORT

materials and properties with "PDF" format

Material

Name

5:Conc' 6:Steel

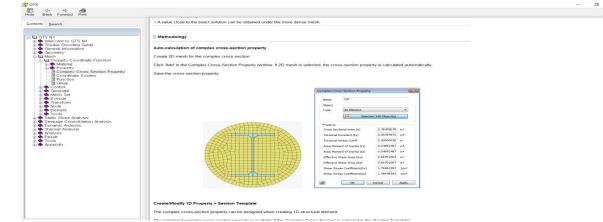
MIDAS

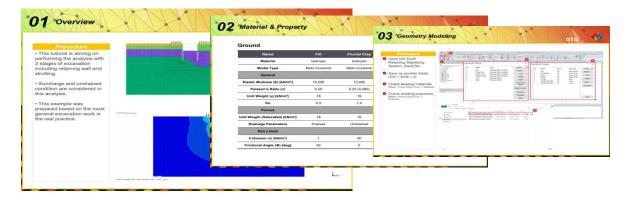
(kN	E //mm²) (I	Inc. of Elastic (kN/mm*)	Inc. of E Ref. Height (mm)	v	γ (kN/mm³)	Ко	Thermal Coeff. (1/[T])	Molecular Vapor Diffusion Coeff. (mm/sec ²)	Thermal Diffusion Enhance ment	Damping Ratio		
(kN	r_sat //mm³)	e_o	kx (mm/sec)	ky (mm/sec)	kz (mm/sec)	Ss (1/mm)	Conductiv ity (W/(mm*[]))	iv Specific Heat [T (J/(ton*[T]))	Heat Gen. Factor			
	28	0	0	0.15	2.4e-008	-	1e-006	0	0	0.05		
2.1	le-008	0.5	0.01	0.01	0.01	5.2302133 3e-009	3 0		_			
	205	0	0	0.15	7.4e-008	-	1e-006		Res	sults ex	ort with "WORD" format	
2.1	le-008	0.5	0.01	0.01	0.01	5.2302133 3e-009	3 0					
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											Contraction Contracti	



TECHNICAL SUPPORTS

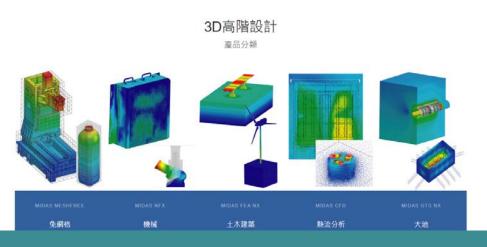
Help manuals / tutorials with various topics





Taiwan MIDAS Solid-Simulation website

MIDAS SOLID SIMULATION MESHFREE NFX FEA_NX CFD CTS_NX 整合性課程 分析案例 課程報名 責要下載 FAQ 量合資資料 C-登出



https://www.midasuser.com.tw/SolidSimulation/

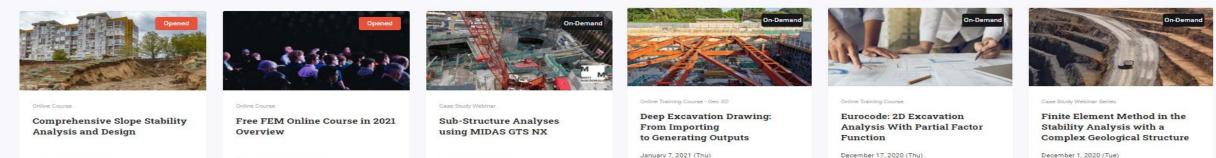


TECHNICAL SUPPORTS

Online training videos

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HOME VIDEOS	PLAYLISTS COMM	UNITY CHANNELS	ABOUT Q			Case Study Webinar Series	PLAY ALL				
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midas GTS NX		ning to discuss what benefits we co a preparing for the design report, you				Case Study Webinar: Finite Element Method Approach t MIDAS GEOTECH OFFICIAL 381 views + 3 months ago	Finite Element Modeling of Tunnels in 2D&3D Most MIDAS GEOTECH OFFICIAL 571 views - 9 months ago	Case Study: Numerical Modelling of a Metro MIDAS GEOTECH OFFICIAL 294 views • 4 months ago	Case Study: Deep Excavation under the Groundwater Tabl MIDAS GEOTECH OFFICIAL 523 views • 5 months ago	Project based Training: Box Culvert Excavation Drawing MIDAS GEOTECH OFFICIAL 435 views • 9 months ago	Case Study: Deep shaft in Central London midas GTS MIDAS GEOTECH OFFICIAL 278 views + 5 months ago
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NOAL ACADEMY Deep Excavation Drawing From importing to generating outputs	ck tour of the major functionalities of MOAS ACADEMY Eurocode: 2D Excavation Analysis with Partial Factor Function	of GTS NX. HIGAS ACADENY Top 10 Most Commonly Asked Questions for Geo XD Beginners	FEM in the Stability Analysi With a Complex Geological Structure	HEAS ACADENY How To Quickly Master The Geotechnical Design Report	Finite Element Method Approach to Pile Foundation of Silo Design	These tutorials show the basic w using GTS NX.	vorkflow with the software. How to	NIGAS ACADEMY	HEDAS ACADEMY	The same in the same second	March March P. P. Strategy and P. Strategy
Deep Excavation Drawing From importing to	HIDAS ACADEMY Eurocode: 2D Excavation Analysis	HIDAS ACADEMY Top 10 Most Commonly Asked Questions	With a Complex Geological Structure PH.D. MICHAE KOWALSKI,	How To Quickly Master The Geotechnical	Approach to Pile Foundation	These tutorials show the basic w using GTS NX.	orkflow with the software. How to		HEAS ACABENY HAW to Do 3D Numerical Modelling for Geotechnical Analysis		
NEAL ACADERY Deep Excavation Drawing From importing to generating outputs	HOAS ACADEMY Eurocode: 2D Excavation Analysis with Partial Factor Function	HEAS ACADEMY Top 10 Most Commonly Asked Questions for Geo XD Beginners	With a Complex Geological Structure PH.D. MICHAE KOWALSKI,	How To Quickly Master The Geotechnical Design Report	Approach to Pile Foundation of Silo Design	These tutorials show the basic w using GTS NX. Moss scropsy Eurocode: 2D Excavation Analysis	HEAL ACASENY HOW TO Guickly Master The Geotechnical	MDAS ACADEMY Why Do We Need 3D Analysis : Comparison with 2D analysis	How to Do 3D Numerical Modelling for Geotechnical Analysis		
PREASANCESSEN Deep Excavation Drawing From importing to generating outputs notes Geo XD Training 33:29 ep Excavation Drawing:	Hors AcAberry Eurocode: 20 Excavation Analysis with Partial Factor Function media Geo XD Training 48:41 Eurocode7 : 20 Excavation Analysis with Partial Factor MIDAS GEOTECH OFFICIAL	House Academy Top 10 Most Commonly Asked Questions for Geo XD Beginners midas Geo XD training 9-27 Top 10 Most Commonly	With a Complex Geological Structure PH.D. MICHAE KOWALSKI, AGH UNIVERSITY Case Study: FEM in the	How To Quickly Master The Geotechnical Design Report relas GTS NX & GEO XD 59:58 Online Tutorial: How to	Approach to Pile Foundation of Silo Design JACEK NAWRACALA, OT PRO. 34:18 Case Study Webinar: Finite	These tutorials show the basic w using GTS NX. Eurocode: 20 Excavation Analysis with Partial Factor Function	workflow with the software. How to How To Quickly Master The Geotechnical Design Report	HOAS ACABBY Why Do We Need 3D Analysis : Comparison with 2D analysis	How to Do 3D Numerical Modelling for Geotechnical Analysis		

Online Courses / Case studies



February 16, 2021 (Tue) Duration : 60 Min

Feb - June, 2021 (6 months) Duration : 60 Min

January 28, 2021 (Thu) Duration : 40 Min



January 7, 2021 (Thu) Duration : 60 Min

Duration: 50 Min



Duration: 60 Min

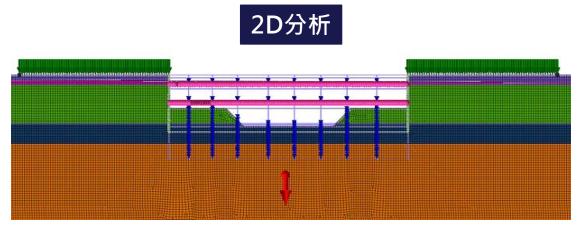
MIDAS Geotech has rich experience and know-how to grow the practical engineers







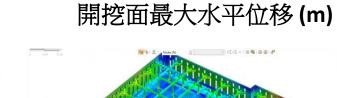
CASE STUDIES

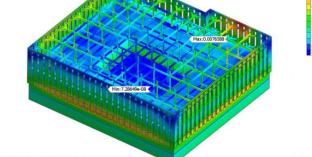


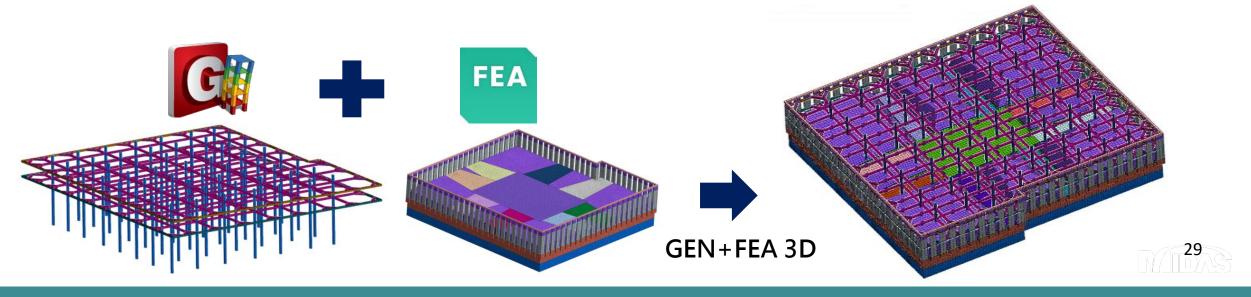
2D 建模只考慮模型的一個平面,縱向 支撐、水平支撐和傾斜梁無法建模。



Miny -0.000991





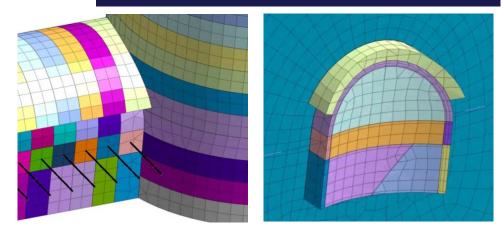




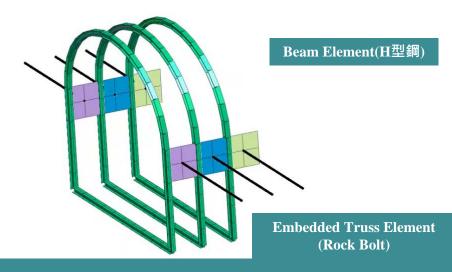
Ł

FEA NX NATM 實例

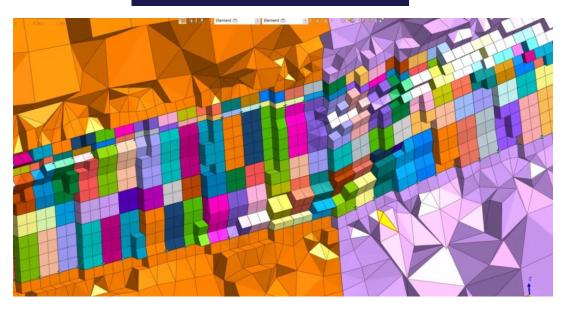
Mixed Mesh with Fully Compatible Nodes



Shell Element(傳力裝置)



FEANX 混合網格/全共點建模

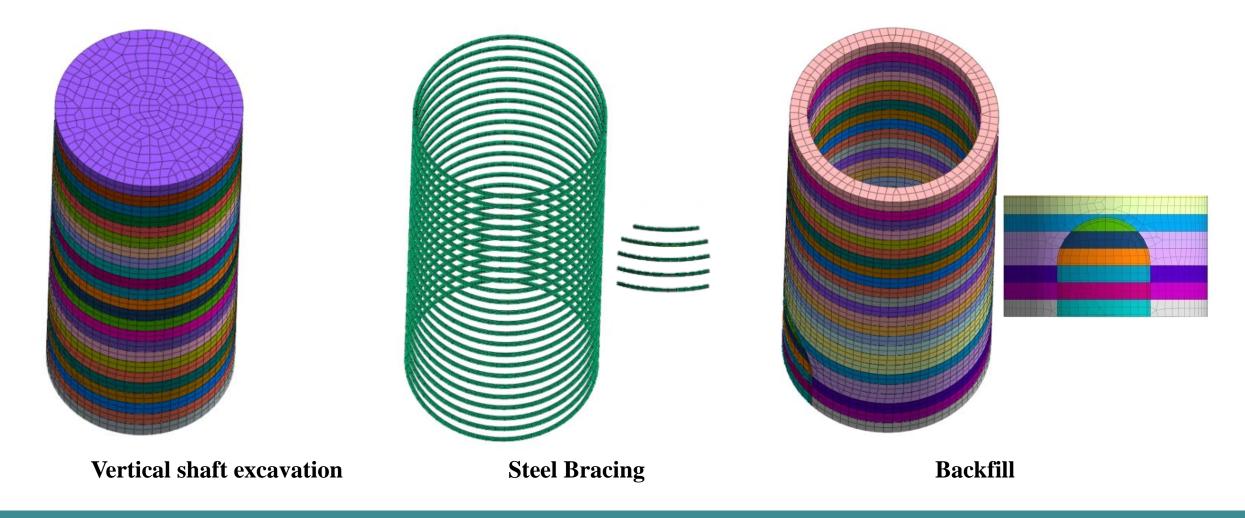






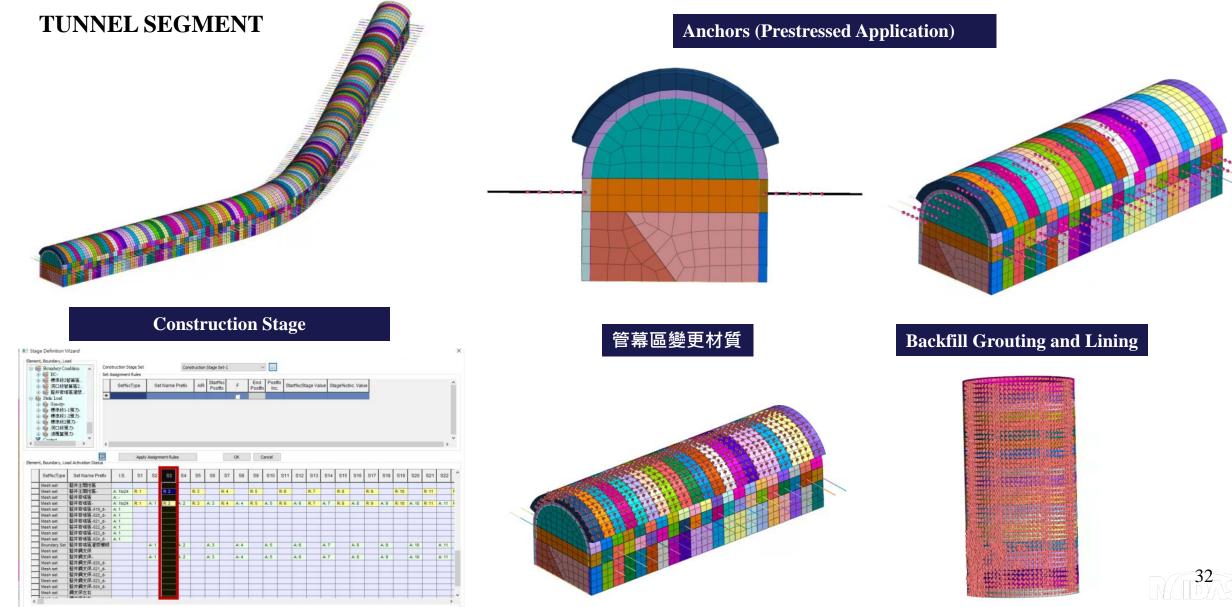
FEA NX Case Study: NATM Tunnel Analysis

VERTICAL SHAFT





FEA NX Case Study: NATM Tunnel Analysis





FEA NX SLOPE STABILITY ANALYSIS

FEA

2D分析 - 方法1 Limit Equilibrium Method(LEM)

