GTS NX

New eXperience of Geo-Technical analysis System

Slope Stability Check

Basic Course Session 2

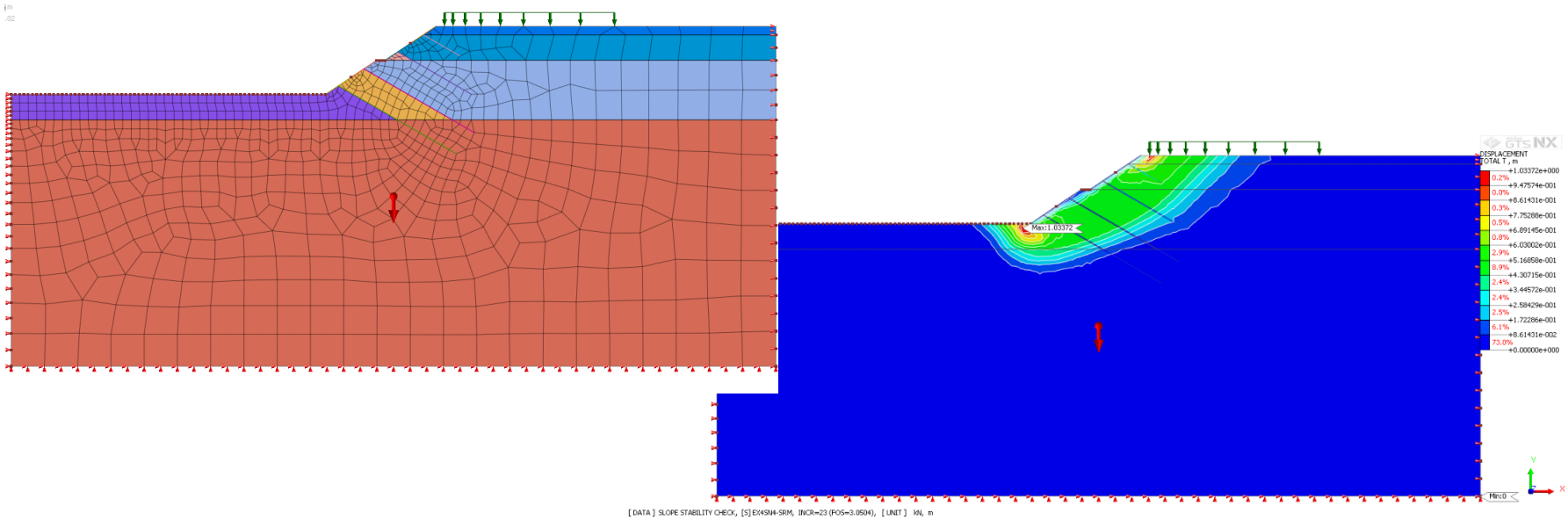
MIDAS

Modeling and Analysis Summary

The model represents 4 stage for slope excavation work which is supported by reinforcement such as lean concrete on the slope face and 4 layers of soilnail.

This tutorial is aiming on performing the analysis to check F.O.S of excavated slope and verify water drawdown.

This tutorial will be carried out with “Semi-Coupled Analysis” which is supported by GTS NX to check water behavior as well.



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Ground

[unit : kN, m]

Name	Fill	SVI	SV	SIV
Material	Isotropic	Isotropic	Isotropic	Isotropic
Model Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
General				
Elastic Modulus (E) [kN/m^2]	10,000	16,666	83,333	250,000
Poisson's Ratio (v)	0.3	0.3	0.3	0.3
Unit Weight (γ) [kN/m^3]	17	20	21	22
Ko	0.5	0.7	0.7	0.7
Porous				
Unit Weight (Saturated) [kN/m^3]	18	21	22	23
Drainage Parameters	Drained	Drained	Drained	Drained
Non-Linear				
Cohesion (c) [kN/m^2]	1	1	5	15
Frictional Angle (Φ) [deg]	30	30	32	34

02 Material & Property

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Structure

[unit : kN, m]

Name	Conc'	Steel
Material	Isotropic	Isotropic
Model Type	Elastic	Elastic
Elastic Modulus (E) [kN/m^2]	28,000,000	205,000,000
Poisson's Ratio (v)	0.15	0.15
Unit Weight (γ) [kN/m^3]	24	74

Property (Structure)

[unit : kN, m]

Name	Material	Type
Lean Concrete (0.1 m)	Conc'	Beam
Soil Nail (Dia. 0.2m @ 2.4m c/c)	Steel	Embedded Truss

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Define Analysis Stage

MIDAS

07 Define Analysis Stage

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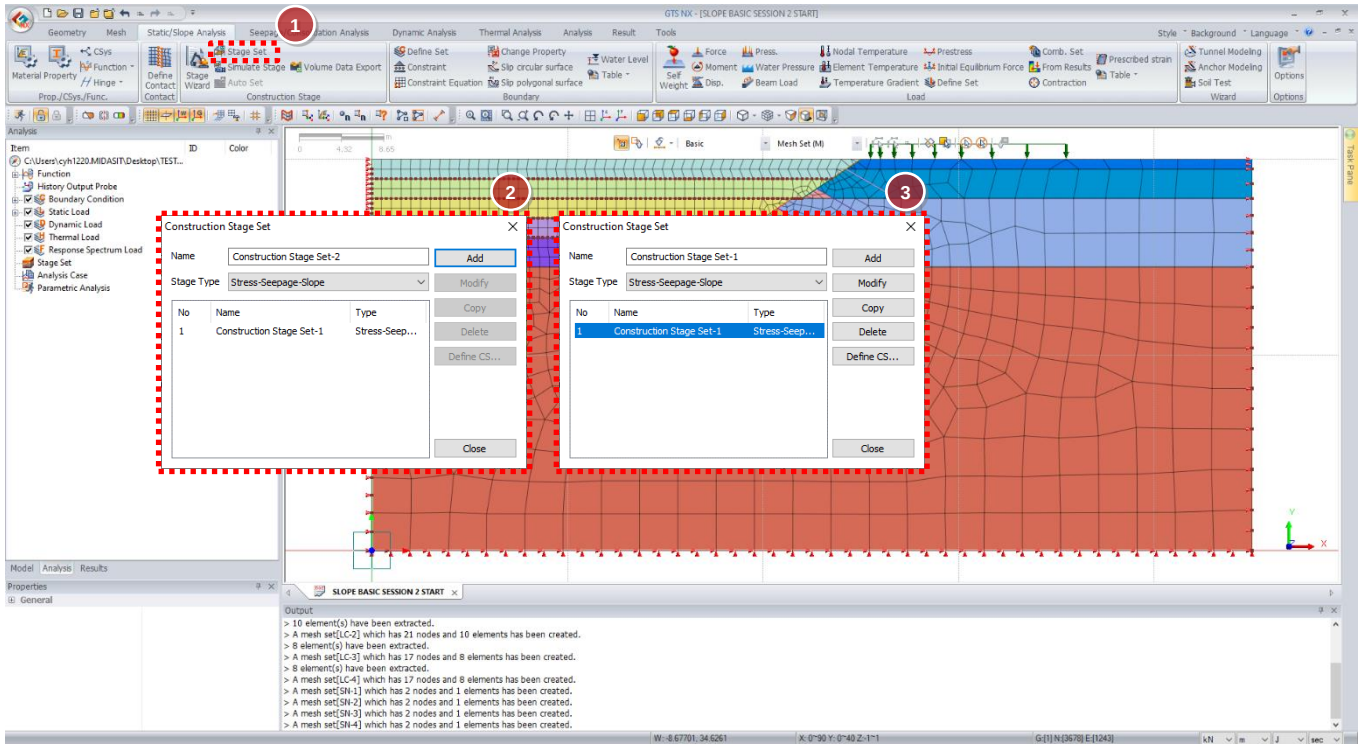
Define stage type

Procedure

1. Click “Stage Set”
2. Stage Type
   “Stress-Seepage-Slope”
   Click “Add”
3. Select created stage set
   Click “Define CS…”



07 Define Analysis Stage

GTS NX

Initial Stage

Procedure

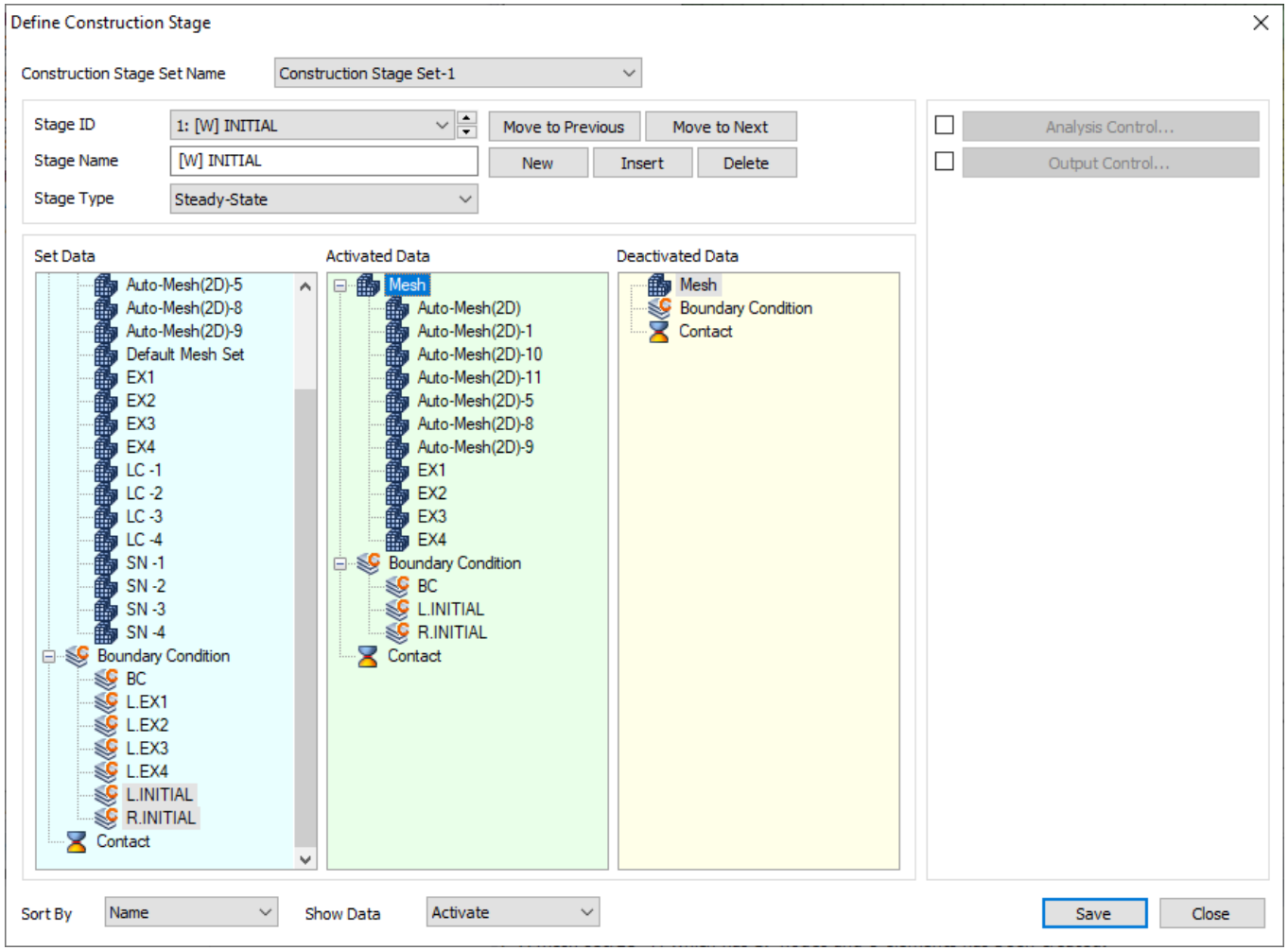
Stage Name “[W] INITIAL”
Stage Type “Steady-State”

