

FEA NX INTRODUCTION

(English Course)

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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







FEA









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

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Point & Curve



Bedding

Plane

Solid Surface

Boolean

Solid Surface

Divide

8

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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





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.





Line / Square / Circle

Extrude / Sweep





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

E (kN/mm²)	Inc. of Elastic (kN/mm®)	Inc. of E Ref. Height (mm)	v	Y (kN/mm³)	Ко	Thermal Coeff. (1/[T])	Molecular Vapor Diffusion Coeff. (mm/sec ²)	Thermal Diffusion Enhance ment	Damping Ratio									
Y_sat (kN/mm³)	e_o	kx (mm/sec)	ky (mm/sec)	kz (mm/sec)	Ss (1/mm)	Conductiv ity (W/(mm·[T]))	Specific Heat (J/(ton*[T]))	Heat Gen. Factor										
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205	0	0	0.15	7.4e-008	38-009	1e-006		Res	sults ex	coort with	"WORD"	format						
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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 分析函例 課程報名 資源下紙 FAQ 上自貢資料 C-登出



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



TECHNICAL SUPPORTS

Online training videos

MIDAS GI 2.28K subscribe	EOTECH OFFICIAL				SUBSCRIBED D						
HOME VIDEOS	PLAYLISTS COMI	MUNITY CHANNELS	ABOUT Q			Case Study Webinar Series	PLAY ALL				
HIDAS ACADEMY Why Do We Need 3D Anal : Comparison with 2D anal	Why Do You Need 3 GTS NX 3D Finite MIDAS GEOTECH OFFICIAL	D Analysis: Comparison w Element Analysis - 321 views + 3 months ago	th 2D analysis midas			Finite Element Method Approach to Pile Foundation of Silo Design JACEK NAWRACALA, 07 PR0 34:18	Finite Element Modeling of Tunnels in 2D&3D Jasseek Yang MIDAS 17	Numerical Modelling of a Motro Pedestrian Social Tunnel in Istanbul Bora Ansian Ans consultance 48:02	Case Study: Deep Excavation under the Groundwater Table Dr. Cosime Issielle AVESA	HEAS ACADENT Project-based Training: Box Culvert Excavation Drawing midaa GeoXD Training 36:49	Case Study: Deep shaft in Central London
midas GTS NX	geotechnical projects. Whe	in preparing for the design report, you	may try to check the 2D analysis			Case Study Webinar: Finite Element Method Approach t	Finite Element Modeling of Tunnels in 2D&3D Most	Case Study: Numerical Modelling of a Metro	Case Study: Deep Excavation under the Groundwater Tabl	Project based Training: Box Culvert Excavation Drawing	Case Study: Deep shaft in Central London midas GTS
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These short videos provide a qui NGALACADERY Deep Excavation Drawing From importing to	k tour of the major functionalities	of GTS NX. HIDAS ACADEMY Top 10 Most Commonly Asked Questions	FEM in the Stability Analysis With a Complex Geological	HOAS ACADEMY How To Quickly Master The Geotechnical	Finite Element Method Approach to Pile Foundation of Sile Desian	Online Tutorials - GTS NX These tutorials show the basic we using GTS NX.	PLAY ALL orkflow with the software. How to	easily perform specific projects			
generating outputs mides Geo XD Training 33:29	with Partial Factor Function midas Geo XD Training 48:41	for Geo XD Beginners midas Geo XD training 9:26	PH.D. MICHAE KOWALSHI, AGH UNIVERSITY 45:50	Design Report midas GTS NX & GEO XD 59:58	JACEK NAWRACALA, OT PRO 34:18	HOAS ACADENY Eurocode: 2D Excavation Analysis with Partial Factor Function	HOAS ACADENY How To Quickly Master The Geotechnical Design Report	Why Do We Need 3D Analysis : Comparison with 2D analysis	HOAS ACABENY How to Do 3D Numerical Modelling for Geotechnical Analysis	Section Alexandre	
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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

