

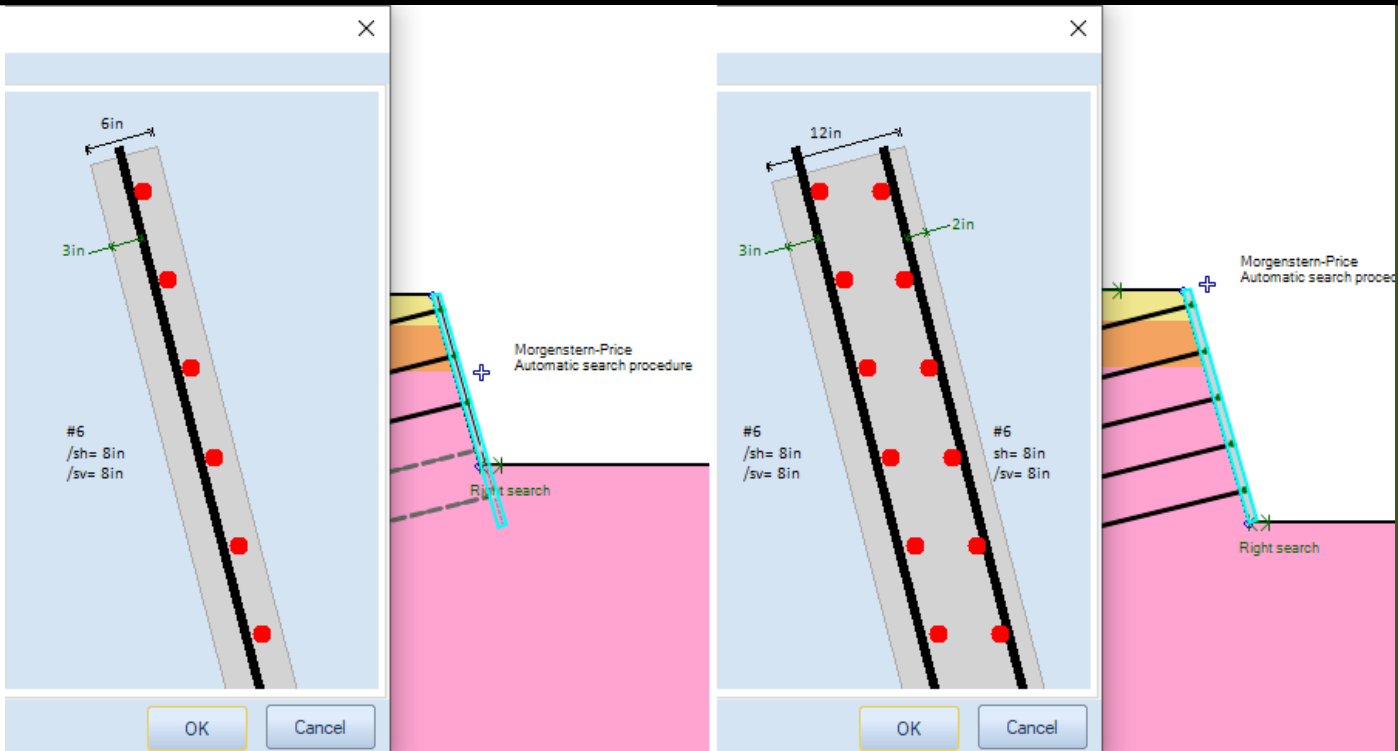


DEEP EXCAVATION

GEOTECHNICAL SOFTWARE & ENGINEERING

Soil Nail Walls: Facing Options and Seismic Effects

Temporary and Permanent Shotcrete Facings – Seismic Pressures Options



SnailPlus
Soil Nail Wall Design
Software

Document Version: 1.0.1.6

Released: June 25, 2020

www.deepexcavation.com

www.deepex.com

Contact Information:

E: sales@deepexcavation.com

T: 1-206-279-3300



INTRODUCTION: SNAILPLUS – SOIL NAIL WALL DESIGN SOFTWARE

SnailPlus is a powerful software program for the slope stability analysis, and the design and evaluation of soil nail wall systems.

SnailPlus can be used for the calculation of the global stability safety factor, and it can also design all soil nail wall structural members (soil nails, shotcrete facing, head plates)

Slope Stability Methods: Bishop, Morgenstern-Price (General Limit Equilibrium), Spencer.

Shotcrete Facing: Temporary, Permanent, Two-Stage (Temporary and Permanent in different construction stages).