<Activate>
Every mesh set of ground
BC
L.INITIAL
R.INITIAL

<Deactivate>
-

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

Initial Stage

Procedure

Stage Name “[S] INITIAL”
Stage Type “Stress”

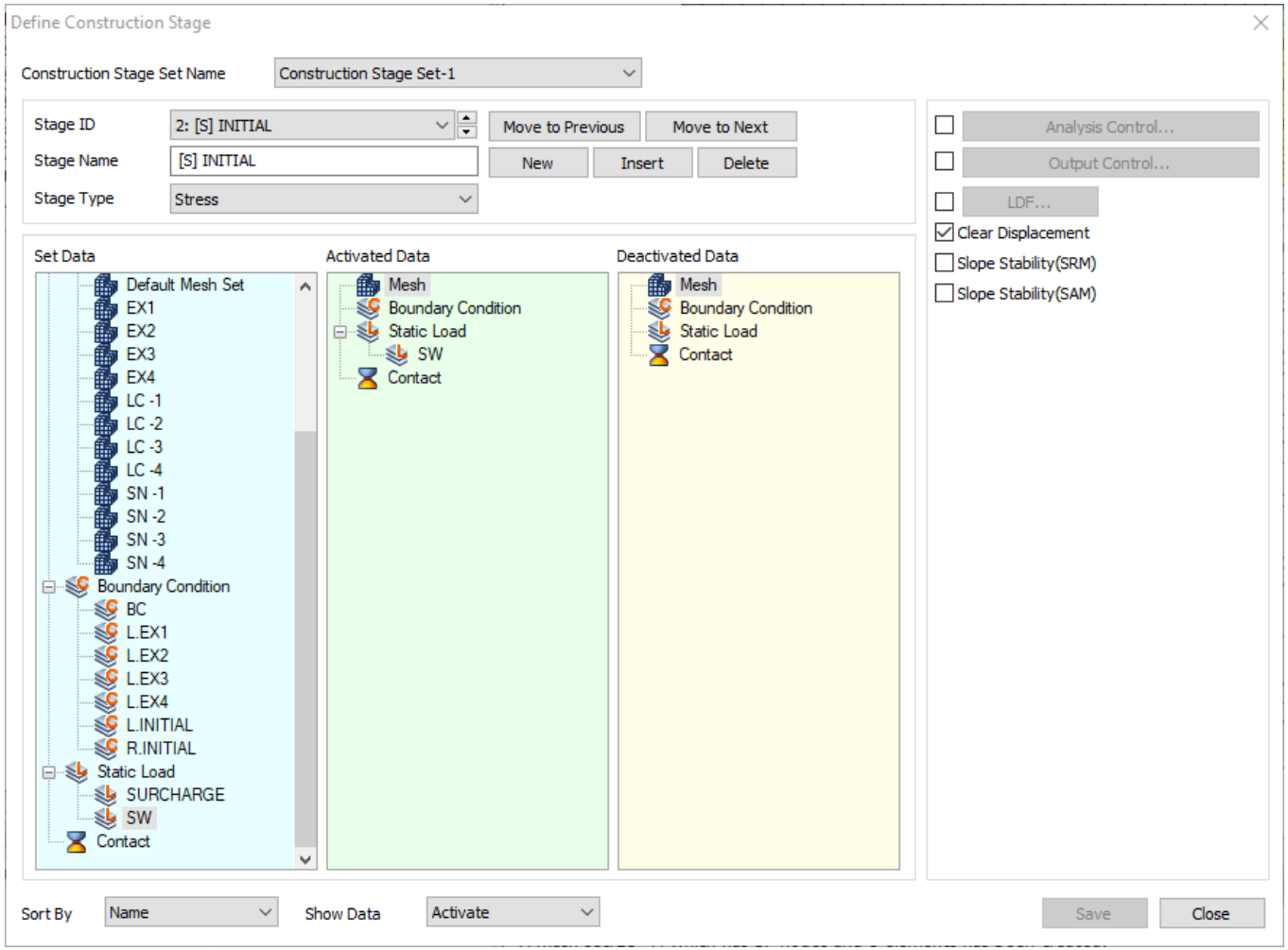
<Activate>
SW

<Deactivate>
-

Check on “Clear Displacement”

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

Surcharge

Procedure

Stage Name “[S] SURCHARGE”
Stage Type “Stress”

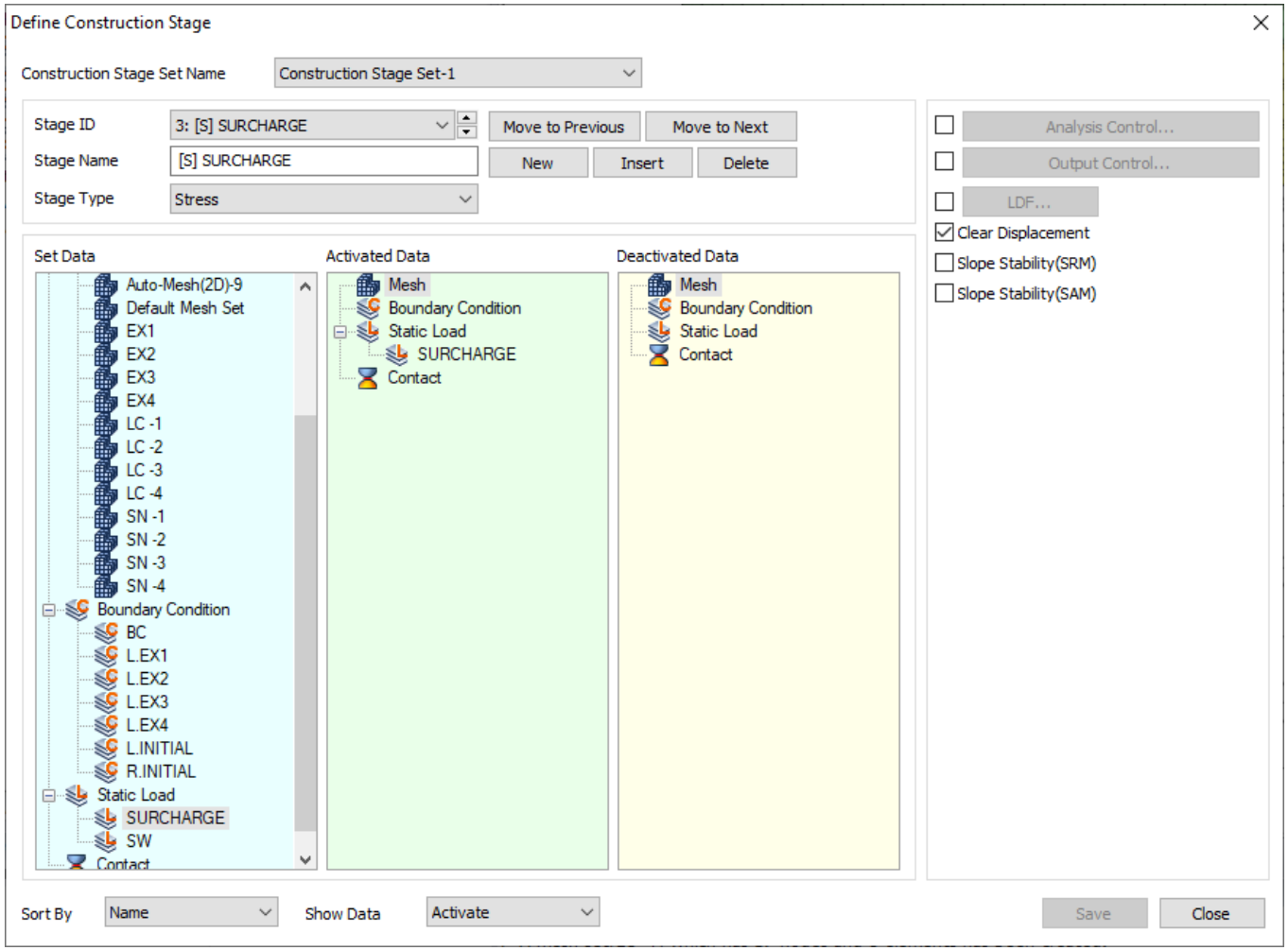
<Activate>
SURCHARGE

<Deactivate>
-

Check on “Clear Displacement”

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

EX1SN1-Seepage

Procedure

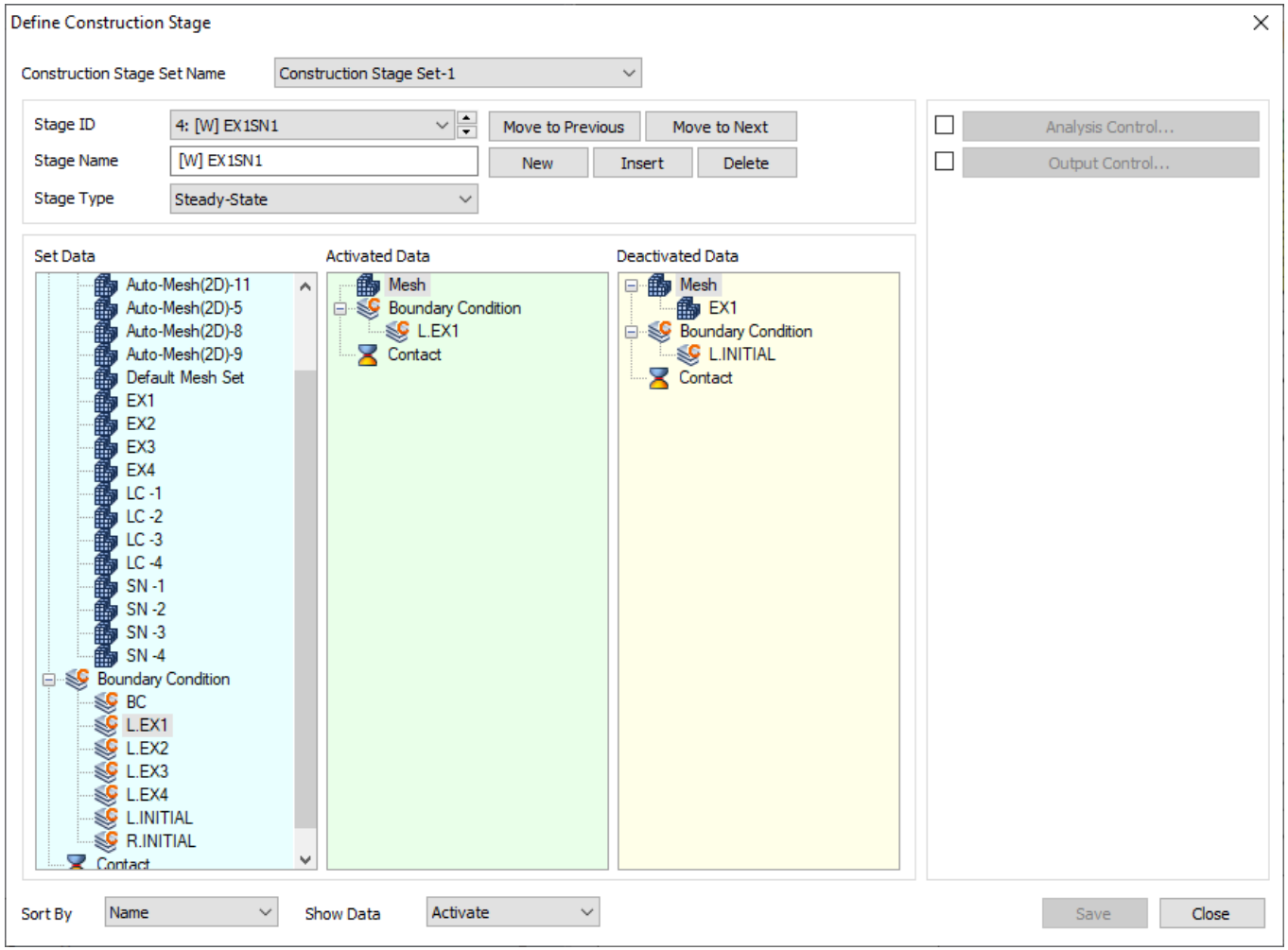
Stage Name “[W] EX1SN1”
Stage Type “Steady-State”