2D分析 - 方法 2 Stress Analysis Method (SAM)

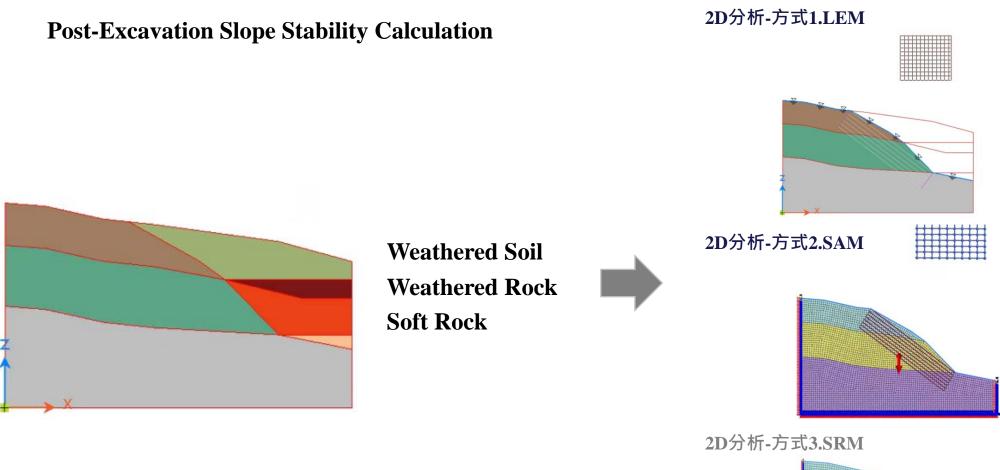
2D分析 - 方法 3 Strength Reduction Method (SRM)

3D分析

Strength Reduction Method (SRM)

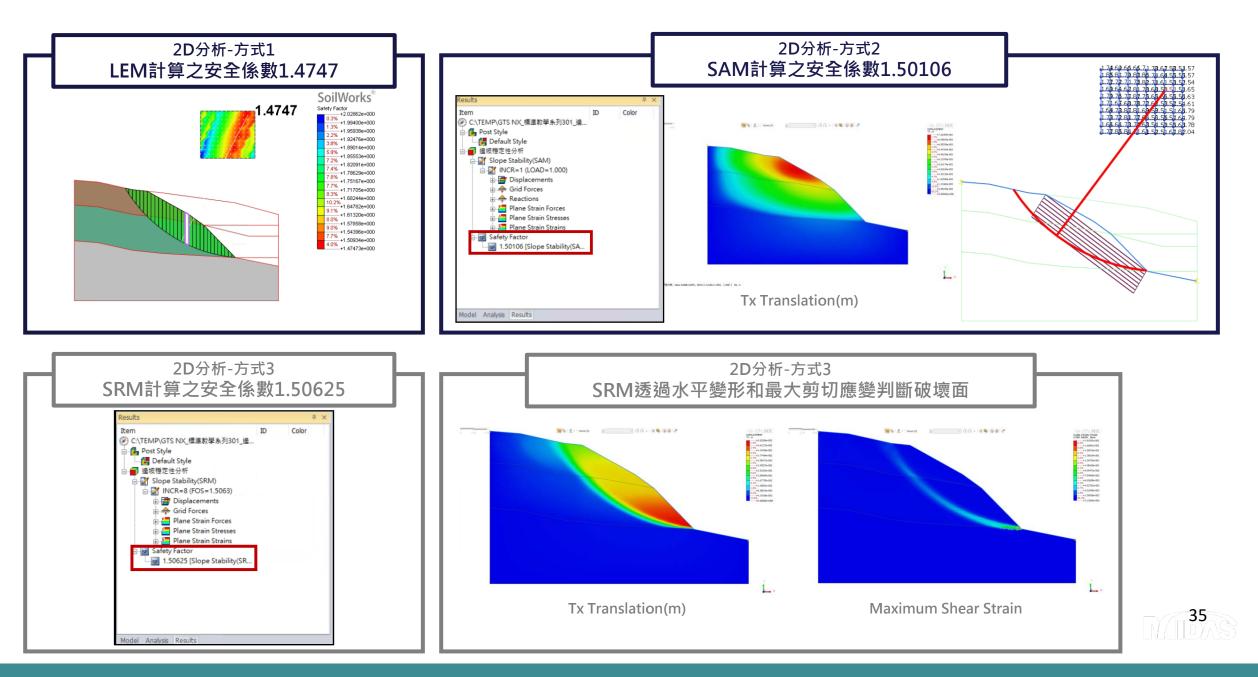


FEA NX 2D SLOPE STABILITY ANALYSIS



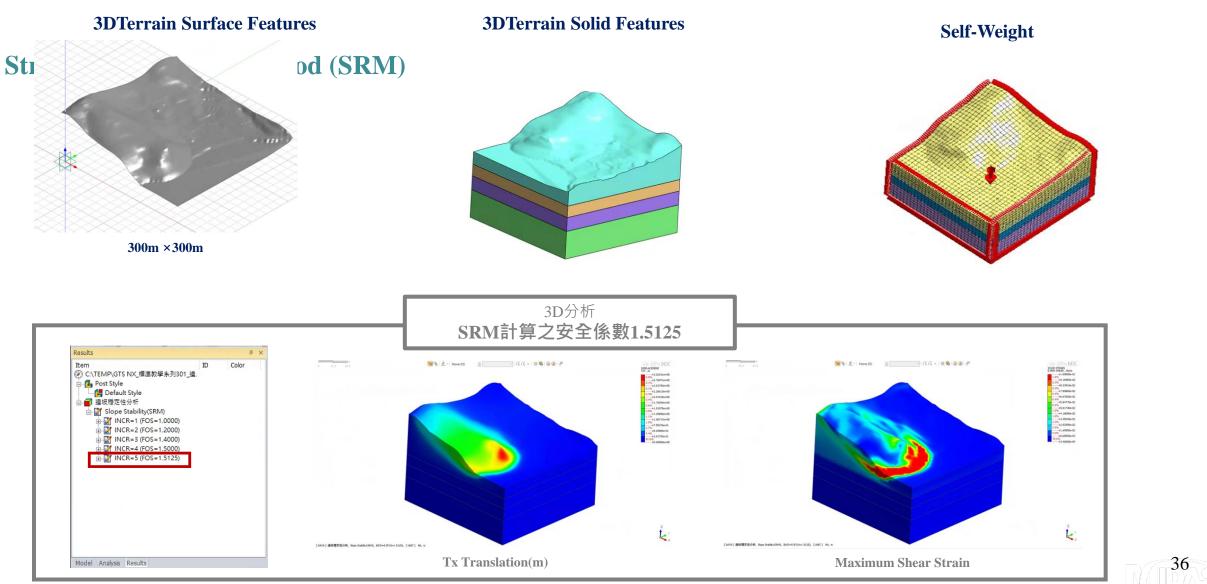
SRM gradually reduces the shear strength parameters (cohesion c and friction angle φ) of the slope foundation material until the analysis becomes unstable (diverges). At this point, slope failure is assumed to occur. The maximum strength reduction factor at this divergence point is taken as the minimum factor of safety for the slope.





