SoilWorks

2020(v1.1) Release Notes

Release Note

Pre/Post-Processing

1. [Slope & Ground] Partial Factor
2. [SoftGround] Generating the report from 1D consolidation analysis
3. [Slope] Display the horizontal seismic force in free body diagram from Limit Equilibrium Method (LEM)
4. [Slope] Display the reinforced forces from Limit Equilibrium Method (LEM)
5. [Seepage] Multi flux result function
6. [Seepage] Saturation result function
7. [Common] Size control function for Result Tag (Tunnel/Slope/Seepage/Softground/Dynamic)
8. [Seepage] Display Seepage flow on the Total Head result

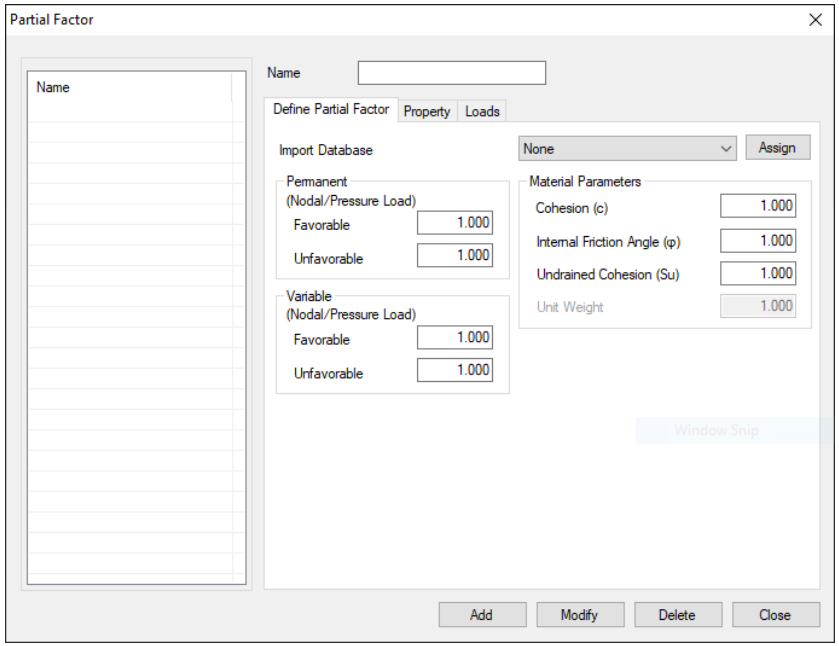
Analysis

1. [Foundation] Including an Acceleration of Convergence
2. [Slope] Updated slice segmentation
3. [Dynamic] Generation of artificial earthquake

1. [Slope & Ground] Partial Factor

- Considering the partial factor from Euro Code (Refer to EN1997-1 Annex A)
- Applying to FEM analysis from Ground Module and LEM & SRM analysis from Slope Module.

•*Analysis I Design* > ***Construction Stage*** > *Partial Factor*



Name: Define name of partial factor

- ***Define Partial Factor***

To Define the values for partial factor

Import Database:

Select database (DA1C1, DA1C2, DA2, DA3) and assign

Permanent (Nodal/Pressure Load):

Input the partial factor values for Favorable & Unfavorable to apply to Load

Variable (Nodal/Pressure Load):

Input the partial factor values for Favorable & Unfavorable to apply to Load

Material Parameters:

Input the partial factor values for material parameters

Cohesion: Partial factor value for Cohesion

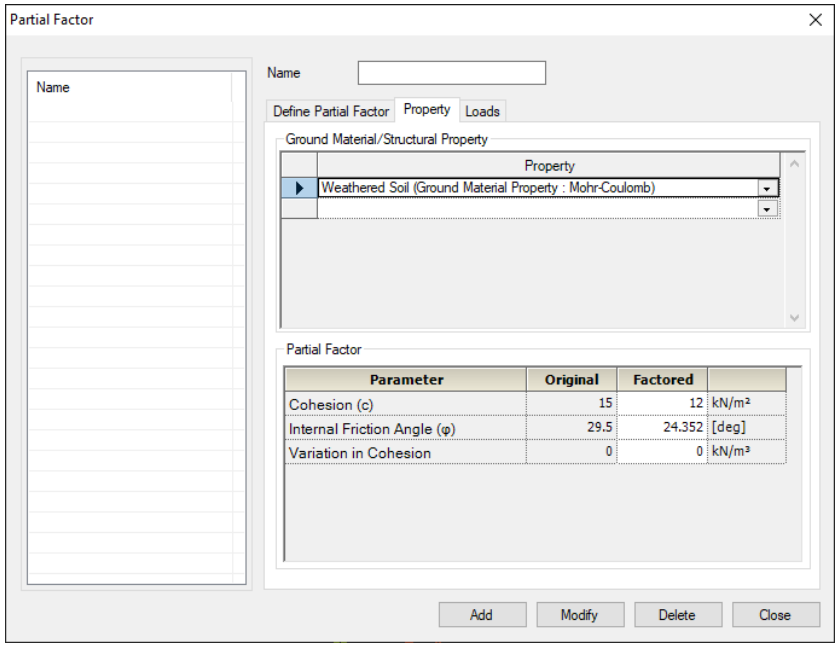
Internal Friction Angle: Partial factor value for friction angle

Undrained Cohesion: Partial factor value for undrained cohesion

1. [Slope & Ground] Partial Factor

- Considering the partial factor from Euro Code (Refer to EN1997-1 Annex A)
- Applying to FEM analysis from Ground Module and LEM & SRM analysis from Slope Module.

