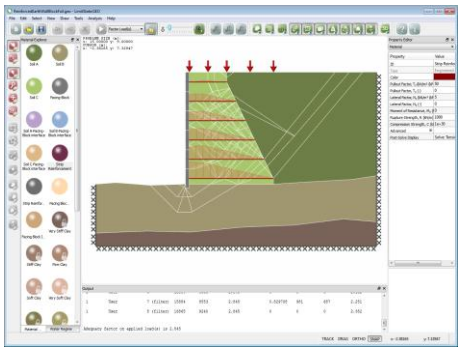
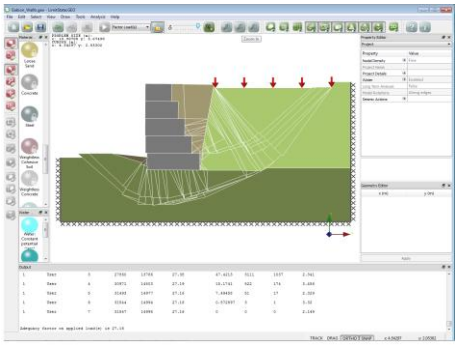
limitstate geo

Version 3.0

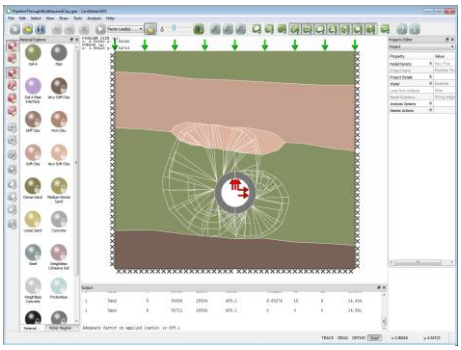
the complete stability analysis solution



Tensile force and bending moment distributions can be automatically shown or queried for soil reinforcing elements



Failure mechanism of a gabion wall, indicating sliding between gabions and a global slip surface



Modelling a pipeline buried in a multi-layered clay soil

limitstate

analysis & design software for engineers

Powerful geotechnical analysis tool with numerous applications

LimitState:GEO uses rigorous optimization techniques to identify the critical ultimate limit state failure mechanism for a wide range of geotechnical engineering problems.

One product, many applications

LimitState:GEO utilizes modern computing technology to identify in seconds failure mechanisms that might take a lifetime to identify manually, and that simply cannot be identified using conventional ultimate limit state analysis software.

The powerful and efficient 'Discontinuity Layout Optimization' analysis procedure (DLO) is used to provide an automatic means of identifying very accurate limit analysis solutions.

LimitState:GEO can handle problems of any geometry and with any loading conditions, so that the engineer no longer needs to resort to application specific hand calculations, or the plethora of spreadsheets and software applications that attempt to automate these.

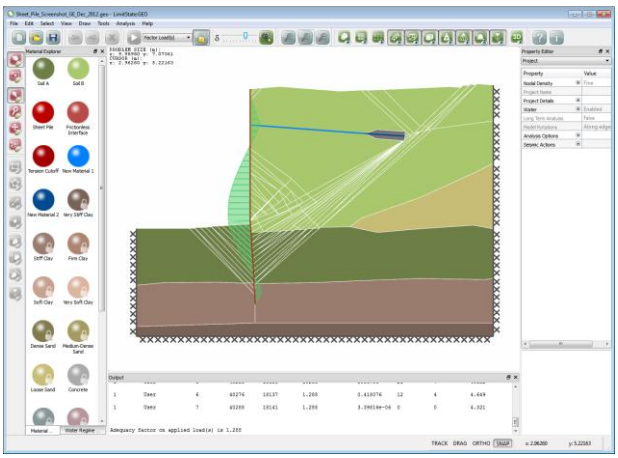
Unlike other generally applicable analysis methods, such as non-linear finite element analysis, problems can be set up quickly and solutions can easily be verified manually using the free-body diagrams provided in the report.

Easy to use

The LimitState:GEO user-interface is designed to be intuitive, modern and fully interactive, allowing even novice users to build a model from scratch in a matter of minutes. Predefined wizards are also provided to enable many commonly encountered geotechnical problems to be setup and analysed even more rapidly. It is easy to then change any aspect of the problem geometry, loading, materials or partial factors.