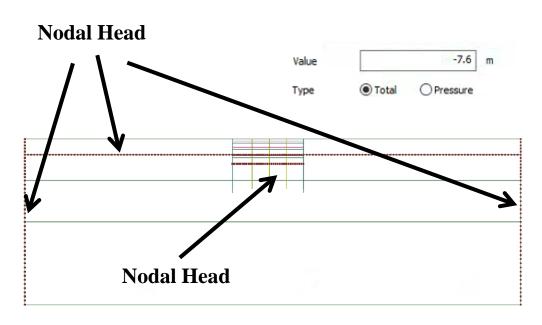


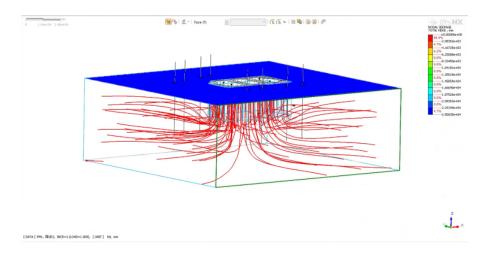
GTS NX 3DSlope Stability Analysis

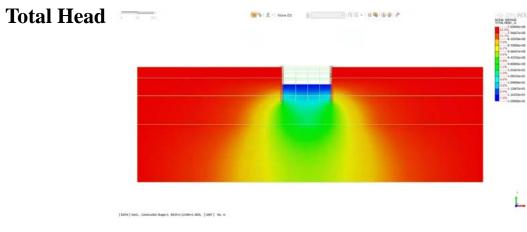


MIDAS

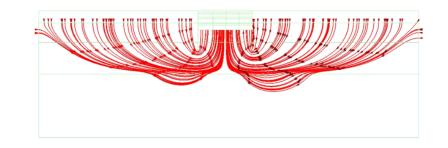
FEA NX GROUNDWATER SIMULATION

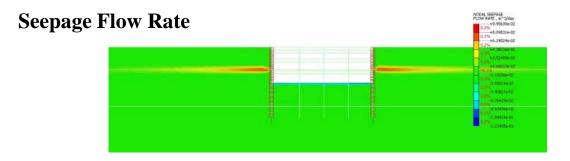






Flow Path

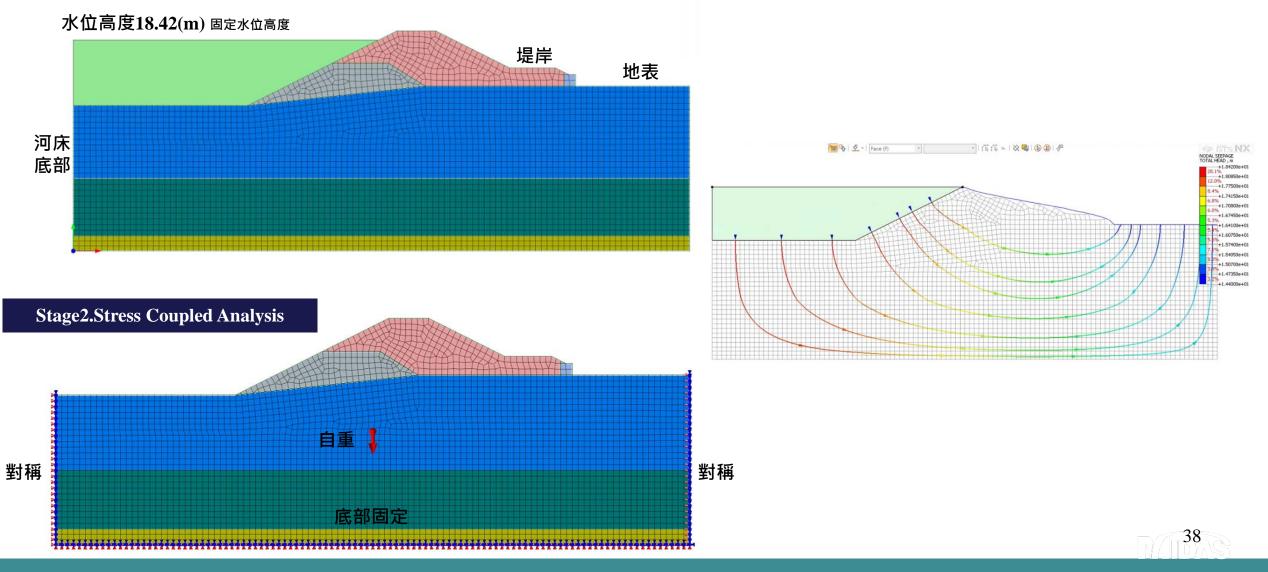






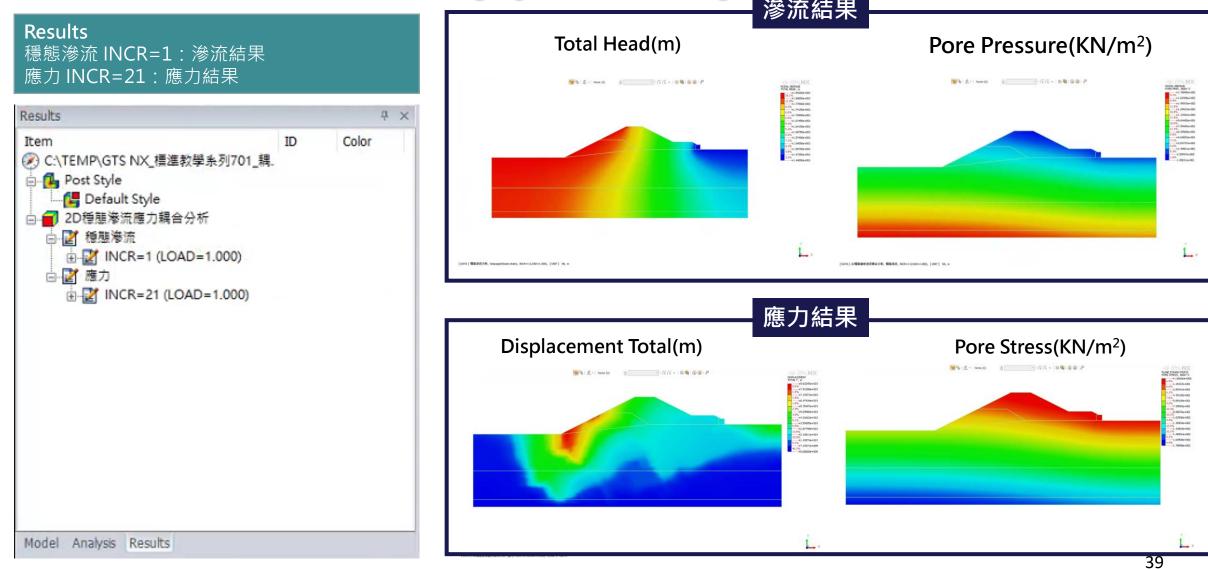
FEA NX Seepage-Stress Coupled Analysis

Stage1.Seepage Analysis





FEA NX Seepage-Stress Coupled Analysis 渗流結果

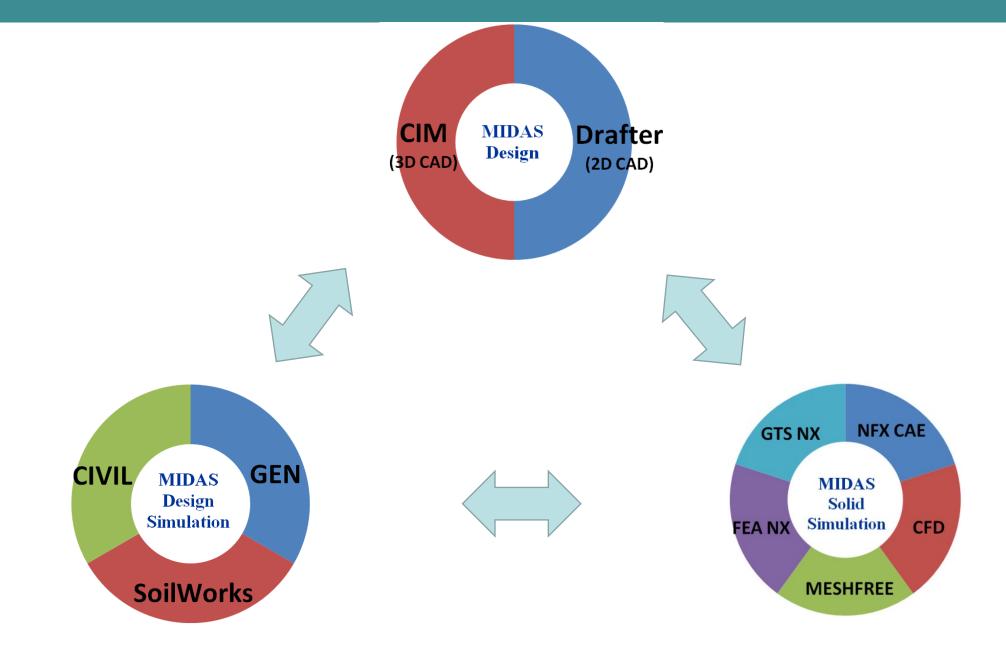






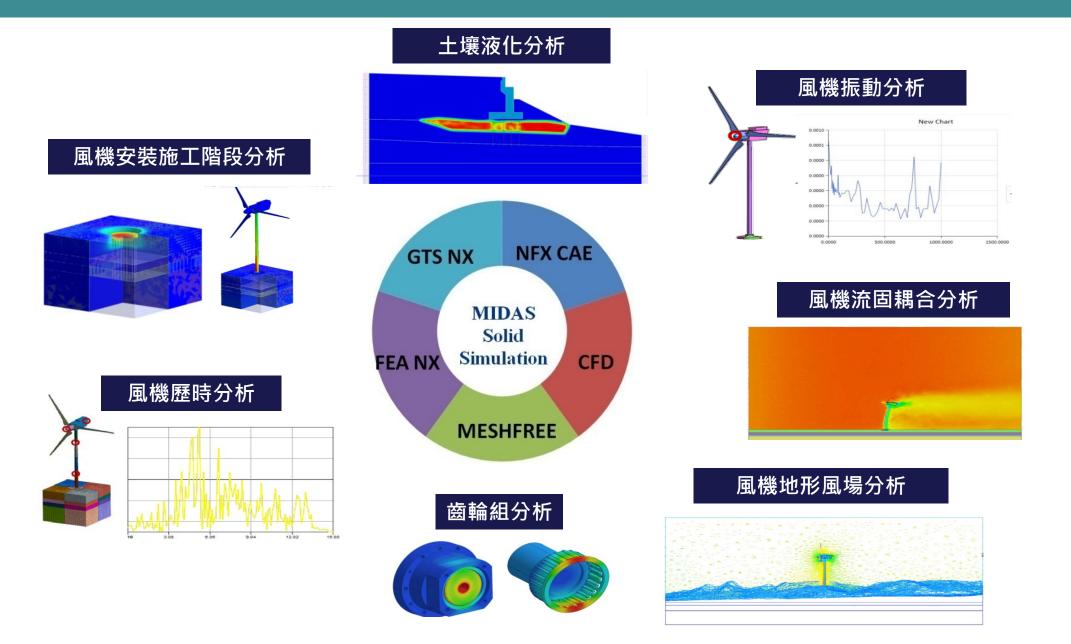
SYSTEM INTEGRATION

MIDAS INTEGRATION





Solid Total Solution

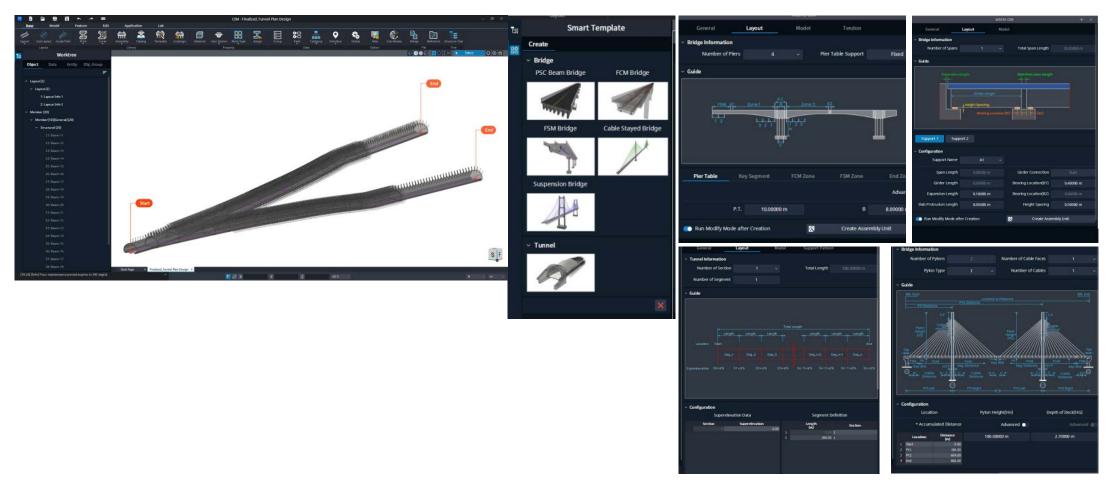




CIM + FEA/GTS 3D Model Integration

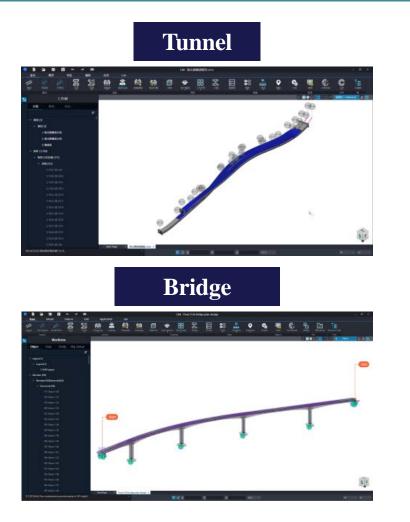
CIM-3DAutomatic Model Adjustment Alo ng Alignment