•*Analysis I Design* > ***Construction Stage*** > *Partial Factor* 



▪ ***Property***

Ground Material/Structural Property

Select material (Soil/structural) from Ground Material/Structural Property table to apply partial factor

Partial Factor

To verify applied partial factor

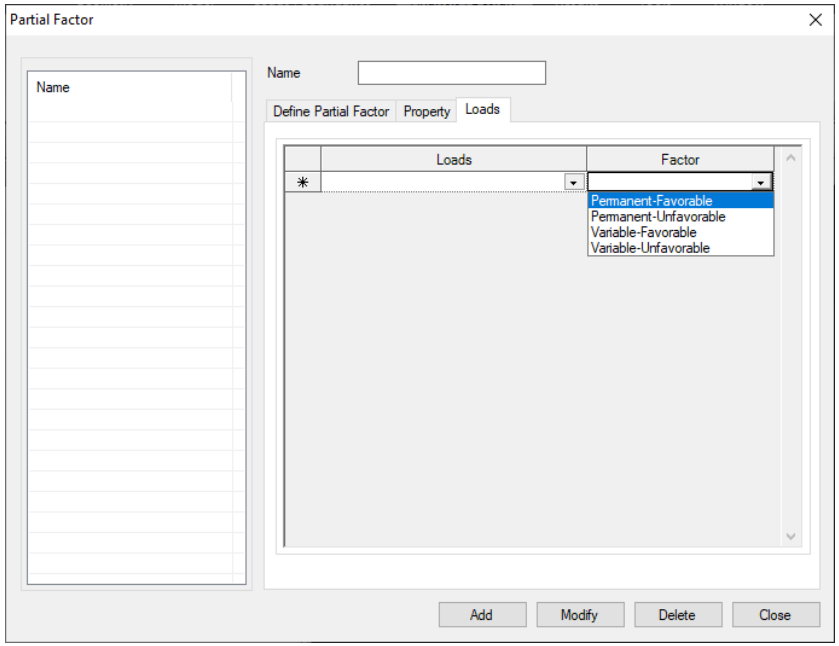
Original: Unfactored values prior to apply partial factor which are defined in the Ground Material Property(Model > Property > Ground Material Property)

Factored: Factored values which are applied partial factor in Define Partial Factor tap

1. [Slope & Ground] Partial Factor

- Considering the partial factor from Euro Code (Refer to EN1997-1 Annex A)
- Applying to FEM analysis from Ground Module and LEM & SRM analysis from Slope Module.

•*Analysis I Design* > ***Construction Stage*** > *Partial Factor*



- ***Loads***

Loads

Select the loads which are created by user and need to apply partial factor

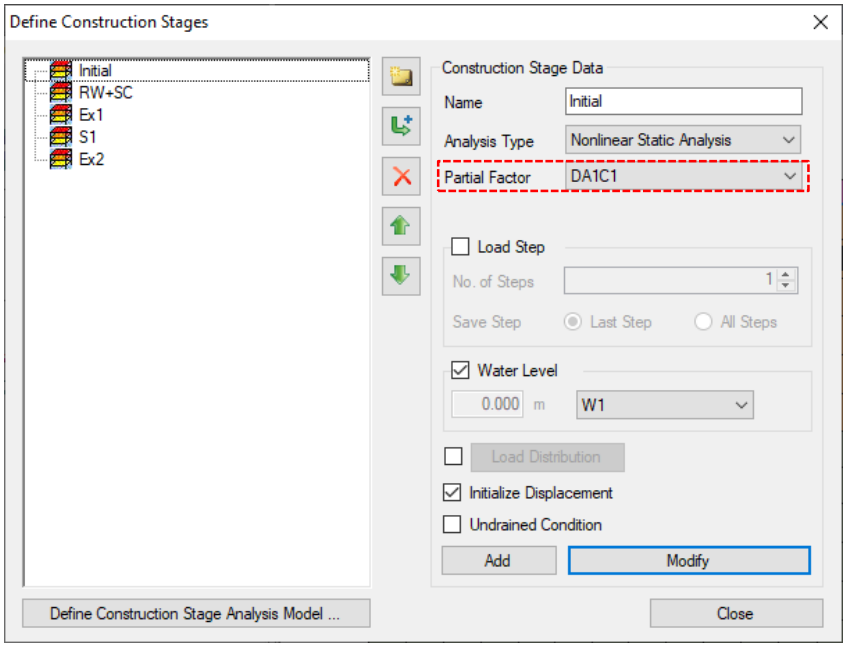
Factor

Select the partial factor to apply to selected load

1. [Slope & Ground] Partial Factor

- Considering the partial factor from Euro Code (Refer to EN1997-1 Annex A)
- Applying to FEM analysis from Ground Module and LEM & SRM analysis from Slope Module.

•*Analysis I Design* > ***Construction Stage*** > *Construction Stage*



▪ ***Partial Factor***

To Apply Partial Factor which is created by Partial Factor function (Analysis I Design > Construction Stage > Partial Factor)

Note:

Partial Factor can be applied first stage only

For **Ground Module**,

Nonlinear Static Analysis can be applied Partial Factor

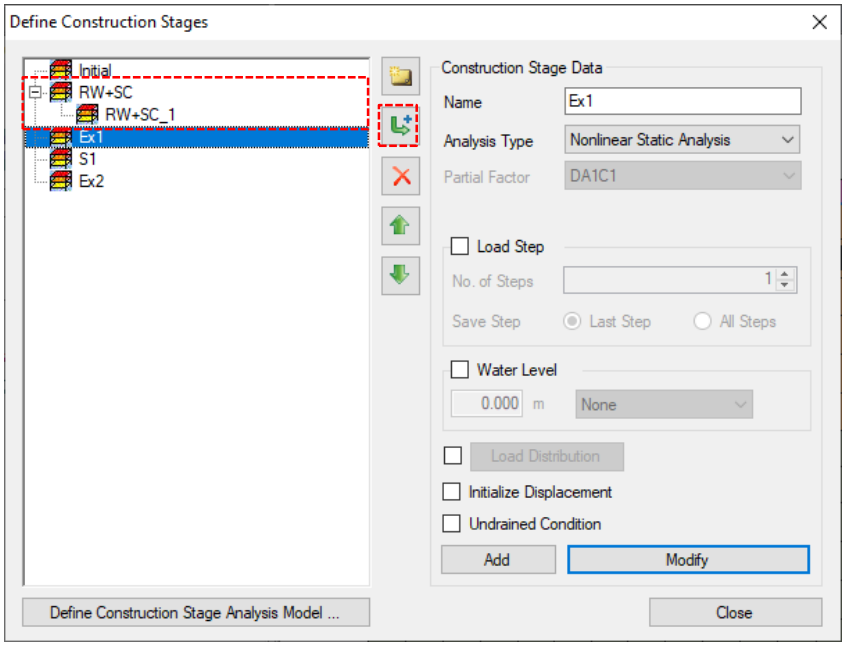
From **Slope Module**,

SRM & LEM Analysis can be applied Partial Factor

1. [Slope & Ground] Partial Factor

- Considering the partial factor from Euro Code (Refer to EN1997-1 Annex A)
- Applying to FEM analysis from Ground Module and LEM & SRM analysis from Slope Module.