Understand more

LimitState:GEO users can quickly explore 'what if' scenarios, each time viewing the corresponding failure mechanism and building up an increasingly clear understanding of both the likely mode of response and the key parameters influencing overall safety.



Failure of an anchored sheet pile wall, modelled using LimitState:GEO 3.0, showing critical failure mechanism and sheet pile bending moment diagram

Eurocode 7 compatible

The adoption of Eurocode 7, which became mandatory in Europe in 2010, represents a significant change in the way geotechnical design is performed.

By utilizing partial factors that are independent of problem type, Eurocode 7 provides the engineer with a robust and flexible limit state design methodology.

LimitState:GEO is fully compatible with the Eurocode 7 philosophy and has:

- Built in Eurocode 7 'problem-agnostic' partial factor sets
- Eurocode 7 style load descriptors (permanent, variable, accidental)
- Favourable and unfavourable load classifications
- The ability to check multiple Design Approaches / Combinations in a single analysis

Compatibility with the Eurocode 7 framework also enables LimitState:GEO to be readily used in conjunction with many other limit state design methodologies.

Add-in modules

A number of add-in modules are available which provide advanced functionality:

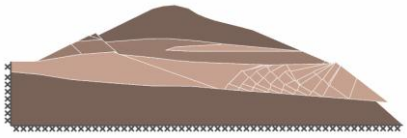
Extra-large problem capacity - a 64bit kernel version of LimitState:GEO for solving complex problems.

Command-line interface - for users conducting parametric studies or wishing to run a number of analyses on an unattended PC, the LimitState:GEO command-line interface add-in allows users to run the software from a command prompt or batch file.

Spatial variation of material properties - create a grid of varying undrained material strengths within material zones using data from a spreadsheet.

Key features

- Fully interactive modelling environment allows any geotechnical construction to be rapidly created and modified.
- Directly establish a factor of safety on material strength or loading.
- Identify critical failure mechanisms that other solution methods are unable to find.
- Analyse problems involving seismic forces (pseudo-static approach).
- A wide range of standard materials and the capability to define others, using Mohr-Coulomb, rigid, cutoff and engineered element material models.



Extrusion failure mechanism in a multi-layered clay embankment

- Model water globally using a conventional (flat or inclined) water table, or on a per-zone basis using a uniform potential / pressure or user-defined grid of pressures.
- Solve for multiple partial factor sets and drainage conditions in a single analysis using the built-in 'Scenario Manager'.
- Check model validity using the object explorers or pre-solve diagnostics tool, which provides error and warning messages to highlight areas where modifications need to be made.
- View post-solve diagrams of solid and element forces, stresses and bending moments.

State of the art technology

The powerful Discontinuity Layout Optimization procedure uses rigorous upper-bound limit analysis theory to automatically identify the critical layout of slip-lines in a failing soil mass. So with DLO there is no need for the user to 'pre-judge' the types of failure mechanism expected to be most critical.

Easy to verify solutions

The solution from a LimitState:GEO analysis is remarkably easy to verify. The software can output a free-body diagram and force equilibrium equation for each sliding block - providing a clear and simple means of checking solution validity.

The software has also been verified against a wide range of closed form solutions and other benchmarks, all of which can be viewed online. To find out more, visit:

www.limitstate.com/geo/verification

Helpful

LimitState:GEO has been designed with the engineer in mind at all stages:

Hyperlinks to the help file are incorporated throughout the software and provide assistance when building models, understanding theory and interpreting generated output.

Tailor the report output for specific audiences, with optional sections covering various aspects of the model, solution and critical failure mechanism.

Export the critical failure mechanism in a number of formats suitable for use in presentations and reports. Filetypes include AVI / GIF (animation), PNG / JPG (bitmap images) and EPS / ASY (vector drawings).

Fully supported

Whether you are in need of technical advice or assistance with your model, our support team are on hand to offer expert advice on all aspects of the software.

Try LimitState:GEO for yourself

Visit www.limitstate.com/download to obtain your copy of the latest version of LimitState:GEO then try it free for 30 days.

limitstate
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