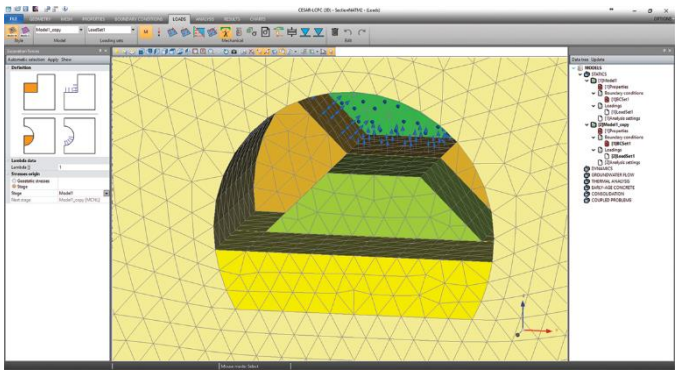
CESAR 3D

FEA software for Civil Engineering

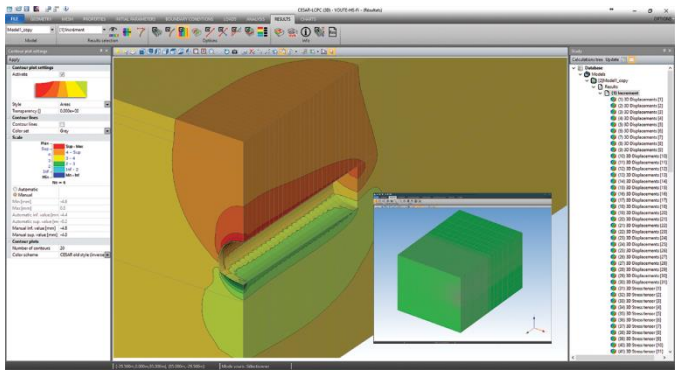
www.cesar-lcpc.com

Tunnels and underground structures

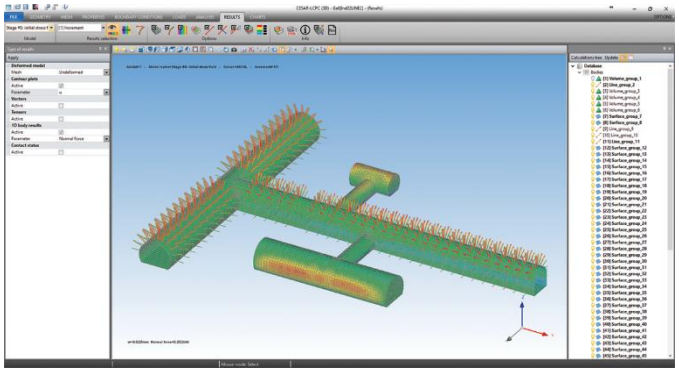
CESAR-LCPC is a Finite Element software for modelling and analysis of geotechnical studies. It can be used in a number of ways in tunnel projects. Reliable, powerful and user-friendly, it covers a large scope of applications in soil and rock mechanics (strains, stabilities…). With CESAR 3D, the tunnel engineer has a powerful tool for conducting his projects of new galleries, accounting for ancient metro lines, interaction with surface constructions, severe soils conditions and more.



NATM - Shield tunnelling - Traditional method



Suitable constitutive models (Soils & Structures)



High capacity 3D meshers and algorithms

Key features

Rich content

CESAR associates mechanics, hydrogeology, heat transfer and dynamics, required for modelling of geotechnical works.

Proven program

Tested and validated against analytical solutions, CESAR has been sold commercially for over 20 years.

Reliable support

Our experienced team provides you with the appropriate level of response and training for your technical questions.

itech
8 quai de Bir Hakeim – F-94410 Saint-Maurice
Tel: +33 149 76 12 59 – Fax: +33 1 42 83 33 84
contact: cesar-lcpc@itech-soft.com

itech

CESAR 3D is equipped with a wide set of tools for generating accurate models. Amongst them…

Pre-processing

Geometry edition

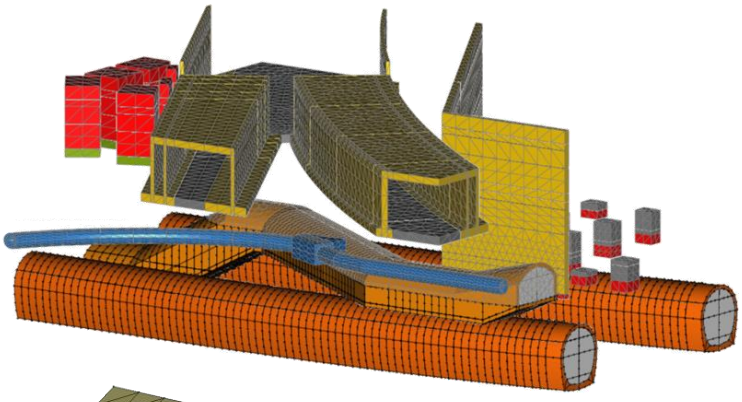
- Standard CAD tools
- Scripts for tunnels
- Imports (LandXML, DXF…)