•*Analysis I Design* > ***Construction Stage*** > ***Construction Stage*** 



- ***Substage***

It is function for creating substage to apply another partial factor from same stage

Note:

Substage can be made one stage only

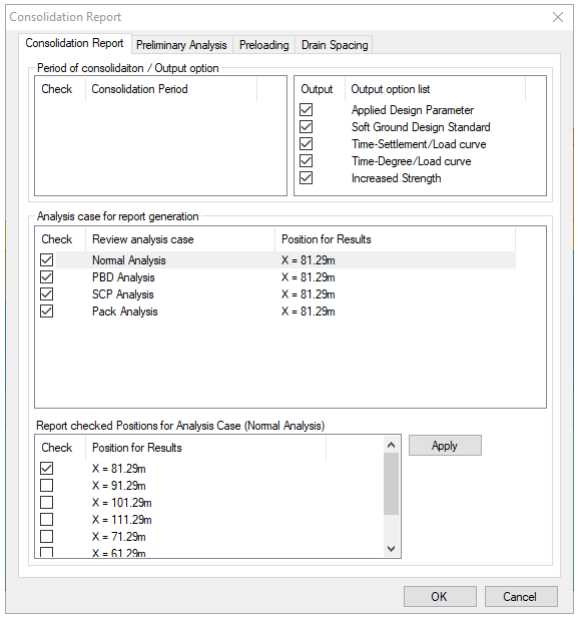
2. [SoftGround] Generating the report from 1D consolidation analysis

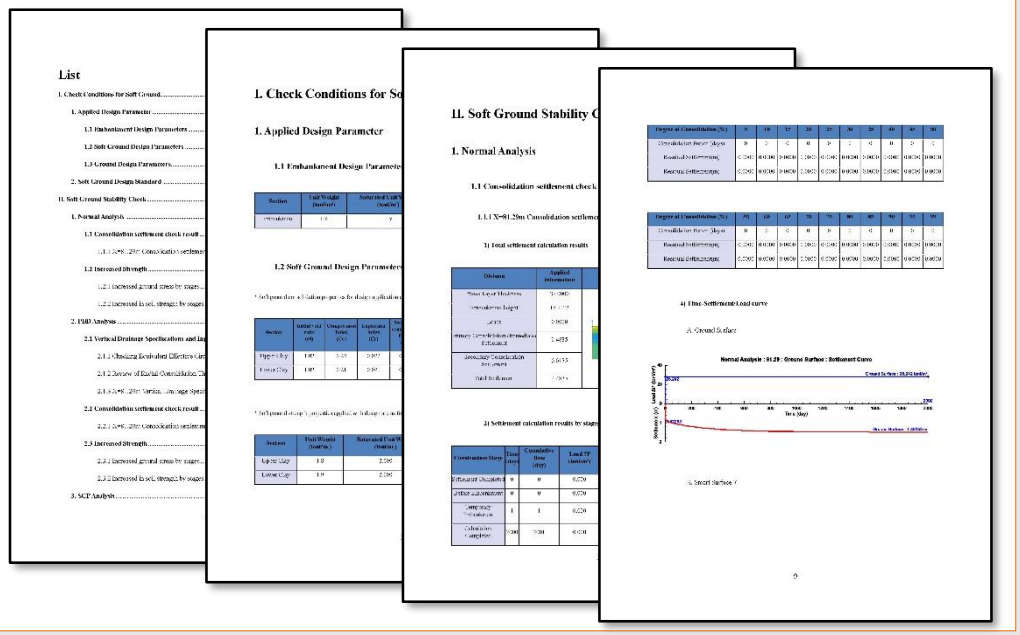
- Previously, report generation function from 1D consolidation analysis was performing to Parametric Analysis (Preliminary Analysis / Drain Spacing / Preloading) only.
- It has updated to generate the report from construction stage analysis and single analysis case (defined from analysis case) as well.

• ***Analysis I Design > Run > Report***

▪ ***Generate the report***

Need to define the **"review analysis case"** and **"position for results"** from **[1D Consolidation > Report > Consolidation Report]** after performing the analysis to generate the report.