<Activate>
L.EX1

<Deactivate>
EX1
L.INITIAL

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

EX1SN1-Stress

Procedure

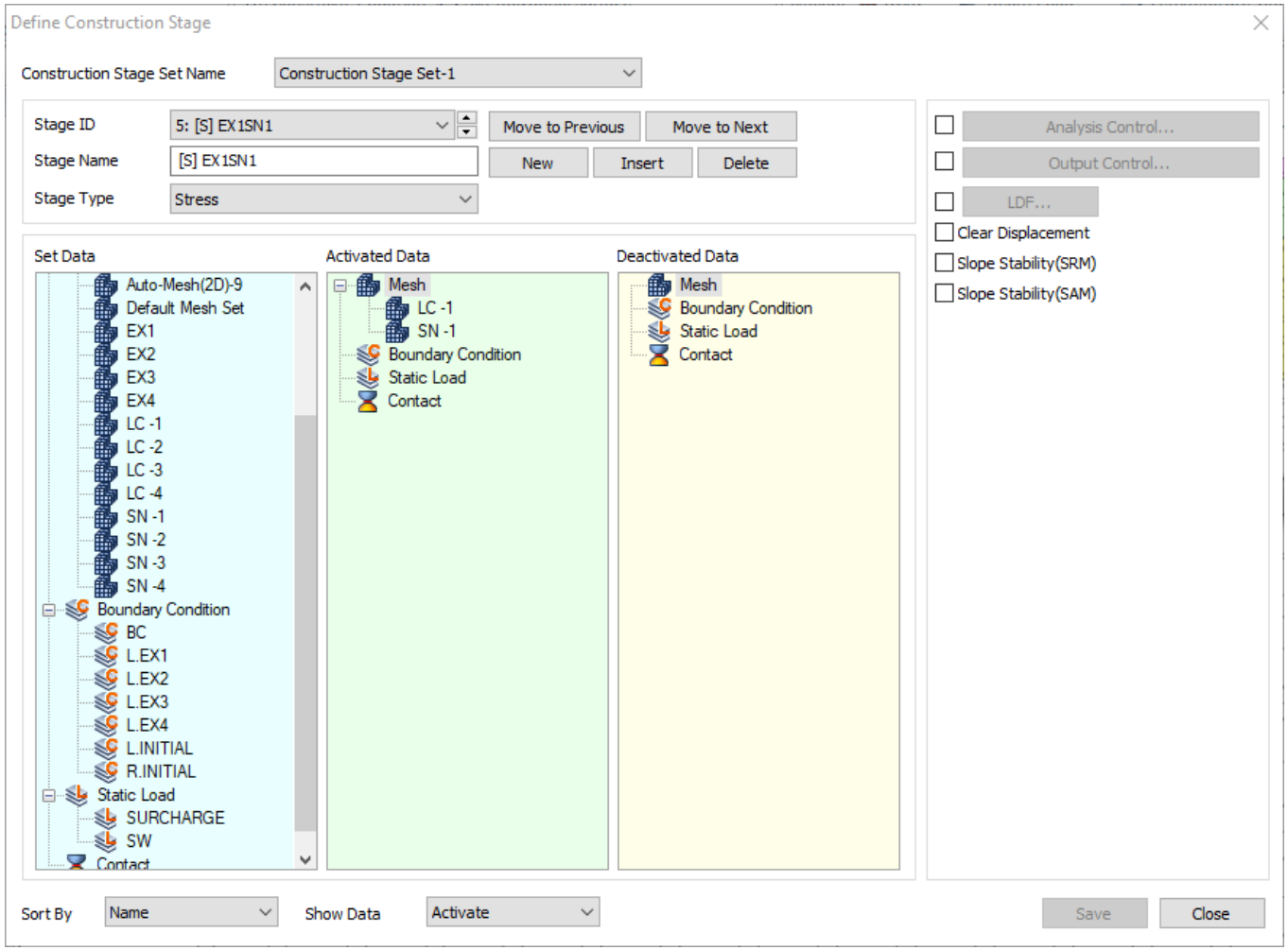
Stage Name “[S] EX1SN1”
Stage Type “Stress”

<Activate>
LC-1
SN-1

<Deactivate>
-

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

EX2SN2-Seepage

Procedure

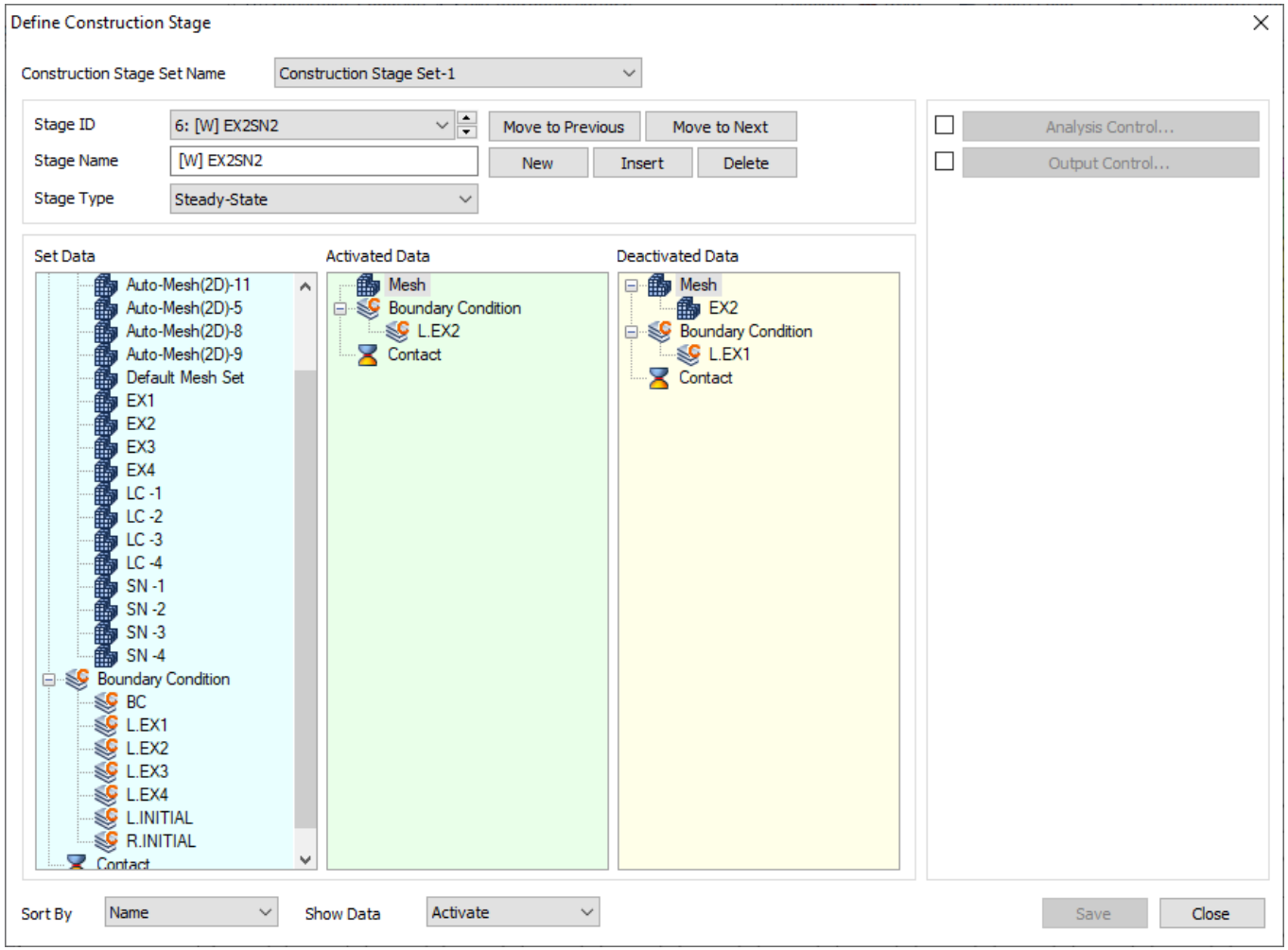
Stage Name “[W] EX2SN2”
Stage Type “Steady-State”

<Activate>
L.EX2

<Deactivate>
EX2
L.EX1

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

EX2SN2-Stress

Procedure

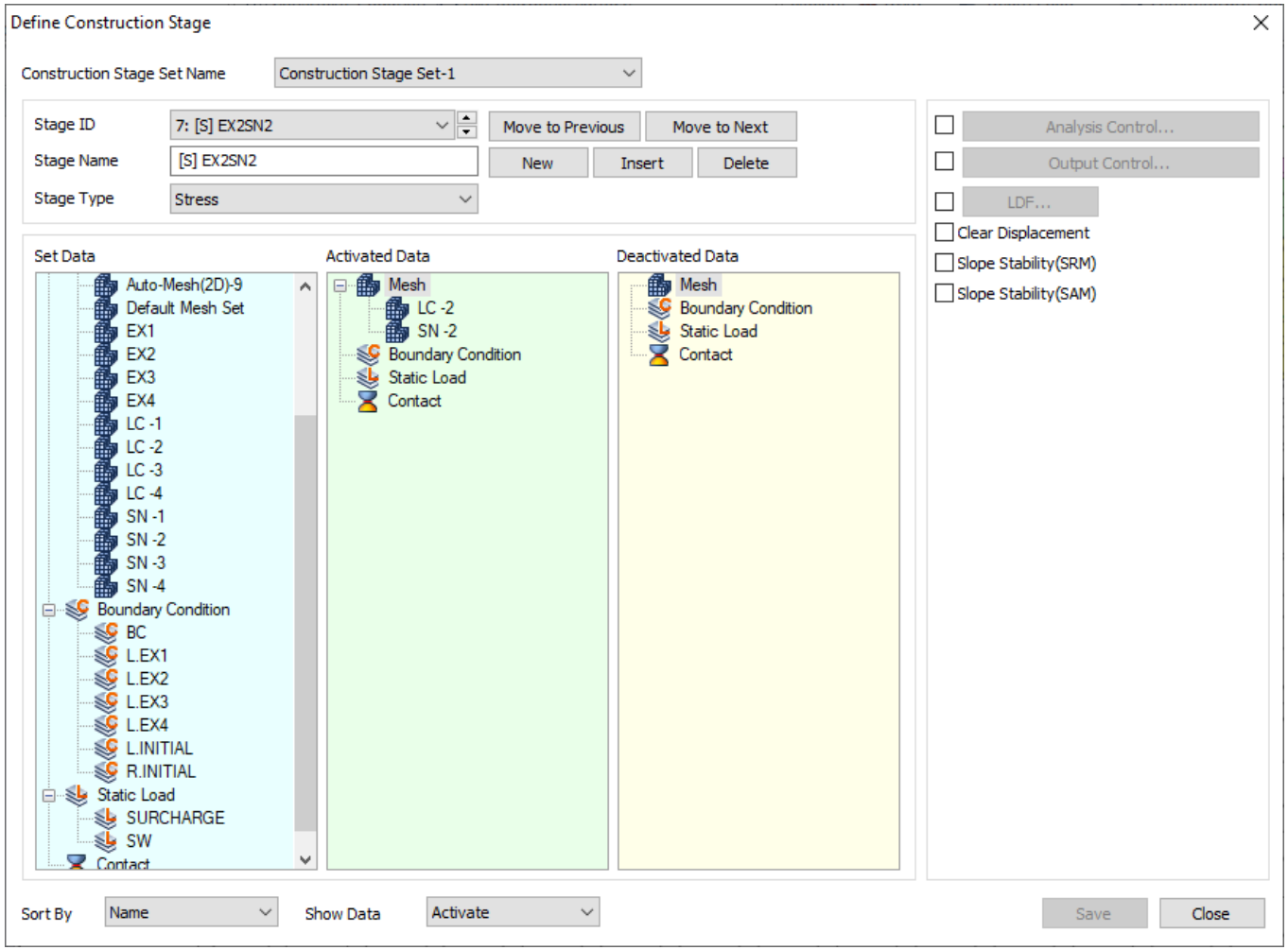
Stage Name “[S] EX2SN2”
Stage Type “Stress”

