

Opt⁺um^{G2}

GEOTECHNICAL ANALYSIS SOFTWARE

A COMPREHENSIVE FINITE ELEMENT PROGRAM FOR
GEOTECHNICAL STABILITY AND DEFORMATION ANALYSIS

- + Efficient and Robust Algorithms
- + Adaptive Mesh Refinement
- + Upper and Lower Bounds
- + Stochastic Analysis
- + Accurate Soil and Rock Models
- + Eurocode 7 Compatibility
- + Command line version
- + CAD Import and Export



COMPLETE GEOTECHNICAL DEFORMATION AND STABILITY ANALYSIS

OptumG2 is a comprehensive finite element program for geotechnical stability and deformation analysis in plane strain or axisymmetry.

Its modern graphical user interface ensures an intuitive and efficient workflow. The computational core builds on state-of-the-art numerical algorithms that lead to an unprecedented efficiency and robustness – independent of the complexity of the model.

WHAT MAKES OPTUMG2 DIFFERENT?

OptumG2 is a finite element program designed specifically for geotechnical applications. While it shares some features with conventional finite element programs it also delivers:

+ Robustness and efficiency

The computational core of OptumG2 builds on state-of-the-art numerical algorithms that mark a radical departure from traditional approaches. These algorithms lead to a level of robustness and efficiency unmatched by any existing programs for geotechnical finite element analysis. Failure to converge and similar “numerical problems” that continue to haunt conventional finite element programs are non-issues in OptumG2. As such, tedious and time consuming tweaking of algorithmic parameters is unnecessary and all attention can be devoted to what it is all about, namely the physics of a given problem.

+ Direct answers to direct questions

OptumG2 provides a range of analysis types designed specifically to provide direct answers to direct questions without having to go through lengthy and superfluous analyses. An example is Limit Analysis, which allows for a rapid assessment of the bearing capacity of geotechnical structures without having to go through a time consuming incremental elastoplastic analysis. On the other hand, if the full load-displacement curve is needed this can be computed

as well. The ability to provide the most direct answer to a given question makes OptumG2 ideal for design.

+ Upper and lower bounds

Conventional finite element programs provide approximate solutions that may be safe or unsafe, but there is no way of knowing by how much. Consequently, the process of gradually refining the mesh is seen as a standard part of any finite element analysis.

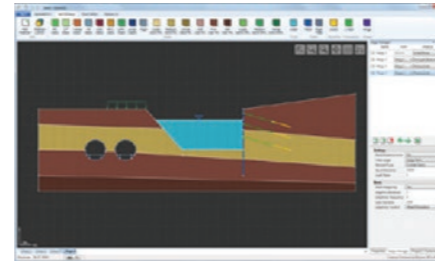
OptumG2 offers an alternative to this lengthy (and often inconclusive) process by enabling the computation of rigorous upper and lower bounds to quantities of interest. With such bounds available, an estimate of the exact solution and a measure of the worst-case error are immediately available, both of which may be improved by using more elements.

+ Automatic adaptive mesh refinement

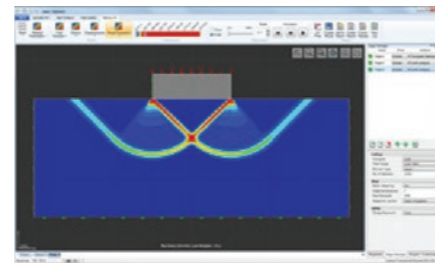
As a standard part of all analyses, it is possible to use automatic adaptive mesh refinement. Combined with ability to compute upper and lower bounds on quantities of interest, adaptive mesh refinement provides a powerful means of maximizing accuracy while keeping the computational cost at a minimum. This feature is not available in any existing packages for geotechnical finite element analysis.