Design Conditions: Temporary Structure, Permanent Structure, Extreme Events (Seismic and High Water).

Seismic Pressures Methods: Semirigid, Mononobe-Okabe, Wood, User-Defined.

Water Pressures Methods: Hydrostatic, Simplified Flow, Full 2D Flownet Analysis.

Soil Properties: User-Defined, Estimation Tools (Test Data), SPT and CPT logs.

Structural Design: ACI, FHWA (ASD), FHWA (LRFD).

Analysis - Combinations: Allowable Design (ASD), LRFD GEC-7, EUROCODE 7 (ULS).

Printed Reports: Reports Exported in PDF and Word.

Model Creation: Graphical (Interactive Interface), Model Wizard.

SnailPlus – Software Capabilities and Examples

SnailPlus is a robust software for the design of soil nail wall systems. It can locate the most critical slope surfaces, the slope stability FS and it can fully design all structural items (soil nails, head plates, shotcrete facings).

[Click here to learn more: SnailPlus: Features and Examples](#)

Our Software Programs

The mission of our company is the creation and distribution of high quality software programs for engineering professionals.

Deep Excavation offers a variety of programs, dedicated to the design and analysis of deep excavation and pile foundation projects, the monitoring of inclinometer proceedings, the export of virtual reality deep excavation models and more.

[Click here to learn more: Our Software Products](#)

[CLICK HERE TO BOOK A FREE ONLINE PRESENTATION](#)
E: training@deepexcavation.com

A. TEMPORARY / PERMANENT SHOTCRETE FACINGS (MODEL WIZARD)

In the SnailPlus Model Wizard, we can select the option to use “Two-Stage Facing). The software will automatically use the temporary facing in all stages and only at the last, it will apply the permanent. In the Wizard, we can define the Temporary and the Permanent Facing thickness and reinforcement layout (Temporary – Single Rebars row , Permanent – Two Rebar rows).