<Activate>
LC-2
SN-2

<Deactivate>
-

Click “Save”

Click “New”



07 Define Analysis Stage

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EX3SN3-Seepage

Procedure

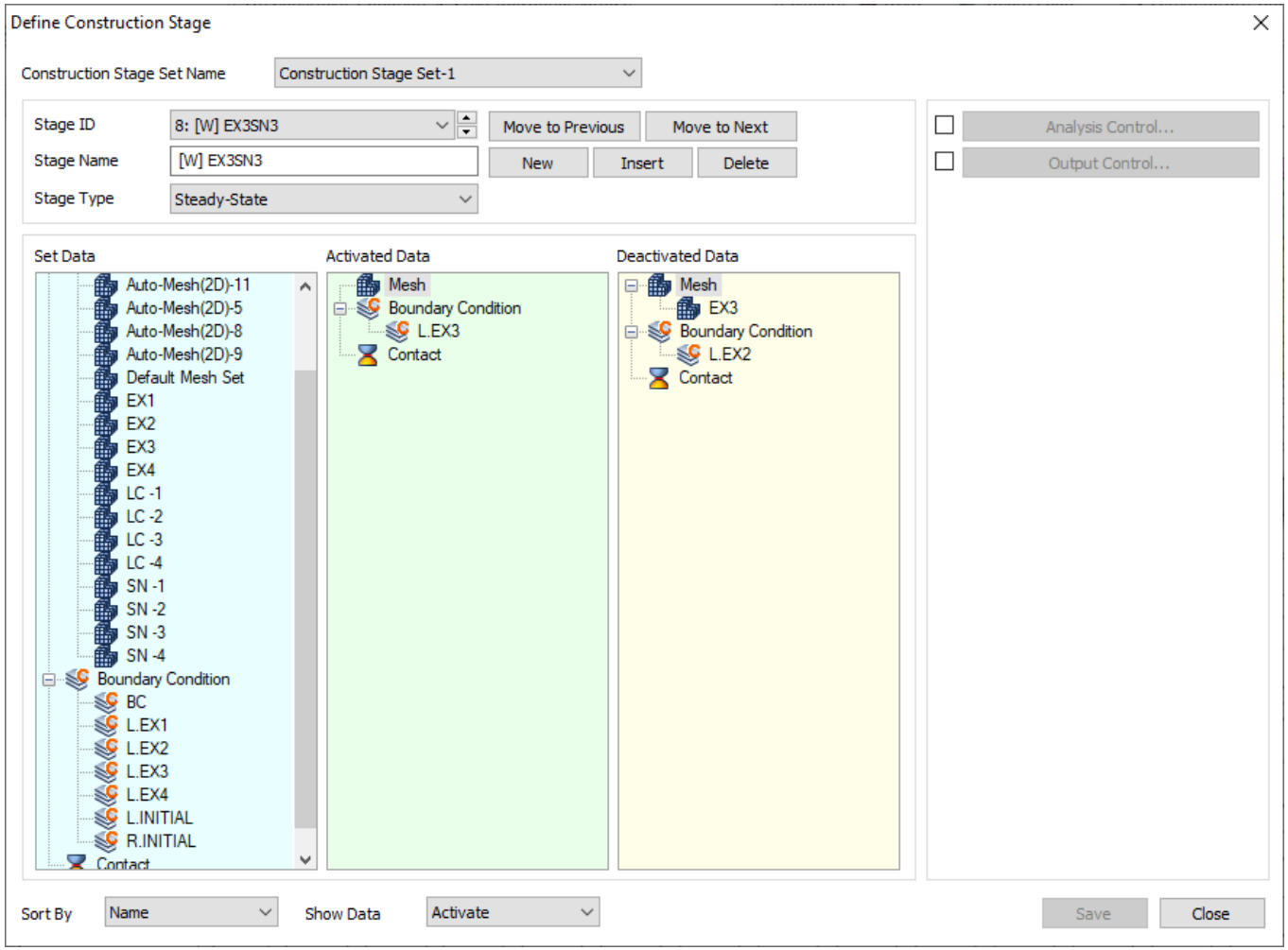
Stage Name “[W] EX3SN3”
Stage Type “Steady-State”

<Activate>
L.EX3

<Deactivate>
EX3
L.EX2

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

EX3SN3-Stress

Procedure

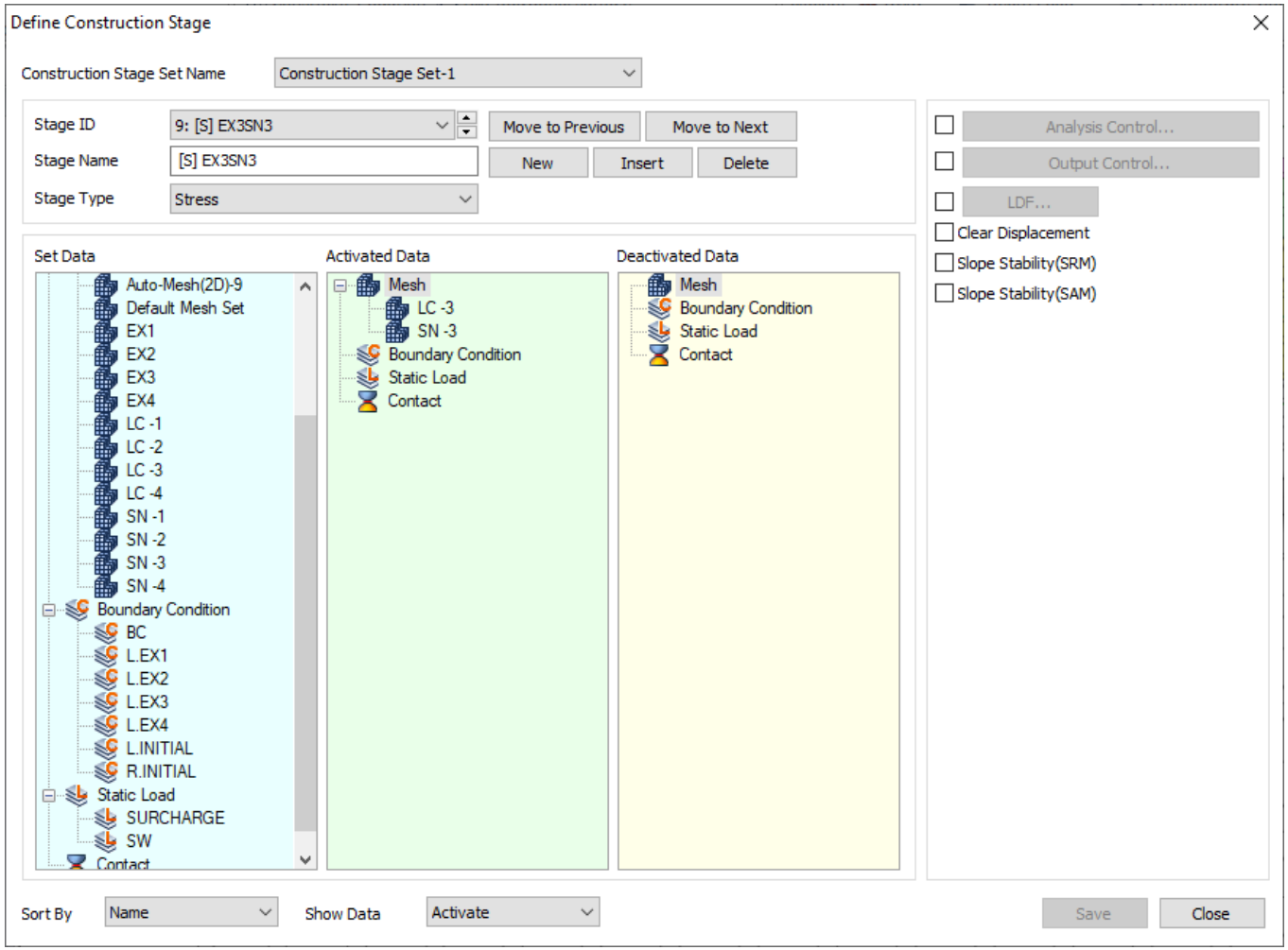
Stage Name “[S] EX3SN3”
Stage Type “Stress”

