CESAR LCPC

FEA software for Civil Engineering

www.cesar-lcpc.com

Constitutive models for materials

Teams of the IFSTTAR research institute, former LCPC, developed and validated numerous constitutive models for various materials used in Civil Engineering. In order to encompass these research works, a numerical toolbox of constitutive models has been designed and integrated in the software CESAR-LCPC, proposing elastic laws, plasticity and hardening criteria. Thus adapted to the project context and geomaterials types, they show value added to geotechnical engineers for a better analysis of earthworks behaviour.

A rich integrated database

Elasticity

- Homogeneous isotropic linear elasticity
- Homogeneous othotropic linear elasticity
- Isotropic linear elasticity with E and ν varying linearly with depth
- Isotropic linear elasticity with E = f(z)
- Non-linear elasticity of the Hardening Soil Model
- Non-linear elasticity of Cam-Clay
- Non-linear elasticity of Duncan
- Non-linear elasticity of Fahey-Carter

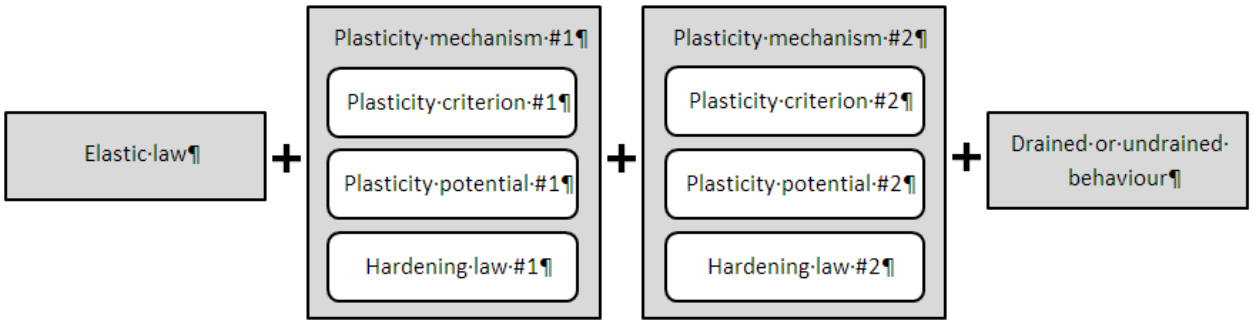
Plasticity criteria for other materials

- Von Mises
- Parabolic criterion
- Hill-Lourenço
- Willam Warnke
- Early-age concrete

Plasticity criteria for soils & rocks

- Mohr-Coulomb
- Mohr Coulomb criterion with c et φ varying linearly with depth (c = f(z) ; φ= f(z))
- Hardening Soil Model
- Cam-Clay (modified)
- Drucker-Prager
- Prévost–Hoëg
- Hoek-Brown (1997)
- Tresca
- Oriented criterion
- HiSS (Shao & Desai)
- S-Clay 1
- Vermeer
- Nova
- Mélanie.

Synoptic of possible combinations



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Information, videos, demo version

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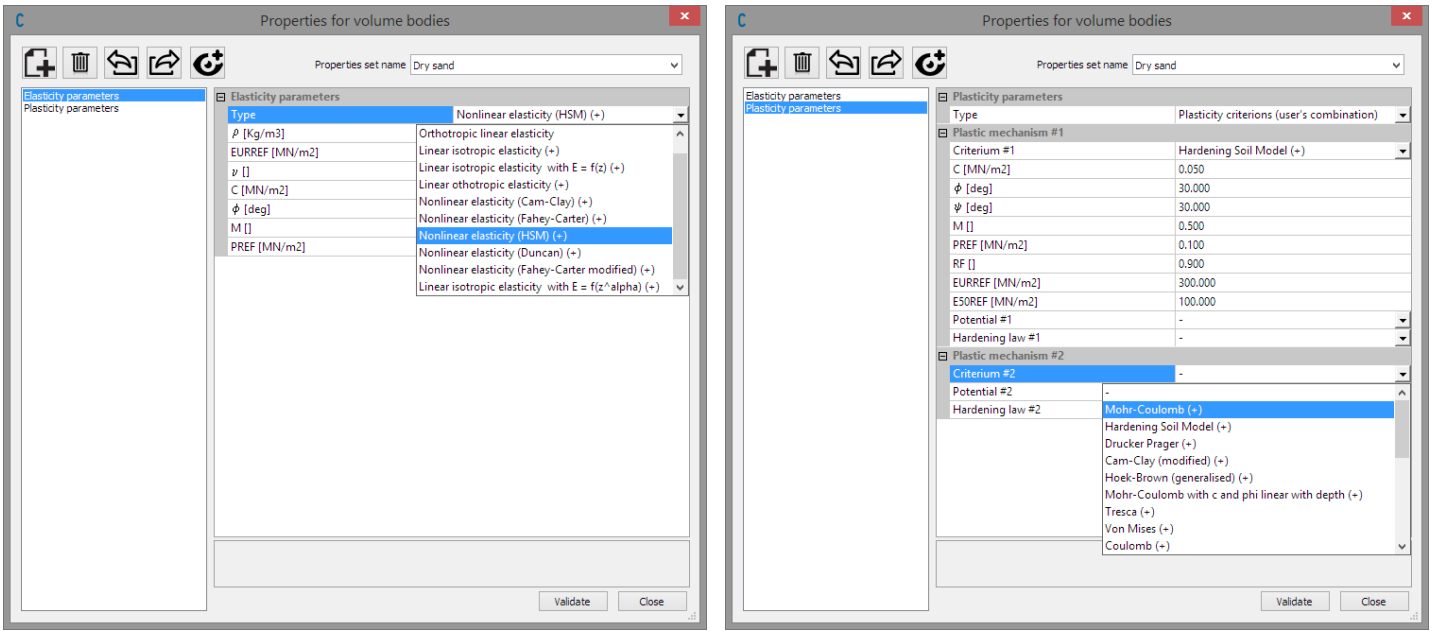
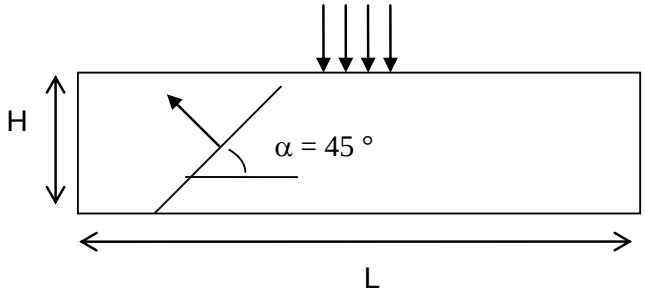
A toolbox for user-defined constitutive laws