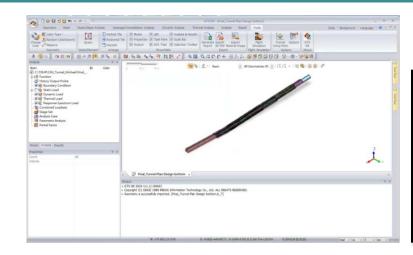
Bridge & Tunnel Wizard

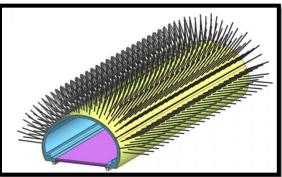


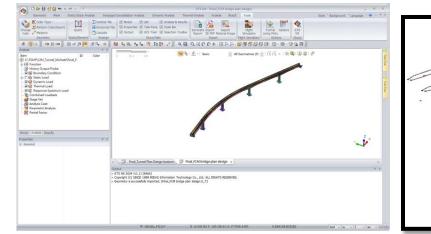


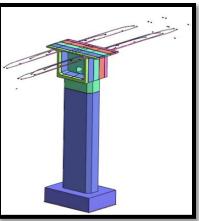
CIM+GTS 3D Model Integration







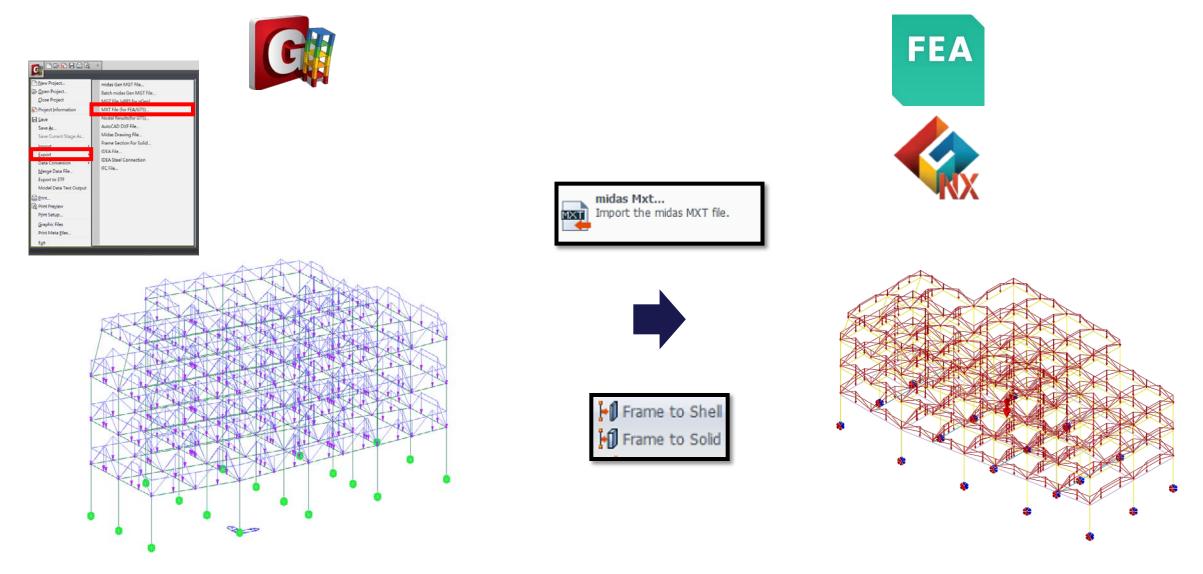




CIM>S NX Direct Conversion of Solid Features

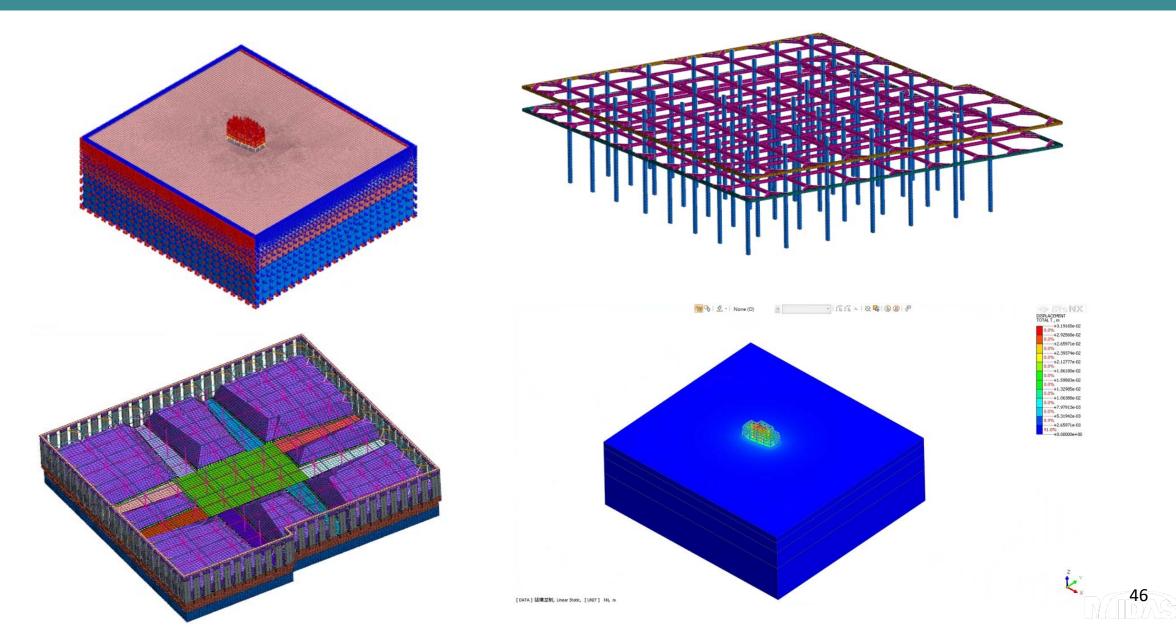


FEA or GTS NX & Gen | Structural Interaction Analysis

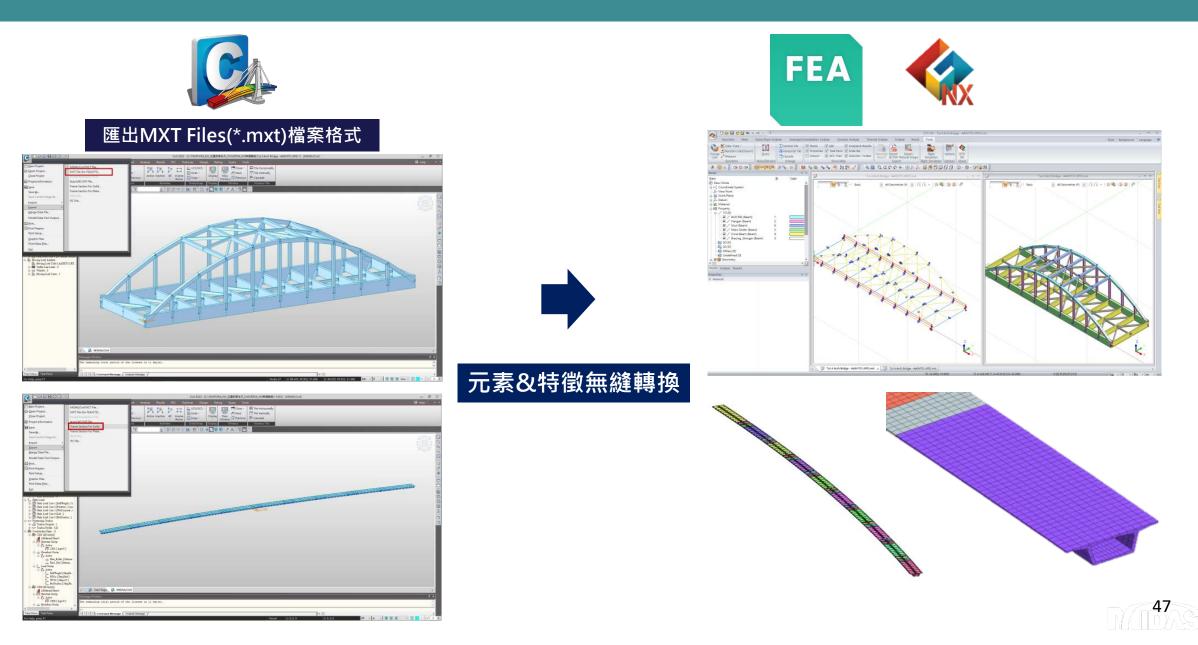




FEA or GTS NX & Gen | Structural Interaction Analysis



FEA / GTS NX+CIVIL Smooth Conversion



Thank you.





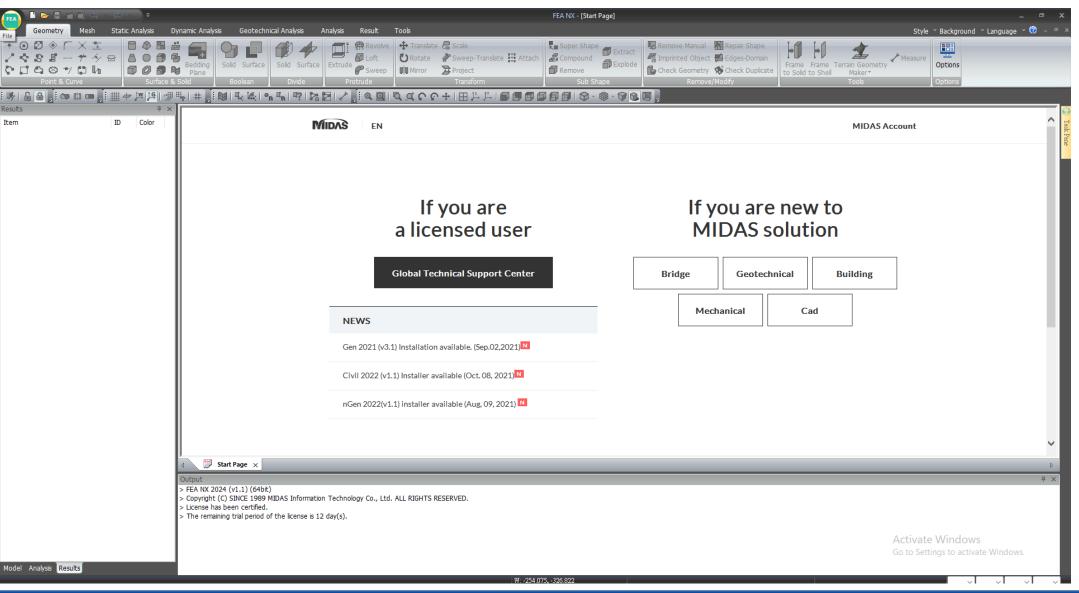


FEA NX GUI

Version: FEA NX 2025 V1.1 | APRIL 14 2025

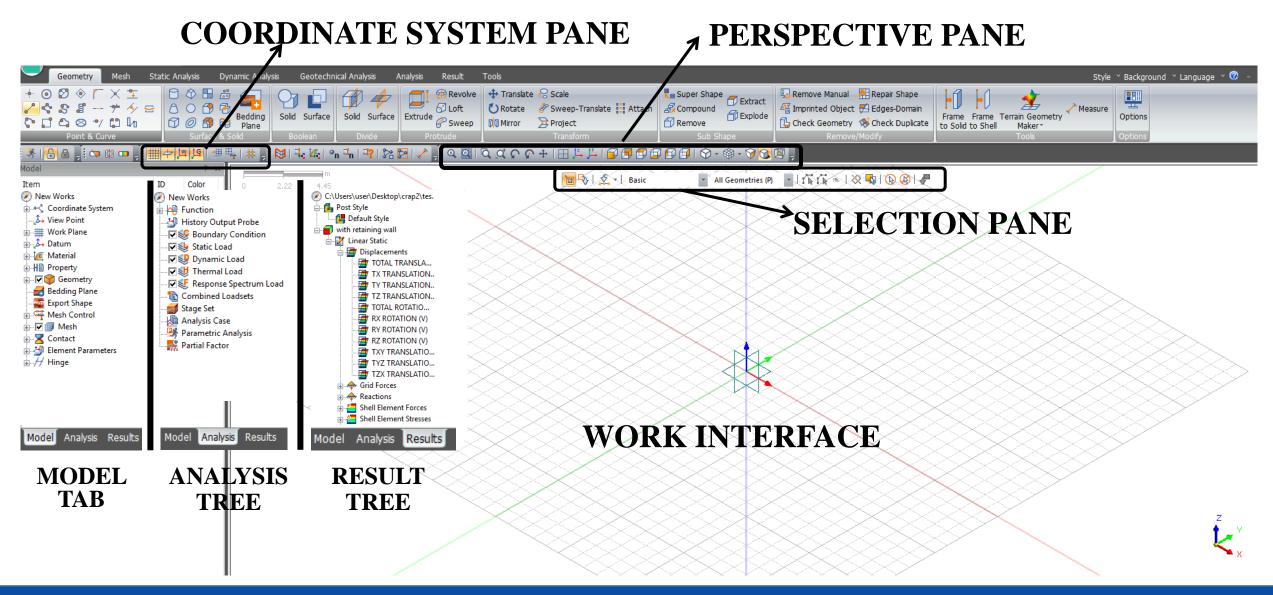
MAIN INTERFACE





WORKSPACE





SHORTCUT and MOVEMENT

LEFT CLICK -Select

CTRL + S -Save

RIGHT CLICK -Additional options

MOUSE WHEEL UP/DOWN -Zoom in or Zoom out CTRL + Y -Redo

-Undo

CTRL + Z

MOUSE 3/ MOUSE WHEEL PRESSF3-Rotate or Translate-Measure

CTRL + MOUSE 3/ MOUSE WHEEL PRESS -Move or Drag

-2D or 3D Generate Mesh



F7/F8





2D/3D Excavation with Retaining Wall Tutorial





2D TUTORIAL



GEOMETRY SET-UP

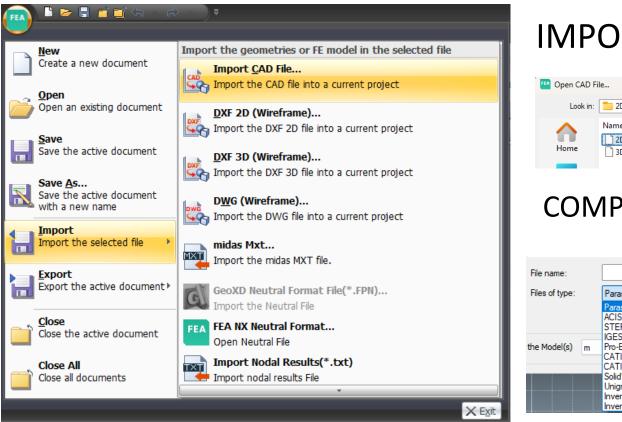
Analysis Setting			×
Project Title		Engineer	
Desc.			
Model Type		Gravity Direc	tion
◯ 3D		OY	
O 2D		⊖z	
Axisym	metric		
Unit System			
kn ~	m ~) ~	sec 🗸
Initial Paramet	ers Water Par	rameters	
Gravity Accel	eration(g)	9.80665	m/sec²
Initial Temper	ature	0	[T]
Plane Strain T	hickness	1	m
		ОК	Cancel

Analysis setting:

- Model Type : 2D
- Choose the preferred unit system



GEOMETRY SET-UP



IMPORTING CAD FILE

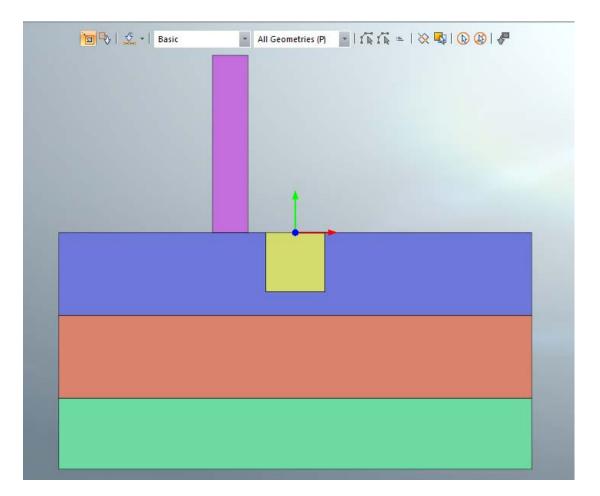
Open CAD F	ile				
Look in:	2D and 3D excav comparison 🗸 🗸	G 🜶 📂 🛄 -			
\wedge	Name	Date modified	Туре	Size	
1	D.X_T	4/30/2025 1:25 PM	X_T File	13 KB	
Home] 3D.X_T	4/30/2025 1:25 PM	X_T File	36 KB	

COMPATIBLE FILES

File name:	~	Open
Files of type:	Parasolid (9 to 34) Files (*x_t;*xmt_txt;*x_b;*xmt_bin)	Cancel
	Parasolid (9 to 34) Files (*.x. t;*xmt_txt;*x_b;*xmt_bin) ACIS (R1 - 2023 1.0) Files (*.sat;*.sab;*.asat;*.asab) STEP (AP203, AP214, AP242) Files (*.stp;*.step) IGES (Up to 5.3) Files (*.igs;*.iges)	
the Model(s) m	Pro-E (16 - Creo 9.0) Files (*.prt;*.prt.;*.asm;*.asm;*) CATIA V4 (CATIA 4.1.9 - 4.2.4) Files (*.model;*.exp;*.session) CATIA V5 (V5 R8 - V5-6 R2022) Files (*.CATPart;*.CATProduct)	
	SolidWorks (98 - 2023) Files (*.sldptr.*.sldasm) Unigraphics (11 - NX2007) Files (*.prt) Inventor Part (V6 - V2023) Files (*.jpt) Inventor Assembly (V11 - V2023) Files (*.iam)	



GEOMETRY SET-UP



MESHING

IMPORTING PROPERTY

	i ፍ 🛋 🖻 📼 🗟 🗧 Isah Static Analysis Dynamic Analysis	Geotechnical Analysis	Analysis Result	Tools	
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 OneDrive Desktop Downloads Documents Pictures Music Videos 	Ider Name 2D.X_T 2D.X_T 2D_Property Input 2D-Simulation 3d excav.bak 3d excav 3d excav 3d excav_3d with RW 3d excav_3d with RW.mec 3d excav_3d with RW.mec 3d excav_3d with RW.nfxp 3d excav_3d with RW.out	Date modified 4/22/2025 3:03 PM 4/22/2025 3:03 PM 4/22/2025 3:03 PM 4/22/2025 5:00 PM 4/22/2025 5:27 PM 4/22/2025 5:01 PM 4/22/2025 5:01 PM 4/22/2025 5:01 PM	X_T File GTS NX Documen GTS NX Documen BAK File GTS NX Documen Text Document MEC File NFXP File OUT File	Size 13 KB 1,250 KB 1,878 KB 5,077 KB 4,980 KB 1 KB 5,645 KB 35,988 KB 4 KB	

MESHING

IMPORTING PROPERTY



No	Name	Туре	Sub-Type	Create
1	連續壁_beam	1D	Beam	Modify
2	±1_2d	2D	Plane Strain	
3	<u>+</u> 2_2d	2D	Plane Strain	Copy
4	<u>3_</u> 2d	2D	Plane Strain	
5	基礎板_beam	1D	Beam	Delete
6	建物_2d	2D	Plane Strain	Import
				Renumber
				Close

*Properties and materials can be manually added, imported or both.