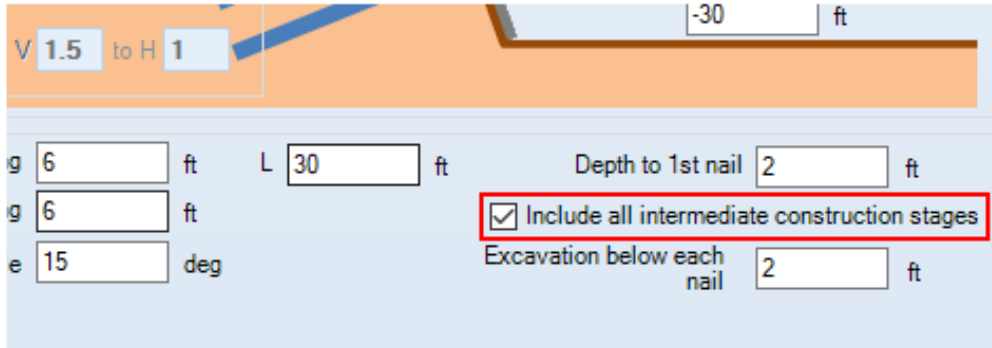


Figure: Model Wizard – Option to Include All Construction Stages

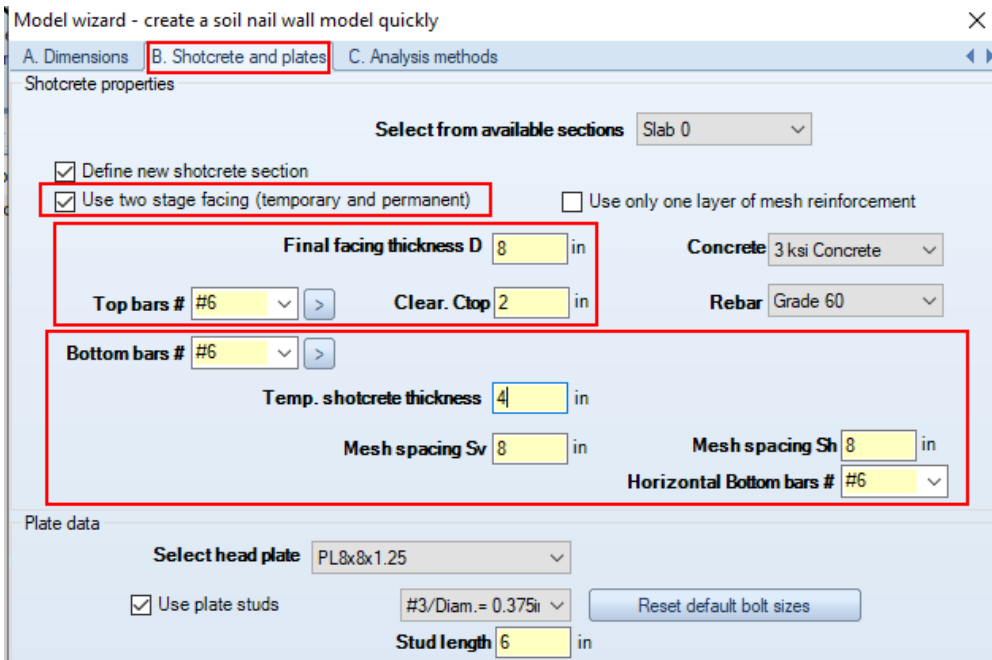


Figure: Model Wizard – Two-Stage (Temporary and Permanent) Facing Options

SnailPlus – Software Capabilities and Examples

SnailPlus is a robust software for the design of soil nail wall systems. It can locate the most critical slope surfaces, the slope stability FS and it can fully design all structural items (soil nails, head plates, shotcrete facings).

[Click here to learn more: SnailPlus: Features and Examples](#)

Our Software Programs

The mission of our company is the creation and distribution of high quality software programs for engineering professionals.

Deep Excavation offers a variety of programs, dedicated to the design and analysis of deep excavation and pile foundation projects, the monitoring of inclinometer proceedings, the export of virtual reality deep excavation models and more.

[Click here to learn more: Our Software Products](#)

[CLICK HERE TO BOOK A FREE ONLINE PRESENTATION](#)
E: training@deepexcavation.com

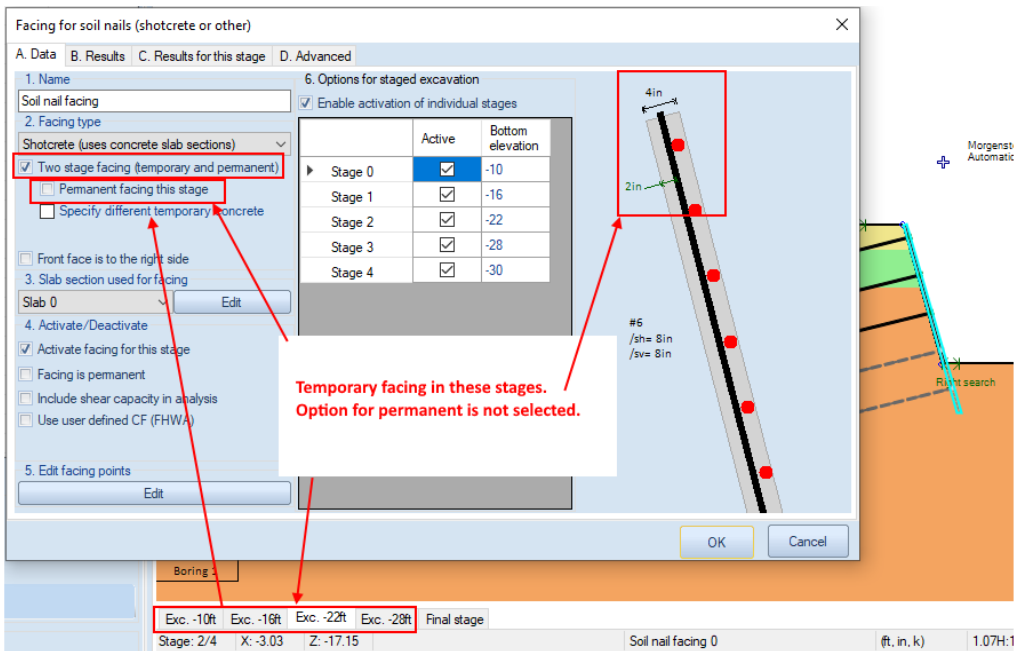


Figure: Generated Model – Temporary Facing in First Stages – Option to use Permanent Facing in any selected Stage.