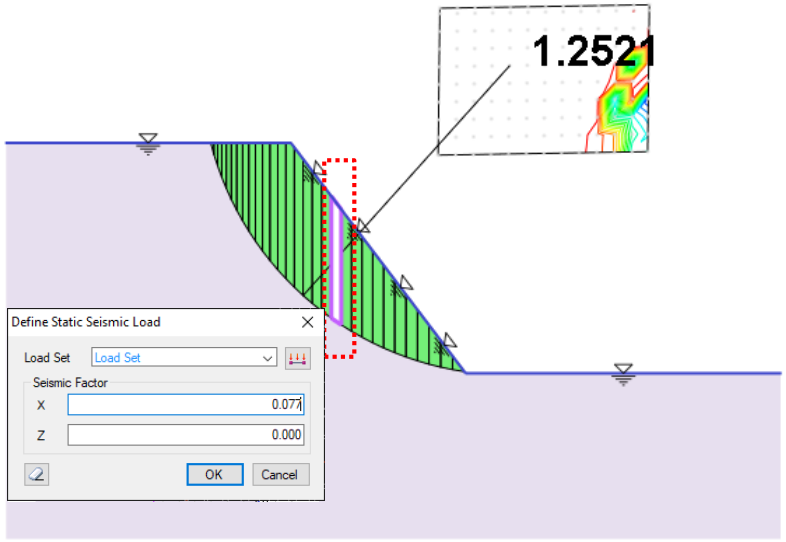




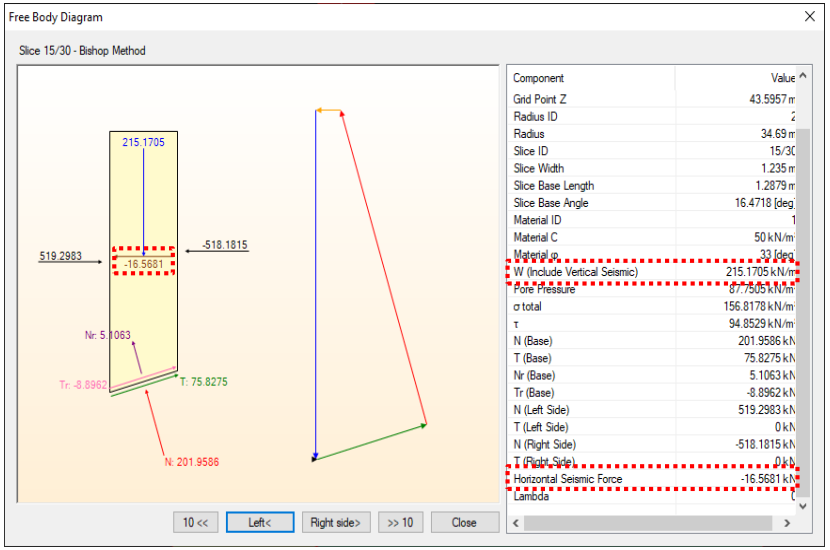
3. [Slope] Display the horizontal sesmic force in free body diagram from Limit Eequilibrium Method (LEM)

- Display the horizontal seismic force (direction, value) in the free body diagram from Limit Equilibrium Method (LEM)
  - Vertical capacity: W -> W(Include Vertical Seismic)
  - Horizontal capacity: Horizontal Seismic Force

- *Result Tree* > ***Result*** > *Arc Failure Surface*



[Display on Design Report]

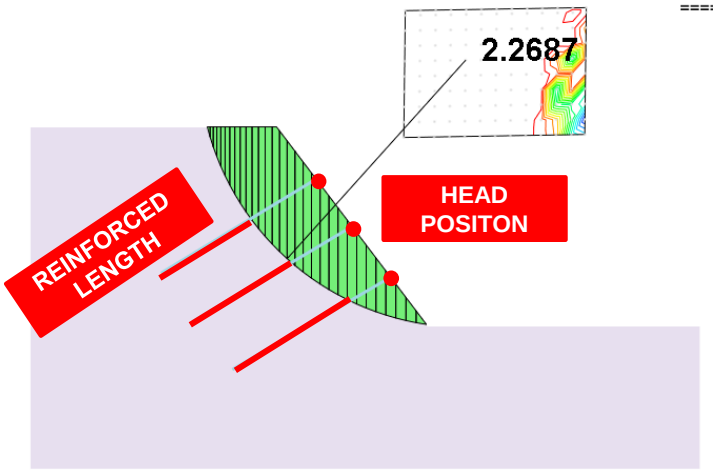


[Display on safety result]

4. [Slope] Display the reinforced forces from Limit Equilibrium Method (LEM)

- Display the reinforced force of the reinforcement from Limit Equilibrium Method (LEM)
- The axial resist mechanism will be covered by pull out and tensile strength, will be used smaller value.

•*Results* > ***Print*** > *Result File*



[Reinforcement]

REINFORCE TYPE	HEAD POSITION X-COORD	HEAD POSITION Z-COORD	REINFORCED LENGTH	REINFORCED FORCE NORMAL	REINFORCED FORCE SHEAR
NAIL	0,7826	21,7667	6,8844	1,500000E+02	0,000000E+00
NAIL	3,1404	18,6629	7,5119	1,500000E+02	0,000000E+00
NAIL	5,6683	15,3355	8,9186	1,500000E+02	0,000000E+00

[Display Reinforced Force]

REINFORCED TYPE (Nail/Anchor/Strp/Strut)

HEAD POSITON : Installation position of reinforcement (x, z) (m)

REINFORCED LENGTH (m)

REINFORCED FORCE - Normal : Axial Force (kN)

- SHEAR : Shear Force (kN)

Ex) If, Tensile force of Nail : 150kN, Equivalent radius : 0.05m, qs=200kN/m^2 and Lext=6.8844m

$RCS = qs \times \pi \times 2R$ $P_{Resist} = \int_0^{l_{ext}} (l_{ext} \times RCS) dl$ = 432.56 kN

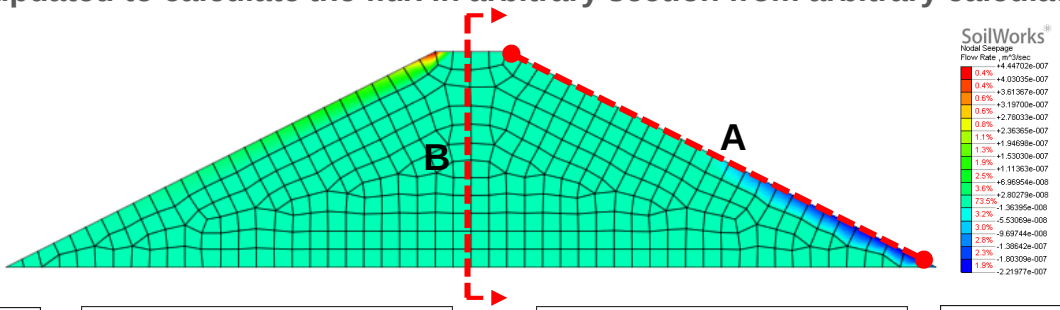
$R_{Nail\_axial} = \min(P_{Resist}, T_{Yield})$ = 150kN

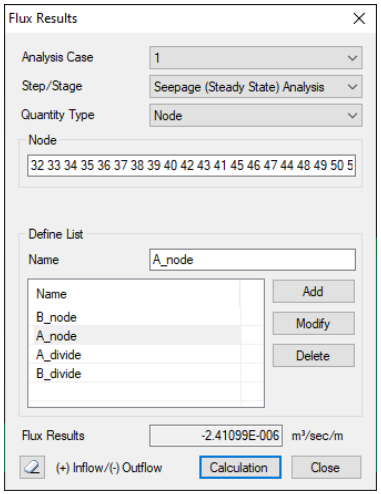
5. [Seepage] Multi flux result function

- It is possible to calculate the flux of arbitrary section which is passing the elements from a post window.

