

## VON – WOLFFERSDORFF – MODEL

### Description

The von-Wolffersdorff-Model is a hypo-plastic constitutive model, especially used to model the compaction and shear deformation of sand.

A detailed description is given in the following publications:

von Wolffersdorff, P.-A.: A hypoplastic relation for granular materials with a predefined limit state surface, *Mechanics of Cohesive-Frictional Materials*, vol. 1, 251-271 (1996)

Marcher Th., Vermeer P.A. and von Wolffersdorff P.-A.: Hypoplastic and elastoplastic modelling - a comparison with test data, *Constitutive modelling of granular materials*, Springer-Verlag Berlin Heidelberg (2000)

Kolymbas, D.: Introduction to Hypoplasticity, *Advances in Geotechnical Engineering and Tunneling 1*, A.A. Balkema, 2000, 94 pages

### Input parameters

Property name	Description	Description in literature	Typical data set (exemplary)
hs	Granular stiffness	$h_s$	1e9
n	Exponent of compression law	n	0.29
phic	Critical friction angle	$\varphi_c$	32
ec0	Critical void ratio	$e_{c0}$	0.91
ed0	Void ratio at maximum density	$e_{d0}$	0.61
ei0	Void ratio at minimum density	$e_{i0}$	1.09
Alpha	Pycnotropy exponent	$\alpha$	0.19
Beta	Pycnotropy exponent	$\beta$	2.00
voidz	Actual void ratio	----	0.59
conmodulus	Maximum stiffness	----	5e9

### Practical hints

- The model was successfully tested with FLAC in 2D using the large and small strain configuration as well as FLAC-3D in small strain configuration.
- When using velocity boundary conditions, the user should take care, that small increments are used.
- The behaviour of sand under single loading and unloading is well reproduced, but cyclic loading not (more complex constitutive models are needed).
- It is necessary to use the 'double precision'-version of FLAC
- The input parameter 'conmodulus' is used by the code to calculate the maximum wave propagation speed and the corresponding time-step for a physical stable calculation (it is not a material property of the constitutive model itself)

**Included documents / files**

Name	Type	Description
hypoplast_1.dat	FLAC-Inputfile	Single element loading / unloading test
hypoplast_2.dat	FLAC-Inputfile	Foundation on a half space (settlements)

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