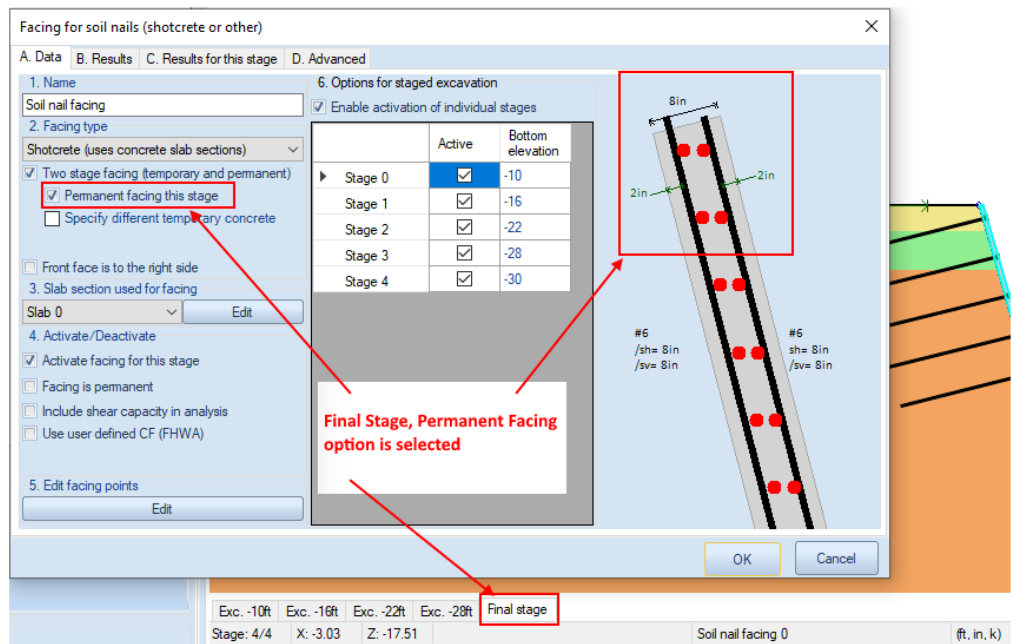


Figure: Generated Model – Permanent Facing in Final Stage

SnailPlus – Software Capabilities and Examples

SnailPlus is a robust software for the design of soil nail wall systems. It can locate the most critical slope surfaces, the slope stability FS and it can fully design all structural items (soil nails, head plates, shotcrete facings).

[Click here to learn more: SnailPlus: Features and Examples](#)

Our Software Programs

The mission of our company is the creation and distribution of high quality software programs for engineering professionals.

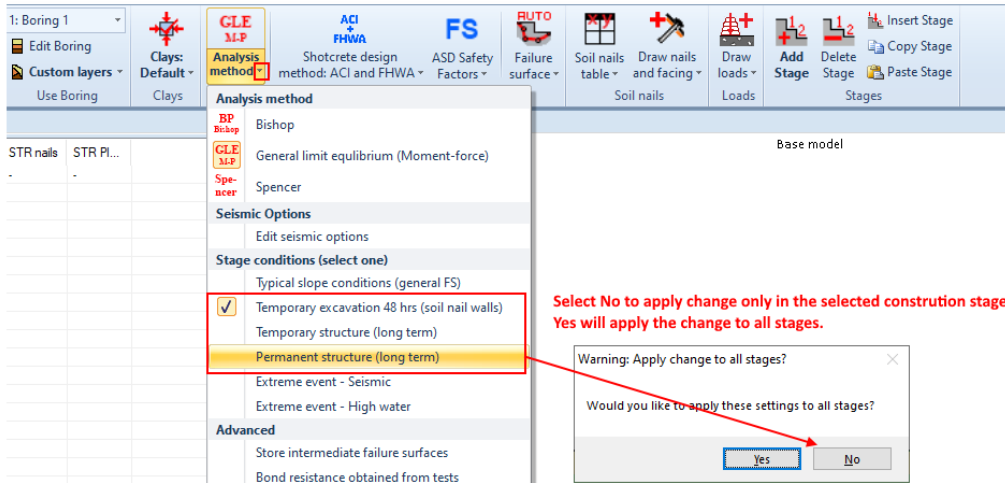
Deep Excavation offers a variety of programs, dedicated to the design and analysis of deep excavation and pile foundation projects, the monitoring of inclinometer proceedings, the export of virtual reality deep excavation models and more.

[Click here to learn more: Our Software Products](#)

[CLICK HERE TO BOOK A FREE ONLINE PRESENTATION](#)
E: training@deepexcavation.com

B. TEMPORARY AND PERMANENT DESIGN CONDITIONS

In SnailPlus, we can define the design conditions on each stage independently from the Analysis Methods tab of the software. Our selection affects the safety factors in the program.