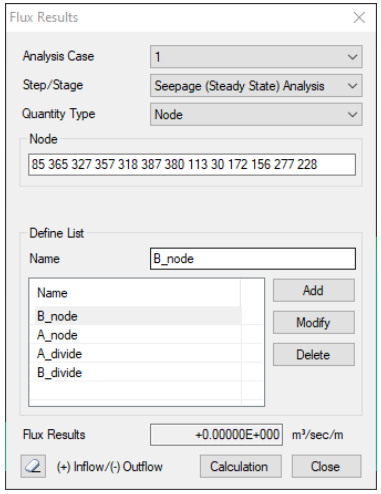
•*Result* > ***Seepage Results*** > *Flux Results*

Previously, it was calculated 0 when the flux and inflow are same.
This function has updated to calculate the flux in arbitrary section from arbitrary calculation type.

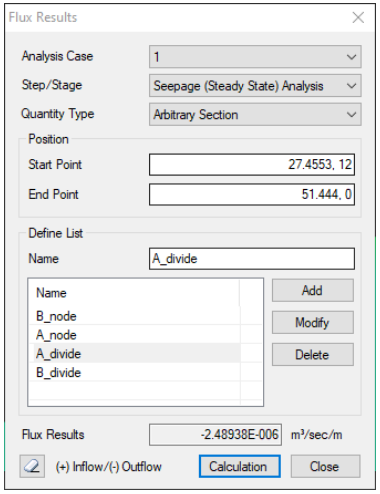




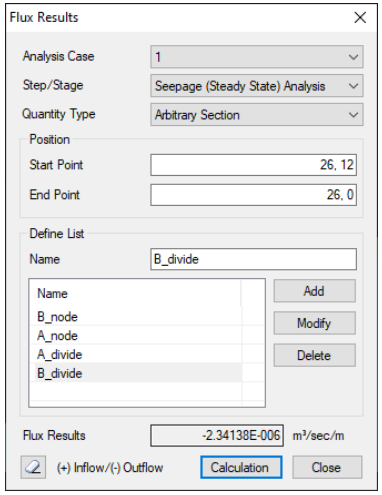
[Section A-Node]



[Section B-Node]



[Section A-Arbitrary Section]

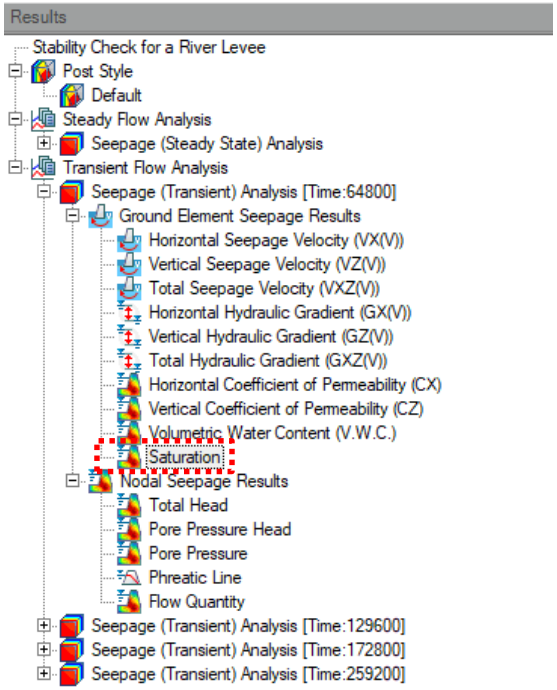


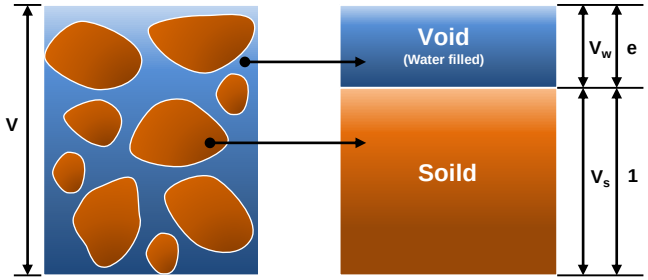
[Section B-Arbitrary Section]

6. [Seepage] Saturation result function

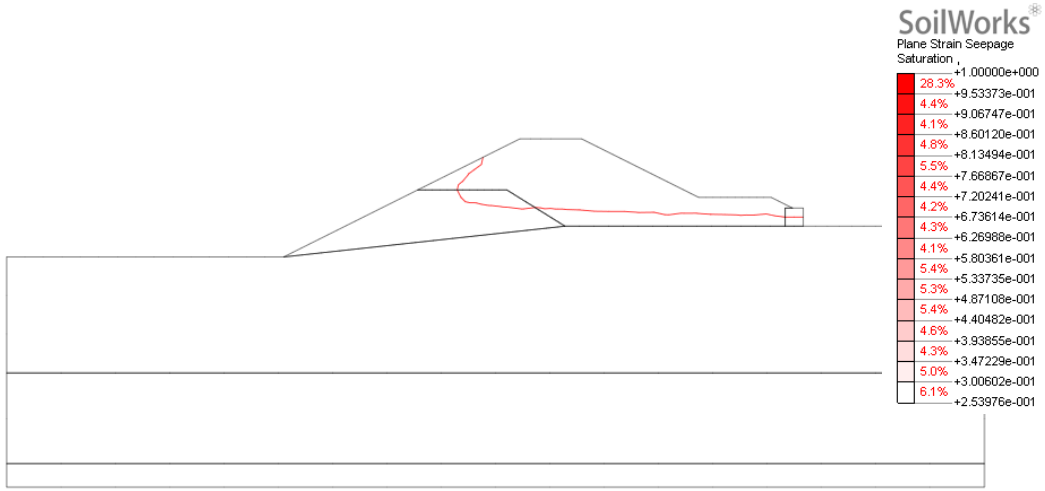
- It has updated to analyze the saturation in the ground element seepage results from the post.