Element library

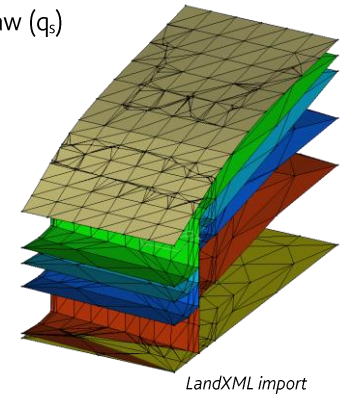
- Volumes: soils, massive structures
- Beams: retaining walls, linings
- Trusses: anchors with interaction law (q_s)
- Interfaces: joints, contact, faults

Load library

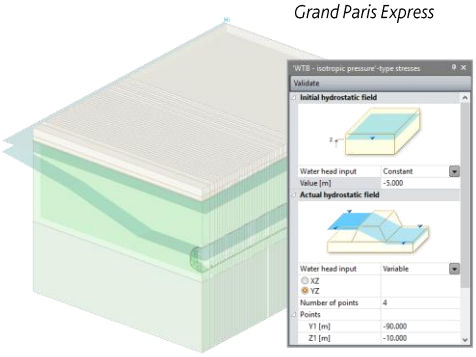
- Stress release in soil
- Nodal forces and various pressures
- Hydrostatic pressure
- 3D WTB variation
- Thermal stresses
- Long-term effects



Network of underground structures Grand Paris Express



LandXML import



WTB definition

Constitutive models

CESAR 3D integrates a comprehensive library of constitutive models:

- Soil mechanics: linear or non-linear elasticity; Mohr-Coulomb, Cam-clay, HSM reduced, Hoek-Brown plastic criteria…
- Nonlinear concrete
- Masonry constitutive models for ancient metro galleries

> See dedicated leaflet « Constitutive models »

Analysis algorithms

Staged construction

- Initial stress states
- C-phi reduction method
- Safety factor analysis

Hydrogeology

- Steady or transient flows
- Saturated or unsaturated soil masses

Coupling

- Consolidation
- Thermo-mechanics

Post-processing tools

Result display

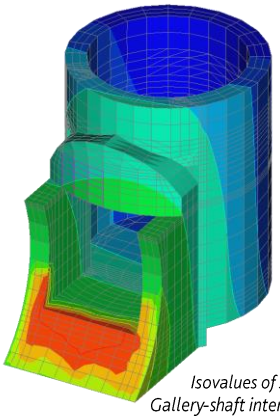
- Displacement and stress isovalues
- N, V, M in 1D elements
- Stresses, efforts and moments in shell elements
- Contact status (bonding, sliding, opening)
- Movable cut plane

Graphs

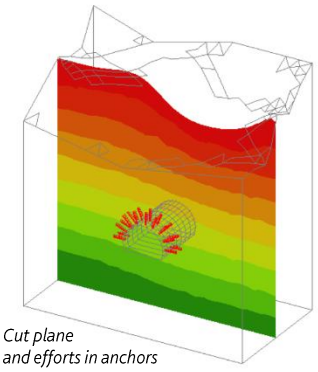
- Scalar along a user-defined line
- Integration of stresses into forces N, V, M
- Point tracking relative to increments (load, time)

Listings

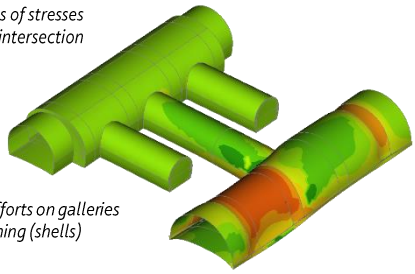
- MS-Excel compatible tables
- Results export per object or stage



Isovalues of stresses Gallery-shaft intersection



Cut plane and efforts in anchors



Efforts on galleries lining (shells)

itech
8 quai de Bir Hakeim – F-94410 Saint-Maurice
Tel: +33 149 76 12 59 – Fax: +33 1 42 83 33 84
contact: cesar-lcpc@itech-soft.com

itech