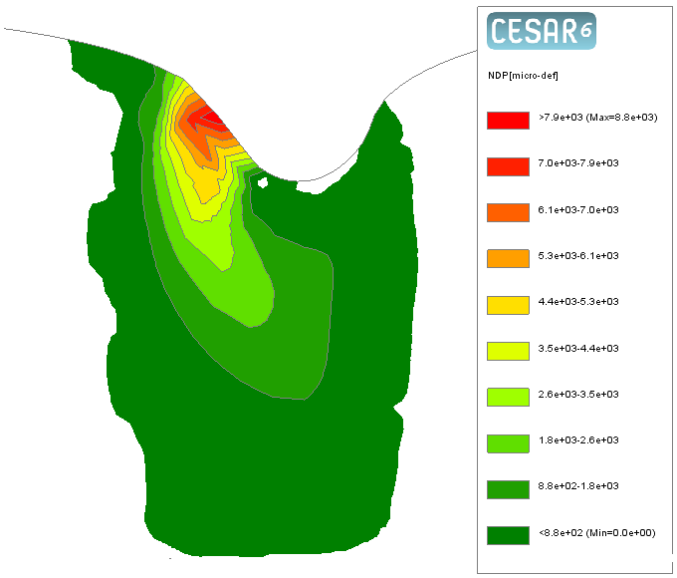
Examples of dialog toolboxes in CESAR-LCPC (version 6) for input of parameters of the constitutive laws

Example #1: Association of anisotropic elasticity with a plasticity criterion

Sketch of the problem

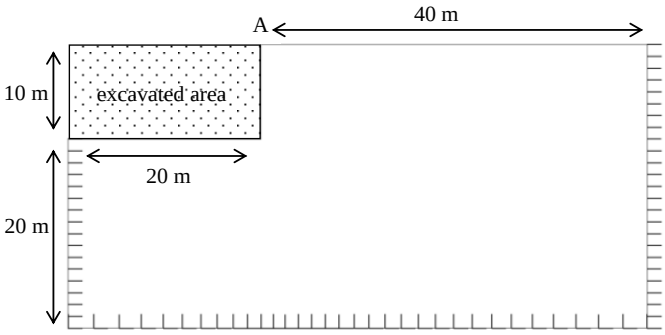


Results as scalar plots of plastic strains on the deformed mesh.

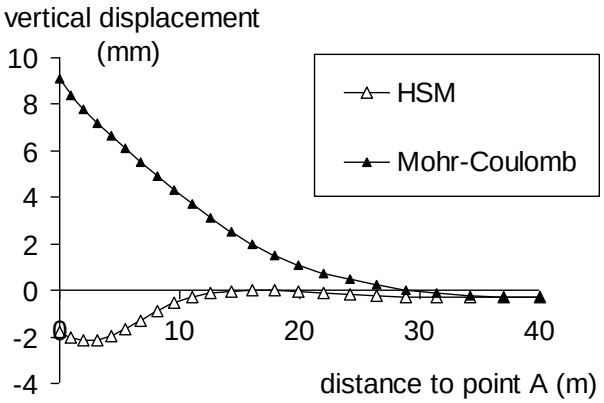


Example #2: Use of the Hardening Soil Model a non-supported excavation

Sketch of the problem



Comparison of vertical displacements computed at the surface of the earth behind excavation.



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