•*Result* > ***Ground Element Seepage Results*** *> Saturation*





$$Saturation(S) = \frac{V_w}{V_a + V_w}$$

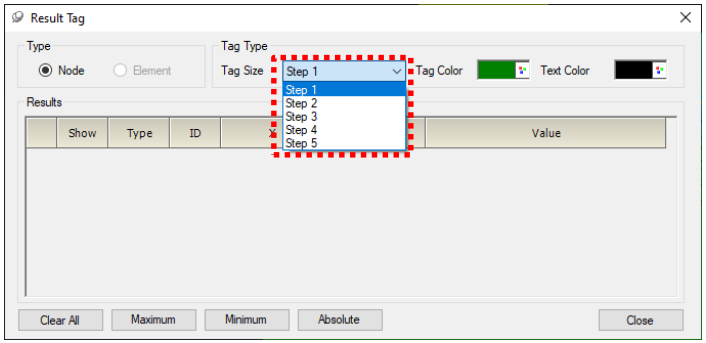


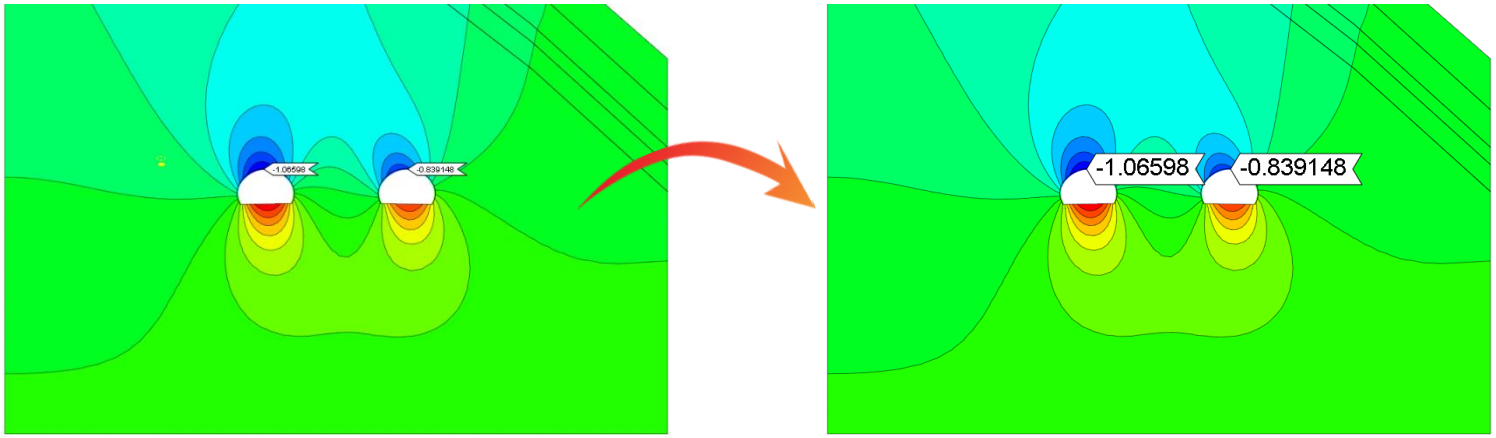
[Saturation result of seepage analysis for levee]

7. [Common] Size control function for Result Tag

- It has updated to control the result tag from Tunnel/Slope/Seepage/Softground/Dynamic modules, FEM Analysis (Step 1 ~ Step 5)

- ***Results > Detailed Results > Result Tag***





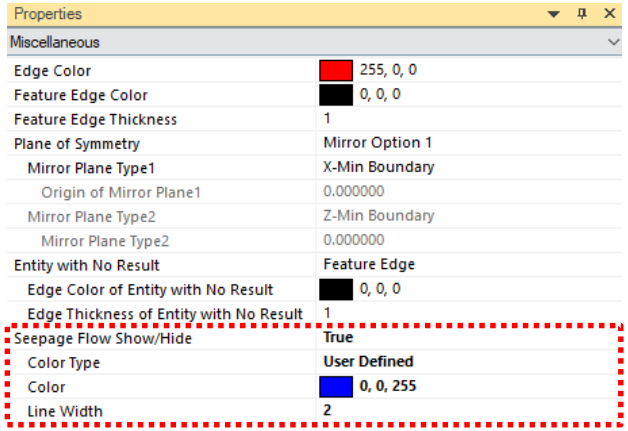
Tag Size (Step 1) Tag Size (Step 5)

[Control the Result Tag Size]

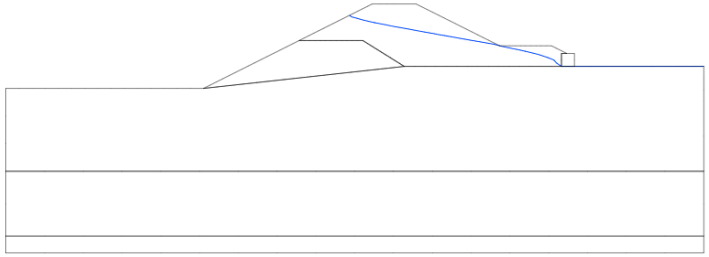
8. [Seepage] Display Seepage flow on the Total Head result

• Overlay the result of seepage flow line with other results from the seepage analysis.