<Activate>
LC-3
SN-3

<Deactivate>
-

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

EX4SN4-Seepage

Procedure

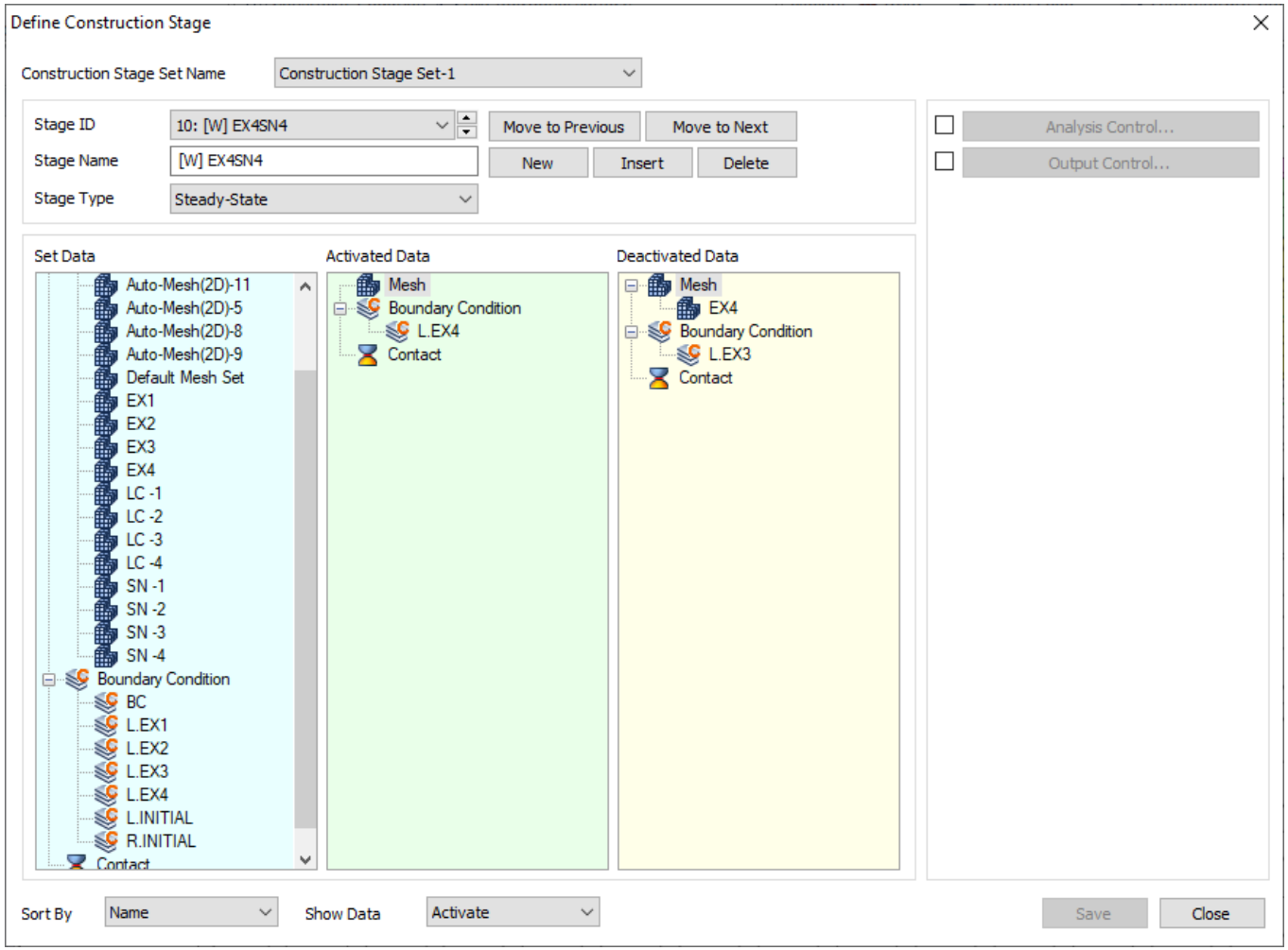
Stage Name “[W] EX4SN4”
Stage Type “Steady-State”

<Activate>
L.EX4

<Deactivate>
EX4
L.EX3

Click “Save”

Click “New”



07 Define Analysis Stage

GTS NX

EX4SN4-Stress

Procedure

Stage Name “[S] EX4SN4”
Stage Type “Stress”

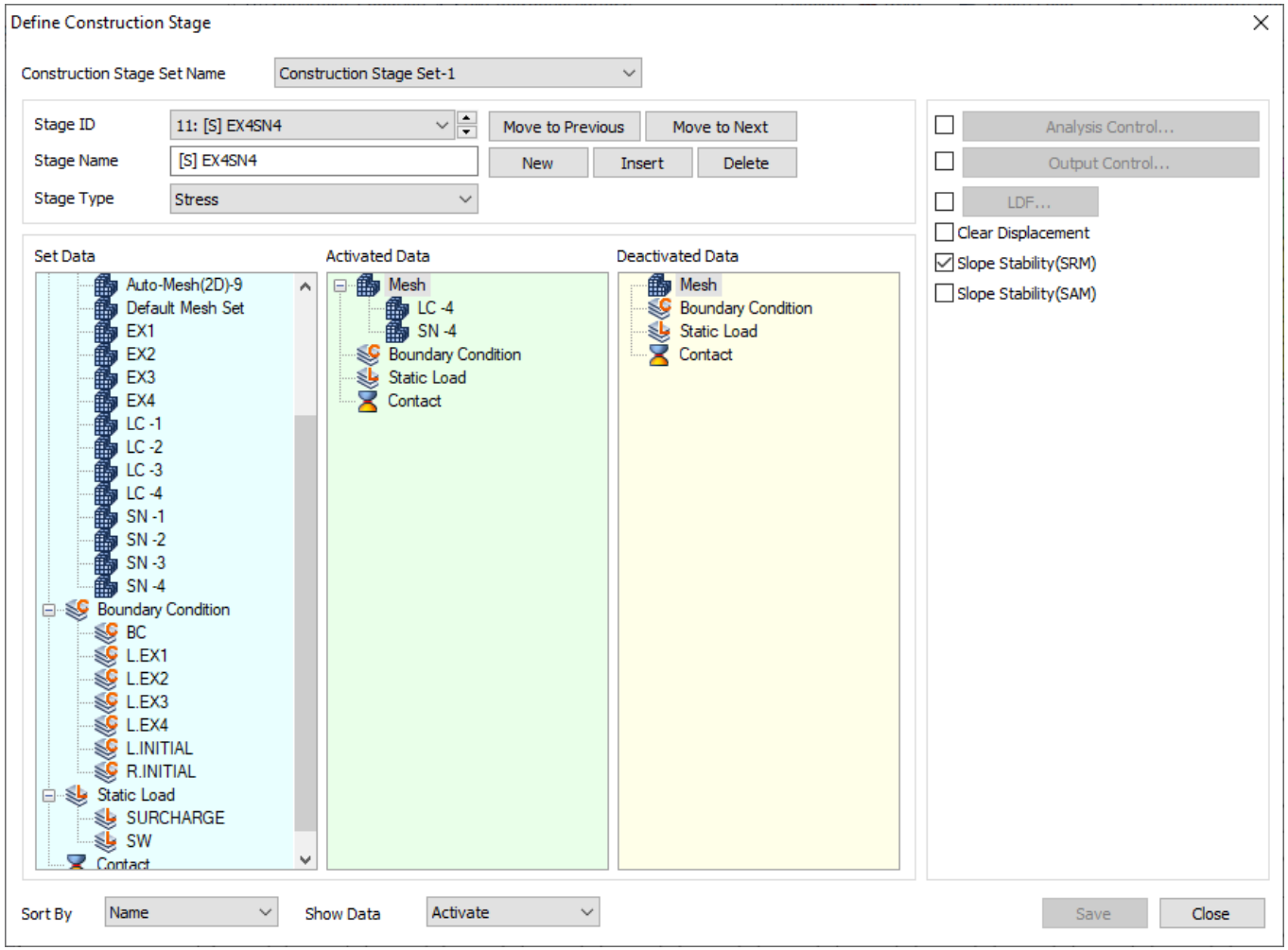
<Activate>
LC-4
SN-4

<Deactivate>
-

Check on “Slope Stability(SRM)”

Click “Save”

Click “Close”



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Analysis Case

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Define stage type

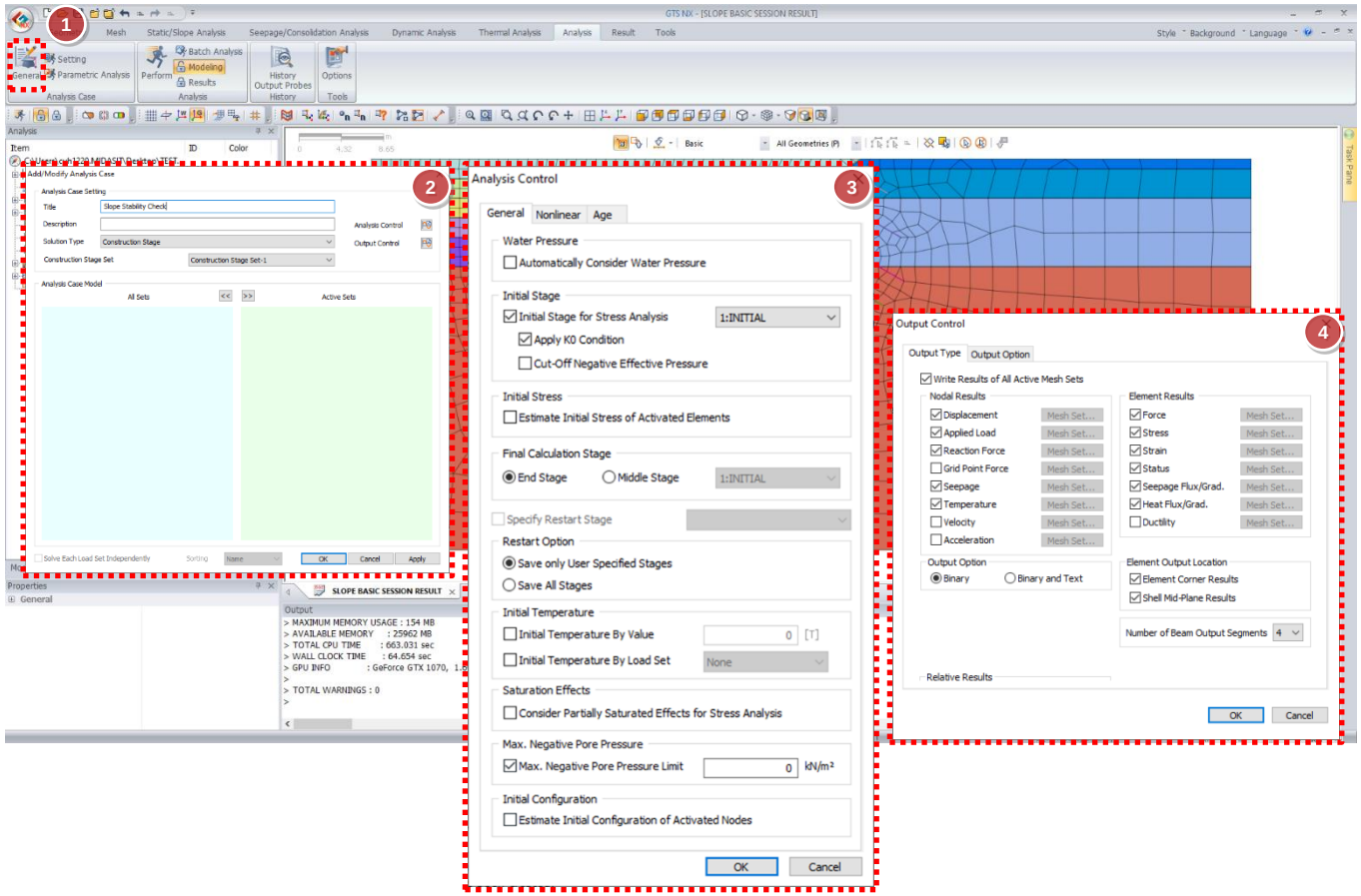
Procedure

1. Click “General”
2. Title “Slope Stability Check”

   Construction Stage Set
   “Construction Stage Set-1”

   Click “Analysis Control”
3. General tab
   Check on “Initial Stage for…”
   Check on “Apply K0 Condition”
   Click “OK”
4. Click “Output Control”
   Check on “Strain”
   Click “OK”

   Click “OK”