Model ID Item Color New Works E Coordinate System → View Point 🗄 🛵 Datum 🚊 🙋 Material 🛓 🚛 Isotropic [5] -- 🙋 Structure material 1 (Is... 1 E Buried layer (Isotropic-. 2 Colluvium (Isotropic-... 3 Weathering soil (Isotro., 4 Reinforced Concrete (I., 5 📲 2D Equivalent [0] Interface and Pile [0] -- 🙋 Sloshing Medium [0] -H Property 🛓 🗸 1D [2] - 🕅 2D [4] -- 🏼 🖽 建物_2d (Plane Stra.. 6 13_2d (Plane Strai... 4 - 🖂 🕅 ±1_2d (Plane Strai... 2 🔊 3D [0] H Others [0] -H Undefined [0]

Add/Modify Property

Materials and properties should be reflected in tree model





MESHING

MESHING THE ELEMENTS

1. 2D > Select the object > highlight the element

2. Define the mesh size (The smaller the size, the more accurate the result but also the more difficult it is for the computer to process)

3. Select the appropriate property for the element4. Rename the mesh

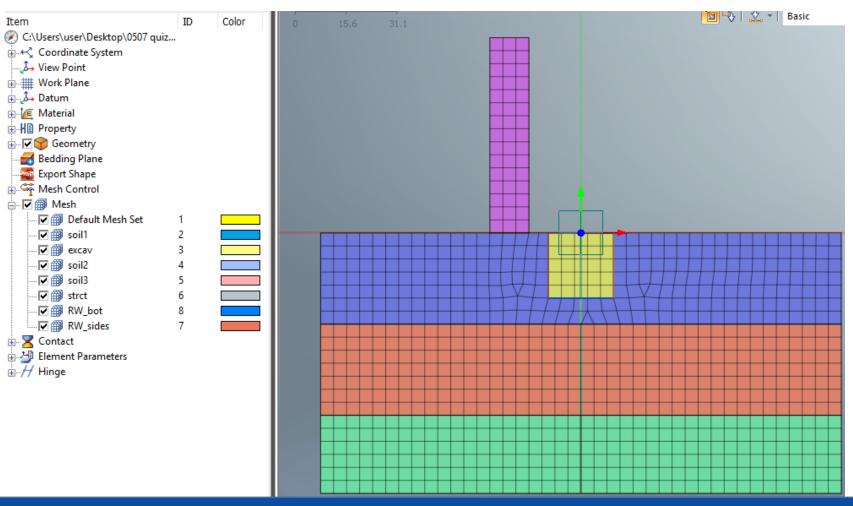
4. Rename the mesh 5. Donoot for all alam

5. Repeat for all elements in the project

	Rename Copy EDivide	Extrude 🖉 Sweep	Trans. Rotate	∽ Delete 😚	Create N Modify Topo	[] Divide 📑 Pile/P
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MESHING MESHING THE ELEMENTS



NOTE: After meshing all the elements, it should appear in the drawing, also in the model tree



MESHING DEFINING THE RETAINING WALL

Rotate Scale			Interface // Hinge ~ Pile/Pile Tip 📕 Infinite Free Field 🛍 Seepage Cut
Transform N	lode	_	Element
) 🖪 🗗 🗊 🗗 🗗 🛇 - 🔇	🗟 - 🍞 🕜 🗐 📮	Extract Element	×
✓ Edge (E)		Geometry Mesh Type Edge Selected 2 Ot Skip Duplicated Faces Orientation (Element Z-Axis) Beta Angle: 90 [deg] Property 1 1: 速請壁_beam Mesh Set Register Based-on Object S Register Based-on Owner S Register Based-on Owner S Register Based-on Owner S Ok	shape

To define a retaining wall

Click Extract
 Select objects/element to become a retaining wall
 Define the property
 Rename

5. Apply and repeat to all elements



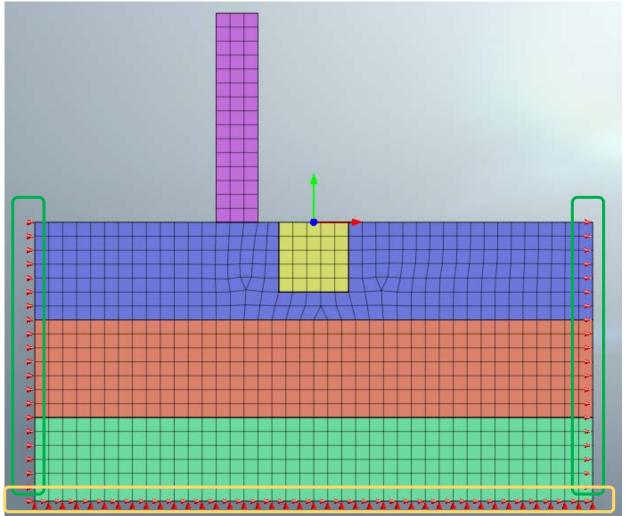
BOUNDARY CONDITIONS

Static Analysis	Dynamic Analysis	Geotechnical Analysis
Befine Set	🔠 Change Prop	erty 🛛 👑 Slip polygonal s
<u> </u> Constraint	🔁 Water Level	😤 Review
Constraint Equa	tion 🐇 Slip circular s	urface 🏅 Nodal Head
		Boundary
Constraint		× 🚬 🎞 🔤 🖓
Basic Advanced	Auto	
Name Constra	aint-1	8
?	Select Object(s)	
🗹 Consider All N	lesh Sets	
Boundary Set BC		∽ ≋
	OK Cancel	Apply

To set the boundary conditions

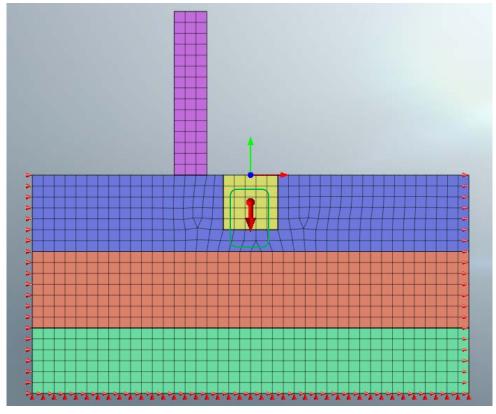
- **1. Click Constraint**
- 2. Set to auto
- 3. Rename

Note: The side of the wall will be set to a pin support while the bottom will be set to a fixed support



GRAVITY/SELF-WEIGHT

Geotechnical Analysi	s Analysis Result Tools
oerty 🔥 Slip polygon 📽 Review aurface 🏅 Nodal Head Boundary	al surface 🔷 Flux Table * Gravity
⊐ t ₃ M ₃ ∘ _n ⊐ ⁿ ⊐	Gravity $\square \stackrel{z}{\rightarrowtail} \stackrel{y}{\rightarrowtail} \stackrel{z}{\Box} \stackrel{z}{\frown}$
m .3 30.7	Name Gravity-1
	Type Coordinate ~
	Ref. CSys Global Rectangular V
	Components
	Gx 0
	Gy
	Gz 0
	Spatial Distribution Base Function None
	Load Set SW
	OK Cancel Apply



To define set the gravity/self-weight 1. Click Self-weight

- 2. Define the load to the axis of gravity
- 3. Rename

Note: Gravity/Self-weight is indicated in the diagram as the downward arrow

ANALYSIS CASE

To define the analysis case

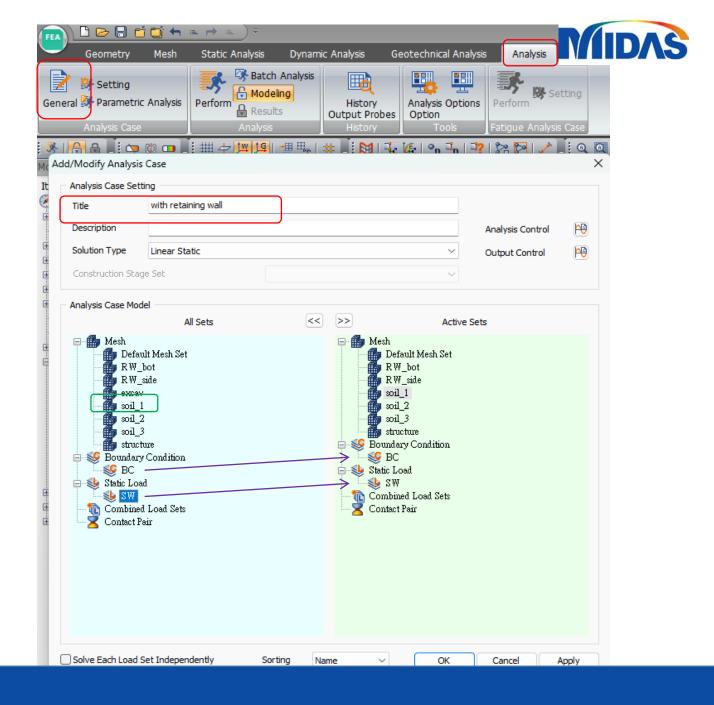
1. Click General in the analysis tab

2. Define a title depending on the project situation

3. Remove excavation mesh from the active sets

4. Add the boundary condition

5. Add the self weight



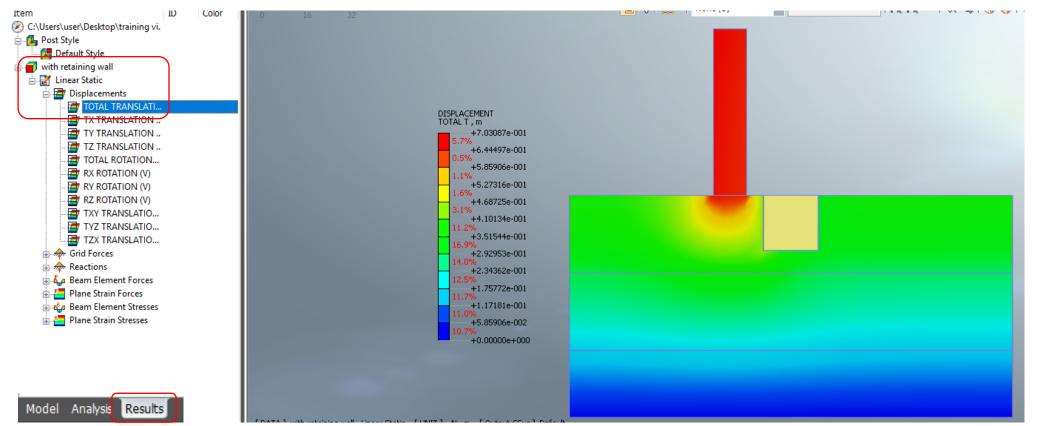


RUN THE CASE

Static Analysis Dynam	ic Analysis G	eotechnical A	nalysis	Analysis	Resu	ult To
Perform Results Analysis	History Output Probes History			form So	etting is Case	
FEA NX Solver					×Q	Q Q
with retaining wa	Ty Linear Static		Descript	ion		
Check On/Off			ОК	Cancel		

To run the case 1. Click Perform in the analysis tab 2. Activate the analysis case that needed to be solved



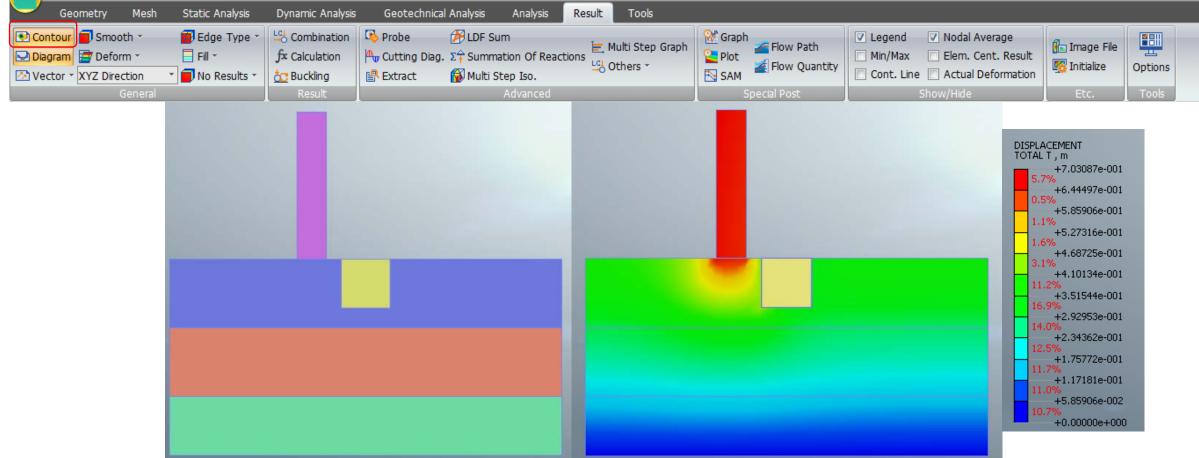


To view results

1. From the model tree, results tab, drop the analysis cases

2. Click the desired result



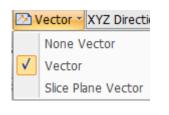


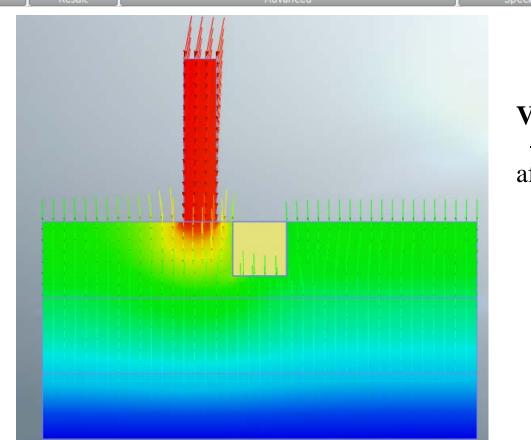
Contour

-Applies color mapping to the model based on the selected result type, such as displacement.



G G	Geometry	Mesh	Static Analysis	Dynamic Analysis	Geotechnical	Analysis	Analysis	Result T	Fools					
🔁 Diagrar	ur 📄 Smoot n 营 Deforr	n -	Edge Type - Fill - No Results -	fx Calculation	Autting Diag.	LDF Sum Σ ⁺ Summati	ion Of Reactio	ons 🔄 Multi :	Step Graph	Craph	🚄 Flow Path 🛃 Flow Quantity	 Nodal Average Elem. Cent. Result Actual Deformation 	Initializa	Options
		ieneral		Result			dvanced				Special Post	Show/Hide	Etc.	Tools

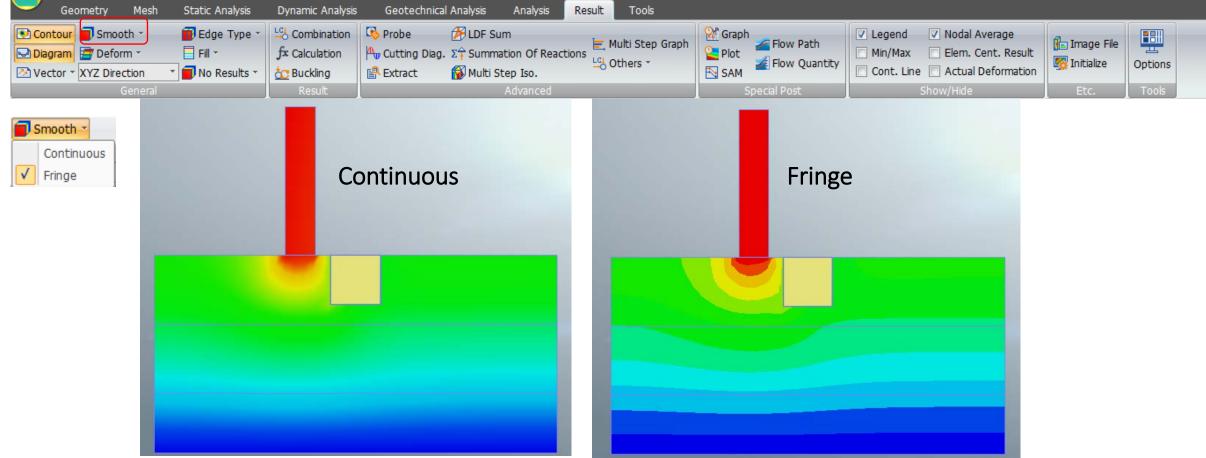




Vector

-Shows the force and direction affecting the diagram.