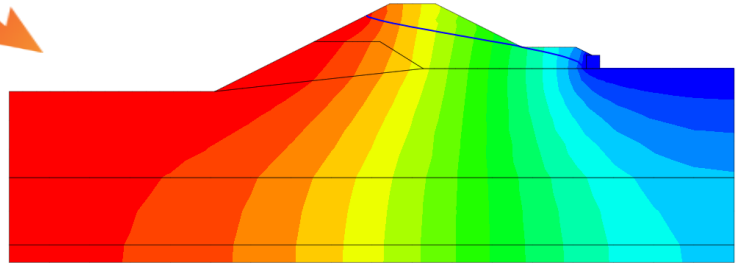
•Properties > Miscellaneous > Seepage Flow Show/Hide



Previous version : Seepage flow only



2019(v1.1) : Seepage flow line with total head



[Overlay the water line with others]

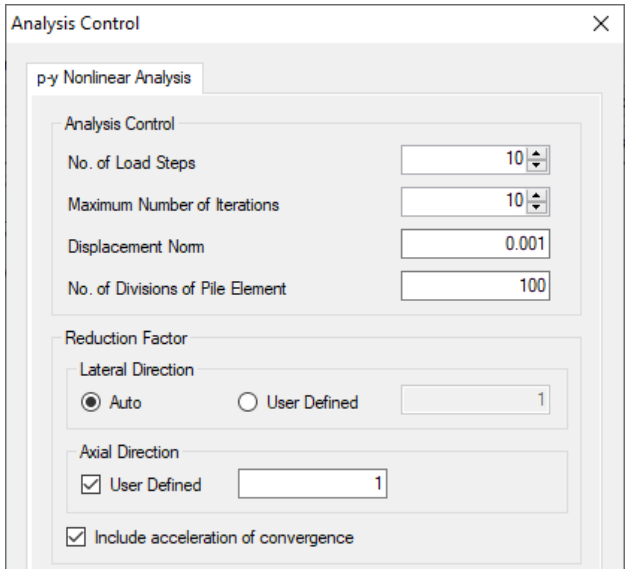
▪ ***Seepage Flow Show/Hide***

- Color Type : Select a color type from “contour” or “User Define”.
- Color : In case of ‘Color Type > User Define’, Select an line color for seepage flow.
- Line Width : Assign the width of Seepage Flow line.

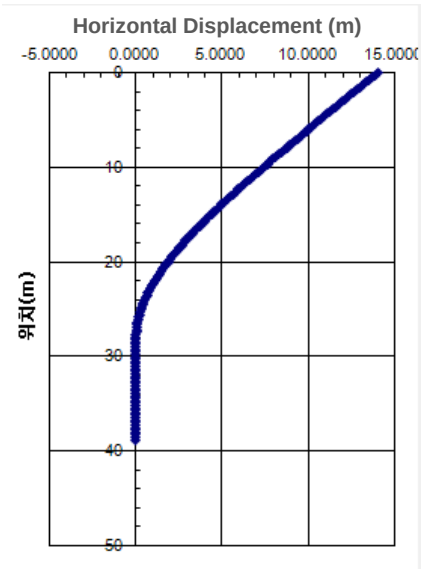
1. [Foundation] Including an Acceleration of Convergence

- To apply acceleration algorithm to P-y analysis to get the result more quickly from iterative method.
- If, there is divergence with P-y analysis. It can be got higher convergence with activation of this option.

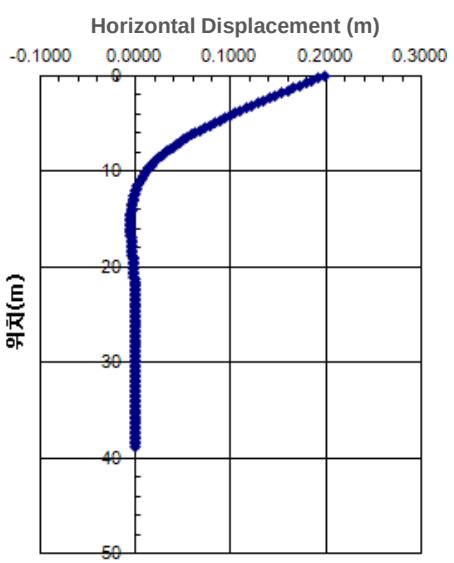
•*Foundation* > ***Analysis and Report Control> Define Analysis Case*** *> Analysis Control Data*



[Foundation – Acceleration]