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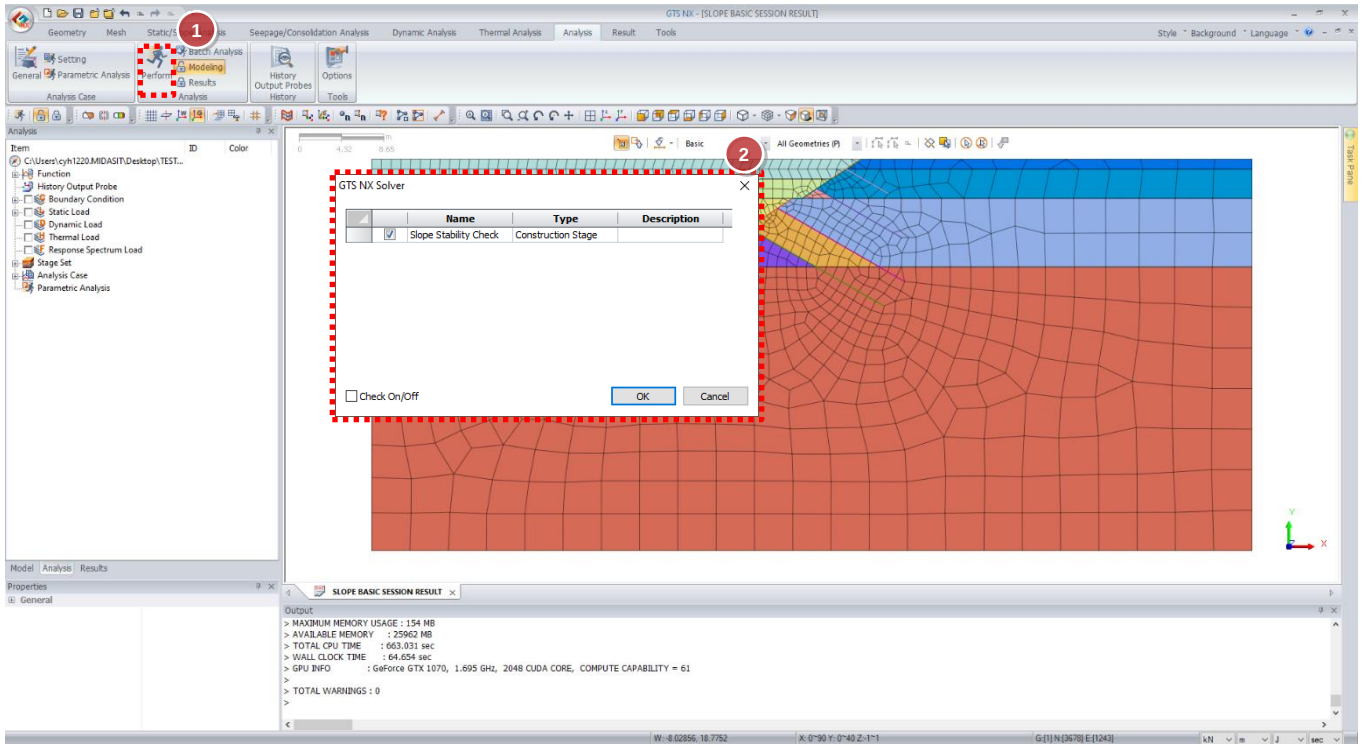
Perform the analysis

Procedure

1. Click “Perform”
2. Check on 3D EXCAVATION
   Click “OK”



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Result Checking

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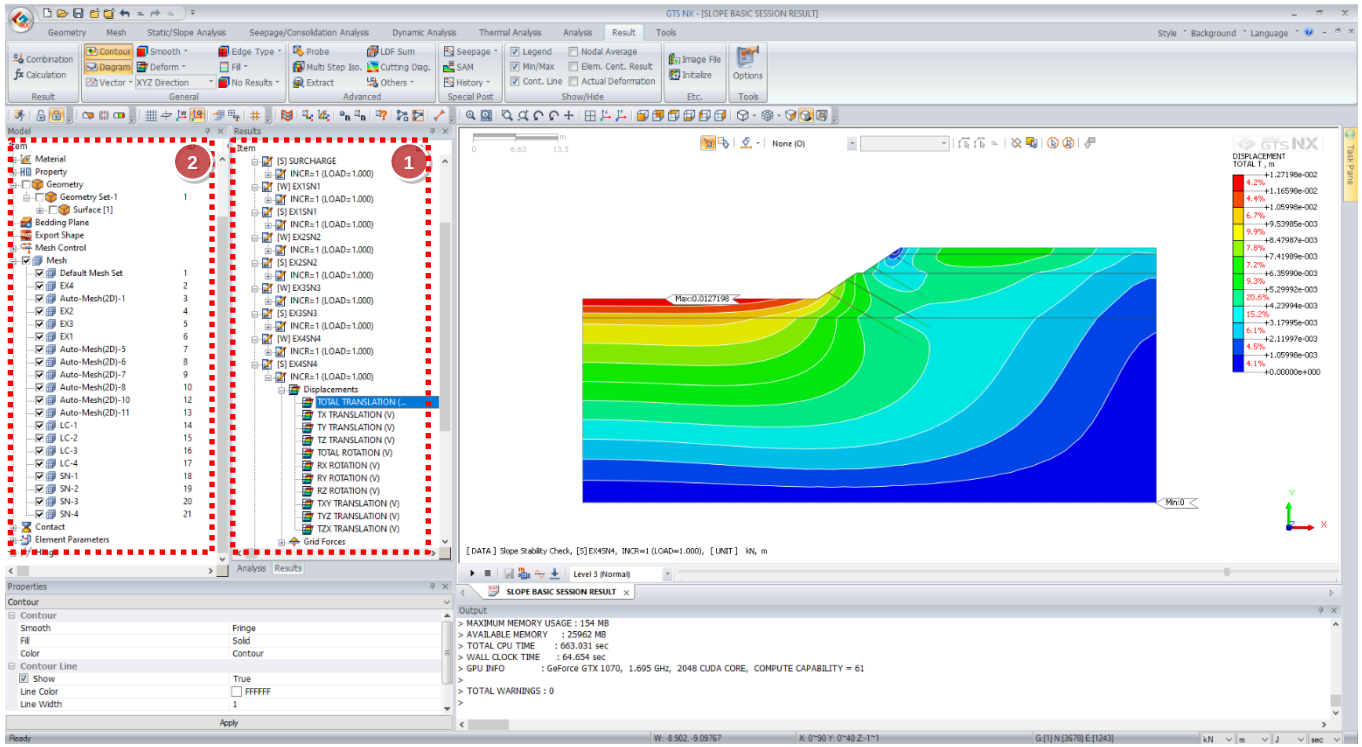
Total Displacement

Procedure

1. Click “Displacements” > “Total Translation(v)”

2. <Mesh Tree>
   Show every mesh set



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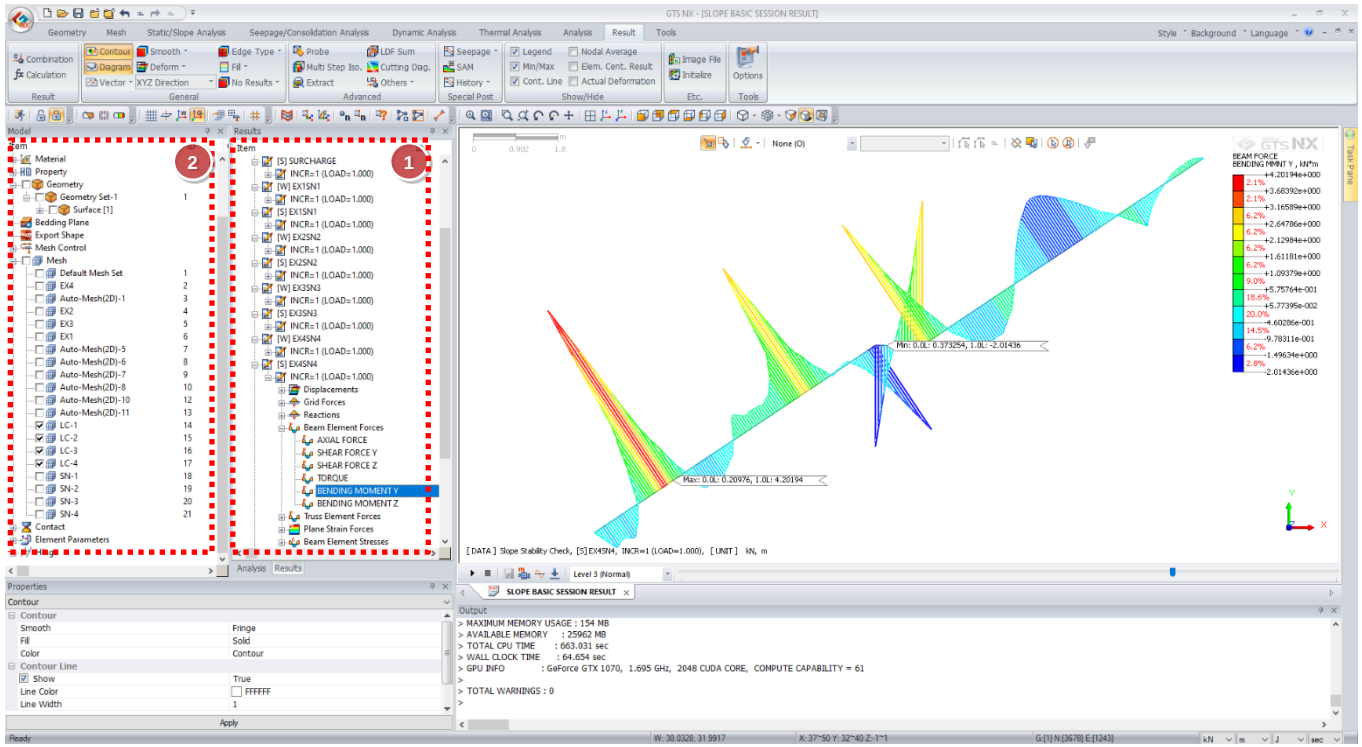
Forces from lean concrete

Procedure

1. Click “Beam Element Forces”
   Bending moment & Shear force

2. <Mesh Tree>
   Show only LC mesh sets



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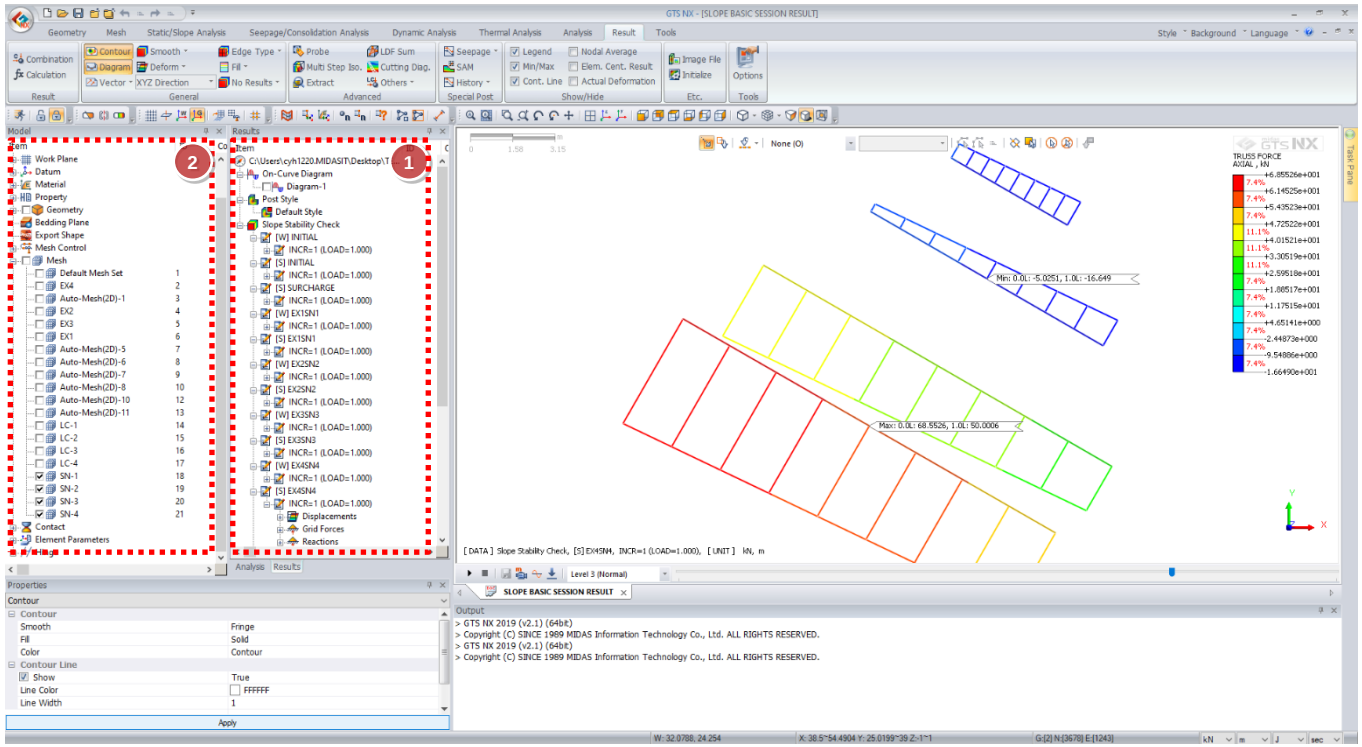
Forces from soil nail concrete