Smooth

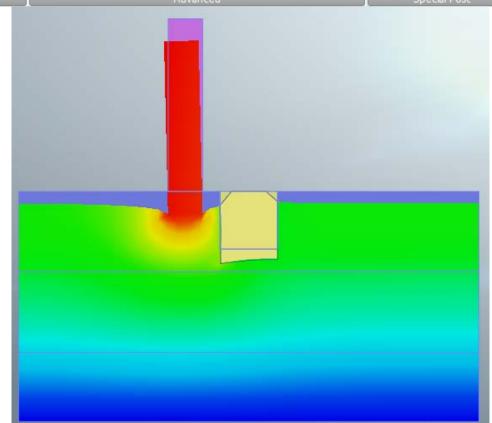
-Smooths the contour for a more refined appearance.



		Geometry	Mesh	Static Analysis	Dynamic Analysis	Geotechnical	Analysis	Analysis	Result Tools						
Ī	🔁 Diag	tour 🗐 Smoot ram 📴 Deform tor 🕆 XYZ Direc	n "	🗐 Fill 🕈	Combination fx Calculation Calculation	🕰 Cutting Diag.	DF Sum Σ ² Summati Multi Ste	ion Of React	ions 🔄 Multi Step Gra	iph 👫 Graph	Flow Path	 Legend Min/Max Cont. Line 	 Nodal Average Elem. Cent. Result Actual Deformation 	ቤ Image File 🎇 Initialize	Options
		G	eneral		Result		Α	\dvanced			Special Post		Show/Hide	Etc.	Tools

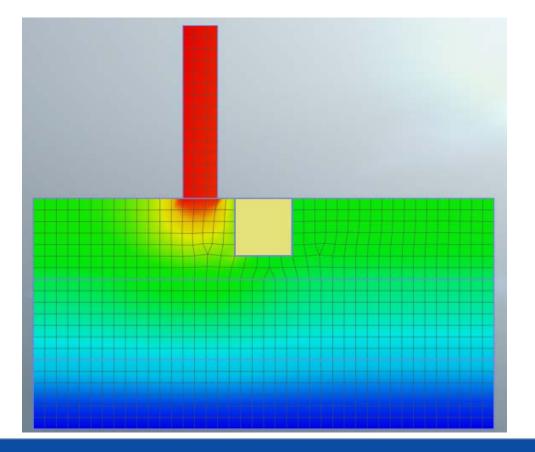
Deform

-Shows the deformed shape to compare easily from the original shape of the structure





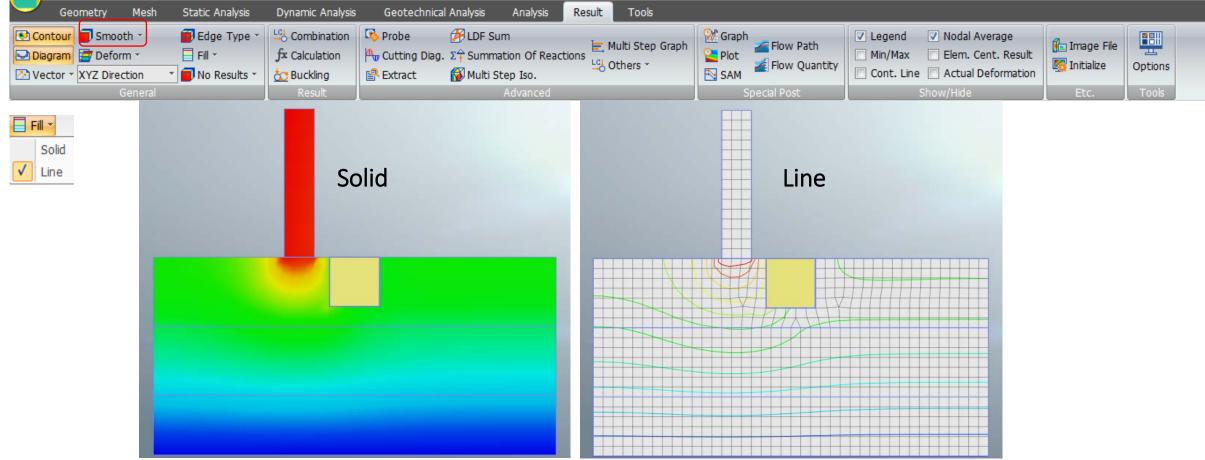
Geometry Mesł	Static Analysis	Dynamic Analysis	Geotechnica	al Analysis	Analysis	Result Tools						
Contour Smooth * Diagram To Deform * Vector * XYZ Direction	Edge Type *	fx Calculation	Probe Probe Cutting Diag	LDF Su Σ ² Summa Multi Si	ation Of React	tions	Graph 2	Graph Plot SAM	🚄 Flow Path 🛃 Flow Quantity	 Nodal Average Elem. Cent. Result Actual Deformation 	🚹 Image File 🕵 Initialize	Options
Genera		Result			Advanced			S	pecial Post	Show/Hide	Etc.	Tools



Edge Type

-Shows the mesh of the diagram

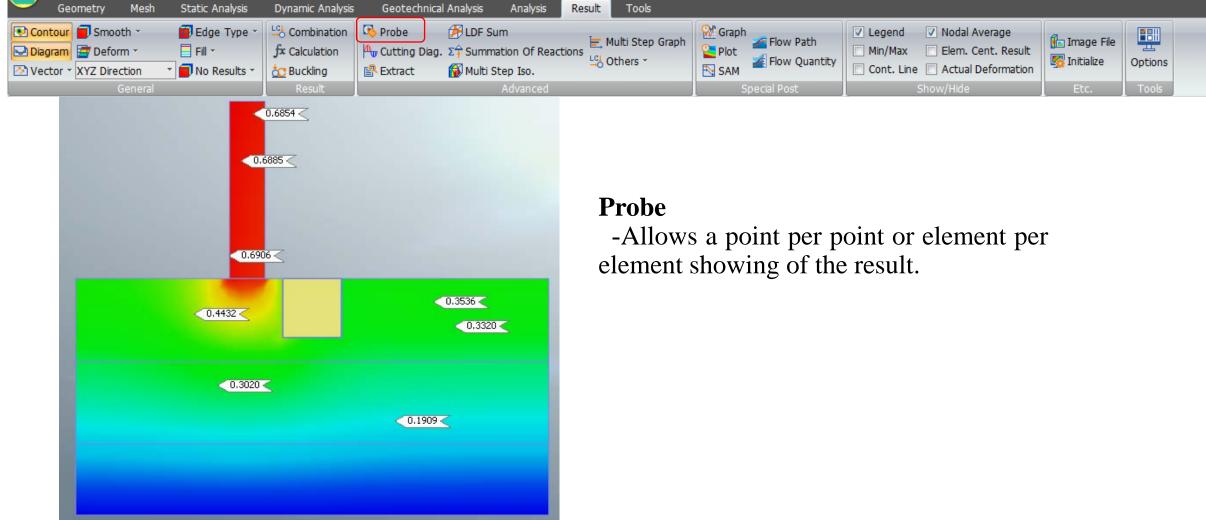




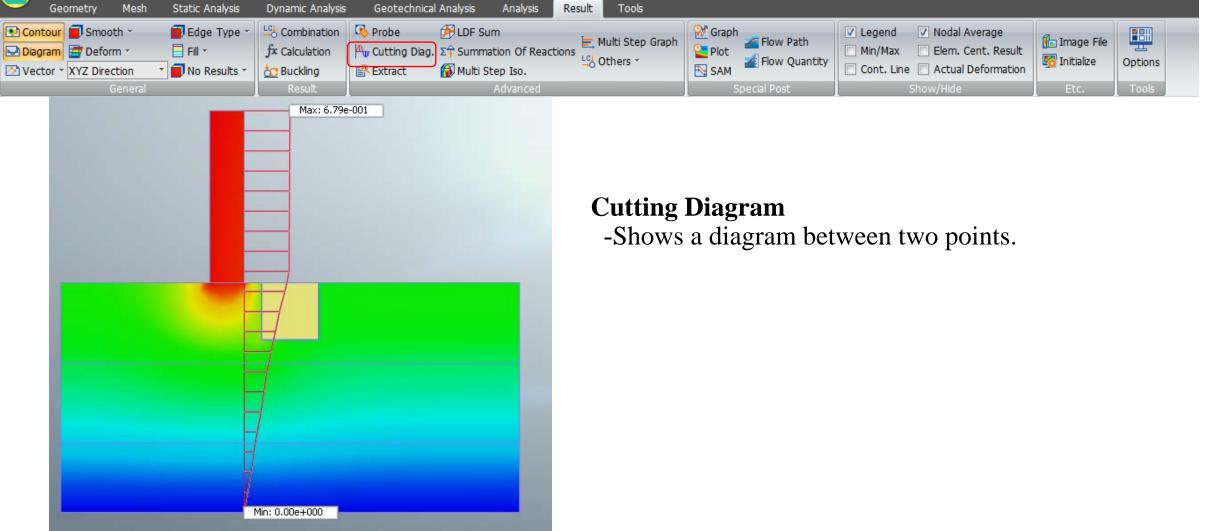
Fill

-Allows the option to fully color or just show the colored line of the diagram.











:::

Geometry Mesh Stat	tic Analysis I	Dynamic Analysis	Geotechnical	Analysis	Analysis 🛛 🛛	tesult Tools						
Diagram 🚰 Deform 👻 📒 F	ill -	Combination	Cutting Diag.		on Of Reaction	E Multi Step Graph	👫 Graph	Flow Path	 Legend Min/Max 	 Nodal Average Elem. Cent. Result 	🕼 Image File	Options
🖄 Vector 🕆 XYZ Direction 📑 🗖 N	No Results 👻 👌	C Buckling	🖺 Extract	🙀 Multi Step	o Iso.		📉 SAM		🔲 Cont. Line	Actual Deformation	THORE	Options
General		Result		A	dvanced		S	Special Post		Show/Hide	Etc.	Tools



-Tabulates the displacements of all the node selected in the diagram.

le:83	Node:83	Node:83	Node:83	Node:83	Node:83	Node:84	Node:84	Node:84	Node:84	Node:84
SLATION (V)	TZX TRANSLATION (V)	TOTAL ROTATION (V)	RX ROTATION (V)	RY ROTATION (V)	RZ ROTATION (V)	TOTAL TRANSLATION (V)	TX TRANSLATION (V)	TY TRANSLATION (V)	TZ TRANSLATION (V)	TXY TRANSLATION (V)
m)	(m)	([rad])	([rad])	([rad])	([rad])	(m)	(m)	(m)	(m)	(m)
6.651329e-001	4.300737e-003	0.000000e+000	0.000000e+000	0.000000e+000	0.000000e+000	6.736153e-001	-4.261994e-003	-6.736017e-001	0.000000e+000	6.736153e-001



Contour Somoth * Step Lofe Type * Combination & Probe Def Lof Sum & Others * Some time of Log Software in the calculation & Culturg Diag Software in the calculation & Culturg Diag Software in the culturg Diag Software in the culturg Diag Software in the culture of the culture
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Analysis Set with retaining wall Step Linear Static Target All Node Mith retaining wall Step Linear Static Target All Node Mith retaining wall Step Linear Static Target All Node Mith retaining wall Summation of Reactions -Provides the total load reactions of all the nodes
Target All Node the nodes
Selected 8 Node(s)
Update Summations
Dir Load Reaction 1 FX -0.0000 0.0000
2 FY -2332788.1094 0.0000
3 FZ 0.0000 0.0000
4 MX 0.0000 0.0000
5 MY 0.0000 0.0000
6 MZ 0.0000 0.0000
Close





3D TUTORIAL



GEOMETRY SET-UP

Analysis Setting	9		×
Project Title		Engineer	
Desc.			
Model Type		Gravity Direc	tion
🗿 3D		OY	
🔾 2D		⊂z	
Axisyn	nmetric		
Unit System			
N ~	_ m ~	J ~	sec 🗸
Initial Parame	ters Water Par	rameters	
Gravity Acce	leration(g)	9.80665	m/sec²
Initial Tempe	rature	0	[7]
Plane Strain	Thickness	1	m
		ОК	Cancel

Analysis setting:

- Model Type : 3D
- Choose the preferred unit system

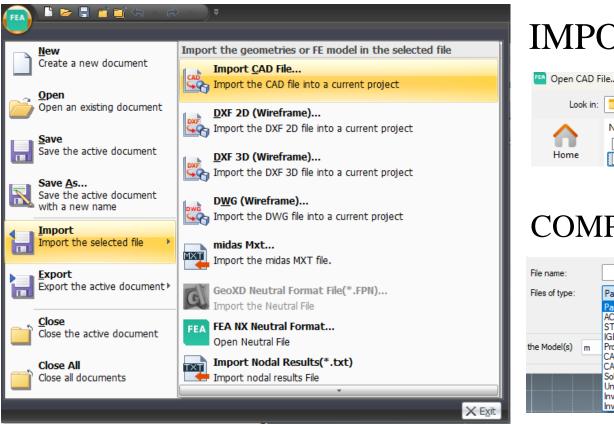
Note:

1. The axis of gravity can only be defined in this setting.

2. Unit system can be modified throughout the entire operation.



GEOMETRY SET-UP



IMPORTING CAD FILE

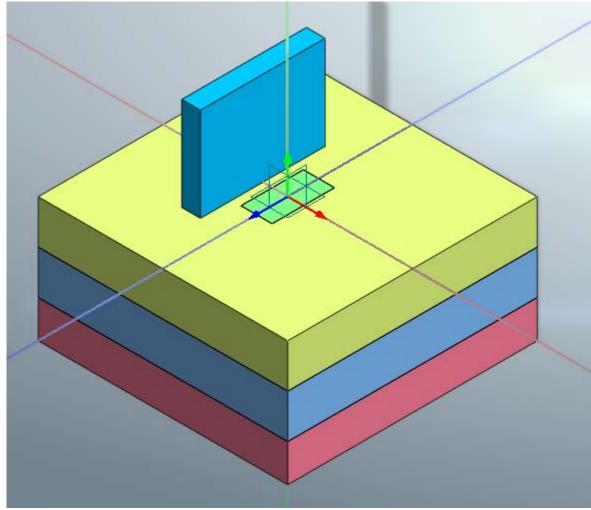
Open CAD F	ile			
Look in:	늘 2D and 3D excav comparison	G 🔌 📂 🛄 -		
\wedge	Name	Date modified	Туре	Size
	D.X_T	4/30/2025 1:25 PM	X_T File	13 KB
Home	3D.X_T	4/30/2025 1:25 PM	X_T File	36 KB