SnailPlus – Software Capabilities and Examples

SnailPlus is a robust software for the design of soil nail wall systems. It can locate the most critical slope surfaces, the slope stability FS and it can fully design all structural items (soil nails, head plates, shotcrete facings).

[Click here to learn more: SnailPlus: Features and Examples](#)

Our Software Programs

The mission of our company is the creation and distribution of high quality software programs for engineering professionals.

Deep Excavation offers a variety of programs, dedicated to the design and analysis of deep excavation and pile foundation projects, the monitoring of inclinometer proceedings, the export of virtual reality deep excavation models and more.

[Click here to learn more: Our Software Products](#)

[CLICK HERE TO BOOK A FREE ONLINE PRESENTATION](#)
E: training@deepexcavation.com

Figure: SnailPlus – Option to Change to Permanent Conditions in a Single Stage

Stage conditions	Short term 48hrs	Stage conditions	Permanent structure long term
Min. required FS	1.3	Min. required FS	1.5
Method	Morgenstern-Price	Method	Morgenstern-Price
Nail methods	Available shear	Nail methods	Available shear
Surface search	Automatic	Surface search	Automatic
Left limits	-52.038ft to -13.538ft	Left limits	-64.038ft to -15.038ft
Right limits	-2.144ft to 0.356ft	Right limits	-0.536ft to 1.964ft
Number of points	5	Number of points	5
Min. slice width	3ft	Min. slice width	3ft
Tolerance	1%	Tolerance	1%
Force Tolerance	10%	Force Tolerance	10%
Initial FSO	1	Initial FSO	1
MP interslice factor m	1	MP interslice factor m	1
MP interslice factor v	1	MP interslice factor v	1
MP initial Lamda.0	0	MP initial Lamda.0	0
Soil nail analysis	Same settings on all nails	Soil nail analysis	Same settings on all nails
Nail stability	External-Internal	Nail stability	External-Internal
Nail shear	Ignored	Nail shear	Ignored
FS on nail STR strength	1.8	FS on nail STR strength	1.8
FS on nail pullout	2	FS on nail pullout	2
FS on facing bending	1.35	FS on facing bending	1.5
FS on facing punching	1.35	FS on facing punching	1.5
FS on bolts	1.5	FS on bolts	1.7
FS on bearing	2.5	FS on bearing	3

Figure: SnailPlus – Required Safety Factors for Temporary and Permanent Conditions

C. SEISMIC OPTIONS AND EXTREME EVENT CONDITIONS IN SNAILPLUS

In SnailPlus, we can access the Seismic Options Dialog from the Analysis Method drop down. There, we can define the horizontal and vertical design accelerations (Ax and Az), and we can select the method for the calculation of the seismic pressures (Semirigid, Mononobe-Okabe for frictional soils, user-defined pressures). The seismic pressures will be calculated and taken into consideration on the model only if the Extreme Event – Seismic Conditions option is selected in the Analysis Method drop down.