Non Convergence



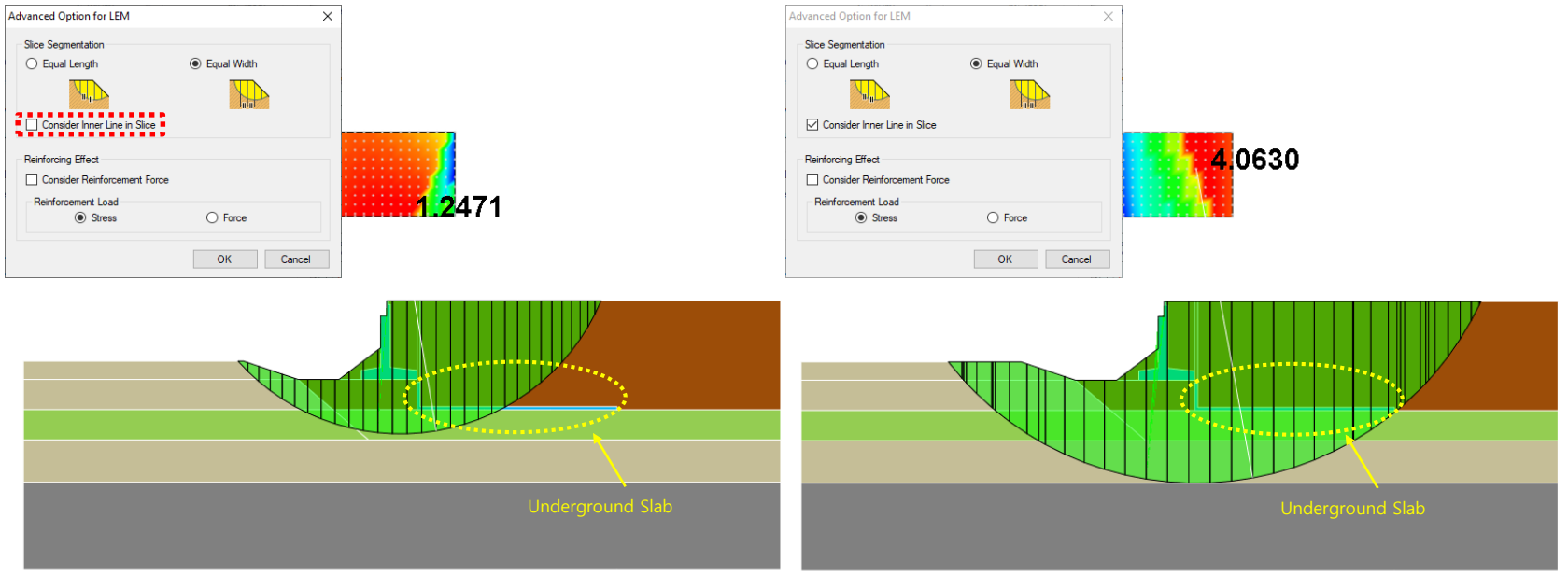
Convergence

[Result of P-y Analysis]

2. [Slope] Updated slice segmentation

- In case of underground structure, It has updated to assume the considering inner line in slice from slice segmentation in the Limit Equilibrium Method (LEM) analysis to prevent lateral flow of installation structure.

- *Slope* > ***Analysis and Report Control > Analysis Case*** *> Analysis Control*



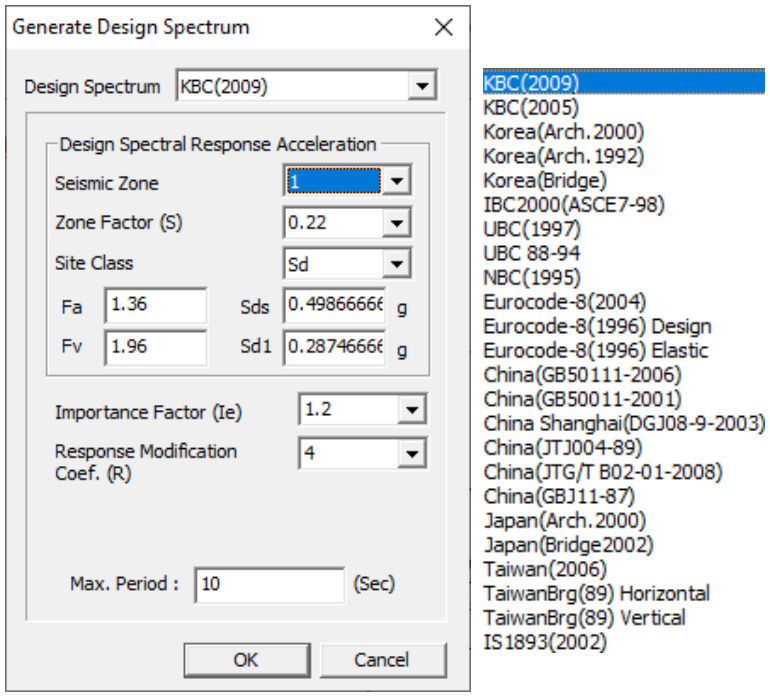
[Consider Inner Line in Slice] [Non-consider Inner Line in Slice]

3. [Dynamic] Generation of artificial earthquake

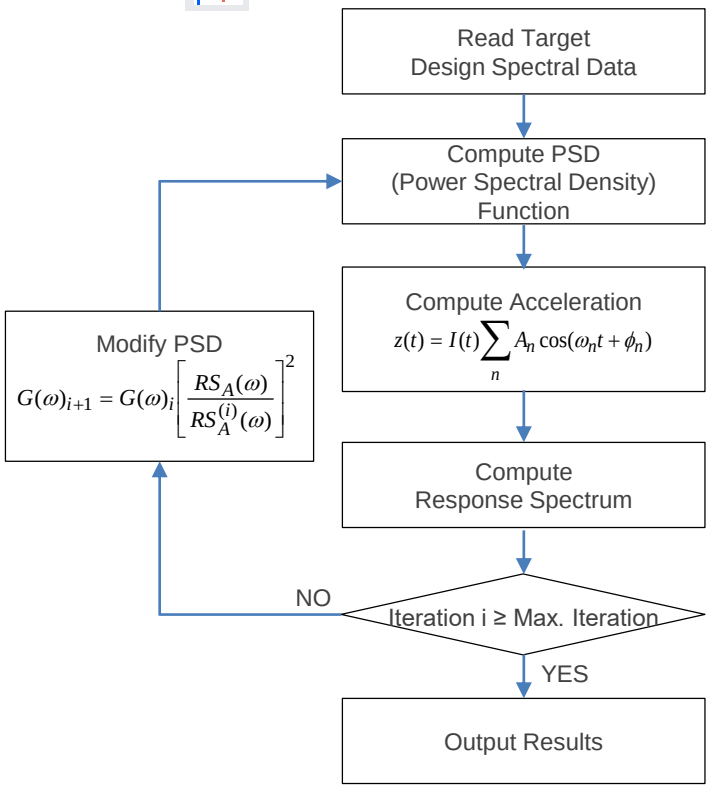
MODS

- Acceleration data is updated by the spectrum database in the SoilWorks.
- The artificial earthquake will be generated difference every time due to the artificial earthquake is using random function so that using the seismic wave which is similar as response spectrum is recommended

•*Dynamic* > ***Tools > Tools*** *> Artificial Earthquake Generator*



[Design Spectrum in Dynamic Module]



[Flow chart of aritificial earthquake]