December 17, 2020 (Thu) Duration: 50 Min



Duration: 60 Min

27

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 -0.000997/





FEA GEN+FEA 3D CONTRACTOR



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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

F7/F8

-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







2D/3D Excavation with Retaining Wall Tutorial





2D TUTORIAL



GEOMETRY SET-UP

Analysis Setting]		×					
Project Title		Engineer						
Desc.								
Model Type	Gravity Direction							
🔾 3D		OY						
O 2D		⊖z						
Axisym	imetric							
Unit System								
kn ~	m ~) ~	sec 🗸					
Initial Paramet	ters Water Par	rameters						
Gravity Acce	leration(g)	9.80665	m/sec²					
Initial Tempe	rature	0	[T]					
Plane Strain	Thickness	1	m					
		ОК	Cancel					

Analysis setting:

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



GEOMETRY SET-UP



IMPORTING CAD FILE

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Look in:	2D and 3D excav comparison v	G 🤌 📂 🛄 -							
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Home	3D.X_T	4/30/2025 1:25 PM	X_T File	36 KB					

COMPATIBLE FILES

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	Unigraphics (36 - 2023) Files (*.jot) Inventor Part (V6 - V2023) Files (*.jot) Inventor Assembly (V11 - V2023) Files (*.jam)	



GEOMETRY SET-UP



MESHING

IMPORTING PROPERTY

Geometry M	Static Analysis Dynamic Analysis p. Prop. ← p/Shrinkage ← ic Modulus Function ↓ is:/Func. Control	Geotechnical Analysis Prop Ctrl. Match Seed Gener	Analysis Result 2D->3D Remesh rate Mesh S	Tools	ude 👹 Sweep olve 🖉 Project an Offset Protrude
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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>±2_2d</u>	2D	Plane Strain	Сору
4	<u></u> ±3_2d	2D	Plane Strain	(
5	基礎板_beam	1D	Beam	Delete
6	建物_2d	2D	Plane Strain	Import
				Renumbe
				due

*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] He 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	Create Delete C	Create N Modify Topo	Extract III Interi
Generate	Mash Sat	Protrude	Transform	ode Node	Modify L. Connection	Measure Nan Fleme
						Lieffie
Generate mesh(Face)		×				
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Auto-Face Auto-Area	a Map-Face Map-Area	5				
📄 Selec	ted 1 Object(s)					
Size Method						
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2 2: ±1_2d	I 🗸 🔢					
Mesh Set soil_1						
🐺 🥒 📫 🛛 ок	Cancel Apply >	>				



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

Trans. Scale Rotate Sweep Mirror Mirror Modify			
Image: Contract of the second of the sec	Trans.	Create K Modify Topo Extract I Interface // Hing Create K Modify Topo Extract I Interface // Hing Create I Parameters II Divide Pile/Pile Tip Infir Modify I Connection I Measure K Free Field See	je * nite ¢page Cut
Edge (E) Geometry Mesh Type Edge Selected 2 Object(s) Skip Duplicated Faces Orientation (Element Z-Axis) Beta Angle: 90 [deg] Property 1 1: 建讀壁_beam Mesh Set		Extract Element X	
Register Based-on Object Shape Register Based-on Owner Shape Register Based-on Owner Mesh Set RW_sides OK Cancel Apply	• • <td>Geometry Mesh Type Edge Selected 2 Object(s) Skip Duplicated Faces Orientation (Element Z-Axis) Beta Angle: 90 [deg] Property 1 1: 速讀壁_beam Mesh Set Register Based-on Object Shape Register Based-on Owner Mesh Set Register Based-on Owner Mesh Set RW_sides OK Cancel Apply</td> <td></td>	Geometry Mesh Type Edge Selected 2 Object(s) Skip Duplicated Faces Orientation (Element Z-Axis) Beta Angle: 90 [deg] Property 1 1: 速讀壁_beam Mesh Set Register Based-on Object Shape Register Based-on Owner Mesh Set Register Based-on Owner Mesh Set RW_sides OK Cancel Apply	