+ Integrated analysis types

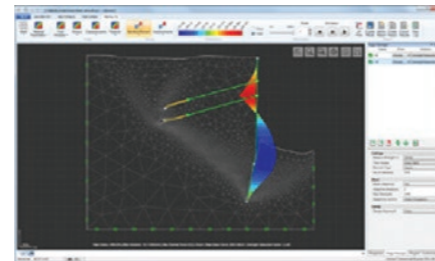
Most geotechnical analyses require several independent analyses before the main analysis can proceed. In OptumG2 preliminary analyses are carried out automatically as part of the main analysis. This includes seepage analysis based on general variably saturated flow theory and a unique procedure for calculating the initial stresses on the basis of a specified earth pressure coefficient.



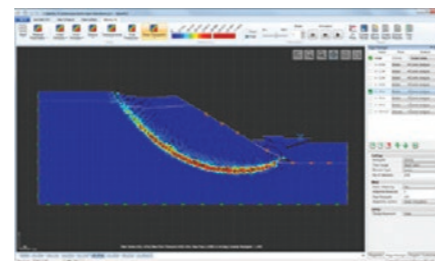
Modern Graphical User Interface ensuring an intuitive and efficient workflow



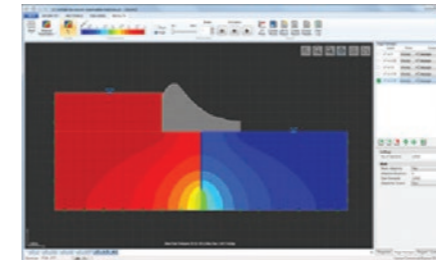
Limit Analysis for rapid and rigorous evaluation of upper and lower bounds on bearing capacity



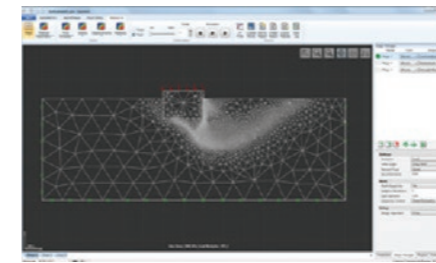
Staged Construction for excavation analysis, embankment construction, tunneling etc.



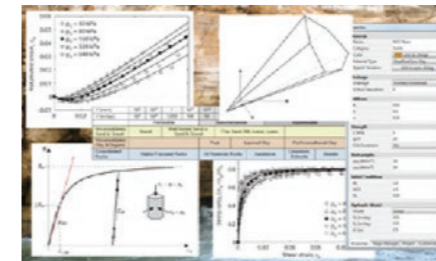
Strength Reduction Analysis for rapid and rigorous evaluation of upper and lower bounds on factor of safety



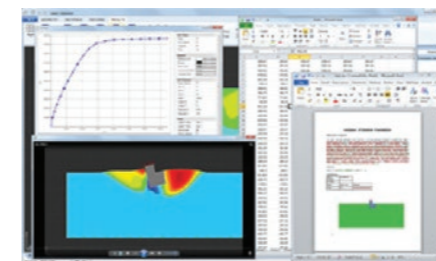
Seepage Analysis based on general variably saturated flow theory



Automatic adaptive mesh refinement ensuring maximum accuracy at minimum computational cost



Soil and Rock Models including Mohr-Coulomb, Tresca (Standard and generalized), Hoek-Brown, Modified Cam Clay, GSK, HMC, AUS and Bolton



Documentation Tools including plotting, videos, automatic report generation (MS Word) and results export (MS Excel)

+ Eurocode 7 compatibility

The analysis types available in OptumG2 are very well aligned with the philosophy of Eurocode 7. ULS can be handled via Limit Analysis and Strength Reduction while SLS is handled via Elastoplastic or Consolidation analysis. Furthermore, OptumG2 includes functionalities for applying partial factors according to the various design approaches prescribed by Eurocode 7.

+ Modern graphical user interface

The graphical user interface of OptumG2 has been designed to ensure maximum efficiency in defining problems and interpreting results. Coupled with a computational core that poses very few limitations, the result is a program that is easy and intuitive to use – both for simple problems as well as for problems involving numerous construction stages, materials, and analysis types.