Procedure

1. Click “Truss Element Forces” Axial force

2. <Mesh Tree>
   Show only SN mesh sets

   [Information]
   You need to show one by one when you want to check one by one



GTS NX

Water drawdown using “Multi Step Iso.” function

Procedure

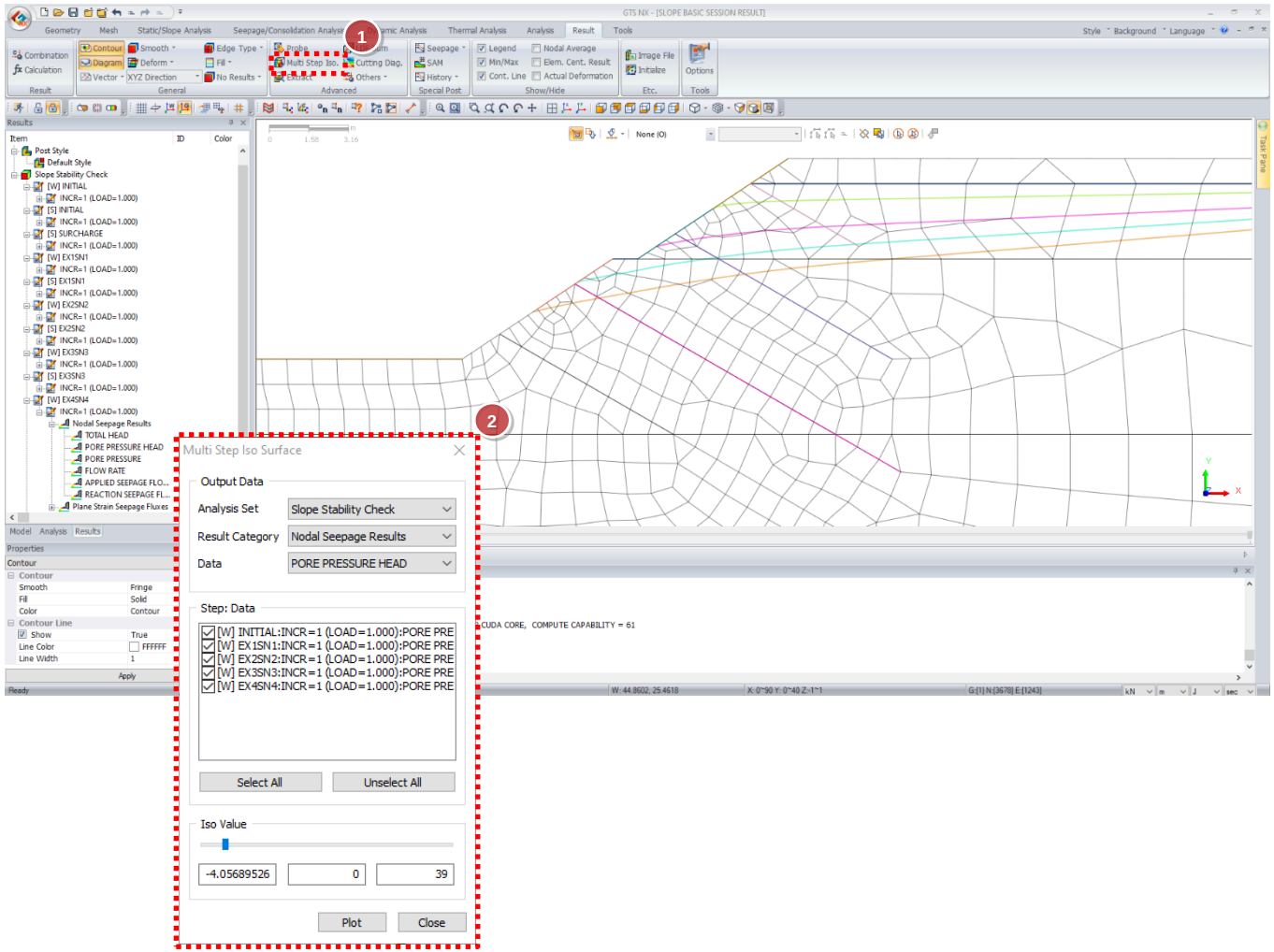
1. Click “Multi Step Iso.”
2. Result Category:
   Nodal Seepage Results

   Data: Pore Pressure Head

   ISO Value “0” in middle

   Click “Plot”

   [Information]
   You can find water drop down with line from each stages using this function



GTS NX

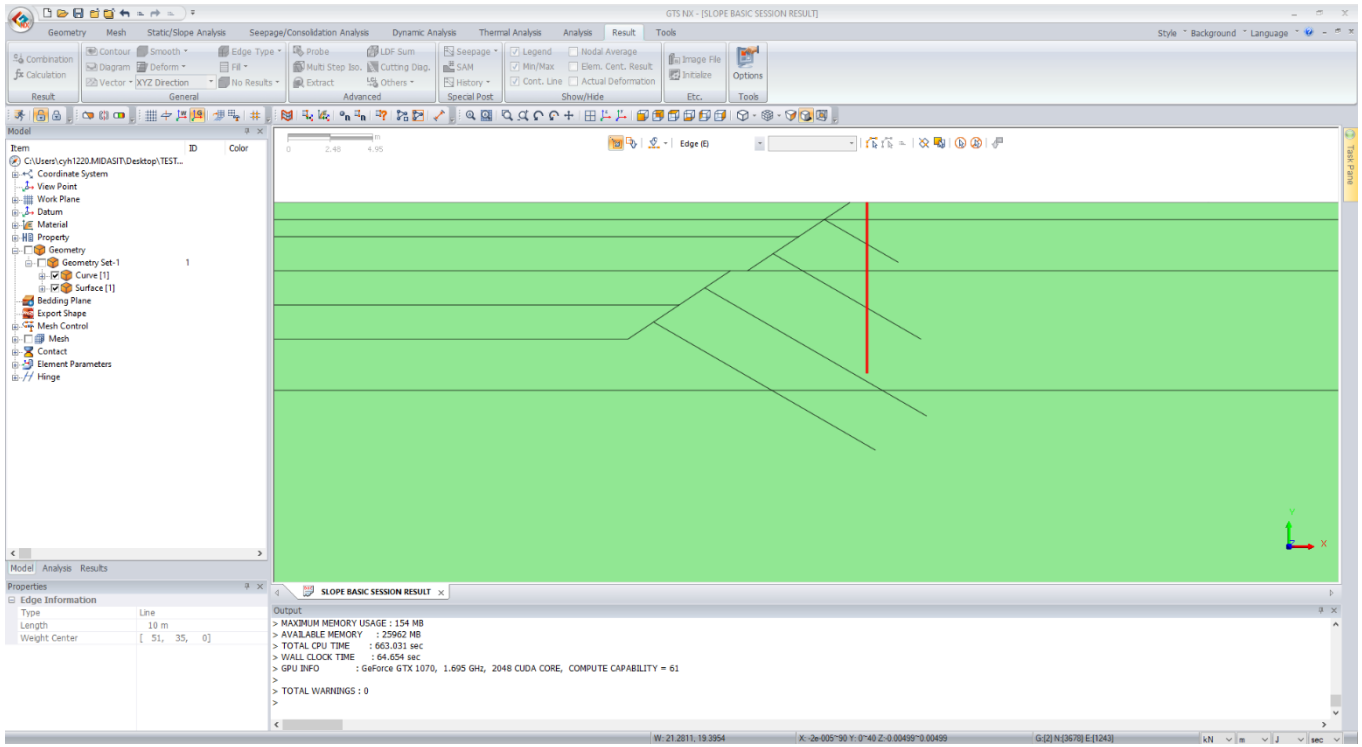
Water drawdown using specific line

Procedure

Go to pre-mode

Draw the vertical line where you want to check water drop down

Go to post-mode



GTS NX

Water drawdown using specific line

Procedure

Click “Cutting Diag.”

Click starting and end point of created line

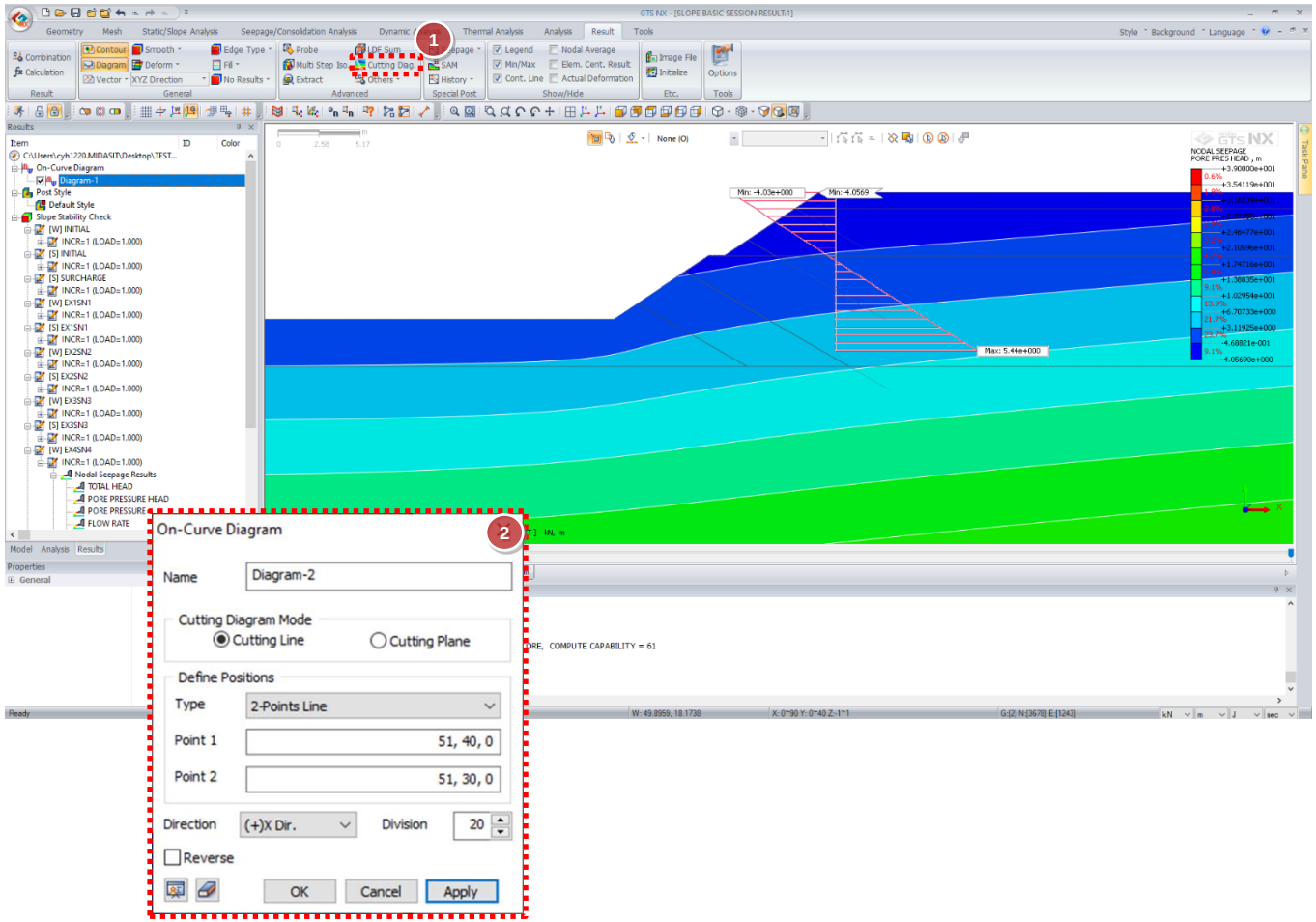
Direction: (+)X Dir.