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
Define Set	🔁 Change Prop	erty 🛛 👑 Slip polygonal s
🞰 Constraint	🔁 Water Level	😤 Review
Constraint Equa	tion 🐇 Slip circular s	urface 🏅 Nodal Head
		Boundary
Constraint		× 💦 🎝 🖓 🕹
Basic Advanced	Auto	1
Name Constr	aint-1	3
?	Select Object(s)	
🔽 Consider All M	Mesh Sets	
Boundary Set BC		✓ S
	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 X X X X X X X X X X X X X X X X X X X
⊐ t ₃ M ₃ ∘ _n ⊐ ⁿ ⊐	Gravity 🖽 📇 🎽 🗐 🗐
m .3 30.7	Name Gravity-1
	Type Coordinate V
	Ref. CSys Global Rectangular V
	Components
	Gx 0
	Gz 0
	Spatial Distribution
	Base Function None V
	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	Analysis	Analysis	Res	ult To
Perform Results Analysis	History Output Probes History	Analysis O Option Tool	ptions Pe	serform Status	etting is Case	
FEA NX Solver					×Q	Q Q
Name with retaining wa	Ty Linear Static	pe	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





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.



Geometry Mesh Static Analysis Dynamic Analysis	Geotechnical Analysis Analysis Result Tools				
Contour Smooth * Edge Type * 4 Combination Diagram Deform * Fill * 5 Combination	Probe Prob Probe Probe <th< th=""><th>Graph</th><th>Legend Nodal Average Min/Max Elem. Cent. Result</th><th>🚹 Image File</th><th></th></th<>	Graph	Legend Nodal Average Min/Max Elem. Cent. Result	🚹 Image File	
🔀 Vector 🕆 XYZ Direction 🔹 🛑 No Results 🐐 📩 Buckling	🖹 Extract 👔 Multi Step Iso.	SAM Kontity	Cont. Line 🔲 Actual Deformation	🛒 Initialize 🛛	Options
General Result	Advanced	Special Post	Show/Hide	Etc.	Tools





Vector

-Shows the force and direction affecting the diagram.





Smooth

-Smooths the contour for a more refined appearance.



\bigcirc	Geomet	try M	esh	Static Analysis	Dynamic Analysis	Geotechnical	Analysis	Analysis	Result	Tools						
Cor Dia Vec	tour 🗐 ram 📑 tor • XYZ	Smooth - Deform - Z Direction	-	Edge Type *	Combination f≭ Calculation t Calculation	Probe Cutting Diag. Extract	DF Sum Σ ² Summati Multi Ste	on Of Reactio p Iso.	ons 🔄 Mi	ulti Step Graph thers *	Graph	🚄 Flow Path 🛃 Flow Quantity	 Legend Min/Max Cont. Line 	 Nodal Average Elem. Cent. Result Actual Deformation 	🕼 Image File 🌠 Initialize	Options
		Gene	ral		Result		A	dvanced			S	pecial Post		Show/Hide	Etc.	Tools

Deform

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




Geometry	Mesh	Static Analysis	Dynamic Analysis	Geotechnical	Analysis	Analysis	Result Tools								
🗅 Contour 🗐 Smoo	oth -	🗃 Edge Type 🔹	Combination	🔖 Probe	🕖 LDF Sur	n	📛 Multi Sto	Graph	👷 Graph	C Elow Dath	✓ Legend	Nodal Average	🖉 - Imago Eilo		
🛛 Diagram 🔄 Defor	m *	FIII	fx Calculation	Autting Diag.	Σ † Summat	tion Of React	tions		🎦 Plot		Min/Max	📃 Elem. Cent. Result	Ma Initializa	Ontions	
🖥 Vector 👻 XYZ Dire	ction *	📕 No Results 👻	<u>ठ</u> Buckling		🔞 Multi St	ep Iso.	-S Others		🔁 SAM		📃 Cont. Line	e 🔲 Actual Deformation	so muaize	Options	
	General		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	Static Analysis	Dynamic Analysis	Geotechnica	l Analysis	Analysis	Result	Tools							
Con Diag	tour 🗐 Smoot pram 📑 Deforr tor * XYZ Direc	:h ▼ n ▼ tion ▼	Edge Type *	Combination fx Calculation c Buckling	Probe Cutting Diag. Extract	LDF Support Σ ² Summ Multi S	ım ation Of React tep Iso.	tions 🔄 M	Iulti Step Graph)thers *	Graph	Flow Path	 Legend Min/Max Cont. Line 	 Nodal Average Elem. Cent. Result Actual Deformation 	🚹 Image File 🌠 Initialize	Options	
	G	eneral		Result			Advanced			5	Special Post		Show/Hide	Etc.	Tools	