+ Stochastic analysis

To account for the inherent uncertainty and variability of the material parameters describing the strength and deformation properties of geomaterials, OptumG2 comes with the possibility to conduct stochastic analysis on the basis of the random fields concept. Random distributions of a specified parameter are generated and the analysis is carried out in a Monte Carlo fashion. Rather than a single value of settlement, bearing capacity or similar, the end result is probability distributions of these quantities.

Alternatively, stochastic analysis may be conducted by importing distributions of parameters generated outside OptumG2.

+ Command line version

While most problems are conveniently dealt with using the standard version of OptumG2, it is possible to bypass the graphical user interface and call the computational core from a command prompt or via batch files. This feature is useful when numerous similar problems need to be processed and is ideal for parameter studies.

FEATURES +

+ Efficient and Robust Algorithms

State-of-the-art algorithms ensure unmatched efficiency and robustness

+ Adaptive Mesh Refinement

For all analysis – maximizes accuracy while minimizing computational time

+ Upper and Lower Bounds

Rigorous bounds on quantities of interest including bearing capacities and displacements

+ Accurate Soil and Rock Models

Mohr-Coulomb, Tresca, Hoek-Brown, Modified Cam Clay, Hardening Mohr-Coulomb, Bolton and more.

+ Stochastic Analysis

Random held simulation to determine probability distributions for quantities of interest

+ Material Parameter Distributions

Convenient import of user generated material parameter distributions

+ Eurocode 7 Compatibility

Functionality for applying partial factors according to Eurocode 7

+ Command line version

Bypass the graphical user interface and call the computational core via command prompt

+ CAD Import and Export

Functionality for importing and exporting geometry in DXF format

FULLY SUPPORTED

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

+ SOIL AND ROCK MODELS

+Mohr-Coulomb: the classic benchmark model with numerous enhancements including tension cut-off and fissures

+Drucker-Prager: similar to but sometimes preferred over Mohr-Coulomb for rock and concrete

+Tresca: Standard and Generalized versions, the latter being relevant for axisymmetric analysis

+AUS: Anisotropic Undrained Shear model for advanced analysis of soft soils displaying anisotropic strength and stiffness

+Hoek-Brown: State-of-the-art model for fractured rock masses with various enhancements including compression cap

+GSK: Useful and convenient nonlinear Mohr-Coulomb type model for geomaterials including rock, clay and sands

+Bolton: State-of-the-art model for sands particularly relevant at low stress levels

+Modied Cam Clay: The classic model for clays with various enhancements

+HMC: Accurate and user friendly model for hardening soils including sands and stiff clay

+Hydraulic Models: Various hydraulic models, applicable to all materials, including the van Genuchten model

+ ANALYSIS TYPES

+Limit Analysis: Fast and rigorous evaluation of upper and lower bounds on bearing capacity, stability numbers, etc

+Strength Reduction: Fast and rigorous evaluation of upper and lower bounds on factor of safety

+Elastoplastic: Fast and accurate analysis using a variety of basic and advanced constitutive models

+Consolidation: For analysis of time dependent excess pore pressure dissipation using a general Biot formulation

+Seepage: Based on general variably saturated flow theory

+Initial Stress: Determination of initial stresses on the basis of a specified earth pressure coefficient (arbitrary geometries)

+Staged Construction: convenient and intuitive sequencing of construction stages

+ STRUCTURAL ELEMENTS

+Plate: Elastoplastic plates, possibly with elastoplastic hinges, for modelling walls, tunnel linings, foundation skirts, etc

+Geogrid: For modelling geotextiles and other types of reinforcement

+Nail: For modelling soil nails, rock bolts and similar.

+Fixed End Anchor: Convenient element for modelling anchors as a point element

+Connector: Element for Plate-to-Plate connections and similar without interacting with the soil

+Shear Joint: For modelling discontinuities, faults, and similar features

+ FREE DOWNLOAD

Visit www.optumce.com to download your copy of the latest version of OptumG2.

TRY IT FREE FOR 30 DAYS

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