Click “OK”

Double click “PORE PRESSURE HEAD” from [w] stages

[Information]
you can find values with table using right click on Diagram-1 from result tree.

If you increase “Division” from On-Curve Diagram, You can get more result from diagram



GTS NX

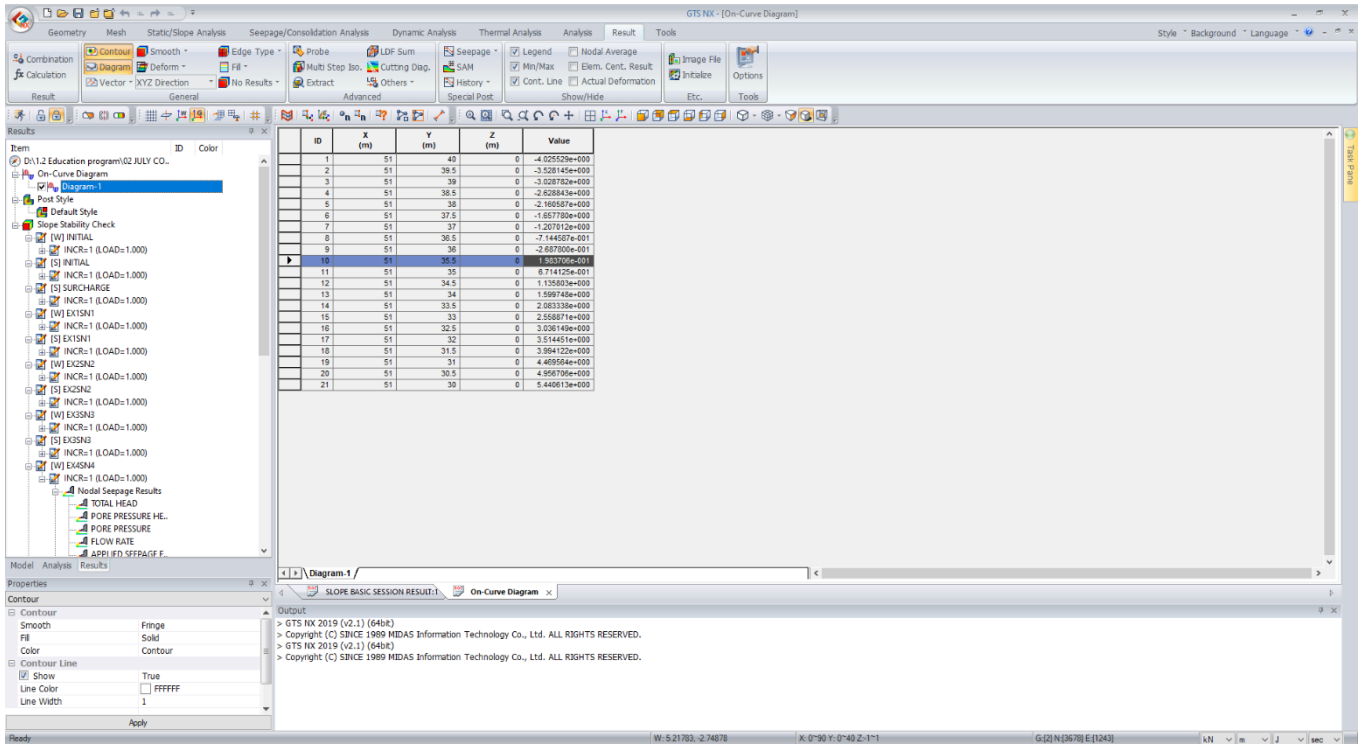
Water drawdown using specific line

Procedure

You can find y coordinate from table which are height of pore pressure head.

Choose minimum absolute value from value row and take y value from every [W] stage.

it will be drawdown water height.

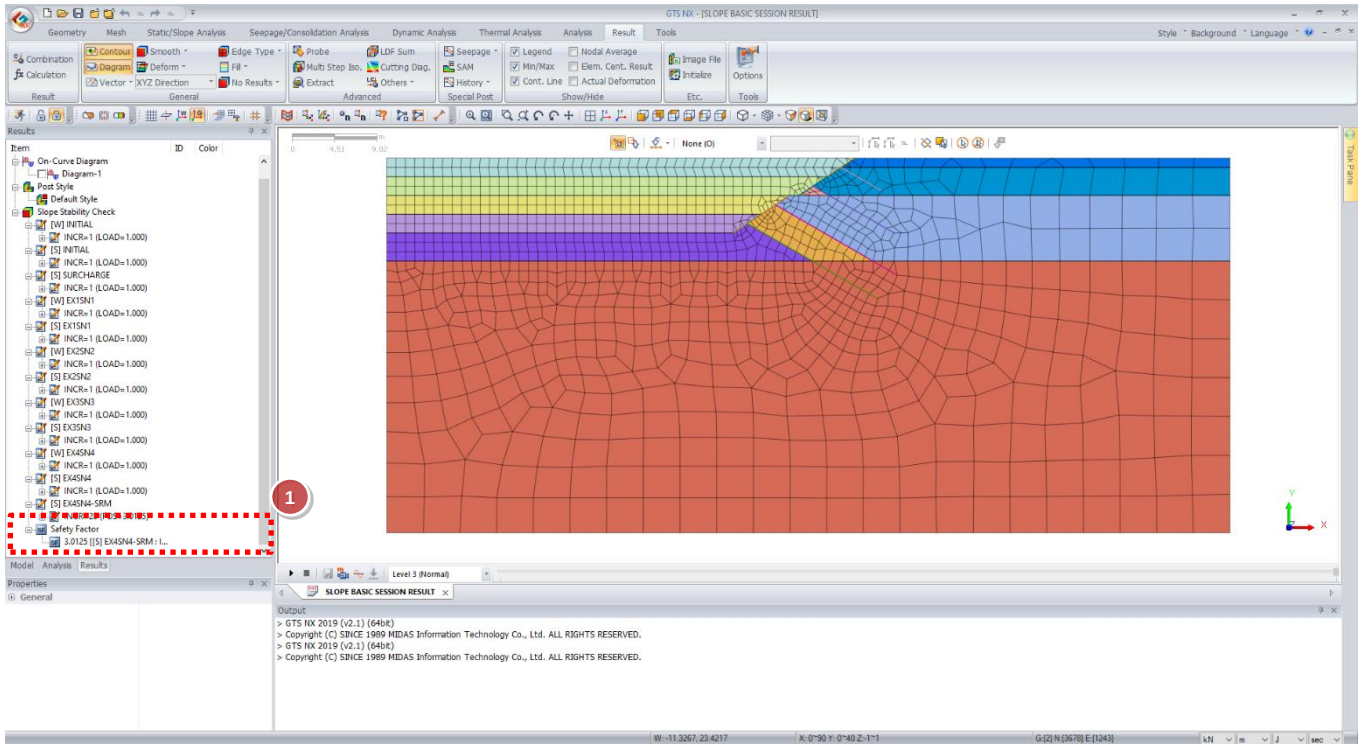


GTS NX

Factor of Safety (F.O.S)

Procedure

1. You can find factor of safety (F.O.S) value from results tree



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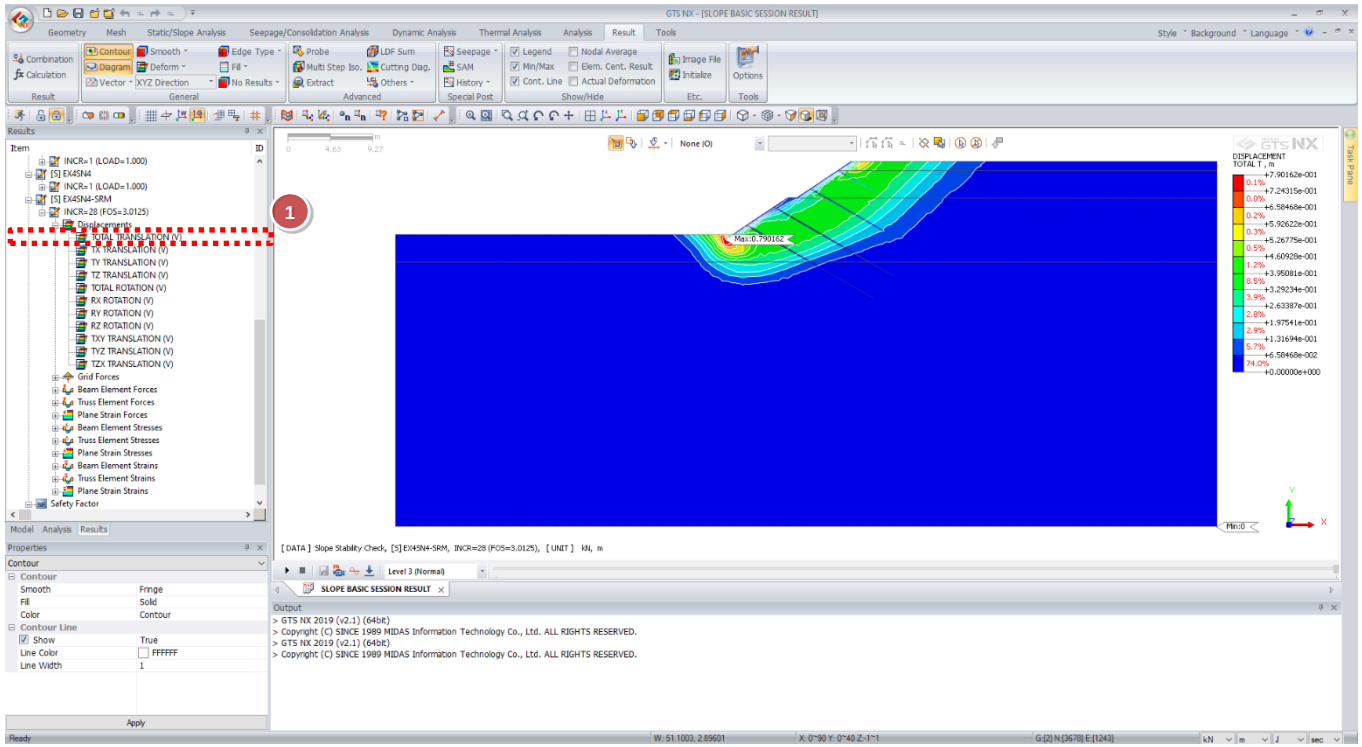
Failure shape

Procedure

1. You can check failure shape with “Total translation” from Displacement tree or “E-Effective plastic” from Plane Strain Strains tree under SRM result



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Thank you!

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