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

le:83 SLATION (V) m)	Node:83 TZX TRANSLATION (V) (m)	Node:83 TOTAL ROTATION (V) ([rad])	Node:83 RX ROTATION (V) ([rad])	Node:83 RY ROTATION (V) ([rad])	Node:83 RZ ROTATION (V) ([rad])	Node:84 TOTAL TRANSLATION (V) (m)	Node:84 TX TRANSLATION (V) (m)	Node:84 TY TRANSLATION (V) (m)	Node:84 TZ TRANSLATION (V) (m)	Node:84 TXY TRANSLATION (V) (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	



G G	eometry	Mesh S	tatic Analysis	Dynamic Analysis	Geotechnic	al Analysis An	alysis Re	esult To	ols			
Contou Diagran	ir 📄 Smoo n 📑 Defo * XYZ Dire	oth • find the section • find th	Edge Type * Fill * No Results *	Combination fx Calculation Buckling Result	Probe My Cutting Diag Probe	LDF Sum Σ† Summation	Of Reactions so. anced	s Cl Others	ep Graph	Graph Plot SAM Special Post	 Legend Nodal Average Min/Max Elem. Cent. Result Cont. Line Actual Deformation Show/Hide 	Image File Initialize Etc. Tools
Summation Analysis S Step	s of Loads a Set with r Linear t All Node	nd Reactions retaining wall r Static		×						Summation -Provides	o f Reactions the total load rea	ctions of all
	Dir	Selected 8 Node Update Summation Load -0.00	e(s) ns Reaction 000 0.0							the houes.		
2 3	FY FZ	-2332788.10	094 0.0									
4 5 6	MX MY MZ	0.00	000 0.0 000 0.0 000 0.0	000	X	777	¥.					
			Close									





3D TUTORIAL



GEOMETRY SET-UP

Analysis Setting	9		×
Project Title		Engineer	
Desc.			
Model Type		Gravity Direc	tion
🔾 3D		OY	
🔾 2D		⊂z	
	nmetric		
Unit System			
N ~	_ m ~] J ~	sec 🗸
Initial Parame	ters Water Par	ameters	
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 Fi	ile			
Look in:	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
	Parasolid (9 to 34) Files (* x t;* xmt_bd;* x b;* xmt_bin) ACIS (R1 - 2023 1.0) Files (* sat;* sab;* asat;* asab) STEP (AP203, AP214, AP242) Files (* stp;* step) [GES (/ lb to 5 3) Files (* ins;* inse)	
the Model(s) m	Pro-E (16 - Creo 9.0) Files (* 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 (*,sldprt;*,sldasm) Unigraphics (11 - NX2007) Files (*,prt) Inventor Part (V6 - V2023) Files (*,ipt) Inventor Assembly (V11 - V2023) Files (*,iam)	