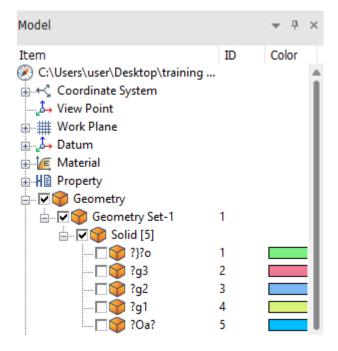
COMPATIBLE FILES

File name:	~	Open
Files of type:	Parasolid (9 to 34) Files (* x_t;* xmt_txt;* x_b;* xmt_bin)	Cancel
the Model(s) m	Parasolid (9 to 34) Files (*x, t;*xmt_tx;*x, b;*xmt_bin) ACIS (R1 - 2023 1.0) Files (*,sat;*sab;*asat;*asab) STEP (AP203, AP214, AP242) Files (*,sb;*step) IGES (Up to 5.3) Files (*igs;*iges) Pro-E (16 - Creo 9.0) Files (*igs;*iges)	
	CATIA V4 (CATIA 4.1.9 - 4.2.4) Files (*.model;*.exp;*.session) CATIA V5 (V5 R8 - V5-6 R2022) Files (*.CATPart;*.CATProduct) SolidWorks (98 - 2023) Files (*.sldpt;*.sldasm) Uniaraphics (11 - NX2007) Files (*.prt)	
	Inventor Part (V6 - V2023) Files (*.ipt) Inventor Assembly (V11 - V2023) Files (*.iam)	



GEOMETRY SET-UP





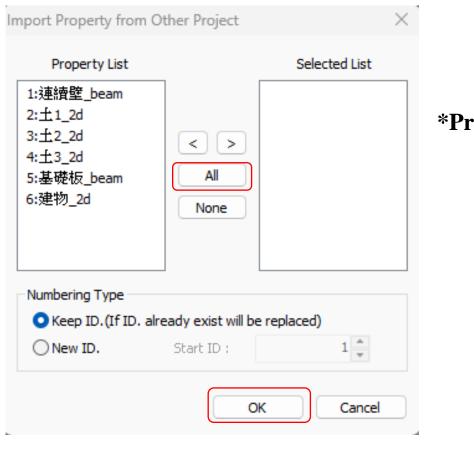
MESHING

IMPORTING PROPERTY

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I.	3d excav_3d with RW.out	4/22/2025 5:01 PM	OUT File	4 KB		
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🚽 Downloads 🖈	3d excav_3d without retaining wall.mec		MEC File	5,625 KB		
Documents *	3d excav_3d without retaining wall.nfxp		NFXP File	35,826 KB		
	3d excav_3d without retaining wall.out	4/22/2025 5:00 PM	OUT File	4 KB		
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🔀 Videos 🖈	3D-Simulation 1221321313.bak 1221321313.fea	5/6/2025 1:46 PM 5/6/2025 1:50 PM	BAK File FEA File	5,107 KB 5,157 KB		
Videos 🖈	 3D-Simulation 1221321313.bak 1221321313.fea 1221321313_without RW 	5/6/2025 1:46 PM	BAK File	5,107 KB		

MESHING

IMPORTING PROPERTY



No	Name	Type	Sub-Type	Create
1	連續壁_shell	2D	Shell	Modify.
2	<u>±1_</u> 3d	3D	Solid	
3	<u></u> ±2_3d	3D	Solid	Сору
4	<u></u> ±3_3d	3D	Solid	
5	基礎板_shell	2D	Shell	Delete
6	建物_3d	3D	Solid	Import
				Renumb
				Close



*Properties and materials can be manually added, imported or both.

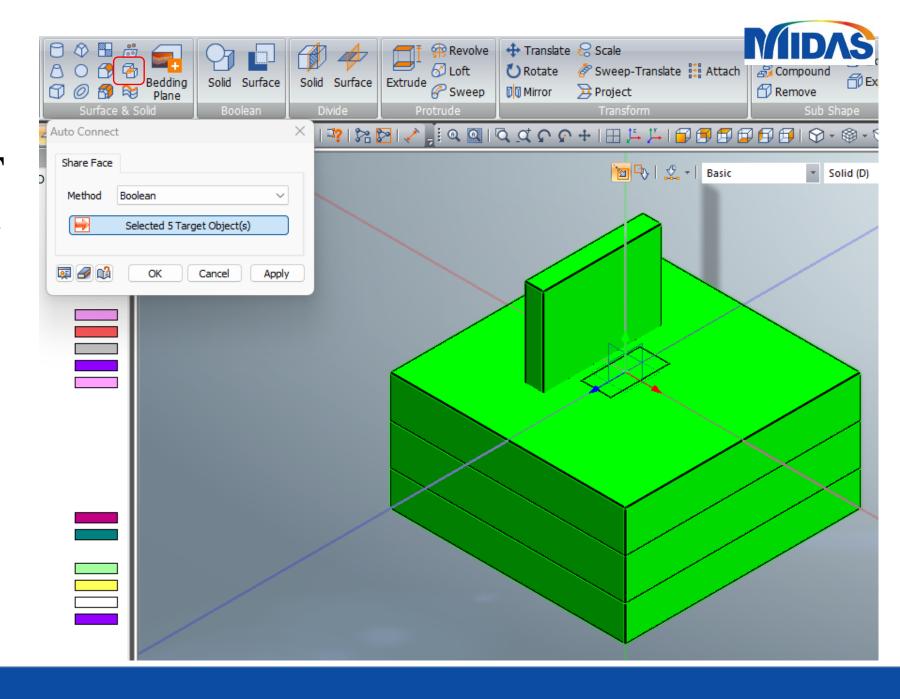
ID Color Item New Works . ⊕ . ↓ Datum 📩 🕼 Material 🛓 🙋 Isotropic [5] 🚛 Structure material1 (Is., 1 E Buried layer (Isotropic.. 2 Colluvium (Isotropic-.. 3 🚛 Weathering soil (Isotr... 4 Reinforced Concrete (.. 5 Orthotropic [0] 🚛 2D Equivalent [0] Interface and Pile [0] 📲 Sloshing Medium [0] Broperty / 1D [0] 🖮 🕅 2D [2] ·□⊞ 連續壁_shell (Shell. 1 - 🖂 🖼 基礎板_shell (Shell. 5 🛓 💫 3D [4] - 🗔 🗮 1_3d (Solid) (No.. 2 - 2_3d (Solid) (No.. 3 - 🗔 🖘 🖂 🖂 🖂 🖂 🖂 🗠 🖂

Add/Modify Property

Materials and properties should be reflected in tree model

MESHING AUTO CONNECT

- Connects elements to make a cohesive diagram



MIDAS

MESHING

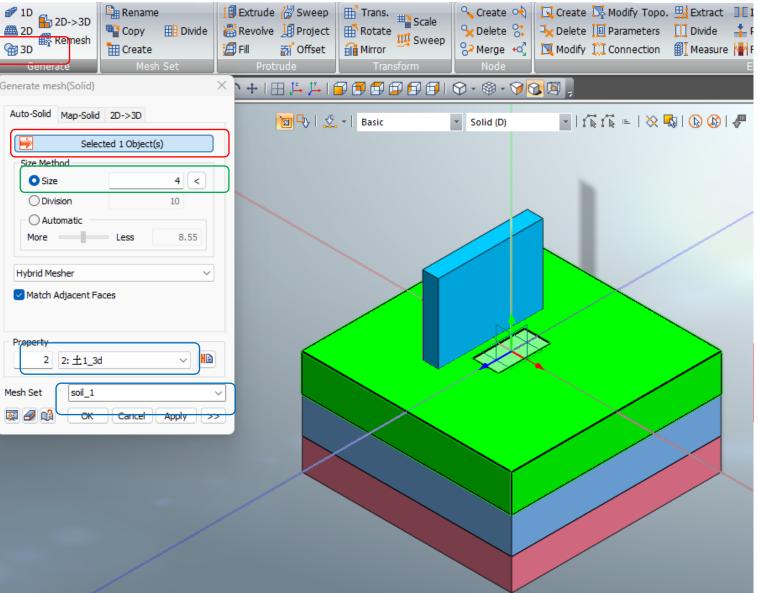
MESHING THE ELEMENTS

1. 3D > Select the object > highlight the element

2. Define the mesh size (The smaller the size, the more accurate the result but also the more difficult it is for the computer to process)

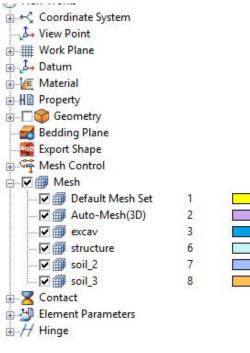
3. Select the appropriate property for the element4. Rename the mesh

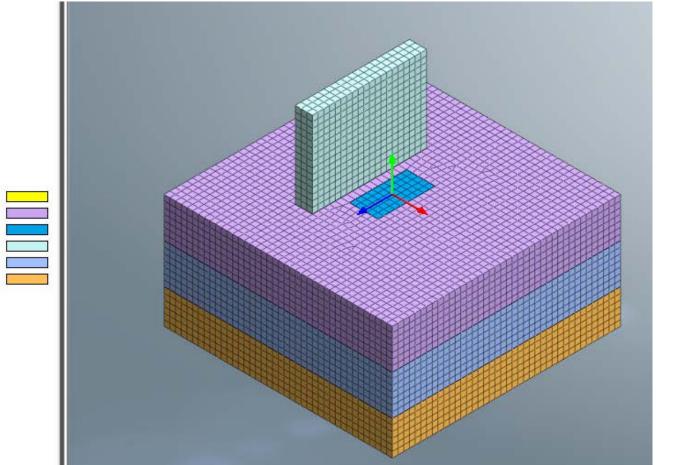
5. Repeat for all elements in the project





MESHING MESHING THE ELEMENTS

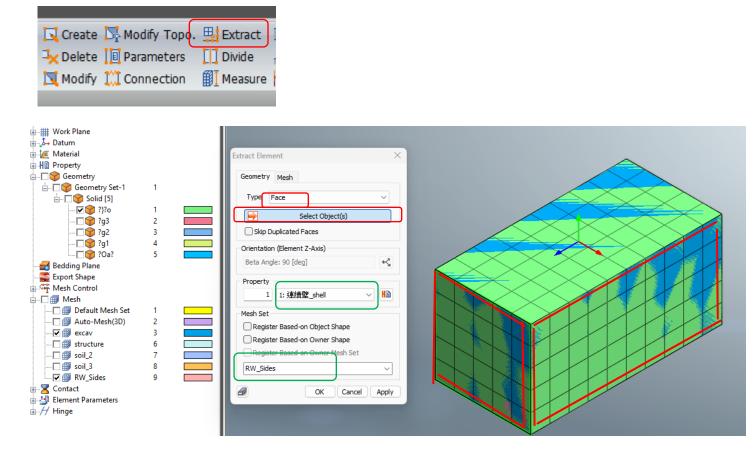




NOTE: After meshing all the elements, it should appear in the drawing, also in the model tree



MESHING DEFINING THE RETAINING WALL



To define a retaining wall

Click Extract, use Face selection
 Select objects/element to become a retaining wall
 Define the property
 Rename
 Apply and repeat to all elements

*Turn off all geometry and mesh except for the excavation to extract the face easier



BOUNDARY CONDITIONS

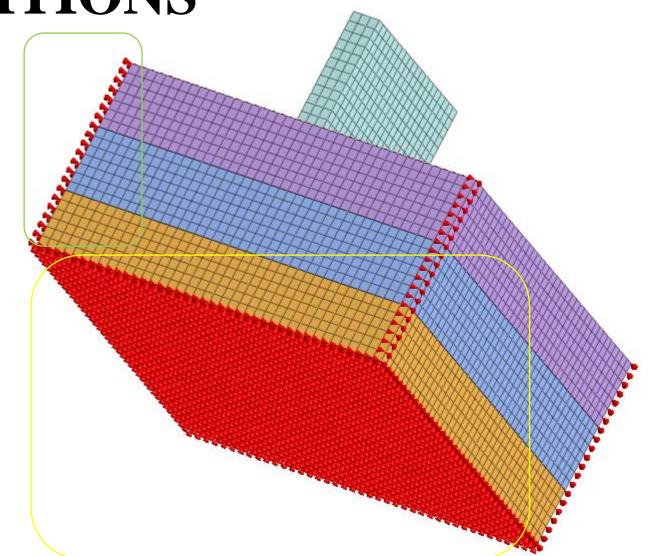
Static Analysis	Dynamic Analysis	Geotechnical Analysis
Set Define Set	🔁 Change Prop	erty 🛛 👑 Slip polygonal
🞰 Constraint	🔁 Water Level	💒 Review
Constraint Equa	tion 🐇 Slip circular s	urface 🏅 Nodal Head
		Boundary
Constraint		× 🚬 🐴 🖓
Basic Advanced	Auto)
Name Constr	aint-1	8
?	Select Object(s)	
Consider All N	Mesh Sets	
Boundary Set BC		~ 😣
Q	OK Cancel	Apply

To set the boundary conditions

- **1. Click Constraint**
- 2. Set to auto

3. Rename

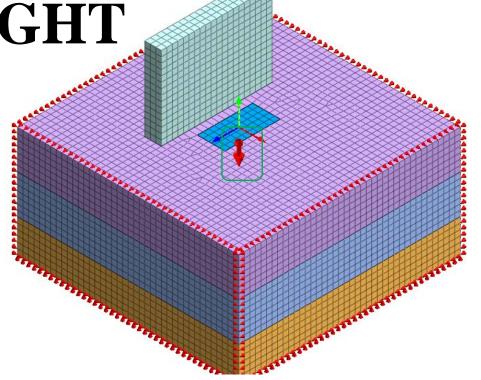
Note: The side of the wall will be set to a pin support while the bottom will be set to a fix support





GRAVITY/SELF-WEIGHT

s	
From Result	Self Weight Disp. 🌮 Beam Lo:
Gravity	×
Gravity	
Name	Gravity-1
Referen	ce Object
Туре	Coordinate ~
Ref. CSy	s Global Rectangular 🗸
Compon	ents
Gx	0
Gy	-1
Gz	0
Spatial D	Distribution
Base Fun	nction None 🗸
Load Set	sw ~ 🍨
🐺 🥒	OK Cancel Apply