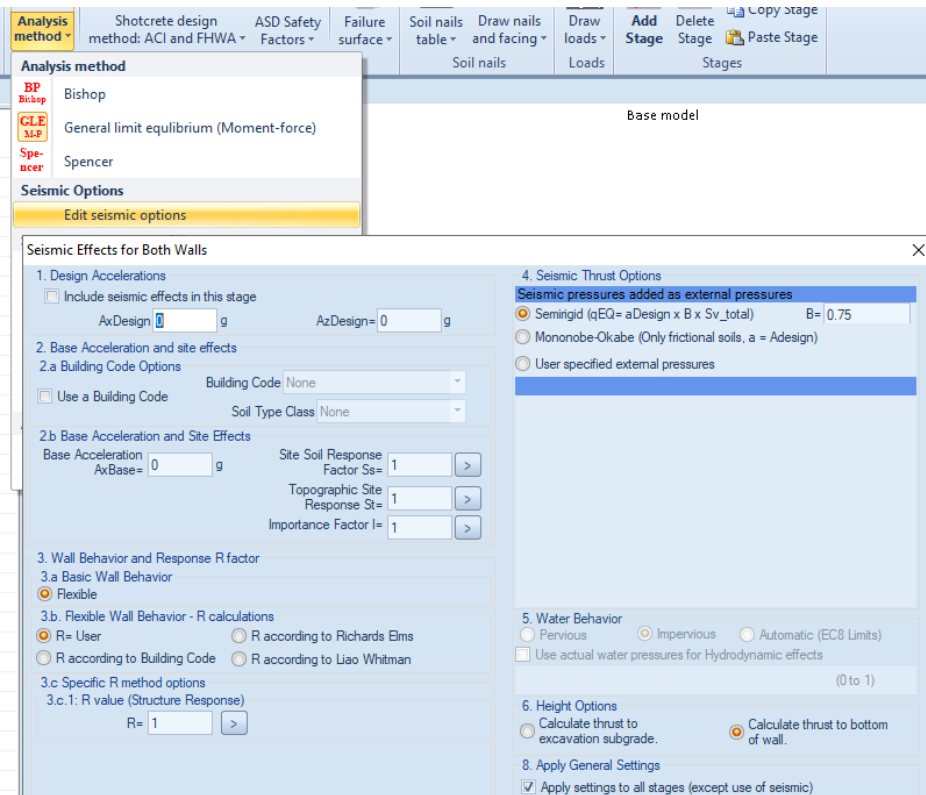


Figure: Model Wizard – Model Dimensions and Soil Nails Layout

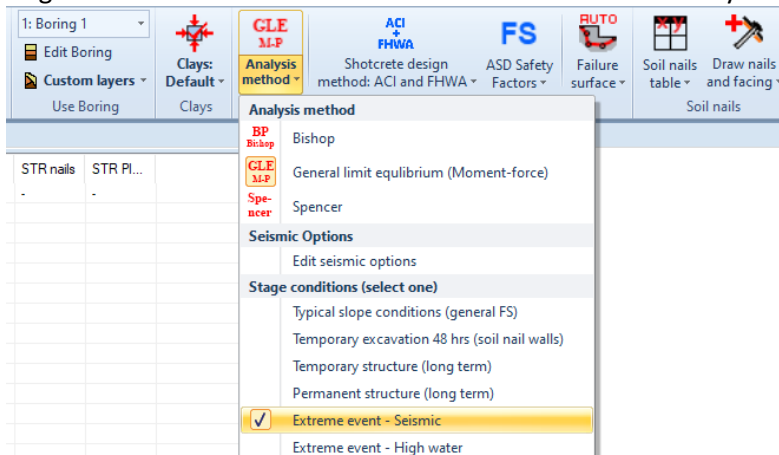


Figure: Extreme Event – Seismic Option in SnailPlus

SnailPlus – Software Capabilities and Examples

SnailPlus is a robust software for the design of soil nail wall systems. It can locate the most critical slope surfaces, the slope stability FS and it can fully design all structural items (soil nails, head plates, shotcrete facings).

[Click here to learn more: SnailPlus: Features and Examples](#)

Our Software Programs

The mission of our company is the creation and distribution of high quality software programs for engineering professionals. Deep Excavation offers a variety of programs, dedicated to the design and analysis of deep excavation and pile foundation projects, the monitoring of inclinometer proceedings, the export of virtual reality deep excavation models and more.

[Click here to learn more: Our Software Products](#)

CLICK HERE TO BOOK A FREE ONLINE PRESENTATION
 E: training@deepexcavation.com

D. RESULTS IN SNAILPLUS – SHOTCRETE FACINGS AND SEISMIC PRESSURES

Facing for soil nails (shotcrete or other)													
A. Data		B. Results		C. Results for this stage				D. Advanced					
	Lh (ft)	Lv (ft)	Mxx.Nail(B) (k-ft/ft)	Mxx.Span(B) (k-ft/ft)	Myy.Nail(B) (k-ft/ft)	Myy.Span(B) (k-ft/ft)	Mcap.Nail. (k-ft/ft)	Mcap.Spar (k-ft/ft)	Mcap.Nail. (k-ft/ft)	Mcap.Spar (k-ft/ft)	Vxx (k-ft/ft)	Vyy (k-ft/ft)	Vcap (k-ft/ft)
▶ 0	6	10	-0.249	0.185	-0.764	0.567	5.712	5.712	5.712	5.712	0.511	0.292	3.944
1	6	8	-0.315	0.234	-0.595	0.442	5.712	5.712	5.712	5.712	0.507	0.369	3.944
2	6	8	-0.462	0.344	-0.708	0.526	5.712	5.712	5.712	5.712	0.604	0.542	3.944
3	6	8	-0.605	0.449	-0.869	0.646	5.712	5.712	5.712	5.712	0.74	0.708	3.944
4	6	6	-0.971	0.722	-0.971	0.722	20.085	22.611	20.012	20.012	0.771	0.771	11.831
5	6	6	-1.209	0.898	-1.209	0.898	20.085	22.611	20.012	20.012	1.177	1.177	11.831