GEOMETRY SET-UP





MESHING

IMPORTING PROPERTY

Geometry	Contraction for the static Analysis	Dynamic Analysis	Geotechnical Analysis	Analysis Result	Tools	Mid/
Material Property	omp. Prop. ← reep/Shrinkage // ~ astic Modulus Function 10 × CSys./Func.	Size Ctrl. Carlor Control Control Control	Prop Ctrl. Match Seed Gene	2D->3D Remesh rate	E Divide	extrude (ở Sweep tevolve 」 Project
Add/Modify Property		×	🍕 🎼 °n 🎝 🎝 🖓	ત્ર 🔀 🧹 👖 🍳 🔯	፬ <u>፬</u> ዮ ዮ	+ 🖽 📇 🎽 🖬 🕼
No Name	Type Sub-Type	Create Modify Copy Delete Import Renumber	m 6 31.1			`⊡ □ \$2 + Ba
Organize 👻 New 🕯	folder					≣ - □ 3
> 🗋 OneDrive	Name	^	Date modified	Туре	Size	
	3d excav_3d with R	W.out	4/22/2025 5:01 PM	OUT File	4 KB	I
💶 Desktop 🔹	3d excav_3d without	ut retaining wall	4/22/2025 5:00 PM	Text Document	2 KB	
L Develords	3d excav_3d without	ut retaining wall.mec	4/22/2025 5:00 PM	MEC File	5,625 KB	
	3d excav_3d without	ut retaining wall.nfxp	4/22/2025 5:00 PM	NFXP File	35,826 KB	
🖺 Documents 🖈	3d excav_3d without	ut retaining wall.out	4/22/2025 5:00 PM	OUT File	4 KB	
🚬 Pictures 🛛 🖈	3D.X_T		4/22/2025 3:03 PM	X_T File	36 KB	
🕖 Music 🛛 🖈	🔩 3D_Property Input		4/22/2025 3:03 PM	GTS NX Documen	1,291 KB	
🛃 Videos 🛛 🖈	😪 3D-Simulation		4/22/2025 3:03 PM	GTS NX Documen	5,159 KB	
📒 MIDAS 🛛 🖈	1221321313.bak		5/6/2025 1:46 PM	BAK File	5,107 KB	
📒 2D and 3D excav	1221321313.fea		5/6/2025 1:50 PM	FEA File	5,157 KB	
	1221321313_withou	ut RW	5/6/2025 1:50 PM	Text Document	2 KB	
Fi	ile name:				 All File(*. 	.*) ~
					Open	Cancel

MESHING

IMPORTING PROPERTY



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



X

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

ID Color Item New Works 📩 🕼 Material 🛓 🙋 Isotropic [5] 🚛 Structure material1 (Is., 1 🚛 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	Geotech	inical Analysis
Set Define Set	🔁 Change Prop	erty 👑	Slip polygonal
🞰 Constraint	🔁 Water Level	22	Review
Constraint Equa	ation 🐇 Slip circular s	urface 🏅	Nodal Head
			Boundary
Constraint		×	n ⊐n ⊐?
Basic Advanced	Auto		1
Name Const	raint-1		8
?	Select Object(s)		
Consider All	Mesh Sets		
Boundary Set BC	1	~ 🥸	
	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	ts Force L Press. Self Moment Arbitrary Weight Disp. Press. Hereit
Gravity	×
Gravity	
Name	Gravity-1
Referen	ce Object
Туре	Coordinate V
Ref. CSy	s Global Rectangular 🗸
Compon	ents
Gx	0
Gy	-1
Gz	0
Spatial D	Distribution
Base Fun	nction None 🗸
Load Set	sw ~ 🍇
I	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	eotechnica	l Analysis	Analysis	Res	ult To
Perform Analysis Analysis	History Output Probes History	Analysis Option	Dptions P ols Fa	erform 😽 S	etting is Case	
FEA NX Solver					×Q	Q Q
Name with retaining wa	Tyi	pe	Descrij	ption		
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		r r r = 🗙 🔩 🕲 🥸
			Define Plane	
			Name P	lane 1
			Plane Directio	n
			Ox	⊖y Oz
			 3 Points 	2 Points Element Face
			Distance	0 m
4 /			Degree	
7			0 ?	Select Axis
	and the second se			cation 0, 0, 0
			○ 2 Poin	ts Vector
				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