To define set the gravity/self-weight
1. Click Self-weight
2. Define the load to the axis of gravity
3. Rename
Note: Gravity/Self-weight is indicated in the diagram as the downward arrow

ANALYSIS CASE

To define the analysis case

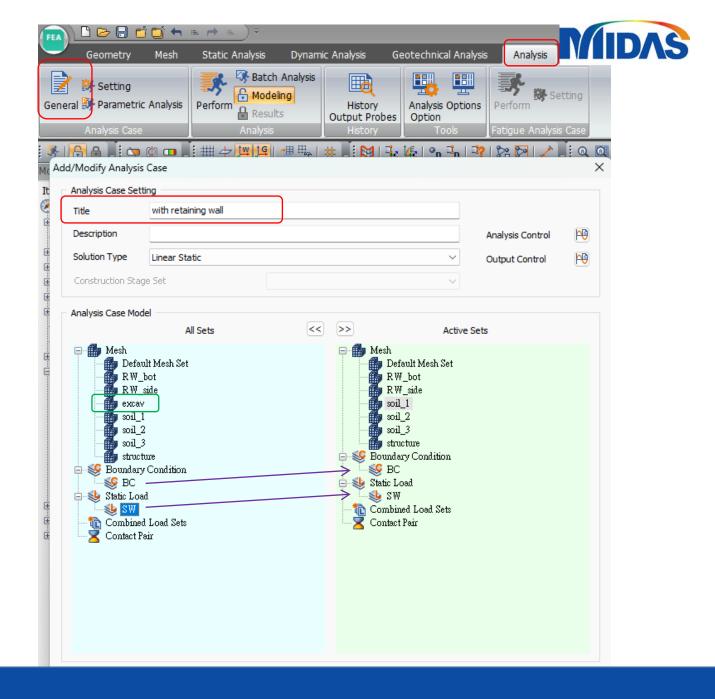
1. Click General in the analysis tab

2. Define a title depending on the project situation

3. Remove excavation mesh from the active sets

4. Activate the boundary condition

5. Activate the self weight



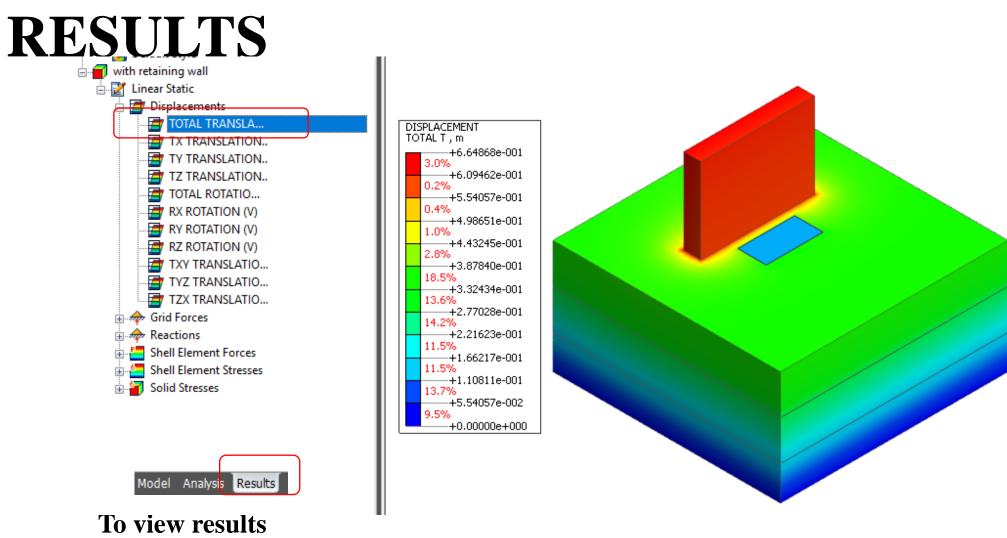


RUN THE CASE

			(
Static Analysis Dynam	ic Analysis G	eotechnical	Analysis	Analysis	Res	ult To
Perform Results Analysis	History Output Probes History	Analysis O Option Tool		serform Status	etting is Case	
FEA NX Solver					×Q	Q Q
Name with retaining wa	Ty Linear Static		Descrip	tion		
Check On/Off			ОК	Cancel		

To run the case 1. Click Perform in the analysis tab 2. Activate the analysis case that needed to be solved





1. From the model tree, results tab, drop the analysis cases

2. Click the desired result



RESULTS - CLIPPING PLANE

27.9 5.9	🔟 🗗 🕵 - None (0)		TR TR = 🔀 🔩 🚯 🥴
		Define Plane	
		Name P	ane1
		-Plane Direction	1
		Ox	⊖y Oz
		🔾 3 Points	○ 2 Points ○ Element Face
		Distance	0 m
		Degree	
		Axis	Select Axis
			ation 0, 0, 0 is Vector X Y Z
			0, 0, 0
			1, 1, 1
		Angle	360 [deg
		Reverse	Add Clos

Clipping Plane

- to section along an axis

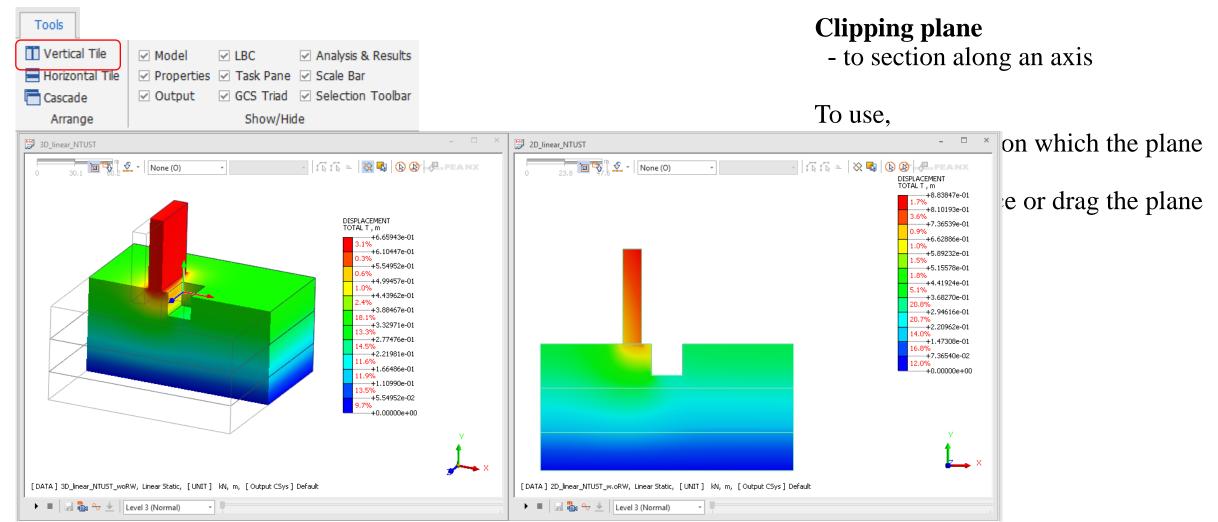
To use,

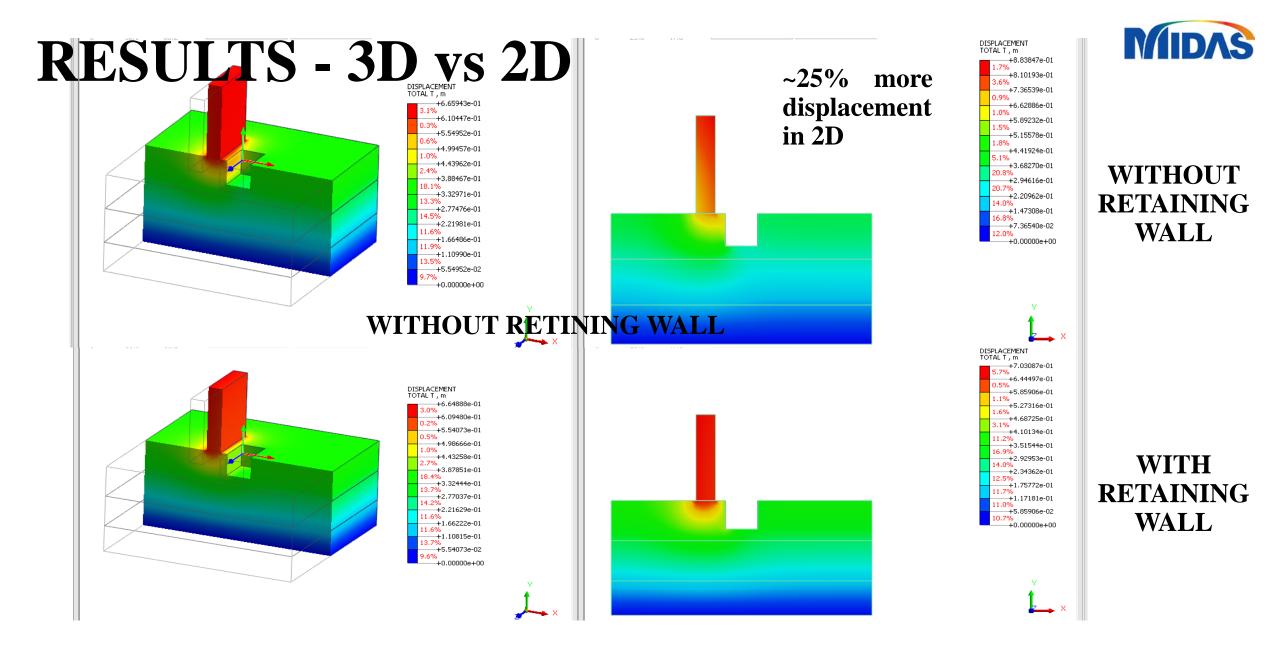
1. Select an axis on which the plane will run on to

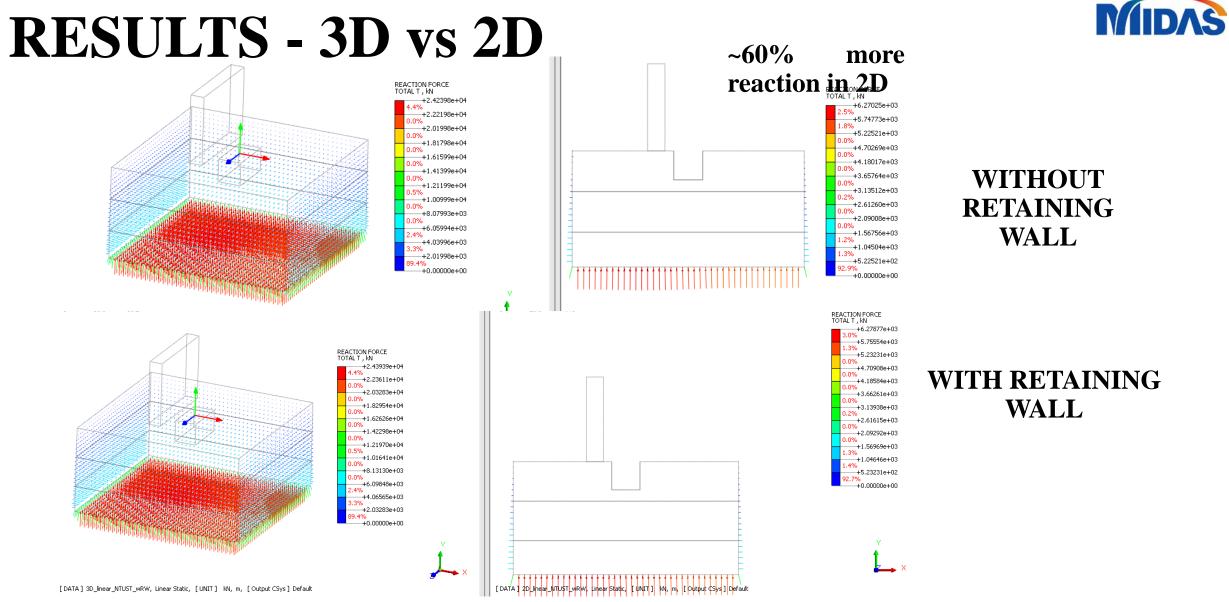
2. Input a distance or drag the plane from the model.



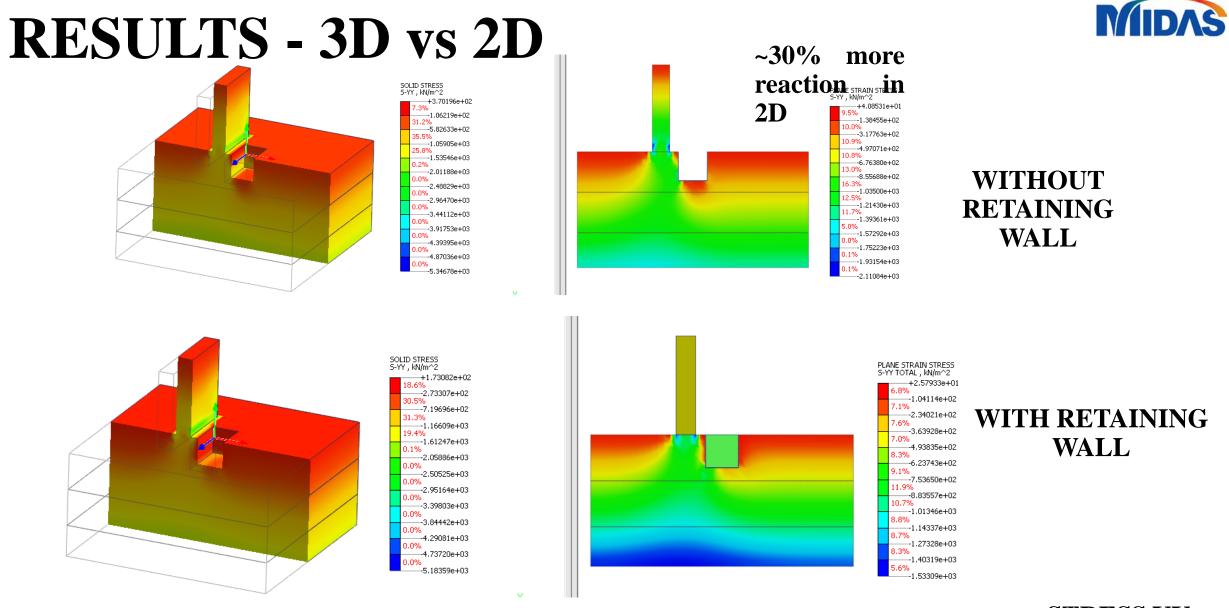
RESULTS - VERTICAL TILE







REACTION FORCE



STRESS YY