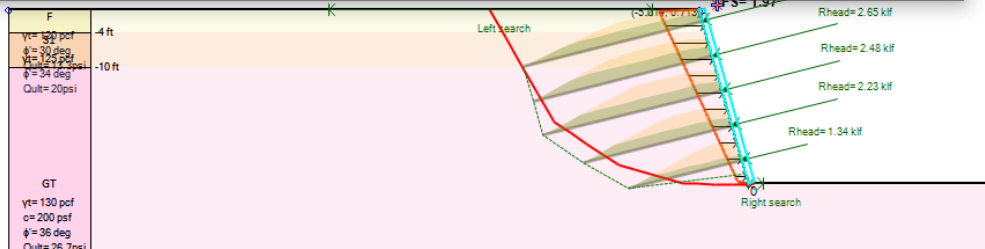


Figure: Facing Results for All Stages (Stage 0 to 3: Temporary Facing, Stages 4 and 5: Permanent Facing)

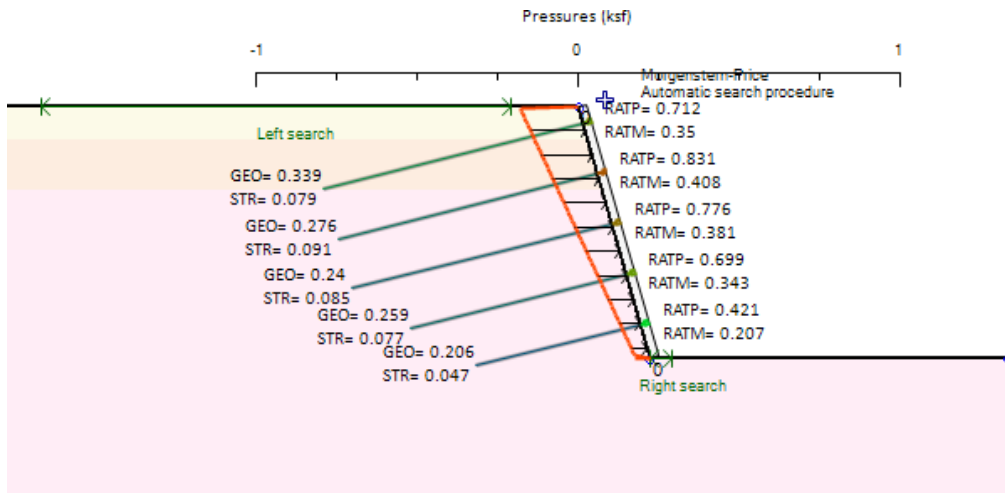


Figure: Extreme Event – Seismic Pressures, Soil Nails and Head Plates Check Ratios

SnailPlus – Software Capabilities and Examples

SnailPlus is a robust software for the design of soil nail wall systems. It can locate the most critical slope surfaces, the slope stability FS and it can fully design all structural items (soil nails, head plates, shotcrete facings).

[Click here to learn more: SnailPlus: Features and Examples](#)

Our Software Programs

The mission of our company is the creation and distribution of high quality software programs for engineering professionals. Deep Excavation offers a variety of programs, dedicated to the design and analysis of deep excavation and pile foundation projects, the monitoring of inclinometer proceedings, the export of virtual reality deep excavation models and more.

[Click here to learn more: Our Software Products](#)

[CLICK HERE TO BOOK A FREE ONLINE PRESENTATION](#)
 E: training@deepexcavation.com

THANK YOU

DESIGN AND OPTIMIZE ANY DEEP EXCAVATION SYSTEM IN MINUTES AND GAIN A COMPETITIVE EDGE!

Learn tips and tricks of deep excavation design

CLICK HERE TO BOOK A FREE ONLINE
PRESENTATION
E: training@deepexcavation.com

Learn from examples, videos and case studies

CLICK HERE FOR EXAMPLES, VIDEOS
AND ARTICLES

Prices and Licensing Questions: sales@deepexcavation.com

Technical Support support@deepexcavation.com

TRUSTED BY

